Lawrence Berkeley Laboratory

UNIVERSITY OF CALIFORNIA

ENVIRONMENT, HEALTH AND SAFETY DIVISION

**Mixed Waste Certification Plan for the
Lawrence Berkeley Laboratory Hazardous
Waste Handling Facility**

January 1995

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Mixed Waste Certification Plan
for the Lawrence Berkeley Laboratory
Hazardous Waste Handling Facility

Revision 1
Effective Date: January 10, 1995

Environment, Health and Safety Division
Lawrence Berkeley Laboratory
University of California
Berkeley, CA 94720

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**Mixed Waste Certification Plan for the LBL
Hazardous Waste Handling Facility**

PUB-5354

Revision 1

Effective Date: January 10, 1995

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Contents

1.	Introduction	1-1
2.	Organization and Responsibilities	2-1
3.	Certification Methodology	3-1
4.	Quality Assurance	4-1
5.	References	5-1

Appendices

A.	Master Procedure List, Waste Management Program	A-1
B.	Definitions	B-1

List of Figures

Figure 1-1.	Location of LBL in relation to its surroundings	1-3
Figure 1-2.	LBL site map showing location of the HWHF	1-4
Figure 1-3.	HWHF site plan	1-5
Figure 2-1.	Environment Department Organization Chart	2-1
Figure 2-2.	Organizational Flow for Mixed Waste	2-2
Figure 3-1.	Master Flow Chart for Low-Level Mixed Waste at LBL, with Governing Documents Listed	3-2
Figure 3-2.	Characterization of Waste from RMMAs	3-4
Figure 3-3.	Onsite Transfer of Waste to the HWHF	3-5
Figure 3-4.	Offsite Transfer of Radioactive and Mixed Waste to the HWHF	3-6
Figure 3-5.	Application Process for SDARs	3-7
Figure 3-6.	Documentation and Release of Radioactive Waste to Hanford— Prior to Arrival of Truck that will Ship the Waste	3-8
Figure 3-7.	Documentation and Release of Radioactive Waste to Hanford— After Arrival of Truck that will Ship the Waste	3-9
Figure 4-1.	EH&S Organization	4-2

List of Tables

Table 4-1.	NQA-1 Criteria and Relevant WM QA Plan Sections	4-17
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1. Introduction

1.1 Purpose

The purpose of this plan is to describe the organization and methodology for the certification of mixed waste handled in the Hazardous Waste Handling Facility (HWHF) at Lawrence Berkeley Laboratory (LBL). This plan is composed to meet the requirements found in the Westinghouse Hanford Company (WHC) Solid Waste Acceptance Criteria (WAC) [1] and follows the suggested outline provided by WHC in the letter of April 26, 1990, to Dr. R. H. Thomas, Occupational Health Division, LBL. Mixed waste is to be transferred to the WHC Hanford Site Central Waste Complex and Burial Grounds in Hanford, Washington.

The plan also incorporates the applicable elements of waste reduction, which include both up-front minimization and end-product treatment to reduce the volume and toxicity of the waste; segregation of the waste as it applies to certification; a summary of the Waste Management Quality Assurance (QA) Plan [2] for the HWHF (Section 4); and a list of the current and planned implementing procedures used in waste certification (Appendix A).

This plan provides guidance from the HWHF to waste handlers and the Waste Certification Specialist to enable them to conduct their activities and carry out their responsibilities in a manner that complies with the requirements of WHC-WAC. It also provides guidance to waste generators through the *Guidelines for Generators of Hazardous Chemical Waste at LBL and Guidelines for Generators of Radioactive and Mixed Waste at LBL* [3] (hereinafter called the *Guidelines for Generators*). These Guidelines incorporate all minimization, characterization, separation, segregation, labeling, and packaging requirements applying to generators of mixed waste. Waste generators have the primary responsibility for the proper characterization of mixed waste. The Waste Certification Specialist verifies and certifies that LBL mixed waste is characterized, handled, and shipped in accordance with the requirements of WHC-WAC.

Certification is the governing process by which LBL personnel conduct their waste generating and waste handling activities in such a manner that the Waste Certification Specialist can verify that the requirements of WHC-WAC are met.

Continued on next page.

1. Introduction (continued)

1.2 Scope

This Mixed Waste Certification Plan applies to mixed waste that is generated at LBL and becomes the responsibility of the HWHF. Mixed waste is defined in Appendix B of this document, in WHC-WAC, and in Department of Energy (DOE) Order 5820.2A [4]. Mixed waste is low-level waste or transuranic waste that also contains dangerous waste as defined in the Washington State *Dangerous Waste Regulations*, 173-303-040 (18) [5]. The certification process for low-level waste and is addressed in the *Low-Level Waste Certification Plan* [6]. The certification process for transuranic waste is addressed by the *Transuranic Waste Certification Plan* [7].

1.3 Facility Description

1.3.1 Overall Description

LBL is located in the Oakland-Berkeley hills, adjacent to the Berkeley campus of the University of California. Figure 1-1 is a map of the Laboratory and surrounding area. LBL is a multipurpose national scientific laboratory, whose mission is to conduct forefront scientific research in several areas related to energy sciences, general sciences, and life sciences.

These research activities result in the generation of radioactive and hazardous wastes, as well as mixed waste.

1.3.2 Hazardous Waste Handling Facility

Hazardous waste, radioactive waste, and mixed waste are stored, packaged, and prepared for offsite transport at the HWHF. The HWHF is a Resource Conservation and Recovery Act (RCRA) facility and consists of several indoor and outdoor handling and storage areas. Activities performed at the HWHF consist primarily of consolidation, storage, and packaging of the waste for safe removal and transportation to a permanent offsite disposal facility. LBL has no waste disposal facilities. Figure 1-2 is the LBL site plan, showing the location of the HWHF. Figure 1-3 is a site plan of the HWHF, showing the location of the waste handling and storage areas.

Continued on next page.

1. Introduction (continued)

Figure 1-1

Location of LBL in relation to its surroundings

Continued on next page.

1. Introduction (continued)

Figure 1-2

LBL site map, showing location of the HWHF

Continued on next page.

1. Introduction (continued)

Figure 1-3

HWHF site plan

Continued on next page.

1. Introduction (continued)

1.3.2 (continued) Mixed waste is managed at LBL in accordance with applicable U.S. DOE, U.S. Environmental Protection Agency (EPA), State of California, and Washington State regulations and is packaged and transported to the WHC disposal/storage site in accordance with U.S. Department of Transportation (DOT) regulations.

WHC determines whether each request for storage or disposal of mixed waste meets its requirements, and prepares and issues a Storage/Disposal Approval Record (SDAR). Transuranic mixed waste is currently received for storage only by WHC and is intended for eventual shipment to the Waste Isolation Pilot Plant in New Mexico, which is not yet available for waste disposal. Transuranic waste shipped to Hanford must, therefore, also meet the waste acceptance criteria specified in WIPP-DOE-069 [8].

A new HWHF is currently under construction. The new facility will consolidate separate waste-handling operations in one modern facility with enhanced safety and waste-containment functions. A Part B Permit Application was approved by the California Department of Toxic Substances Control to cover operations at the new facility and to close the existing one.

1.4 Facility Waste Management Strategy

The Environment, Health and Safety Division (EH&S) is responsible for the preparation of the *Waste Management Plan* [9], which governs treatment, storage, and shipment of mixed waste. Individual generators are responsible for the characterization of wastes, including mixed waste, in accordance with procedures established by EH&S.

1.4.1 References

The LBL Waste Management Program meets the applicable guidance of the following:

- DOE Order 5820.2A, *Radioactive Waste Management*
- Code of Federal Regulations (CFR), Title 40 [10]
- Code of Federal Regulations (CFR), Title 49 [11]
- Washington State, *Dangerous Waste Regulations*, Washington Administrative Code, Chapter 173-303, latest revision
- California Code of Regulations Title 22 [12]
- *Hanford Site Radioactive Solid Waste Acceptance Criteria* (WHC-EP-0063), latest revision

Continued on next page.

1. Introduction (continued)

1.4.1 (continued)

The Waste Management Program at LBL is implemented through the following documents, in addition to this Mixed Waste Certification Plan:

- LBL Health and Safety Manual, LBL PUB-3000 [13]
- *Certification Plan, Low-Level Waste, Hazardous Waste Handling Facility*, LBL PUB-5352, latest revision
- *Certification Plan, Transuranic Waste, Hazardous Waste Handling Facility*, LBL PUB-5355, latest revision
- *Hazardous Waste Certification Plan, Hazardous Waste Handling Facility*, LBL PUB-5356, latest revision [14]
- Waste Management procedures (listed in Appendix A)
- *Waste Management Plan*
- *Waste Management Function Notebook and Hazardous Waste Handling Facility Facility Notebook* [15]
- *Guidelines for Generators of Hazardous Chemical Waste at LBL and Guidelines for Generators of Radioactive and Mixed Waste at LBL*, LBL PUB-3092, latest revision
- *Waste Minimization and Pollution Prevention Awareness Plan* [16]
- *Waste Management Quality Assurance Plan*, latest revision
- *Guidelines for Waste Accumulation Areas (WAAs) at LBL*, LBL PUB-3093, latest revision [17]
- *Medical and Biohazardous Waste Generator's Guide*, LBL PUB-3095, latest revision [18]

Continued on next page.

1. Introduction (continued)

1.4.2

Summary of Waste Minimization, Segregation, Certification, Packaging, and Shipping Activities

Minimization

The *Waste Minimization and Pollution Prevention Awareness Plan* provides the policy, strategy, objectives, and goals for waste minimization at LBL.

Segregation

Segregation activities include specific separation and storage instructions contained in the *Guidelines for Generators* and detailed in specific waste stream procedures, as listed in Appendix A. Actions currently practiced at LBL to achieve waste segregation include

- handling radioactive wastes separately from all other wastes
- using good housekeeping in hoods, glove boxes, and laboratories
- accumulating radioactive wastes in separate, labeled, specially designated containers (e.g., ice cream cartons or waste sacks in garbage cans)
- transporting radioactive wastes separately from other types of waste
- storing radioactive waste in separate areas at the HWHF
- keeping sharp objects (e.g., hypodermic needles, scalpels) in separate protective containers.

Certification

This Mixed Waste Certification Plan is established by the HWHF to demonstrate compliance with WHC-WAC for mixed waste. The processes for identifying, packaging, labeling, marking, and documenting mixed waste are identified in Section 3 of this Mixed Waste Certification Plan.

LBL requires all waste generators to attend training courses that support the detailed implementation of waste handling, sampling, and analysis activities sufficient to assure certification. The *Guidelines for Generators* has also been issued for use.

Continued on next page.

1. Introduction (continued)

1.4.2 (continued)

Packaging

Waste packaging criteria are identified in Section 3.14 for each waste stream. LBL practices for packaging of mixed waste include

- packaging noncompactable waste separately
- keeping sharp objects (hypodermic needles, scalpels) in separate protective containers
- inspecting shipping containers upon receipt to assure that the containers are in acceptable condition and properly marked, and after packaging to assure marking, labeling, and closure are adequate, according to quality control (QC) inspection procedures
- conducting inspection or surveillance during packaging operations to assure that the waste acceptance criteria are being met.

Shipping

Shipping requirements are identified in Section 3.16. LBL shipping practices include

- transporting mixed waste separately in containers that meet all applicable regulations
- inspecting all shipping containers for integrity and proper marking and labeling
- inspecting the loaded vehicle to ensure that it is properly blocked and braced, properly placarded, and meets dose-rate and contamination limits
- complying with DOT radioactive materials transportation regulations (49 CFR) and WHC-WAC.

