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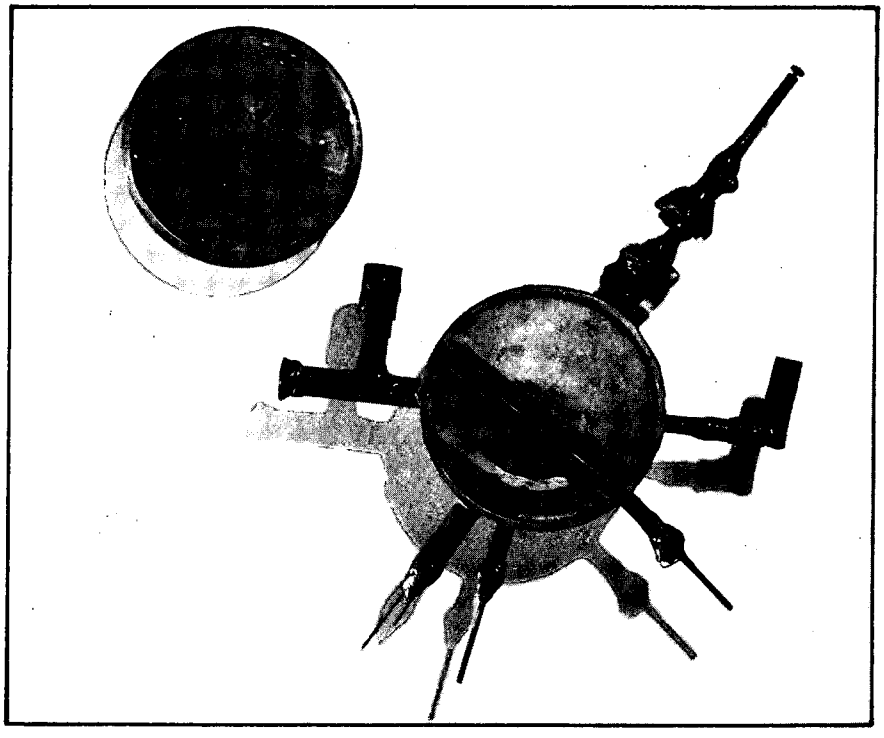
Lawrence Berkeley Laboratory

UNIVERSITY OF CALIFORNIA

ENVIRONMENT, HEALTH AND SAFETY DIVISION

Certification Plan, Radioactive Mixed Waste Hazardous Waste Handling Facility

June 1992



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PUB-5354

Certification Plan Radioactive Mixed Waste

Hazardous Waste Handling Facility

Environment, Health and Safety Division

Lawrence Berkeley Laboratory

Prepared for the U.S. Department of Energy under Contract No. DE-AC03-76SF00098

PUB-5354

Certification Plan
Radioactive Mixed Waste
Hazardous Waste Handling Facility

Environment, Health and Safety Division

Lawrence Berkeley Laboratory

Revision 0
June 30, 1992

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Section 1: Introduction

1.1 Purpose

The purpose of this plan is to describe the organization and methodology for the certification of radioactive mixed waste (RMW) handled in the Hazardous Waste Handling Facility (HWHF) at Lawrence Berkeley Laboratory (LBL). RMW is low-level radioactive waste (LLW) or transuranic (TRU) waste that is co-contaminated with dangerous waste as defined in the Westinghouse Hanford Company (WHC) Solid Waste Acceptance Criteria (WAC) [1] and the Washington State *Dangerous Waste Regulations,* 173-303-040 (18) [2]. This waste is to be transferred to the Hanford Site Central Waste Complex and Burial Grounds in Hanford, Washington.

This plan 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; an executive summary of the Waste Management Quality Assurance Implementing Management Plan (QAIMP) 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 at LBL to waste generators, 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 [1]. Waste generators have the primary responsibility for the proper characterization of RMW. The Waste Certification Specialist verifies and certifies that LBL RMW 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 LBL Waste Certification Specialist can verify that the requirements of WHC-WAC are met.

1.2 Scope

This RMW Certification Plan applies to RMW-LLW or RMW-TRU waste that is generated by LBL and becomes the responsibility of the HWHF. This plan is composed to meet the requirements of WHC-WAC, Sections 5.9 and 6.9, and follows the suggested

outline provided by the WHC letter of April 26, 1990, to Dr. R. H. Thomas, Occupational Health Department Director, LBL. LLW is defined in DOE 5820.2A [3]. TRU waste is defined in WHC-WAC Section 2.2.2. Dangerous Waste is defined in the Dangerous Waste Regulations [2] and includes dangerous wastes [173-303-040 (18)] and extremely hazardous wastes [173-303-040 (29)]. These definitions are provided in Appendix B for convenience.

The term "hazardous waste" is used generically throughout this document to refer to dangerous waste and extremely hazardous waste.

The certification process for LLW is addressed in the *Low-Level Waste Certification Plan* [4]. The certification process for TRU waste is addressed in the *Transuranic Waste Certification Plan* [5].

1.3 Facility Description

1.3.1 *Overall Facility*

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 RMW.

1.3.2 *Hazardous Waste Handling Facility*

Hazardous waste, radioactive waste, and RMW are stored, packaged, and prepared for offsite transport at the HWHF. The HWHF is a Resource Conservation and Recovery Act (RCRA) permitted 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