Continued on next page.

1. Introduction (continued)

1.4.3 Waste Disposal QA Oversight Summary

A summary of the Waste Management QA Plan requirements for mixed waste certification is presented in Section 4. The following are some important requirements of the Waste Management QA Plan.

- Regular inspections of the HWHF and the stored waste are performed by EH&S personnel.
- Internal audits are conducted by LBL's Office of Assessment and Assurance on a two- or three-year basis.
- DOE external audits are done periodically.
- Functional audits of the Waste Management program by each of the other EH&S Departments (Health, Safety) are done at least annually, depending on the findings of previous audits. The following groups provide annual functional audits of the Waste Management Program:
 - *Health Department:* Industrial Hygiene Group, Radiation Assessment Group
 - *Safety Department:* Occupational Safety Group, Fire Department's Prevention Unit (the Fire Department is part of the Safety Department)
- Waste disposal personnel periodically review waste packaging, storage, and disposal requirements, including those stated in WHC-WAC and other governing documents.
- Waste disposal personnel review all documentation and applicable DOE orders on a regular basis.

Continued on next page.

1. Introduction (continued)

1.5 Mixed Waste Generation

Mixed waste is generated by many divisions at LBL. These include the Materials Sciences, Chemical Sciences, Accelerator and Fusion Research, Energy and Environment, Structural Biology, and Life Sciences divisions. Currently the mixed waste streams are identified, based on the following forms and characteristics:

- Low-level mixed aqueous liquids, which contain laboratory radioactive solutions contaminated with hazardous substances.
 - Low-level noncompactable solids, composed of solid dry material such as arsenic targets that are contaminated via accelerator bombardment.
 - Low-level induced metals, such as lead, that have been irradiated via accelerator bombardment.
 - Low-level mixed organic liquids, consisting of flammable or combustible solutions mixed with radioisotopes.
 - Transuranic mixed liquid, resulting from glove box operations.
 - Transuranic mixed solids, resulting from glove box operations.
-

2. Organization and Responsibilities

2.1 Description of Facility Organization

The Environment Department of the Environment, Health, and Safety Division (EH&S) has the responsibility for management of mixed waste at LBL. Within the Environment Department, the Radioactive/Mixed Waste Operations Unit is responsible for handling and shipping mixed waste. Figure 2-1 shows the Environment Department organization, and Figure 2-2 shows the organizational flow for these wastes.

Figure 2-1

Environment Department Organization Chart

Continued on next page.

2. Organization and Responsibilities (continued)

Figure 2-2

Organizational Flow for Mixed Waste

2.2 Duties and Responsibilities

This section lists positions responsible for the management and handling of mixed waste, with the responsibilities for each job title. Quality assurance (QA) responsibilities are listed where relevant. Additional responsibilities are listed in Section 4, *Quality Assurance*.

2.2.1 Division Director, Environment, Health and Safety Division

- Has overall responsibility for environment, health, and safety issues at LBL.
- Assures the resources necessary to conduct HWHF operations in a safe manner.

2.2.2 Head, Environment Department

- Has overall responsibility for implementation of the Waste Management QA Plan at the HWHF.
- Reviews and approves the Waste Management QA Plan and revisions.

Continued on next page.

2. Organization and Responsibilities (continued)

2.2.3

Waste Management Group Leader

- Is responsible for directing and monitoring all HWHF operations.
- Is responsible for directing and monitoring the implementation of the HWHF QA program.
- Reviews and approves this Mixed Waste Certification Plan.
- Reviews and approves the Waste Management procedures.
- Assures that waste handling operations are conducted in accordance with the requirements of WHC-WAC.
- Assures that the procedures developed for LBL wastes are reviewed and updated regularly.
- Approves the development and use of calibration procedures and requirements for control of measuring and test equipment.
- Develops and keeps current the LBL *Waste Management Plan*.

2.2.4

Radioactive Waste Operations Manager

- Is responsible for the supervision of mixed waste handling, processing, and transportation.
- Evaluates decontamination and waste disposal work, and issues assignments to Unit members.
- Organizes and trains personnel and evaluates their performance.
- Is trained in the regulations of WAC 173-303.
- Maintains up-to-date knowledge of all current Cal-EPA, DOE, and other regulations pertaining to hazardous and radioactive waste disposal for implementation within the department.
- Assures that waste is properly analyzed for a safe waste disposal system and that effective methods of minimizing and segregating wastes are instituted.
- Advises and coordinates the mixed waste and radioactive waste processing.

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2. Organization and Responsibilities (continued)

-
2.2.4 (continued)	• Prepares for state and federal audits and inquiries, and responds to various regulatory entities when required.• Assures that waste disposal files are maintained.• Interacts with regulatory agencies to maintain compliance with all regulations.• Supervises and coordinates job assignments.• Assures that each assigned person reads the Waste Management QA Plan and is briefed on the HWHF quality goals, areas of responsibility, and formal work controls, with emphasis on the individual's specific responsibilities.• Assures that services, materials, equipment, and components of shipping containers are selected from supplier that meet DOT requirements, as specified in 49 CFR.• Reviews and approves the Waste Management Program procedures.• Finds vendors to provide services for disposal, recycling, and transportation of mixed waste, and assures that such services comply with all applicable State of California, Washington State, DOE, EPA, and DOT requirements.
2.2.5
Specialist
Radioactive
Waste Technicians	• Under limited supervision, collects, identifies, transports, prepares, stores, and prepares shipments (for disposal) of hazardous, radioactive, and mixed wastes.• Cleans up spills and decontaminates equipment/areas as required.• Applies comprehensive knowledge of hazards associated with hazardous and radioactive materials for safe handling, possible reuse, and appropriate disposal.• Improves methods to minimize mixed waste.• Maintains compliance with all applicable regulations.
-

Continued on next page.

2. Organization and Responsibilities (continued)

-
- 2.2.5 (continued)
- Takes prompt and appropriate action, when necessary, to prevent the effects of a detected quality problem from spreading.
 - Subjects mixed waste generated at LBL to minimization and proper packaging for shipment to approved waste disposal sites.
 - Evaluates contaminated laboratory equipment and reclaims it by chemical or physical decontamination.
 - Maintains an adequate disassembly and decontamination facility.
 - Maintains all required inventories and records associated with the above duties in an accurate, current, and useful format.
 - Performs other duties as directed by the Operations Manager.
- 2.2.6
Principal/Senior
Radioactive Waste
Technician
- Under normal supervision, performs complex duties in the field of radioisotope safety and hazardous and radioactive waste disposal and decontamination to achieve compliance with the LBL safety standards and with applicable legal requirements.
 - Monitors laboratory facilities, equipment, and personnel, decontaminating exposed areas.
 - Transports, stores, and disposes of mixed waste.
 - Keeps inspection records for all of the above.
 - Evaluates contaminated laboratory equipment and reclaims it by chemical or physical decontamination.
 - Assumes responsibility for equipment disposal based on hazardous conditions.
 - Performs other duties as directed by the Operations Manager.

Continued on next page.

2. Organization and Responsibilities (continued)

2.2.7 *Compliance Unit Manager*

- Is trained in the regulations of WAC 173-303.
- Maintains up-to-date knowledge of all current Cal-EPA, DOE, and other regulations pertaining to hazardous and radioactive waste disposal for implementation within the department.
- Evaluates each LBL operation that generates mixed waste.
- Prepares for state and Federal audits and inquiries, and responds to various regulatory entities when required.
- Interacts with regulatory agencies to maintain compliance with all regulations.
- Generates reports as required by DOE, EPA, or other regulatory agencies.
- Ensures that computer data are maintained on all waste streams.

2.2.8 *Waste Certification Specialist*

- Signs generator certification on the Uniform Hazardous Waste Manifest
- Signs the certification statement on the Low-Level Waste Storage/Disposal Request.
- Certifies compliance with waste acceptance criteria in general, and with WHC-WAC and the SDAR specifically for each waste package.
- Certifies that mixed waste storage, packaging, waste form criteria, and waste package criteria meet the applicable requirements of WHC-WAC.
- Certifies that DOT shipping requirements for surface radiation dose rates are met.
- Certifies that RMW disposal criteria specified in 40 CFR 268 and the Revised Code of Washington Title 70.105 are met.

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2. Organization and Responsibilities (continued)

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2.2.8 (continued)	• Finds vendors to provide services for disposal, recycling, and transportation of mixed waste, and assures that such services comply with all applicable State of California, Washington State, DOE, EPA, and DOT requirements.• Certifies that labeling and marking requirements of 49 CFR 171, 172, and 173, and WHC-WAC are met.• Certifies that the appropriate documentation and records are prepared.• Is trained in the regulations of WAC 173-303.
2.2.9
<i>Compliance Unit
Data Entry Clerk</i>	• Maintains computer data on all waste streams.
2.2.10
<i>Waste Minimization
Specialist (Environmental Protection
Group)</i>	• Works with waste generators to effect waste reduction as much as practicable.• Investigates and implements chemical recycling programs, as practicable.• Maintains records of waste minimization efforts.

Note: These duties were formerly handled by Waste Management Group staff. Although these duties have been transferred to the Environmental Protection Group, they are still listed here to assure readers that the waste minimization program continues.

Continued on next page.

2. Organization and Responsibilities (continued)

2.3

Principal Interfaces

2.3.1 *Internal*

HWHF personnel interface with all generators of mixed waste at LBL. For radioactive materials, HWHF personnel interface with users both before the research begins and after the material has been used and is intended for disposal. Interactions also occur in the case of an emergency and when calls for information regarding the handling of mixed waste are received from a user.

2.3.2 *External*

External interfaces occur with the Westinghouse Hanford Company's Solid Waste Engineering, material haulers, disposal facility personnel, and DOE, OSHA, State of California, University of California, and City of Berkeley personnel.

HWHF management also monitors the activities of "participating external groups," e.g., non-LBL organizations that provide services or materials for HWHF operations. The role of these groups is defined in various vendor purchase agreements.

3. Certification Methodology

**3.1
Certification
Process
Description—
Requirements**

This plan for certification of mixed waste is designed to assure that all mixed waste from the LBL HWHF meets the waste acceptance criteria for the Hanford Site Central Waste Complex and Burial Grounds. These criteria are established in WHC-WAC. The certification methodology addresses the following areas:

- *Waste Reduction:* LBL imposes technical and administrative controls for the minimization of mixed waste.
- *Waste Segregation:* LBL has developed technical and administrative procedures to identify and segregate mixed waste from low-level waste, transuranic waste, and hazardous waste.
- *Waste Characterization:* Any waste material that is known to be, or suspected of being, contaminated with hazardous components and radionuclides is fully characterized by the waste generators.
- *Waste Package and Shipment:* All mixed waste packages meet the surface dose, surface contamination, nuclear criticality, thermal power requirements, void space, and gas generation criteria imposed by WHC-WAC.

These criteria and LBL compliance are discussed in detail in the following sections.

Figure 3-1 shows the master flow chart for mixed waste at LBL, with governing LBL documents listed.

Continued on next page.

3. Certification Methodology (continued)

Figure 3-1 Master flow chart for low-level mixed waste at LBL, with governing LBL documents listed

Continued on next page.

3. Certification Methodology (continued)

3.2
Certification
Process Description

Detailed flowcharts are provided for the following discrete activities within the certification process:

- Characterization of waste from RMMAs (Figure 3-2)
- Onsite transfer of waste to the HWHF (Figure 3-3)
- Offsite transfer of waste to the HWHF (Figure 3-4)
- Application process for SDARs (Figure 3-5)
- Documentation and release of radioactive waste to Hanford—prior to arrival of truck that will ship the waste (Figure 3-6)
- Documentation and release of radioactive waste to Hanford—after arrival of truck that will ship the waste (Figure 3-7)

3.2.1
Waste
Minimization

LBL has established a series of documents delineating the policy and procedural requirements for generation and control of mixed waste. These documents include

- *Guidelines for Generators* (LBL PUB-3092)
- Waste Management procedures (Appendix A)
- *Waste Management Plan, Hazardous Waste Handling Facility, LBL*
- *Waste Minimization and Pollution Prevention Awareness Plan*

These documents form the basis of technical and administrative controls imposed on the waste generators in their effort to reduce the volume and amount of mixed waste material requiring disposal.

Mixed waste is assayed by the researchers, and a material balance is required. The radionuclide components are identified, and their quantities are determined and recorded at each stage of the generation process. This is done using process knowledge of the researchers or by analysis by a certified laboratory according to the requirements of the *Guidelines for Generators*. The generation and treatment of transuranic and low-level mixed waste at LBL is accomplished in compliance with DOE Order 5820.2A and WHC-WAC.

Continued on next page.

3. Certification Methodology (continued)

Figure 3-2

Characterization of waste from RMMAs
(adapted from EH&S Procedure 820)

Continued on next page.

3. Certification Methodology (continued)

Figure 3-3

Onsite transfer of waste to the HWHF
(adapted from EH&S Procedure 827)

*Generator may sign tag at either time.

Continued on next page.

3. Certification Methodology (continued)

Figure 3-4

Offsite Transfer of Radioactive and Mixed Waste to the HWHF
(tasks done by Radioactive Operations Unit Technician unless otherwise noted) (adapted from EH&S Procedure 828)

Continued on next page.

3. Certification Methodology (continued)

Figure 3-5

Application process for SDARs
(adapted from EH&S Procedure 830)

Continued on next page.

3. Certification Methodology (continued)

Figure 3-6 Documentation and release of radioactive waste to Hanford—prior to arrival of truck that will ship the waste
(adapted from EH&S Procedure 831)

Continued on next page.

3. Certification Methodology (continued)

Figure 3-7

Documentation and release of radioactive waste to Hanford—after arrival of truck that will ship the waste

(adapted from EH&S Procedure 831)

Continued on next page.

3. Certification Methodology (continued)

- 3.2.1 (continued) To reduce the quantities of mixed waste produced, individual generators are instructed to do the following:
- Minimize the gross volume of radioactive wastes by such practices as ordering only the amount of radioactive materials and chemicals used and designing experiments to use the minimum amount of radioactive materials and chemicals needed.
 - Try to modify procedures to substitute nonhazardous substances for hazardous substances.
 - Recycle or reuse chemicals.
 - Store radioactive wastes separately from hazardous wastes (oxidizers, explosives, flammables, poisons, toxics, and corrosives).
 - Separate radioactive and mixed wastes with half-lives of 45 days or shorter from other radioactive wastes.
 - Separate radioactive wastes into low-level waste, mixed hazardous and low-level wastes, transuranic wastes, and mixed hazardous and transuranic wastes. Keep each kind of waste in a separate container.
 - Do not add radioactive waste to hazardous wastes.
- 3.2.2
Radioactive
Isotope
Characterization
- Radionuclide accountability establishes the types and possibly the quantities of isotopes in the waste. The characterization of the waste identifies the radionuclides to satisfy the requirements of WHC-WAC. This includes the radionuclide distribution, concentration, and activity in the waste matrix. The characterization procedures assure that a realistic representation of the distribution of radionuclides within the waste is provided (given physical limitations). LBL radionuclide characterization procedures are detailed in the *Guidelines for Generators* and specific Waste Management procedures.
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Continued on next page.

3. Certification Methodology (continued)

3.2.2 (continued)

LBL personnel using radionuclides are responsible for characterizing the waste generated in their work areas. Their responsibilities are outlined in the *Guidelines for Generators*. Radioactive materials are analyzed before and after each chemical or physical operation. These assays are used to determine the material balance for each amount of radionuclide placed in the waste. Radioactive contaminated items are surveyed with appropriate portable instruments, and the estimated amounts of activity are determined. Both the physical and chemical composition of the waste and the radionuclides are identified by the user, aided by the HWHF Operations Technician. This information is recorded on the Radioactive Waste Tag attached to each package before the waste package is removed from the user's area. The Operations Technician examines each waste package for accuracy before removing it from the user's area.

3.2.3 *Physical/Chemical Characterization*

Waste certification includes the determination of the physical and chemical characteristics of the waste, including any void-filling material or absorbent. Physical/chemical characterization is accomplished similarly to the method used to characterize the radionuclide content of the waste, i.e., by use of process knowledge, indirect correlation, laboratory analysis, and inventory accountability.

Mixed Waste Designated for Storage

The process of characterization ensures that all of the following criteria are met and documented for mixed waste that is designated for storage:

General

- Waste is not capable of generating toxic gases, vapors, or fumes.

Liquids

- Liquid mixed waste is packaged per the appropriate SDAR.

PCBs

- PCB oils are packaged in liquid form as specified in WHC-WAC.
- Solids contaminated with PCBs are packaged as specified in WHC-WAC.

Continued on next page.

3. Certification Methodology (continued)

3.2.3 (continued)

Scintillation Liquids

- Scintillation liquids are packaged in lab packs (40 CFR 264.316) to comply with 49 CFR 173.12. Scintillation liquids that are restricted from land disposal are accepted only on a case-by-case basis.
- Scintillation vials are packaged as described in WHC-WAC and on the appropriate SDAR.
- Additional restrictions for scintillation liquids in the SDAR are followed.

Metals

- Alkali metals are packaged according to requirements set by the waste disposal criteria of the disposal facilities. They are accepted only on a very limited case-by-case basis.
- Mixed waste that contains lead is packaged in 55-gallon drums, unless the SDAR specifies alternate packaging. Any use of lead as a shielding material in waste containers must be approved by WHC.

Mercury

Mercury waste will meet the requirements of the storage/disposal facility.

Asbestos

- If asbestos is included, the waste is packaged according to WHC-WAC.
- Waste containing asbestos has an approved warning label on the outer packaging.

Continued on next page.

3. Certification Methodology (continued)

3.2.3 (continued)

Low-Level
Mixed Waste
Designated for
Disposal

For low-level mixed waste that is designated for disposal, the characterization process ensures that all of the following criteria are met and documented.

General

- Waste is not capable of generating toxic gases, vapors, fumes, or liquid.
- All waste is of a stable form.
- The waste matrix cannot spontaneously combust, decompose, explode, undergo liquid desorption, or affect containment barrier integrity.
- If the waste is capable of gas generation, catalysts or vents are properly used.
- Mixed waste containing significant concentrations of ^{14}C , ^{79}Se , ^{99}Tc , or ^{129}I is evaluated for acceptability on a case-by-case basis by WHC.
- Waste packages containing compressed gas cylinders adhere to the requirements of the disposal site.

Liquids

- No free liquids are present in the waste; all liquids are stabilized into a solid waste matrix.
- If absorption is used, it is according to WHC-WAC.
- Liquids are not packaged without approval of WHC.

Asbestos

- If asbestos is included, the waste is packaged according to WHC-WAC.

Metals

- If the waste contains alkali metals, it is packaged according to the requirements set by the waste disposal criteria of the disposal facilities.
- Mixed waste containing lead is treated according to 40 CFR 268. Lead used as shielding is reviewed on a case-by-case basis by WHC.

Continued on next page.

3. Certification Methodology (continued)

3.2.3 (continued)

Mercury

Mercury waste will meet the requirements of the storage/disposal facility.

3.2.4 *Waste Handling and Packaging Activities*

The waste certification process includes a review of the waste handling and packaging data, including

- volume of the waste (total of waste and any solidification or absorbent media)
- weight of the waste (total of waste and any solidification or absorbent media)
- packaging details, including date, package weight, total volume, land transportation category.

The certification process includes handling and packaging waste in accordance with procedures that assure that the waste is packaged and records generated in a manner that fulfills the requirements of WHC-WAC and the associated SDAR. This also includes the means to identify and document what is placed in waste containers and the means to prevent unauthorized or incorrect material from being placed in waste containers.

Mixed Waste Designated for Storage

For mixed waste that is designated for storage, certification assures that all of the following criteria are met and documented.

- Container integrity is assured.
- Only DOT-specification 17C or 17H (low-level mixed waste only) steel 55-gallon drums are used, unless alternate packages are approved.
- Drum exterior surfaces comply with WHC specification HS-V-P-0010-A. For other than 55-gallon drums, the SDAR specifies protective coatings.

Continued on next page.

3. Certification Methodology (continued)

3.2.4 (continued)

- At least two containment barriers are provided, or alternate requirements as specified in the SDAR are met. Requirements for barriers are as specified in WHC-WAC.
- Containers meet the handling criteria specified in WHC-WAC.
- Containers are noncombustible. External containment barriers are not wood, plywood, cardboard, or plastic.
- Surface radiation dose rates meet the requirements of 49 CFR 173.441. Approval by WHC is required before receipt of any contact-handled package that exceeds 100 mrem/h at any point.
- Removable surface contamination does not exceed
 - 20 dpm/100 cm² for alpha-contaminated low-level mixed waste
 - 100 dpm/100 cm² for beta/gamma-contaminated low-level mixed waste
 - 20 dpm/100 cm² for alpha-contaminated transuranic mixed waste
 - 999 dpm/100 cm² for beta/gamma-contaminated transuranic mixed waste
- There is no fixation of surface contamination on returnable overpacks.
- The nuclear criticality limits are met. These are specified in WHC-WAC for both low-level and transuranic mixed waste.
- Thermal power acceptance criteria included in the SDAR are met.
- Catalysts or vents required by the SDAR are used properly.
- The void space within the container does not exceed 10% of the container volume.

Continued on next page.

3. Certification Methodology (continued)

3.2.4 (continued)

Low-Level
Mixed Waste
Designated for
Disposal

For low-level mixed waste that is designated for disposal, certification assures that all of the following criteria are met and documented.

- Container integrity is assured.
- Only DOT-specified containers or equivalent are used.
- Two containment barriers are provided, or alternate requirements as specified in the SDAR.
- External containment barriers are not jeopardized by adverse climatic conditions or stresses due to weight, configuration, or handling and transportation loads.
- Containers are constructed of flame-retardant material.
- Surface radiation dose rates meet the requirements of 40 CFR 173.441.
- The maximum surface dose rate for any single contact-handled waste package does not exceed 200 mrem/h at any point on the surface of 55-gallon drums or smaller packages. For packages larger than a 55-gallon drum, the same maximum dose rate applies, except that a marked point up to 1000 mrem/h on the bottom and on one side is allowed with prior approval from WHC.
- Removable surface contamination does not exceed
 - 20 dpm/100 cm² for alpha contamination
 - 1000 dpm/100 cm² for beta/gamma contamination.
- There is no fixation of surface contamination on returnable overpacks.
- Thermal power acceptance criteria included in the SDAR are met.
- Catalysts or vents required by the SDAR are used properly.
- Interior void spaces are minimized to the maximum extent possible.
- The void space within the container does not exceed 10% of container volume.