Figure 1-1. Location of LBL in Relation to its Surroundings

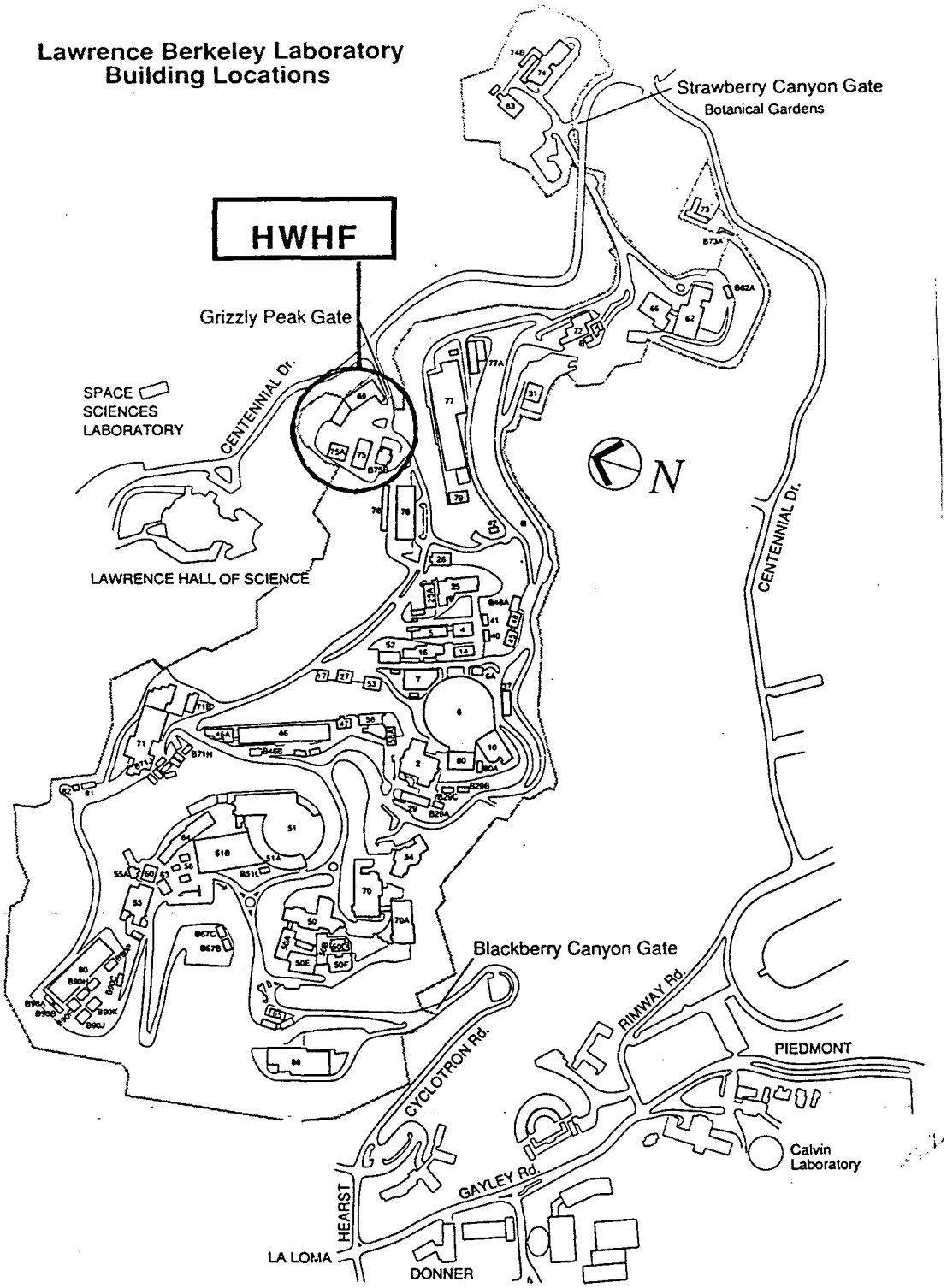

Figure 1-2. LBL Site Map Showing Location of the HWHF

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.

RMW-LLW and RMW-TRU are managed at LBL in accordance with applicable U.S. Department of Energy (DOE), U.S. Environmental Protection Agency (EPA), State of California, and Washington State regulations and are 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 RMW meets its requirements, and prepares and issues a Storage/Disposal Approval Record (SDAR). RMW-TRU 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. TRU waste shipped to Hanford must, therefore, also meet the waste acceptance criteria specified in WIPP-DOE-069 [6].

A new HWHF is currently in the design phase and undergoing NEPA/CEQA review. 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 is being processed by the California Environmental Protection Agency (Cal-EPA) to cover operations at the new facility and to close the existing one.

1.4 Facility Waste Management Strategy

The Environment, Health, and Safety (EH&S) Division is responsible for the preparation of the *Waste Management Plan* [11], which governs treatment, storage, and shipment of RMW. Individual generators are responsible for the characterization of wastes, including RMW, 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* [3]
- EPA regulations, Title 40 CFR 260-264 [7]

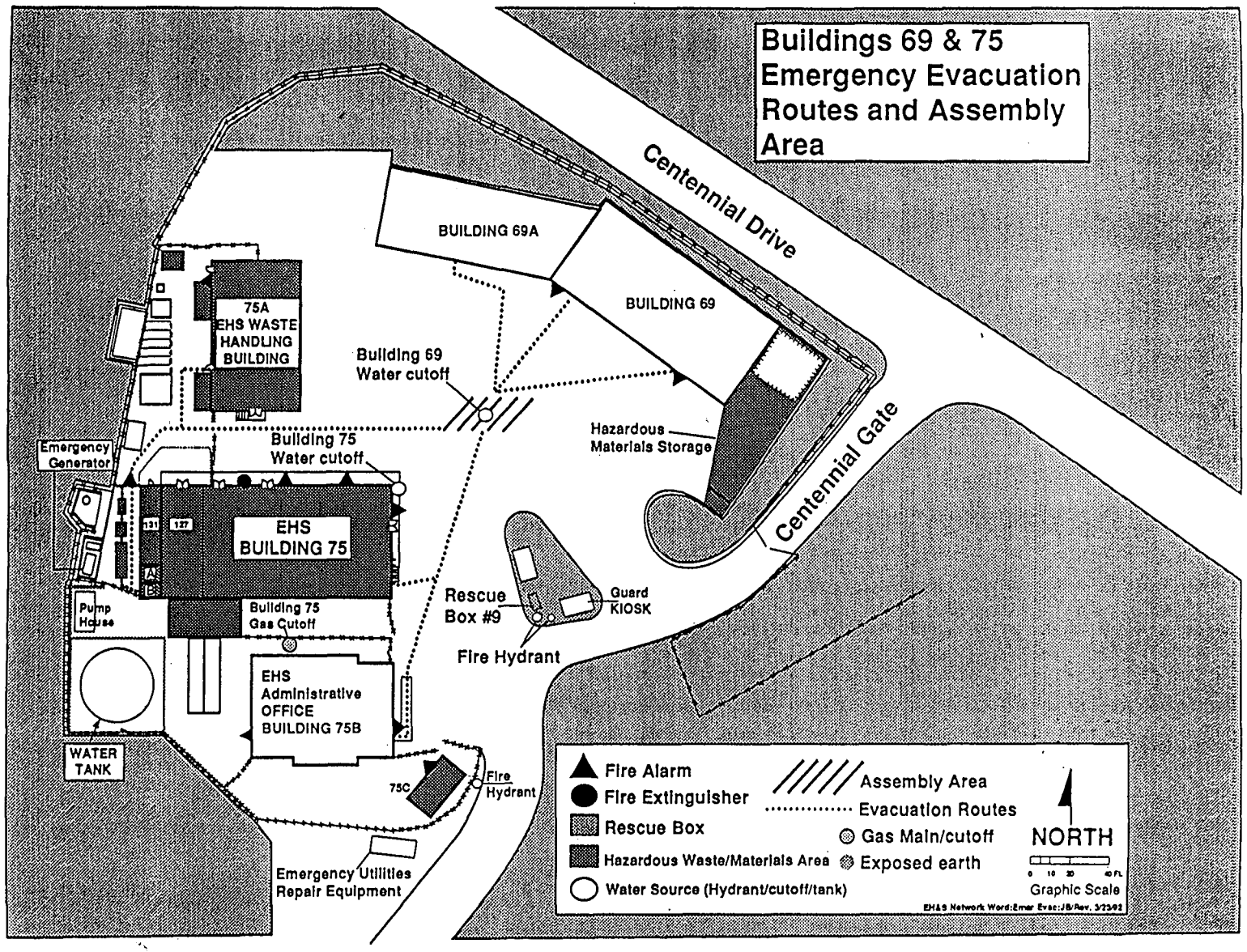

Figure 1-3. HWHF Site Plan

- DOT regulations, Title 49 CFR 171-173 [8]
- EPA regulations, Title 40 CFR 761, Subpart B [7]
- Washington State, *Dangerous Waste Regulations*, Washington Administrative Code, Chapter 173-303 [2]
- Title 26, California Administrative Code [9]
- Hanford Site Radioactive Solid Waste Acceptance Criteria [1]

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

- LBL Health and Safety Manual, PUB-3000 [10]
- Waste Management procedures (listed in Appendix A)
- *Waste Management Plan* [11]
- Hazardous Waste Management Program, *General Policy Statement*, EH&S Procedure 800
- *Guidelines for Generators of Hazardous Chemical Waste at LBL and Guidelines for Generators of Radioactive and Mixed Waste at LBL* [12] (hereinafter called the *Guidelines for Generators*)
- *Waste Minimization and Pollution Prevention Awareness Plan* [13]
- *Waste Management Quality Assurance Implementing Management Plan* [14]

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

Minimization. The *Waste Minimization and Pollution Prevention Awareness Plan* [13] provides the policy, strategy, objectives, and goals for waste minimization at LBL, including minimization of RMW.

Segregation. Segregation activities include specific separation and storage instructions contained in the *Guidelines for Generators* [12] 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 RMW Certification Plan is established by the HWHF to demonstrate compliance with WHC-WAC [1] for RMW. The processes for identifying, packaging, labeling, marking, and documenting RMW are identified in Section 3 of this RMW 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* [12] has also been issued for use.

Packaging. Waste packaging criteria are identified in Section 3.14 for each waste stream. LBL practices for packaging of RMW 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 RMW 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 material transportation regulations (49 CFR) and WHC-WAC [1].

1.4.3 *Waste Disposal QA Program Summary*

A summary of the Waste Management QAIMP [14] requirements for RMW certification is presented in Section 4. The following are some important requirements of the QAIMP:

- 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)

1.5 RMW Generation

RMW is generated by many divisions at LBL. These include the Materials Sciences, Chemical Sciences, Accelerator and Fusion Research, Applied Science, and Biology and Medicine Divisions. Besides being radioactive, the mixed waste may have toxic, corrosive, ignitable, reactive, or biological characteristics. These wastes are primarily RMW-LLW. RMW-TRU may be generated in small quantities and constitute a minor percentage of the <55 gallons per 3 years of TRU waste. No SDAR for RMW-TRU waste has been applied for.

Currently at LBL, the following RMW streams are identified, based on the following forms and characteristics:

- RMW-LLW aqueous liquid, which contains laboratory radioactive solutions contaminated with hazardous substances
- RMW-LLW noncompable solids, composed of solid dry material such as arsenic targets that are contaminated via accelerator bombardment
- RMW-LLW induced metals, such as lead, that have been irradiated via accelerator bombardment
- RMW-LLW organic liquids, consisting of flammable or combustible solutions mixed with radioisotopes

- RMW-TRU liquid, resulting from glove box operations
- RMW-TRU solids, resulting from glove box operations.

Section 2: Organization and Responsibilities

2.1 Description of Facility Organization

The Environment Department of the Environment, Health, and Safety (EH&S) Division has the responsibility for management of RMW at LBL. Within the Environment Department, the Operations Unit is responsible for handling and shipping the waste. Figure 2-1 shows the organizational chart for the Environment Department, and Figure 2-2 shows the organizational flow chart for these wastes. The *Waste Management Plan* [11] defines the minimum standards of operation for the HWHF.

2.2 Duties and Responsibilities

This section lists positions responsible for the management and handling of RMW, with the responsibilities of 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.
- Has overall responsibility for implementation of the Waste Management QAIMP [14] at the HWHF.
- Reviews and approves the Waste Management QAIMP and revisions.
- Approves Waste Management Program procedures.

2.2.2 *Department Head, Environment Department*

- Is responsible for directing and monitoring all HWHF operations.