Continued on next page.

3. Certification Methodology (continued)

3.2.4 (continued)

Labeling and Marking

Labeling and marking requirements are the same for mixed waste storage and disposal, with the exception that no free organic liquids of any kind are allowed for disposal. The certification process ensures that

- All labeling and marking conforms to the requirements in 49 CFR 171, 172, and 173.
- For low-level and transuranic mixed waste, the labeling and marking requirements of WHC-WAC are met.
- For self-contained packages, remote-handled packages, and waste packages other than 55-gallon drums, the SDAR requirements are met.
- The labeling and marking character-size criteria of WHC-WAC are met.
- The location criteria of WHC-WAC are met.
- Packages are labeled with the following information:
 - WRM number
 - Package Identification Number (PIN) approved bar code
 - Gross weight (lbs or kg)
 - DOT hazard class labels, as required
 - RMW-EHW or RMW-DW, as applicable
 - THIS END UP legend, or directional arrows for packages having inner containers for liquids
 - Asbestos warnings, as required
 - Markings for drums that contain PCB contamination, as required by 40 CFR 761 subpart C or by the SDAR
 - LIQUID ORGANIC WASTE, if applicable
 - EPA hazardous waste sticker
 - Flashpoint or flashpoint range for drums with free organic liquids in inner containers.
- The manifest number is marked on the EPA hazardous waste sticker, the LLWSDR, and the Uniform Hazardous Waste Manifest form.

Continued on next page.

3. Certification Methodology (continued)

3.3

Procedures and Processes

Common to All Waste Streams

3.3.1

Qualification and Training

All users of radioactive materials are required to attend EH&S Courses 430 (Radiation Protection), 601 (Hazardous Waste Generators), and 621 (Radioactive and Mixed Waste). All attendees of Courses 601 and 621 receive copies of the *Guidelines for Generators*.

HWHF personnel receive extensive training on the handling of radioactive wastes, as well as handling of hazardous wastes. A complete list of training received by HWHF personnel is maintained by the Waste Management Training Coordinator.

3.3.2

Management Assessment

The Waste Management QA Plan provides the oversight for HWHF certification activities to assure that these activities result in the management of waste in accordance with WHC-WAC. This oversight is accomplished through the use of audits, quality surveillance, and reviews of related activities. Corrective actions and control of nonconforming items are addressed in the QA Plan and Section 4 of this document.

HWHF management reviews and assesses these procedures and processes to assure that the generators characterize the waste adequately and provide adequate environment, health, and safety protection. If deficiencies are found, HWHF management assesses the need for changes and provides the mechanisms needed to make the required changes in the procedures and processes.

3.3.3

Activities Common to Most Waste Streams

A number of activities are common to all waste generators regardless of waste stream. These activities are handled in a uniform manner. Model procedures are prepared by Waste Management. These model procedures are then incorporated in the facility's procedural manual and tailored to suit the situation for each waste stream. A list of these common activities follows.

- Generators and HWHF personnel handle radioactive wastes separately from all other wastes.
- Generators are scrupulous about good housekeeping in hoods, glove boxes, and laboratories.

Continued on next page.

3. Certification Methodology (continued)

3.3.3 (continued)

- Generators keep the buildup of radioactive wastes to a minimum. As soon as waste containers (ice cream cartons, waste sacks in garbage cans) are filled, they are removed to the HWHF.
- Generators characterize and minimize all radioactive waste to the fullest extent possible.
- Generators provide the primary waste containers (ice cream containers, plastic bags, etc.); HWHF personnel provide approved waste collection containers (galvanized waste cans, five-gallon carboys, etc.).
- All radioactive waste is collected from the generators and transported to the HWHF by HWHF or contract personnel. At the HWHF, personnel review each waste package for proper contents and accurate identification on the Radioactive Waste tag.
- HWHF personnel prepare, package, store, and arrange for offsite disposal of the waste.
- No liquid radioactive waste is poured down the sanitary drains. EH&S is notified immediately if liquid radioactive waste is inadvertently poured down a drain.
- No explosives, flammables, or highly toxic chemicals are discarded with radioactive dry wastes.
- All sharp objects (hypodermic needles, scalpels, etc.) are placed in protective containers.
- Where required, ventilation and filtration systems are provided for all radioactive waste disposal operations to maintain radionuclides releases well below DOE guidelines.

Continued on next page.

3. Certification Methodology (continued)

3.4

Mixed Waste, Solid Compacted

3.4.1

Description

This waste stream is made up of laboratory material contaminated with radioactive and hazardous substances (e.g., absorbents contaminated with radioactive chemicals or radioactive oils). Glass or paper may be included. This is a very small waste stream.

3.4.2

Characterization Methodology

The generator is responsible for characterizing the radioactive, physical, and chemical content of the waste and accurately completing the Radioactive Waste tag for each package of mixed waste. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators*. The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analysis.

3.4.3

Segregation Methodology

Researchers are trained to separate waste contaminated with hazardous substances from radioactive wastes. Segregation methodology is provided in the *Guidelines for Generators*.

3.4.4

Waste Handling, Packaging, and Shipping Operations

- The wastes are packaged at the generator areas in cement sacks inside a 24" x 38" polyethylene bag, all placed inside a 15-gallon waste can.
 - At the HWHF, the bags are compacted (4-to-1 compaction) in a 55-gallon DOT 17C or 17H drum, using a compactor.
 - The wastes are stored in the drums until they are shipped for disposal. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.
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Continued on next page.

3. Certification Methodology (continued)

3.5

Liquid Mixed Waste

3.5.1

Description

This waste is made up of laboratory radioactive substances contaminated with hazardous substances. These substances can be toxic, corrosive, poisonous, or oxidizing.

3.5.2

Characterization Methodology

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag for each package of mixed waste. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators*. The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analyses.

3.5.3

Segregation Methodology

Researchers are trained to separate the materials that are contaminated with hazardous substances. They separate mixed waste from other low-level waste and hazardous wastes. Segregation methodology is provided in the *Guidelines for Generators*.

3.5.4

Waste Handling, Packaging, and Shipping Operations

The waste is contained at the generator's area in plastic or glass bottles. The waste is solidified in appropriate-sized drums (55 gallons or less) at the HWHF. If directed by the burial site, the solutions are left as a liquid in plastic bottles with absorbent in drums. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.

Continued on next page.

3. Certification Methodology (continued)

3.6

Mixed Waste, Solid Noncompacted

3.6.1

Description

This waste stream is made up of solid dry material contaminated with radioactive and hazardous substances (poisons, etc.), or hazardous substances made radioactive by bombardment produced by accelerators. Examples include an arsenic target induced by an accelerator beam, induced lead shielding from a cyclotron area, or contaminated Be/U machinery. This is currently a small-volume waste stream.

3.6.2

Characterization Methodology

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag for each package of radioactive waste. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators*. The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analyses.

3.6.3

Segregation Methodology

Generators separate the solid noncompactible materials from other low-level waste and hazardous substances and remove lead from cave areas where the lead may become activated. Segregation methodology is provided in the *Guidelines for Generators*.

3.6.4

Waste Handling, Packaging, and Shipping Operations

These wastes are collected in 55-gallon (or smaller) DOT-approved drums, or in wooden boxes if the wastes are too large to fit in the drums. The drums or boxes are properly labeled and stored at the HWHF until they are shipped for storage. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.

Continued on next page.

3. Certification Methodology (continued)

3.7

Low-Level Induced Metals and Materials

3.7.1

Description

This waste stream consists of hazardous substances made radioactive by bombardment with neutrons or targets bombarded by charged particles by LBL accelerators. Activated lead is an example.

3.7.2

Characterization Methodology

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag for each package of radioactive waste. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators*. The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analyses.

3.7.3

Segregation Methodology

Generators separate hazardous induced materials from other low-level waste and hazardous substances. Segregation methodology is provided in the *Guidelines for Generators*.

3.7.4

Waste Handling, Packaging, and Shipping Operations

These wastes are packaged by HWHF personnel in Hanford-approved drums. The drums are properly labeled and stored at the HWHF until they are shipped for storage. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.

Continued on next page.

3. Certification Methodology (continued)

3.8

Liquid Organic Low-Level Mixed Waste

3.8.1

Description

This waste is made up of laboratory flammable or combustible solutions mixed with radioisotopes.

3.8.2

Characterization Methodology

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag for each package of radioactive waste. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators*. The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analyses.

3.8.3

Segregation Methodology

Researchers are trained to separate these wastes from radioactive nonhazardous liquid wastes. Specific methodology is provided in the *Guidelines for Generators*.

3.8.4

Waste Handling, Packaging, and Shipping Operations

The researchers collect the wastes in glass containers. HWHF personnel package the containers into 55-gallon DOT-approved drums. They put in approved absorbent capable of absorbing twice the volume of the liquid. The waste is stored in the drums until it is shipped for storage. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.

Continued on next page.

3. Certification Methodology (continued)

3.9 Transuranic Mixed Liquid Waste	Note: No transuranic mixed waste SDARs have been applied for.
3.9.1 Description	This waste is made up of laboratory radioactive substances contaminated with hazardous substances and containing more than 100 nCi/g of transuranic radionuclides. Small quantities of transuranic mixed liquid waste are generated on a sporadic basis. These substances can be toxic, corrosive, poisonous, or oxidizing.
3.9.2 Characterization Methodology	The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag for each package of radioactive waste. This waste stream is characterized in accordance with the requirements of the storage/disposal facilities and the guidance provided in the <i>Guidelines for Generators</i> . The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analyses.
3.9.3 Segregation Methodology	Segregation methodology is provided in the <i>Guidelines for Generators</i> .
3.9.4 Waste Handling, Packaging, and Shipping Operations	The wastes are stored in drums until they are shipped for disposal. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.

Continued on next page.

3. Certification Methodology (continued)

3.10 Transuranic Mixed Solid Waste	Note: No transuranic mixed waste SDARs have been applied for.
3.4.1 Description	This waste stream is made up of laboratory material contaminated with radioactive and hazardous substances (e.g., absorbents contaminated with radioactive chemicals or radioactive oils) and containing more than 100 nCi/g of transuranic radionuclides. Glass or paper may be included. This is a very small waste stream.
3.10.2 Characterization Methodology	The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag for each package of radioactive waste. This waste stream is characterized in accordance with the requirements of the storage/disposal facilities and the guidance provided in the <i>Guidelines for Generators</i> . The concentrations of radioactive and hazardous constituents are determined by either direct or indirect methods such as accountability, the use of scaling factors, or laboratory analyses.
3.10.3 Segregation Methodology	Segregation methodology is provided in the <i>Guidelines for Generators</i> .
3.10.4 Waste Handling, Packaging, and Shipping Operations	The wastes are stored in drums until they are shipped for disposal. Specific handling, packaging, and shipping procedures are provided under the Waste Management procedures listed in Appendix A.

Continued on next page.

3. Certification Methodology (continued)

3.11 Minimization

The *Waste Minimization and Pollution Prevention Awareness Plan* provides the policy, strategy, objectives, and goals for waste minimization at LBL. Waste minimization techniques are applied through

- inventory management
- operational procedures
- a maintenance program
- material changes and process equipment modification
- recycling and reuse.

A training program provides LBL employees with instruction on the implementation of the waste minimization plans. Tracking and reporting systems and the Waste Management QA Plan provide a means to verify the implementation of the waste minimization plan activities.