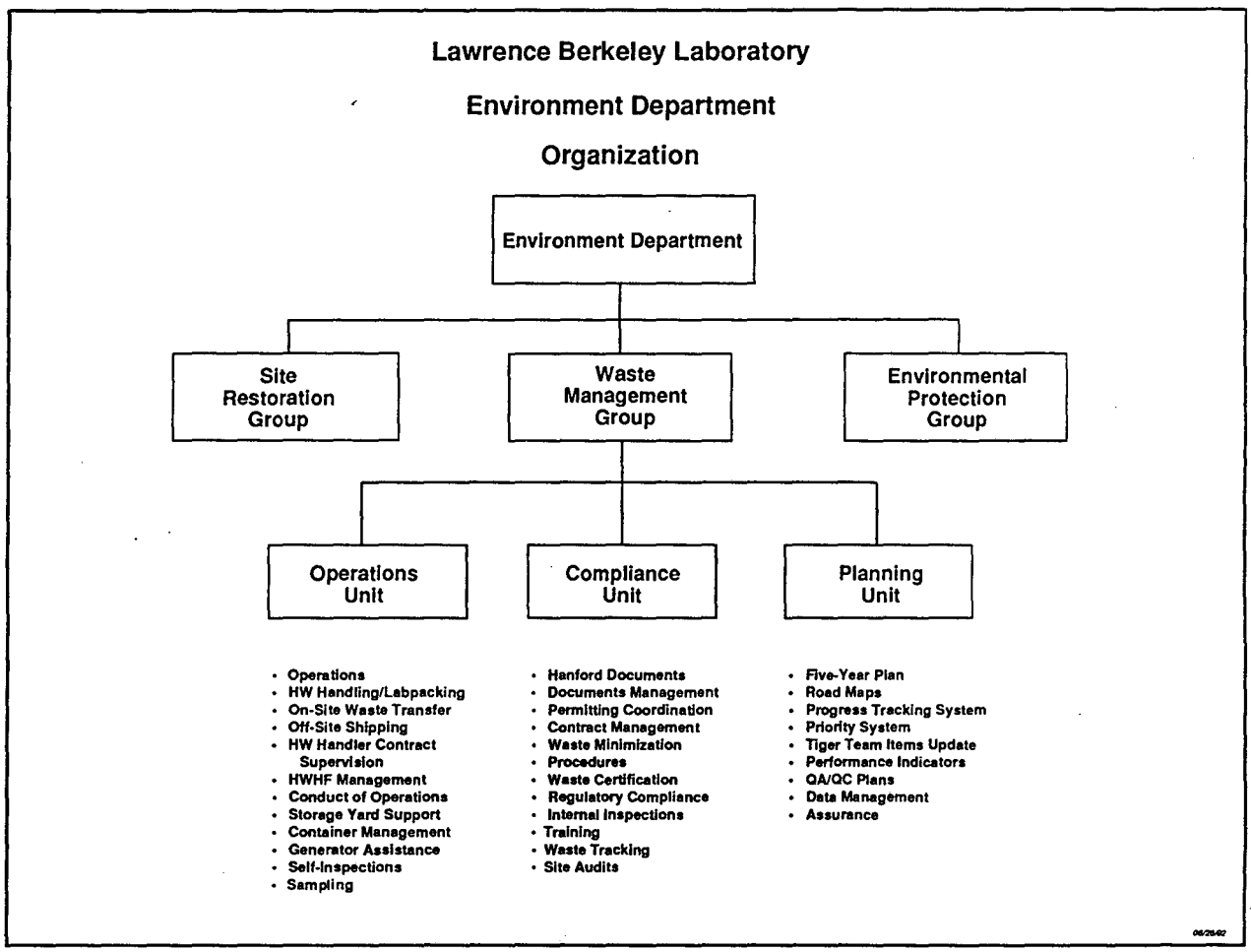

Figure 2-1. Environment Department Organization Chart

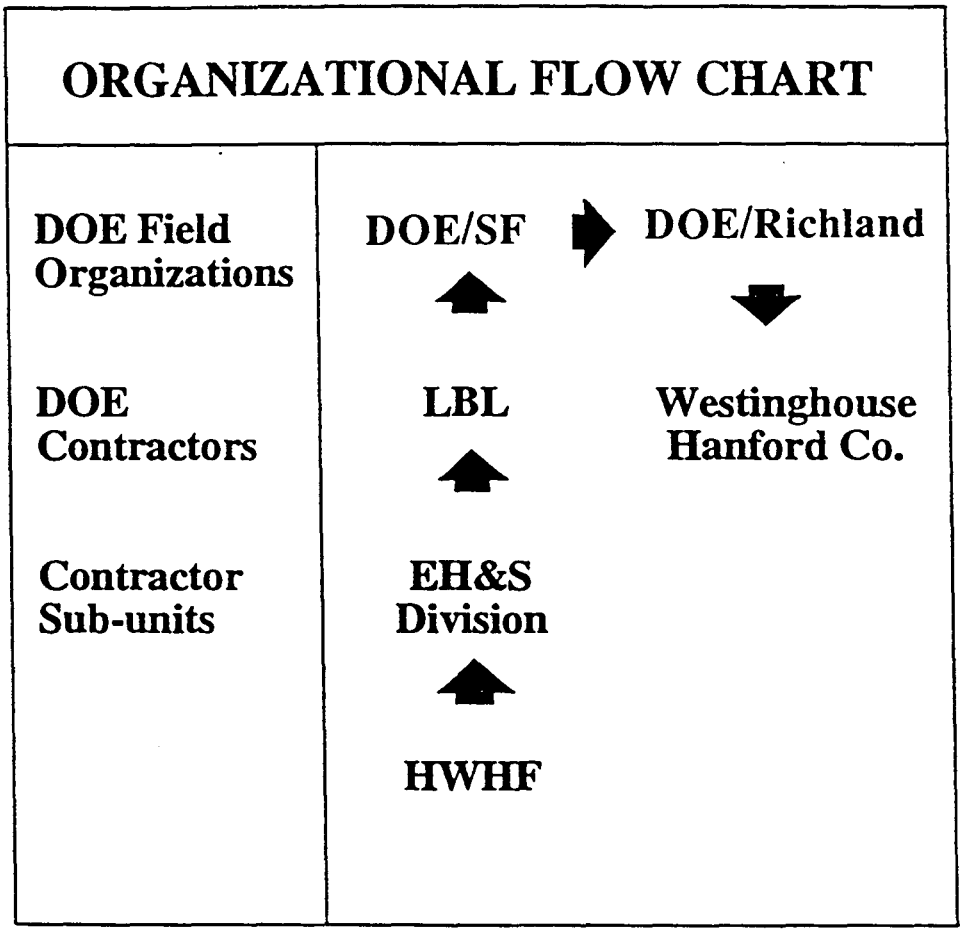

Figure 2-2. Organizational Flow for RMW

- Is responsible for directing and monitoring the implementation of the HWHF QA program.
- Reviews and approves the Waste Management Program procedures.
- Assures that waste handling operations are conducted in accordance with the requirements of WHC-WAC [1].
- Assures 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* [11].