Policies currently in place at LBL to achieve waste minimization include

- holding short-lived isotopes at HWHF for decay
- keeping contaminated and noncontaminated items separate
- using good housekeeping in hoods, glove boxes, and laboratories
- reusing or decontaminating solid noncompacted waste (drums, wooden boxes)
- instructing researchers to avoid introducing items needlessly into radiation fields
- instructing researchers to use the minimum amount of material necessary
- instructing researchers to use nonhazardous materials instead of hazardous material whenever possible
- disposing of explosive, flammable, or highly toxic chemical wastes separately from radioactive waste (no mixing)
- requiring all employees who handle radioactive waste to take EH&S courses 430 (Radiation Protection), 601 (Hazardous Waste Generators), and 621 (Radioactive and Mixed Waste), which include training in waste minimization and disposal procedures
- keeping buildup of all wastes to a minimum.

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3. Certification Methodology (continued)

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- 3.12 Segregation** Specific segregation instructions are contained in the *Guidelines for Generators*. Mixed waste is treated or segregated to reduce any hazardous-waste components using standardized processes and methods. Low-level and transuranic mixed wastes are segregated into separate waste containers to avoid mixing with other low-level or transuranic waste streams. All mixed waste is transported separately and complies with WHC-WAC packaging and segregation requirements.
-
- 3.13 Onsite Treatment and Storage** The California Department of Toxic Substances Control (DTSC) has approved LBL's Part B Permit Application for all LBL treatment processes. Neutralization, solidification, and consolidation are approved treatment processes. The generator is required to chemically, radiologically, and physically characterize the LLW, prior to any waste pick-up and transport to the HWHF by the technician. The waste is stored at the HWHF in DOE approved 55-gallon drums (17H or 17C).
-
- 3.14 Waste Characterization, Sampling, and Analysis**
- 3.14.1 Characterization** All mixed waste is properly characterized chemically, radiologically, and physically. Prior to the approval of the transfer of any waste to the HWHF, the generator is required to estimate the radioactive and chemical concentrations or amounts of contaminating radionuclides using process knowledge or laboratory analysis as defined in *Guidelines for Generators*. Upon completion, the generator certifies that the waste has been accurately and completely characterized. The HWHF Field Technician then reviews the information for accuracy in accordance with applicable regulations and monitors, tags, and packages the wastes for onsite transport to the HWHF.
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Continued on next page.

3. Certification Methodology (continued)

3.14.1 (continued) The generator, with assistance from the HWHF Field Technician, reviews each waste stream against the lists of wastes identified in California Regulations, including:

- The "Hazardous Waste from Non-Specific Sources" list (F-List), 40 CFR 261.31
- The "Hazardous Waste from Specific Sources" list (K-List), 40 CFR 261.32
- The "Discarded Commercial Chemical Products, Off-Specification Species, Container Residues, and Spill Residues Thereof" list (P-List and U-List), 40 CFR 261.33

Each waste stream must also be characterized, either by generator certification or by hazard categorization, to identify its hazardous waste characteristics:

- ignitability, as defined in 40 CFR 261.21
- corrosivity, as defined in 40 CFR 261.22
- reactivity, as defined in 40 CFR 261.23
- toxicity, as defined in 40 CFR 261.24

All mixed waste is characterized to demonstrate that it is transuranic or low-level mixed waste as defined in accordance with DOE Order 5820.2A. Radionuclide constituents are individually identified by isotope, and their concentrations are determined.

Continued on next page.

3. Certification Methodology (continued)

3.14.1 (continued) In addition, all mixed waste is physically characterized to demonstrate that it meets the specifications required by WHC-WAC. Any deficiency is clearly indicated so that the waste can be properly treated prior to final packaging for shipment to the disposal site. At a minimum, the following physical characteristics of the waste are determined:

- free liquids: percent by volume
- moisture content: percent by weight and by volume
- organic material: percent by weight and by volume
- chelating agents: percent by weight
- stabilization: physical and chemical

The determination can be based on process knowledge, provided the process is well-defined and understood. The alternative is a thorough analysis of the waste.

3.14.2
*Waste Sampling
and Analysis*

Mixed waste sampling and analysis is performed in accordance with recognized industry methods and standards. The sampling procedures used by the HWHF to characterize radioactive waste are presented in the *Waste Analysis Plan* [19]. Sampling and analysis provide for an accurate representation of the waste in accordance with statistically valid or EPA-approved methods. Generators must refer to the *Guidelines for Generators* for specific parameters of analysis, sampling techniques, and types of containers required for adequate waste sampling and analysis.

For circumstances where sampling and analysis are not feasible or necessary for characterization of radioactive constituents, techniques that rely primarily on knowledge of the process can be used. This process knowledge is reviewed and approved by the Waste Certification Specialist. Documentation of this process knowledge is a requirement.

It is the policy of the HWHF that ten percent of the waste packages accepted for disposal are verified by a certified laboratory for the accuracy of information provided on the Radioactive Waste tags. This 10% quality assurance/quality control sampling is performed to verify generator information rather than to characterize the waste.

Continued on next page.

3. Certification Methodology (continued)

3.15 Waste Form Criteria	Mixed waste capable of generating toxic gases, vapors, fumes, or liquids is not accepted as specified in DOE Order 5820.2A, Chapter III). The following waste categories are also packaged in accordance with the waste form requirements specified in WHC-WAC and the Washington State Dangerous Waste Regulations, Chapter 173-303, Washington Administrative Code.
3.15.1 <i>Liquid Waste</i>	If practicable, liquid mixed waste is bound to the waste matrix by inert materials. The resulting matrix is not combustible, decomposable, or explosive, nor may it effect the integrity of the containment barriers. All generators should refer to WHC-WAC for the details of this requirement.
3.15.2 <i>Polychlorinated Biphenyl- Contaminated Organic Liquids</i>	PCB oils are packaged in liquid form, and the gross weight of the waste package does not exceed 450 lb. Solids contaminated with PCBs are packaged in DOT-specification 17C or 17H steel 55-gallon drums.
3.15.3 <i>Scintillation Liquids</i>	Scintillation liquids are packaged in lab packs, as defined on 40 CFR 264.316 for storage at WHC in compliance with the requirements of 49 CFR 173.12. Scintillation liquids are sealed and placed in glass containers not to exceed one-gallon capacity each. These glass containers are closed, labeled, and placed in DOT-specification 55-gallon drums in accordance with the requirements of WHC-WAC and the associated SDAR.
3.15.4 <i>Nonorganic Liquids</i>	Nonorganic liquids are accepted only if absorption or solidification are not acceptable packaging alternatives.
3.15.5 <i>Alkali Metals</i>	Acceptance of alkali metals at the disposal site is on a case-by-case basis.
3.15.6 <i>Lead Waste</i>	Elemental lead is classified as hazardous waste based on toxicity tests. Lead, when shipped for storage, is identified and documented on the SDAR and LLWSDR forms. Radioactively contaminated lead is packaged in 55-gallon drums or Hanford-approved storage boxes for storage and future treatment.
3.15.7 <i>Mercury</i>	Mercury waste will meet the requirements of the storage/disposal facility.

Continued on next page.

3. Certification Methodology (continued)

3.15.8 Asbestos is prepackaged in accordance with WHC-WAC.
Asbestos

3.15.9 Waste rags contaminated with listed or characteristic waste or a Washington State-regulated waste are handled as dangerous waste unless sampling and analysis are performed and show otherwise.
Waste Rags

3.16 Waste Package Criteria

3.16.1 All mixed waste packages accepted for disposal by WHC meet or exceed the criteria listed in the following sections.
Packaging

3.16.2 Waste packages have a maximum surface dose rate at contact not greater than 100 mrem/h (beta, gamma, and neutron) at any point. Packages up to 200 mrem/h may be received at WHC; however, justification for exceeding 100 mrem/h is needed, and approval by Hanford Solid Waste Operations is required before receipt of the waste package.
Surface Dose Rates

HWHF personnel measure surface dose rates according to the applicable procedure. Maximum contact surface dose rates are entered on the LLWSDR. Recorded surface dose rates are dose rates at the highest measured points on the surface of the drum or the box.

3.16.3 Low-level mixed waste packages have no removable surface contamination exceeding 20 dpm/100 cm² for alpha contamination and 1000 dpm/20 cm² for beta-gamma contamination. Transuranic mixed waste packages have no surface contamination exceeding 20 dpm/100 cm² for alpha contamination and 999 dpm/100 cm² for beta-gamma contamination.
Surface Contamination

HWHF personnel monitor waste drums and waste boxes for removable surface contamination using swipe techniques according to EH&S Procedure 868.

Continued on next page.

3. Certification Methodology (continued)

- 3.16.4
Nuclear Criticality Fissile material content of individual waste packages does not exceed 200 gm of ^{239}Pu fissile gram equivalents for each 55-gallon drum. 100 gm is the maximum allowed in drums that are lead-lined, contain absorbed liquid organics, or where the fissile material is contained in a volume that is less than 20% of the drum volume. Limits for other waste packages are determined by Westinghouse Hanford Criticality Engineering Analysis.
- The Waste Certification Specialist or designee performs plutonium-equivalent curie (PE-CI) calculations on the waste drum in accordance with the methods and conversion factors provided in WHC-WAC.
- 3.16.5
Thermal Power The acceptance criteria for waste packages exceeding 0.1 watt/ft³ are included in the applicable SDAR. Each waste package meets the requirements of 49 CFR 173.442 for heat generation and temperature.
- The Waste Certification Specialist or designee performs calculations for thermal power output in accordance with procedures specified in WHC-WAC.
- 3.16.6
Gas Generation When the use of catalysts or vents is required for mixed waste packages, it is specified in the applicable SDAR. Liners other than plastic bags are provided, with positive gas communication to the outer container.
- 3.16.7
Interior Void Spaces Bulky or heavy waste items are blocked inside the container to prevent shifting during handling and transport. Void spaces within the container do not exceed 10% of the container volume.
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Continued on next page.

3. Certification Methodology (continued)

3.17

Containers

3.17.1

Types and Specifications

Type A mixed waste shipments are packaged in DOT 17H or 17C drums. WHC-CP-0558 provides part of the documentation required to meet the DOT test specification in 49 CFR 173.4.5(a). All transuranic mixed waste containers are equipped with a method to prevent hydrogen or pressure buildup using an approved device as specified in the applicable SDAR. Transuranic mixed waste is packaged in 55-gallon drums that meet DOT specification 17C, and all interior and exterior surfaces are galvanized in accordance with specification HS-V-P-0010-A. Calculations that involve transuranic mixed waste container volumes use the value of 7.35 ft³ (or 0.208 m³) for a 55-gallon drum, as specified in the requirements of WHC-WAC.

3.17.2

Procurement

Containers procured and used for packaging of mixed waste for disposal are of DOT specification type 17H or 17C and meet the requirements specified in 49 CFR 178.115. The container type is approved by the HWHF Waste Certification Specialist prior to actual procurement. The approval is based on actual testing performed at LBL or by certification in writing from the vendor that the containers meet the design requirements. The vendor is required to submit all documentation related to the method used to demonstrate compliance. This procurement process is presented in detail in EH&S Procedure 822, *Container Procurement, Receipt, and Control*.

3.17.3

Receipt and Inspection

Before use, containers are inspected inside and out by a trained HWHF technician. Inspection must be conducted on receipt or prior to delivery to the field to assure that the containers have not been damaged in a way that will affect their integrity.

The drum is inspected for

- dents
- deformation of sealing surfaces
- continuity of welds
- surface coating, and lack of imperfections
- rust and nicks.