2.2.3 *Operations Unit Manager*

- Is responsible for the supervision of RMW handling, processing, and transportation.
- Evaluates decontamination and waste disposal work, and issues assignments to Unit members.
- Organizes and trains personnel and evaluates their performances.
- Is trained in the regulations of WAC 173-303 [2].
- Maintain up-to-date knowledge of all current Cal-EPA, Washington State, DOE, and other regulations pertaining to hazardous and radioactive waste disposal for implementation within the department.
- Advises and coordinates in RMW processing.
- Prepares for state and Federal audits and inquiries and responds to various regulatory entities when required.
- Assures that waste disposal files are maintained.

- Supervises and coordinates job assignments.
- Assures that each assigned person reads the Waste Management QAIMP 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 suppliers that meet DOT requirements, as specified in 49 CFR.
- Reviews and approves the Waste Management Program procedures.

2.2.4 *Waste Minimization Specialist*

- Advises LBL personnel in effective methods of minimizing and segregating their waste.
- Assures that waste is properly analyzed for a safe waste disposal system and that effective methods of minimizing and segregating wastes are instituted.
- Evaluates each LBL operation that generates hazardous and radioactive waste to assure that minimization and segregation are adequately incorporated.

2.2.5 *Senior Technician, HWHF*

- Under limited supervision, collects, identifies, transports, prepares, stores, and disposes of hazardous and radioactive 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.
- Is trained in the regulations of WAC 173-303 [2].
- Improves methods to minimize RMW.

- Maintains compliance with all applicable regulations.
- Finds vendors to provide services for disposal, recycling, and transportation of RMW and to assure that such services comply with all applicable State of California, Washington State, DOE, EPA, and DOT requirements.
- Completes waste manifests and makes sure they reach the appropriate state offices on time.
- Assures the return of a copy of the waste manifest from transporter and waste disposal site.
- Takes prompt and appropriate action, when necessary, to prevent the effects of a detected quality problem from spreading.
- Subjects RMW 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.
- Assumes responsibility for equipment disposal based on economy and hazardous conditions.
- 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.
- Generates reports as required by DOE, EPA, or other regulatory agencies.
- Maintains an adequate disassembly and decontamination facility.
- Maintains computer data on all waste streams.
- Performs chemical separation and neutralization of RMW.
- Evaluates contaminated laboratory equipment and buildings, reclaiming where possible by physical or chemical decontamination.

- Maintains up-to-date knowledge of new surface materials, solutions, equipment, and techniques used for decontamination.
- 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 *Technician, RCRA Waste, RMW, and Radioactive Waste*

- 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's safety standards and with applicable legal requirements.
- Is trained in the regulations of WAC 173-303 [2].
- Monitors laboratory facilities, equipment, and personnel, decontaminating exposed areas.
- Transports, stores, and disposes of RMW and radioactive 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 supervisor.

2.2.7 *Waste Certification Specialist, HWHF*

- 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 [1] and relevant SDAR specifically for each waste package.
- Certifies that RMW 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.
- Certifies that labeling and marking requirements of 49 CFR 171, 172, and 173 [8], and WHC-WAC are met.
- Certifies that the appropriate documentation and records are prepared.
- Is trained in the regulations of WAC 173-303 [2].

2.3 Principal Interfaces

2.3.1 *Internal*

HWHF personnel interface with all generators of RMW 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 RMW 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 and/or materials for HWHF operations. The role of these groups is defined in various vendor purchase agreements.

Section 3: Certification Methodology

3.1 Certification Process Description

3.1.1 *Requirements*

This plan for certification of RMW is designed to assure that all RMW from the LBL HWHF meets the waste acceptance criteria for the Hanford Site Central Waste Complex and Burial Grounds. These criteria are established in the latest revision of WHC-WAC [1]. The certification methodology addresses the following areas:

- Waste Reduction: LBL imposes technical and administrative controls for the minimization of RMW.
- Waste Segregation: LBL has developed technical and administrative procedures to identify and segregate RMW from LLW, TRU, 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 RMW packages meet the surface dose, surface contamination, nuclear criticality, thermal power, package 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 RMW at LBL, with governing LBL documents listed.

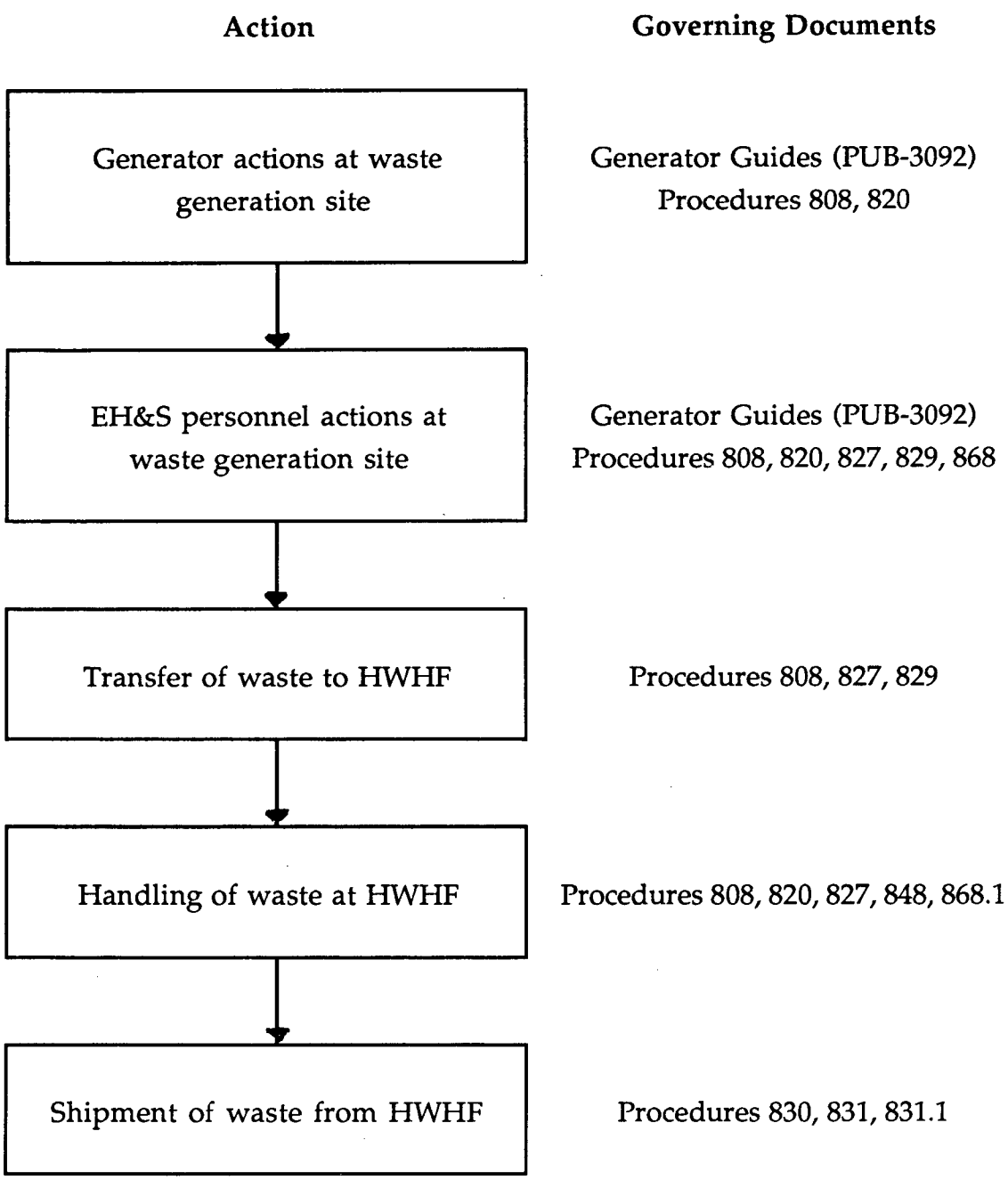

Figure 3-1. Master flow chart for RMW at LBL, with governing documents listed.

3.1.2 *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)
- Application process for SDARs (Figure 3-4)
- Documentation and release of radioactive waste to Hanford—prior to arrival of truck that will ship the waste (Figure 3-5)
- Documentation and release of radioactive waste to Hanford—after arrival of truck that will ship the waste (Figure 3-6)

Waste Minimization. LBL has established a series of documents delineating the policy and procedural requirements for the generation and control of RMW. These documents include:

- *Guidelines for Generators of Hazardous Chemical Waste at LBL and Guidelines for Generators of Radioactive and Mixed Waste at LBL* [12] (hereinafter called *Guidelines for Generators*)
- Hazardous Waste Management Procedures (Appendix A)
- General Policy Statement for the Hazardous Waste Mangement Program (EH&S Procedure 800)
- *Waste Management Plan, Hazardous Waste Handling Facility, LBL* [11]
- *Waste Minimization and Pollution Prevention Awareness Plan* [13]

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 RMW material requiring disposal.

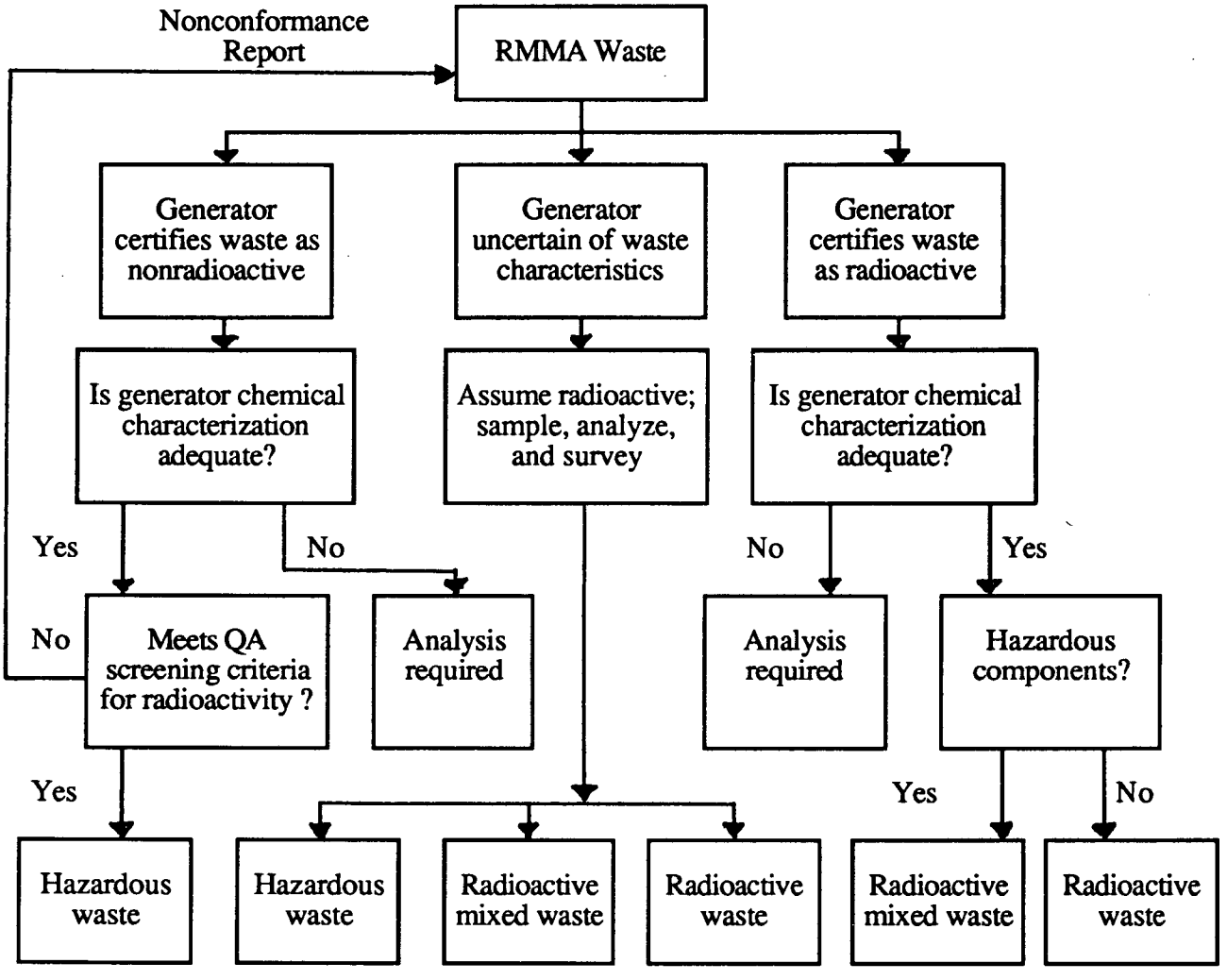

Figure 3-2. Characterization of waste from RMMAs.