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3. Certification Methodology (continued)

3.17.3 (*continued*) The results of this inspection, as well as the name of the person conducting the inspection, are submitted to the Waste Certification Specialist, who is knowledgeable in the criteria for determining the extent of any damage to a container and corresponding reduction of its integrity. This receipt and inspection process is presented in EH&S Procedure 822. Documentation tests conducted on drums to qualify them as DOT Specification Type A container are filed with the HWHF.

3.17.4
Control Containers used for onsite transfer of mixed waste to the HWHF from the generator facilities are approved for onsite use and in good condition, with no signs of damage that could affect the containment capability.

Containers used for packaging and transportation of mixed waste from LBL to the disposal site are controlled to ensure that the integrity to the container has not been affected during packaging or handling. EH&S Procedure 822 is used to ensure that the internal, as well as the external, surfaces have not been unacceptably damaged. These containers are also managed to avoid adverse influence from weather or other factors on the containment capability of the waste package while it awaits packaging, is packaged, or awaits transfer after closure. Only new containers are used for packaging and transportation of mixed waste for disposal.

3.17.5
Containment All mixed waste packages for storage have at least two containment barriers to prevent the release of contamination (for example, a polyethylene liner inside a steel drum or a steel drum inside another steel drum). Inner barriers may consist of a sealed 10-mil or heavier plastic liner or a 90-mil polyethylene drum liner and are made of a material compatible with the mixed waste.

Continued on next page.

3. Certification Methodology (continued)

3.18

Shipping

3.18.1

Labeling and Marking

All mixed waste packages shipped to WHC for storage or disposal meet the labeling and marking criteria specified in 49 CFR 171, 172, and 173, and those of WHC-WAC.

3.18.2

Packaging

Packaging for the different mixed waste streams is described in the appropriate Waste Management procedures.

3.18.3

Handling

All waste packages from LBL are provided with permanently attached skids, cleats, offsets, rings, handles, or other auxiliary lifting devices to allow handling by means of a forklift, crane, or similar handling equipment. Additional handling requirements specified in WHC-WAC are also followed.

3.18.4

Manifests

Wastes shipped off site are manifested. The driver is given copies of

- University of California Shipping Document
- LBL Hazardous Materials Shipping Paper
- California Uniform Hazardous Waste Manifest
- Hanford Low-Level Waste Storage/Disposal Record
- Bill of Lading
- Exclusive Use Shipment Statement, as applicable.
- Land disposal restriction form (if applicable)
- Radioactive Mixed Waste Attachment Sheet

The driver signs the Bill of Lading and the University of California Shipping Document. Documentation is detailed in EH&S Procedure 831.

3.18.5

Transportation

Onsite transportation of mixed waste is described in EH&S Procedure 827. Mixed waste transferred from Building 934 to the HWHF is packaged and shipped per 49 CFR.

Onsite Transfers

Type A quantities of radioactive waste are transported in cans that are placed in 17H drums or lockable boxes permanently bolted to the trucks. Liquid waste has absorbent material in the can surrounding the container of the liquid.

Continued on next page.

3. Certification Methodology (continued)

3.19

Certification, Data Collection, and Record Keeping

3.19.1

Certification Procedure

Certified waste is waste that has been confirmed to comply with storage/disposal site waste acceptance criteria under an approved certification program.

Certification is the process of assuring that each waste package complies with all applicable criteria for offsite shipment, storage, and disposal. For LBL, this includes meeting WHC-WAC and Washington State regulations.

It is the responsibility of the LBL Waste Certification Specialist to sign the generator certification, item 16 on the Uniform Hazardous Waste Manifest, and the certification statement on the LLWSDR.

Compliance with waste acceptance criteria includes proper performance of the following:

- identifying the waste through characterization
- packaging
- labeling and marking
- documenting the waste.

For each waste package, the Waste Certification Specialist certifies adherence to

- all governing regulations
- all applicable storage/disposal-site waste acceptance criteria
- all requirements specified in the SDAR for a particular type of waste.

The Waste Certification Specialist certifies that the requirements of WHC-WAC, as specified in the following subparagraph, are met. For further details, refer to WHC-WAC.

Continued on next page.

3. Certification Methodology (continued)

3.19.2

Mixed Waste Storage

Identification

The Waste Certification Specialist certifies that the types and quantities of radioactive and hazardous constituents in the waste are certified and, if there is sufficient process knowledge to characterize the waste, are analyzed.

Packaging

The Waste Certification Specialist certifies that containers meet the handling and packaging criteria outlined in Section 3.2 of this Plan and detailed in WHC-WAC. The Waste Certification Specialist also certifies that the waste form criteria outlined in Section 3.2 of this Plan and detailed in WHC-WAC are met.

3.19.3

Mixed Waste Disposal

For disposal of mixed waste at Hanford, the waste must meet the criteria specified in 40 CFR 268 and in Revised Code of Washington Title 70.105.150 [xx]. Land-disposal-restricted hazardous wastes cannot be accepted for disposal at WHC, except as allowed according to 40 CFR 268. Transuranic mixed waste cannot be accepted for disposal at the Hanford site. Therefore, the following subparagraphs refer only to low-level mixed waste disposal.

Identification

The Waste Certification Specialist certifies that

- Techniques employed to treat the waste are Best Demonstrated Available Technology (BDAT) as required in 40 CFR 268. The waste also adheres to applicable treatment standards in 40 CFR 268, subpart D.
- Types and quantities of radioactive and hazardous constituents in the waste are known and certified.
- If there is insufficient process knowledge to characterize the waste, it is analyzed using the methods given in WHC-WAC.

Packaging

The Waste Certification Specialist certifies that containers meet the handling and packaging criteria outlined in Section 3.2 of this Plan and detailed in WHC-WAC. The Waste Certification Specialist also certifies that the waste form criteria outlined in Section 3.2 of this Plan and detailed in WHC-WAC are met.

Continued on next page.

3. Certification Methodology (continued)

3.19.4 *Labeling and Marking*

Labeling and marking requirements are the same for mixed waste storage and disposal, with the exception of free organic liquids. No free organic liquids of any kind are allowed for disposal. The Waste Certification Specialist certifies that labeling and marking criteria outlined in Section 3.2 of this Plan and detailed in WHC-WAC are met.

3.19.5 *Documentation and Records*

Before Shipment

The Waste Certification Specialist certifies that

- The draft SDAR has been submitted for review and approval to WHC.
- All hazardous-waste constituents are identified and quantified on a Radioactive Mixed Waste Attachment Sheet, including test results, MSDSs, and any other necessary data.
- Rigging details for special handling, if required, are identified.

At Time of Shipment

The Waste Certification Specialist certifies that

- Each mixed waste container is accompanied by a properly completed LLWSDR form, RMWAS, and California Uniform Hazardous Waste Manifest.
- The certification statements on the California Uniform Hazardous Waste Manifest and the LLWSDR are signed by the Waste Certification Specialist.

General Requirements

- Manifests are held on file for a minimum of five years.
- All LBL employees who perform these tasks must be fully trained on the relevant procedures, including performance-based (on-the-job) training as described in the Waste Management Function Notebook.

Continued on next page.

3. Certification Methodology (continued)

- 3.19.5 (continued)
- LBL has created and retains an itemized list of chemicals, concentrations, and quantities by container. This list is readily available in the event of an emergency during transport. LBL provides a copy of this list with the shipping papers.
 - LBL, as a generator, maintains all the records per generator-recordkeeping requirements set forth in 40 CFR 262.40 and WHC-WAC.
-

4. Quality Assurance

4.1 QA Organization, Duties, and Responsibilities Summary

The LBL Waste Management Quality Assurance (QA) Plan describes the Quality Assurance organization, duties, and responsibilities for the management of activities required to handle, store, and prepare for shipment LLW at LBL. The program has been designed to ensure that generated waste meets the following:

- WHC-WAC
- NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facilities* [20]
- DOE Order 5700.6C, *Quality Assurance* [21]
- DOE Order 5820.2A, *Radioactive Waste Management*
- Code of Federal Regulations (CFR) 40
- LBL PUB-3111, the *LBL Operating and Assurance Program Plan* [22]

The Waste Management QA Plan is the written quality assurance program plan required by the LBL Operating and Assurance Program Plan (OAPP) for EH&S activities related to the HWHF.

4.2 Summary of the Facility Quality Assurance Program

The LBL Waste Management QA Plan establishes the framework and requirements that are met in planning, implementing, documenting, and verifying HWHF activities. The subsections that follow identify the implementing plans and procedures.

4.2.1 *Organization and Responsibilities*

The organizational structure, functional responsibilities, level of authority, lines of communication, and the interface relationship required for activities affecting the quality of the waste handling program are delineated in the QA Plan. Figures 4-1 and 2-1 show the organizational relationships of positions. Functional responsibilities are listed in the following pages by job title.

Continued on next page.

4. Quality Assurance (continued)

Figure 4-1

EH&S Organization

Revised 10/6/94

Continued on next page.

4. Quality Assurance (continued)

EH&S Division Director

The Division Director, Environment, Health and Safety Division, is responsible for the functions listed below. The Director may delegate any or all of the EH&S QA program functions to the Deputy Division Director or other appropriate personnel but retains overall management responsibility for such functions.

- Ensures that the LBL OAP requirements are appropriately implemented through the use of notebooks and/or plans and procedures, using the graded approach outlined in the OAP.
- Administers the division self-assessment process, which supports the assessment requirements of the OAP.
- Provides sufficient divisional resources to support the objectives and implementation of OAP requirements.
- Determines which EH&S documents, instructions, and drawings are controlled, and maintains a master list of these documents.
- Ensures that sufficient records are generated, identified, and maintained to accurately demonstrate completed Division, department, and group work and activities.
- Develops and issues the Division Self-Assessment Program Implementation Plan.
- Administers the Division self-appraisal process, and provides adequate resources for implementation, including the Laboratory Self-Assessment Database (LSAD).
- Participates in the Division self-assessment process to ensure that the Division focus is on achievement of performance objectives and quality improvement.

Continued on next page.

4. Quality Assurance (continued)

EH&S QA Manager

The Environment, Health and Safety Division QA Manager is responsible for the functions listed below. The EH&S QA Manager may delegate any or all of these functions to other appropriate personnel but retains overall management responsibility for such functions.

- Provides guidance and consultation to Division personnel and management regarding quality assurance/conduct of operations (QA/CO) requirements and methods.
- Acts as a primary point of contact with OAA's QA/CO Group for Division QA/CO matters, such as independent assessment coordination, promulgation of new requirements or information, and training.
- Reviews and approves WM Group quality assurance plans, quality implementation plans, and operational plans and procedures to assure inclusion of QA requirements.
- Monitors WM quality-affecting activities by conducting reviews, quality surveillances, audits, and other assessments.
- Assists WM personnel in QA matters through guidance, consultation, and participation in training activities, document reviews, meetings, presentations, and task forces.
- Monitors computer software code development and verification activities.
- Monitors design activities by participating in design reviews, conducting surveillances and audits, and reviewing appropriate output documents.
- Monitors the procurement process to verify that applicable procurement documents and procurement actions include appropriate QA requirements.

Continued on next page.