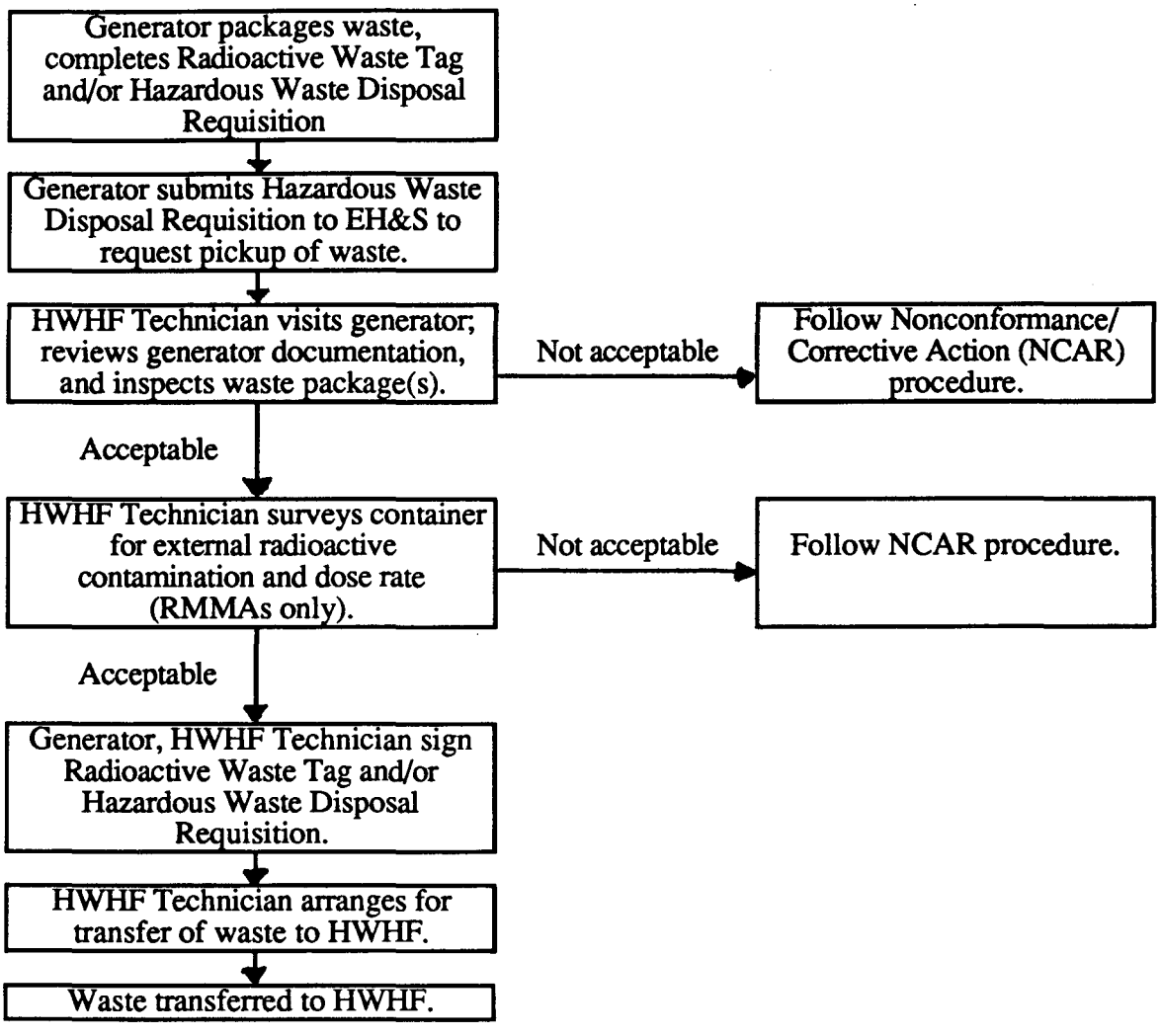

Figure 3-3. Onsite transfer of waste to the HWHF.