4. Quality Assurance (continued)

EH&S QA
Manager
(continued)

- Directs contractor and vendor QA surveillances and audit processes, approves contractor and vendor qualifications, and reviews contractual documents for inclusion of appropriate QA provisions.
 - Verifies that personnel performing special processes, inspections, tests, and other quality-affecting activities are properly trained, qualified, and certified, as applicable to the activity.
 - Prepares implementing procedures that provide specific requirements and methods for training, qualifying, and certifying assessment personnel. Personnel are trained and qualified per the requirements described in Section 5.3.2 of the OAP.
 - Verifies that inspections are performed at appropriate activity intervals and that tests are properly planned.
 - Verifies that measuring and test equipment items used in WM quality-affecting activities are controlled, calibrated, and documented by the applicable EH&S organization.
 - Reviews and concurs with dispositions of nonconformance and corrective action reports (NCARs), where the WM QA Plan or related procedures are affected by the resolution of the NCAR.
 - Initiates corrective-action documentation for conditions adverse to quality, and investigates and validates corrective-action reports.
 - Verifies corrective-action implementation.
-

Continued on next page.

4. Quality Assurance (continued)

Environment Department Head

The Environment Department Head is responsible for the functions listed below. The Environment Department Head may delegate any or all of the QA program functions to staff members but retains overall management responsibility for such functions.

- Manages Environment Department operations, personnel, and activities, including the implementation and application of this WM QA Plan.
- Fulfills the objective of assuring that operations are carried out in a safe manner, meeting applicable requirements of LBL, and complying with appropriate DOE, DOT, EPA, Cal/EPA, and QA regulations in handling, storage, and transportation of hazardous and/or radioactive wastes.
- Defines corrective-action and improvement details with the objective of assuring that they are completed, effective, properly documented, and closed.
- Approves and issues the WM QA Plan and any revisions.
- Performs periodic management reviews of the WM QA Plan and system, in order to direct corrections and improvements.
- Implements the EH&S QA program as it relates to the activities of WM.
- Determines the need for and assuring that appropriate QA plans, procedures, and instructions are developed for applicable department activities.

Continued on next page.

4. Quality Assurance (continued)

Environment
Department
Head (continued)

- Approves software design plans and code validation and verifying requirements applicable to WM.
- Plans design activities, and reviews design inputs, outputs, and reports.
- Participates in design verification as appropriate, and implements configuration management and design procedures.
- Assures that procurement documents include the appropriate technical, regulatory, LBL Procurement Department, and QA requirements applicable to that item or service, including receipt, inspection, and acceptance.
- Develops and implements appropriate controls for assuring that only properly identified and controlled items are used in quality-affecting activities.
- Develops test plans, overviews testing activities, and assures that test results are properly documented.
- Assures that measuring and test equipment used in the acceptance of data is properly calibrated.
- Assures that conditions adverse to quality are identified and documented.
- Assures that personnel generate and maintain QA records, and directs departmental document and records management functions.
- Provides input into quality verification schedules, and assures the availability of personnel participating in these activities.
- Reports information directly to the EH&S Division Director on issues affecting quality in WM where independence from WM is deemed necessary.

Continued on next page.

4. Quality Assurance (continued)

Waste Management Group Leader

The Waste Management Group Leader is responsible for the functions listed below. The Waste Management Group Leader may delegate any or all of the QA program functions to staff members but retains overall management responsibility for such functions.

- Applies and documents OAP requirements using the LBL graded approach outlined in the OAP.
- Periodically assesses WM performance against established performance objectives and OAP requirements, and takes corrective action as necessary.
- Develops, issues, maintains, and controls the WM Function Notebook and the Hazardous Waste Handling Facility (HWHF) Facility Notebook.
- Ensures that personnel are qualified, trained, and proficient for assigned tasks.
- Determines and documents job requirements and qualifications, and evaluates initial qualifications of personnel for a position.
- Determines and documents the initial and ongoing training requirements for employees, including specialized job training, mentoring, on-the-job training, ES&H training, and OAP orientation training.
- Periodically evaluates and documents staff proficiency.
- Provides administrative controls for on-the-job training.
- Specifies those activities that require written procedures, instructions, or drawings.
- Develops and approves administrative, QA-related, CO-related, maintenance management-related, and operating procedures as required for the appropriate activities.

Continued on next page.

4. Quality Assurance (continued)

Waste
Management
Group Leader
(continued)

- Plans, reviews, and documents design activities.
- Ensures that measuring and test equipment items are calibrated and maintained in accordance with their actual or intended use.
- Ensures the use of properly identified and controlled items to prevent the use of incorrect or defective items.
- Plans and performs inspections or tests of completed work at appropriate intervals.
- Uses the LBL procurement system to ensure that items meet requirements and perform as specified.
- Ensures the control and use of those documents associated with WM that provide instructions or direct the work.
- Ensures that records are generated, identified, and maintained to demonstrate completed WM work.
- Regularly and routinely observes and surveys activities, and takes an active role in prevention of quality problems, correction of deficiencies, and improvement of performance (ongoing assessment).
- Performs, documents, and reports on management assessment (self-assessment).
- Cooperates with the independent assessment (functional appraisal) process and assessors.
- Tracks identified problems and corrective actions using LSAD.
- Assures that nonconforming conditions are promptly addressed and documented.
- Performs root-cause analysis of significant or recurring problems.

Continued on next page.

4. Quality Assurance (continued)

Waste
Management
Operations Units
Managers

The Waste Management Operations Units Managers are responsible for the functions listed below.

- Assure that the HWHF is operated in a safe manner, meeting applicable requirements of LBL, Federal, state, local, and QA regulations.
- Assure that the proper work environment exists for HWHF personnel.
- Manage and coordinate maintenance activities for HWHF.
- Manage and coordinate facility activities for the HWHF.
- Assist with safety and control measures for employee and environmental protection during HWHF operations.
- Provide support for the accountability, tracking of documents, and regulatory guidance for the preparation of radioactive and mixed hazardous waste shipments.
- Assure that field operations are carried out in a safe manner, meeting applicable requirements of LBL, DOE, DOT, and other Federal and state regulations.

Continued on next page.

4. Quality Assurance (continued)

Waste
Management
Compliance Unit
Manager

The Waste Management Compliance Unit Manager is responsible for the functions listed below. The Compliance Unit Manager may delegate any or all of the QA program functions to staff members but retains overall management responsibility for such functions.

- Provides technical support to the WM Operations units in emergency planning, compliance issues, computations, RCRA, LLW, certification, procedure writing, record-keeping, computer production, and other major systems activities.
- Identifies WM quality-related problems.
- Initiates, recommends, or provides solutions to WM quality-related problems.
- Provides a method to verify that activities affecting quality in WM have been correctly performed.
- Provides the quality control inspection function for WM.
- Reviews procurement documents for technical content affecting WM.
- Develops quality assurance procedures.
- Provides and maintains a document control system for WM procedures.
- Maintains records as required.
- Assures that safety procedures and standard operating procedures are followed.
- Provides technical input, guidance, and assurance to WM to assure compliance with Federal and state regulations, DOE Orders, and waste management acceptance requirements of treatment/disposal sites.

Continued on next page.

4. Quality Assurance (continued)

Waste
Management
Compliance Unit
Manager
(continued)

- Assumes responsibility for communications, permitting, reporting, and correspondence between LBL and regulatory agencies.
- Prepares reports to comply with DOE Orders and additional regulatory and management requirements as applicable.
- Assures compliance with applicable safety measures.
- Assures that chemical and radioactive waste treated on site is in compliance with the appropriate regulations and DOE Orders.
- Assures compliance with waste treatment and disposal regulations.
- Maintains the status tracking system for nonconformance reports, and monitors the control of nonconforming conditions and status indicators.
- Assures that reports to DOE are generated periodically.
- Trains personnel on computer usage and applications.
- Assists in the review of purchase orders dealing with DOE radioactive waste management facilities.
- Prepares manifests and related shipping documents.
- Provides technical support and expertise to LBL personnel as related to packaging and labeling.
- Inspects waste packaging and loading.
- Assists WM in meeting the radioactive criteria and hazardous waste acceptance criteria for shipments off site to other DOE treatment/disposal facilities.
- Arranges for the shipment and disposal of the Laboratory's hazardous and radioactive waste at Hanford/WIPP facilities.

Continued on next page.

4. Quality Assurance (continued)

All Waste Management Personnel

- Understand LBL organizational responsibilities and authorities as described in the OAP and elsewhere.
- Perform assigned tasks in accordance with OAP requirements as described in the WM Facility Notebook and the HWHF Function Notebook.
- Identify noncompliances or unsafe work practices, and understand and implement (as appropriate) the LBL stop-work policy.
- Identify, and report to management, deficiencies in the OAP or other management systems that hinder the ability to achieve performance objectives.
- Understand the assigned tasks and position description for their position.
- Perform only those assignments for which they have the requisite qualifications, training, and proficiency.
- Effectively apply qualifications and abilities in proficient performance of assigned tasks.
- Perform activities in accordance with approved procedures, instructions, and drawings (when required).
- Continuously assess individual performance to prevent quality problems and identify nonconforming conditions and opportunities for improvement in process or item quality:

4.2.2 *Program*

The QA program is designed to assure the quality and reliability of HWHF activities and that activities are planned, controlled, implemented, maintained, and documented in accordance with the NQA-1-1989 standard, DOE Order 5700.6C, and the LBL OAP (LBL PUB-3111).

4.2.3 *Design Control*

The design and construction of new facilities and the modification of existing facilities are performed in accordance with the design criteria specified in DOE Order 6430.1A [23].

Continued on next page.

4. Quality Assurance (continued)

4.2.4 <i>Procurement Document Control</i>	Quality-affecting procurement documents are controlled to assure that the procurement cycle has been implemented effectively.
4.2.5 <i>Instructions, Procedures, and Drawings</i>	Instructions, procedures, and drawings are prepared for each quality-affecting activity to the level of detail necessary to assure that the activity can be performed as required. Waste Management Program procedures are listed in Appendix A.
4.2.6 <i>Document Control</i>	The Compliance Unit is responsible for document preparation, review, approval, revision, control, and distribution of documents related to waste disposal operations. Controlled documents include, but are not limited to, the Waste Management QA Plan and implementing procedures.
4.2.7 <i>Control of Purchased Items and Services</i>	Procurement and Work Order Requests are used to assure that materials, equipment, and services important to the EH&S activities are procured to meet specific requirements.
4.2.8 <i>Identification and Control of Items</i>	Waste containers, waste samples, and disposal activities are controlled in a manner designed to provide unique container identification, unique sample identification, and tracking and labeling of waste. Procedures governing these activities are listed in Appendix A.
4.2.9 <i>Control of Processes</i>	Waste-handling activities are performed in accordance with procedures specified in the relevant certification plans and related implementing procedures. Waste certification is controlled by the applicable waste certification plan requirements.
4.2.10 <i>Inspections</i>	Inspections are conducted to verify waste characterization, container adequacy and packaging, and the correctness of records. Procedures for inspection include standards of acceptance and rejection in the form of checklists.
4.2.11 <i>Test Control</i>	Tests are performed by HWHF personnel to verify performance of treatment processes and characterization of waste, and to demonstrate container and packaging adequacy.

Continued on next page.

4. Quality Assurance (continued)

4.2.12 *Control of Measuring and Test Equipment*

Measuring and test equipment used in the waste certification process is calibrated on a schedule recommended by the vendor. In addition, calibration (operational readiness) checks are performed by analysts and technicians before instruments are used. Calibration tags or stickers are attached to instruments and equipment to indicate the last calibration date and the next due date.

All measuring and test equipment will be certified against equipment having known valid relationships to nationally recognized standards, such as the National Institute for Standards and Technology.

Instrument and equipment calibration procedures and records are maintained by the EH&S Division. The Environment Department Manager approves the development and use of calibration procedures and requirements for control of measuring and test equipment for LLW.

4.2.13 *Handling, Storage, and Shipping*

The handling, storage, and shipping of LLW is accomplished in accordance with procedures and instruction specified in the Waste Management Program procedures listed in Appendix A.

4.2.14 *Inspection, Test, and Operating Status*

The inspection, test, and operating status indicators used are in accordance with the requirements specified in the relevant procedures.

4.2.15 *Control of Nonconforming Items*

Nonconforming items can be out-of-specification waste containers, imperfect or malfunctioning test and measurement devices, or other out-of-specification or noncompliance items that could adversely affect waste certification, handling, transportation, or disposal. Items in the HWHF that are identified as nonconforming are segregated and marked until corrected or properly dispositioned (e.g., waste containers that do not meet approved standards, waste that cannot be accepted by the WHC, etc.), as detailed in EH&S Procedure 808, *Nonconformance and Corrective Action Control*.

Continued on next page.

4. Quality Assurance (continued)

4.2.16 *Corrective Action*

The HWHF staff is responsible for taking prompt and appropriate action to prevent the effects of a detected quality problem from spreading. The attendant HWHF staff person notifies the Operations Manager and others whose work is affected, and documents the problem and the corrective action taken when any of the following apply:

- An approved documentation record is changed because of the problem or will be by the corrective action taken;
- The problem is not trivial, and there is a significant probability that it will reoccur; or
- A written agreement (maintenance agreement, vendor specifications, etc.) related to HWHF work, cost, or schedule is affected by the problem or correction.

4.2.17 *Certification Records*

In general, records are retained for the three years at the HWHF and for "lifetime" in the LBL Archives and Records files. However, the Environment Department Head may limit or extend the retention period and may specify methods of disposal.

4.2.18 *Surveillance and Audits*

In accordance with the LBL OAP, all divisions are audited on a rotating basis within a two- to three-year period.

4.3 **QA Program Index**

In compliance with Department of Energy Order 5700.6C, WM has selected ASME NQA-1-1989 as the national consensus standard basis of its QA program. Table 4-1 identifies the NQA-1 criteria and the relevant WM QA Plan sections.

Continued on next page.

4. Quality Assurance (continued)

Table 4-1

NQA-1 Criteria and Relevant WM QA Plan Sections

NQA 1 Criterion	WM QA Plan Criterion									
	1	2	3	4	5	6	7	8	9	10
1 Organization	✓								✓	
2 Quality Assurance Program	✓	✓								
3 Design Control						✓*				
4 Procurement Document Control							✓			
5 Instructions, Procedures, & Dwgs.					✓					
6 Document Control				✓						
7 Purchasing Control							✓			
8 ID and Control					✓					
9 Special Processes		✓			✓					
10 Inspection		✓						✓		
11 Test Control								✓		
12 Measuring and Test Equipment					✓					
13 Handling, Shipping, and Storage					✓					
14 Inspection, Test, and Ops Status								✓		
15 Nonconformances			✓							
16 Corrective Action			✓							
17 Records				✓						
18 Audits		✓								✓

*Design control measures do not apply to the Waste Management Program.

5. References

1. Westinghouse Hanford Company, *Hanford Site Radioactive Solid Waste Acceptance Criteria*, Richland, WA, WHC-EP-0063, latest revision
2. Lawrence Berkeley Laboratory, *Waste Management Quality Assurance Plan*, LBL PUB-5352, latest revision
3. Lawrence Berkeley Laboratory, *Guidelines for Generators of Hazardous Chemical Waste at LBL and Guidelines for Generators of Radioactive and Mixed Waste at LBL*, LBL PUB-3092, latest revision
4. Department of Energy (1988), *Radioactive Waste Management*, U.S. Department of Energy, Washington, D.C., DOE Order 5820.2A
5. Washington State, *Dangerous Waste Regulations*, Chapter 173-303, Washington Administrative Code, Washington State Department of Ecology, Olympia, WA, latest revision
6. Lawrence Berkeley Laboratory, *Low-Level Waste Certification Plan*, LBL PUB-5353, latest revision
7. Lawrence Berkeley Laboratory, *Transuranic Waste Certification Plan*, LBL PUB-5355, latest revision
8. Waste Isolation Pilot Plant (1989), *TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, WIPP-DOE-069, Westinghouse Electric Corporation
9. Lawrence Berkeley Laboratory, *Waste Management Plan*, LBL PUB-5352, latest revision
10. Environmental Protection Agency, *Protection of Environment*, Code of Federal Regulations (CFR) 40, Washington, DC
11. Department of Transportation, *Transportation*, Code of Federal Regulations (CFR) 49, Washington, D.C
12. State of California, California Code of Regulations Title 22
13. Lawrence Berkeley Laboratory, *Health and Safety Manual*, LBL PUB-3000, latest revision

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5. References (continued)

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14. *Hazardous Waste Certification Plan, Hazardous Waste Handling Facility* (LBL PUB-5356), latest revision
 15. *Waste Management Function Notebook and Hazardous Waste Handling Facility Facility Notebook*
 16. Lawrence Berkeley Laboratory, *Waste Minimization and Pollution Prevention Awareness Plan*, LBL PUB-3106, latest revision
 17. *Guidelines for Waste Accumulation Areas (WAAs) at LBL*, LBL PUB-3093, latest revision
 18. *Medical and Biohazardous Waste Generator's Guide*, LBL PUB-3095, latest revision
 19. Lawrence Berkeley Laboratory, *Waste Analysis Plan*, Section III of Volume 2A of *Hazardous Waste Treatment and Storage Permit Application for the Lawrence Berkeley Laboratory Hazardous Waste Handling Facility*
 20. NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facilities*
 21. Department of Energy (1991), *Quality Assurance*, U.S. Department of Energy, Washington, D.C., DOE Order 5700.6C
 22. LBL PUB-3111, the *LBL Operating and Assurance Program Plan*
 23. Department of Energy (1989), *General Design Criteria*, U.S. Department of Energy, Washington, D.C., DOE Order 6430.1A
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Appendix A

Master Procedure List Waste Management Program

<u>Procedure #</u>	<u>Short Title</u>
800–819: Administrative, Vendor Oversight, Quality Control	
803	Document Control
804	Records Management
805	Procedure Development and Revision
808	Nonconformance and Corrective Action Control
810	General Vendor Oversight Policy Statement
811	Oversight Procedures—Onsite Transportation
812	Oversight Procedures—Lab Packing
813	Control of Measuring and Test Equipment
814	Internal Audits and Quality Surveillances
818	Waste Management Training Program Plan
820–825: Work procedures applying to both hazardous and rad waste	
820	Characterization Procedures
820.11	Acutely and Extremely Hazardous Waste
820.2	The RMMA Waste Certification Form
821	Sampling Procedure
822	Container Procurement, Receipt, and Control
823	Transfer of Waste from Inadequate Drums
826–859: Procedures applying to radioactive and mixed waste only	
826	Basic Health/Safety for Rad Workers
827	Onsite Transportation of Radioactive and Mixed Waste
828	Offsite Transfer of Radioactive and Mixed Waste
829	Radwaste Tracking
830	SDARs
831	Radwaste Documentation/Release Procedures for Shipments to Hanford Burial Site
833	Labeling/Characterization/Segregation of Stored Radwaste
833.1	Processing of Legacy Waste at the HWHF
835	Storage/Inspection of Radwaste at HWHF
840	Compaction of Solid Low-Level Radioactive Waste
840.1	QA Checking of Solid LLW Bags to be Compacted
842	Packaging of Noncompacted Solid Low-Level Radioactive Waste

Appendix A (continued)**Master Procedure List
Waste Management Program (p. 2)**

<u>Procedure #</u>	<u>Short Title</u>
843	Packing of Induced Metals, Materials, and Equipment
844	Packing of Low-Level Animal Carcasses
845	Packing of Low-Level Absorbed Tritium
846	Packing of Scintillation Vials
847	Solidification of Low-Level Radioactive Waste Liquid
848	Packaging of Low-Level Mixed Waste
855	Packaging of Transuranic Radioactive Waste

860–889: Procedures applying to hazardous waste only

860	Inspection of Commercial TSDFs
861	Manifesting and Shipping
863	Inspections
863.1	Staging of Drums at the HWHF
865	Consolidation Procedure
867	Hazwaste Tracking
868	Release of Hazardous Waste from RMMAs
871	Handling of Bulk Acids
872	Draining and Consolidation of Battery Acid
873	Consolidation of Mercury Wastes
874	Handling of Bulk Caustics
876	Consolidation of PCBs
877	Analysis and Consolidation of Waste Oils
878	Handling of Bulk Coolants
879	Organic Liquids—Flammable
880	Organic Liquids—Halogenated Solvents
881	Consolidation of Asbestos
882	Consolidation of Contaminated Soil
883	Empty Container Disposal

890–899: Emergency Procedures

890	Emergency Procedures
891	Discovery of Explosives or Reactives

Appendix B

Definitions

Dangerous Wastes: Those solid wastes designated in WAC 173-303-070 through 173-303-103 as dangerous or extremely hazardous waste. As used in this chapter, the words "dangerous waste" will refer to the full universe of wastes regulated by this chapter (including dangerous and extremely hazardous waste). (See also "extremely hazardous waste" and "hazardous waste" definitions).

Extremely Hazardous Waste: Those dangerous wastes designated in WAC 173-303-070 through 173-303-103 as extremely hazardous. (See also "dangerous waste" and "hazardous waste" definitions).

Hazardous Wastes: Those solid wastes designated by 40 CFR Part 261, and regulated as hazardous waste by the United States EPA. (See also "dangerous" and "extremely hazardous waste" definitions).

Low-Level Waste: Waste that contains radioactivity and is not classified as high level waste, TRU waste, spent nuclear fuel, or by-product material as defined in DOE Order 5820.2A. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be designated as LLW, provided the concentration of TRU radionuclides is ≤ 100 nCi/g of the waste matrix. The mass of the waste container must not be used in calculating the concentrations of radionuclides in the waste.

Mixed Waste: Radioactive waste (LLW or TRU waste) that is co-contaminated with dangerous waste as defined in WAC 173-303-040.

Transuranic Waste: Without regard to source or form, TRU waste is waste contaminated with alpha-emitting TRU radionuclides with half-lives >20 yr and concentrations >100 nCi/g of the waste matrix. Transuranic radionuclides are radionuclides having an atomic number >92 . In addition to TRU radionuclides, radium sources and ^{233}U in concentrations >100 nCi/g of the waste matrix are designated as TRU waste by Westinghouse Hanford because of hazards similar to TRU waste. The concentration limit (100 nCi/g of waste matrix) for TRU waste applies to the item at the time it is declared waste. Additional processing of the waste (e.g., grouting) cannot be used to dilute the concentration of the fissile material and thereby change its waste designation. The only acceptable methods to be used in reducing the concentration of fissile material in waste packages are approved, permitted decontamination or treatment processes. The mass of the waste container must not be used in calculating the specific activity of the waste.

Packaged TRU waste with a surface dose rate that does not exceed 200mrem/h is designated as contact-handled TRU. Packaged TRU waste with an external dose rate in excess of 200 mrem/h is designated as remote-handled TRU. Radioactive waste with quantities of TRU radionuclides in concentrations of 100 nCi/g of the waste matrix or less is LLW.