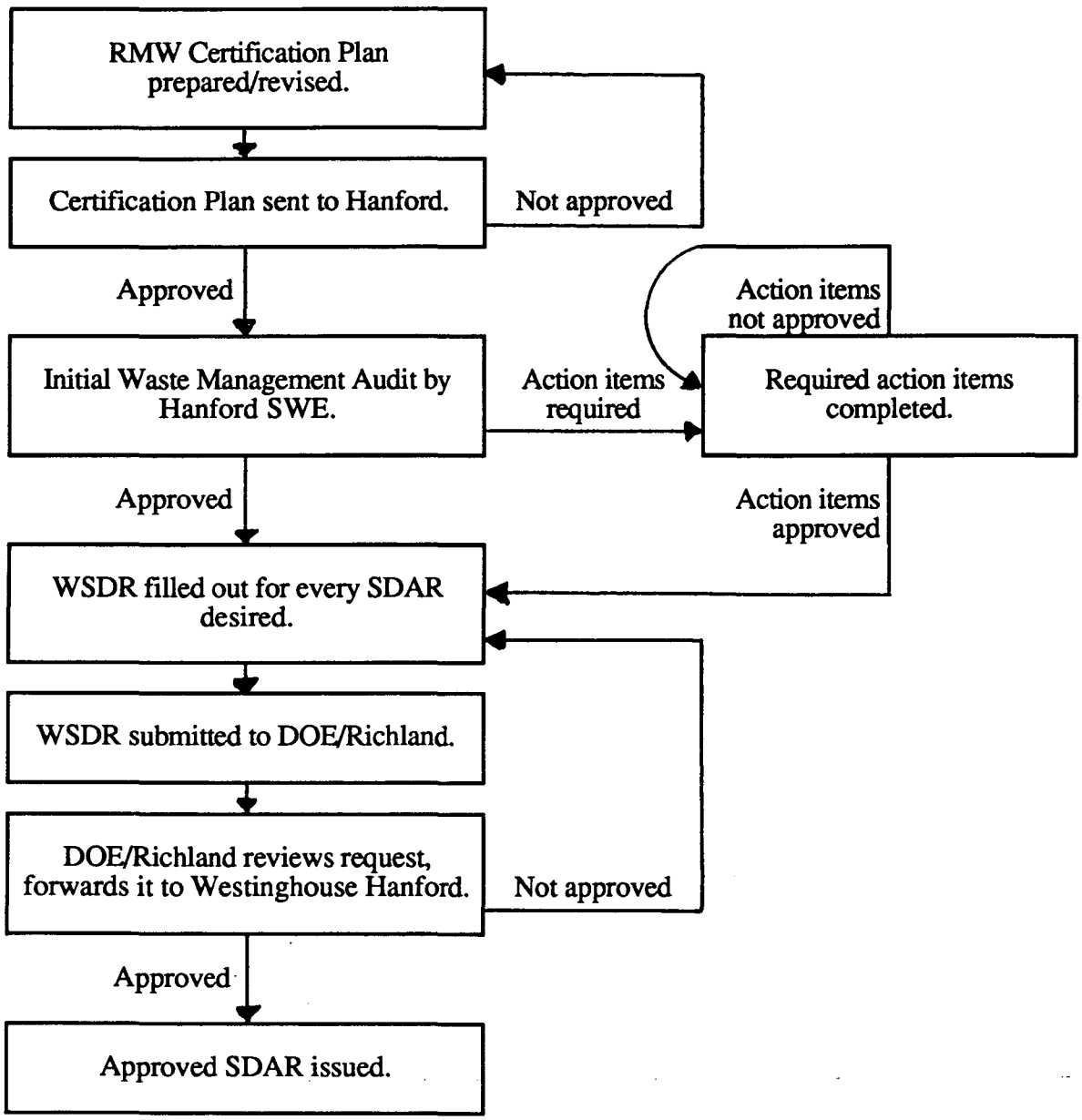

Figure 3-4. Application process for SDARs.

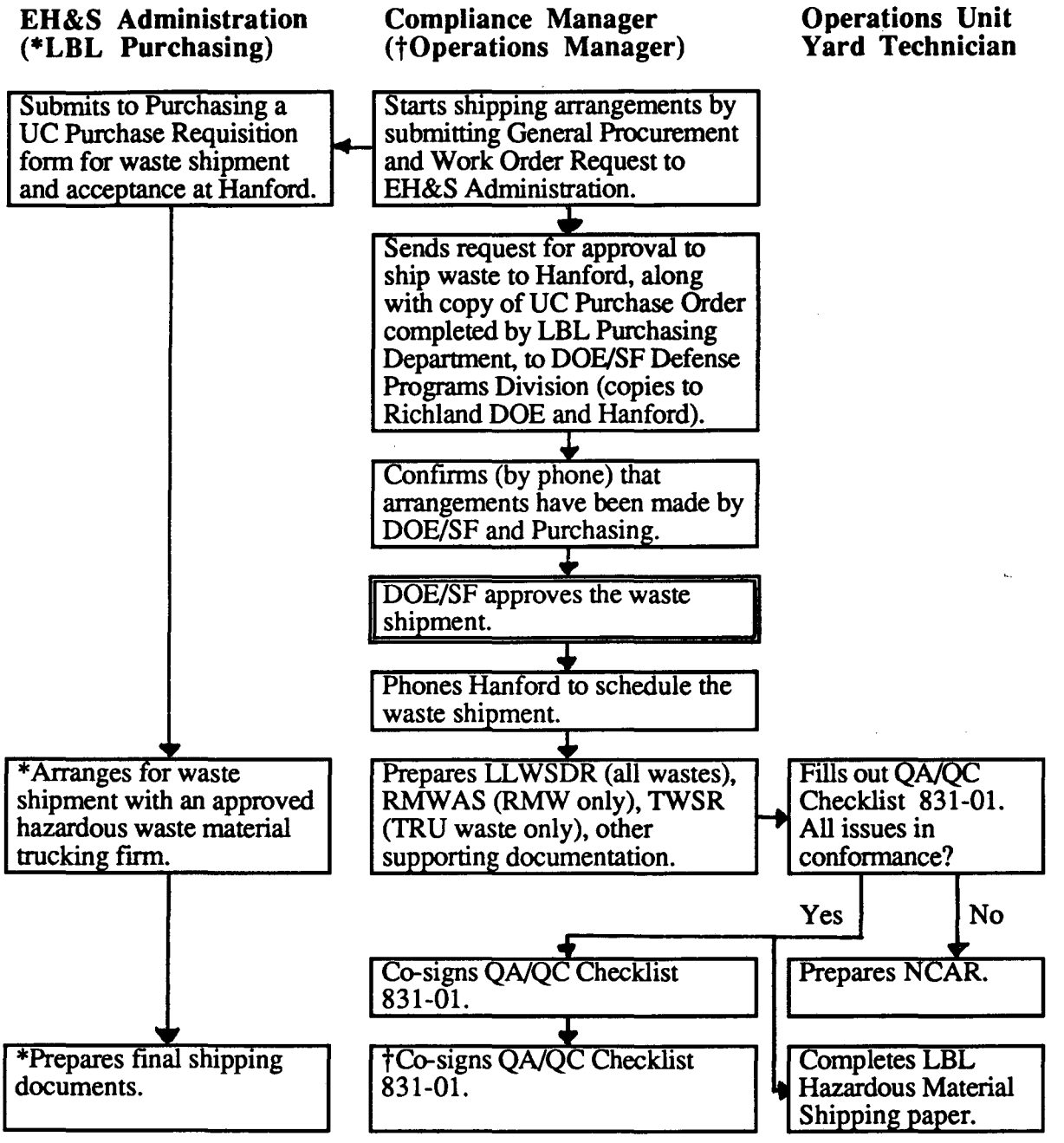

Figure 3-5. Documentation and release of radioactive waste to Hanford—prior to arrival of truck that will ship the waste.

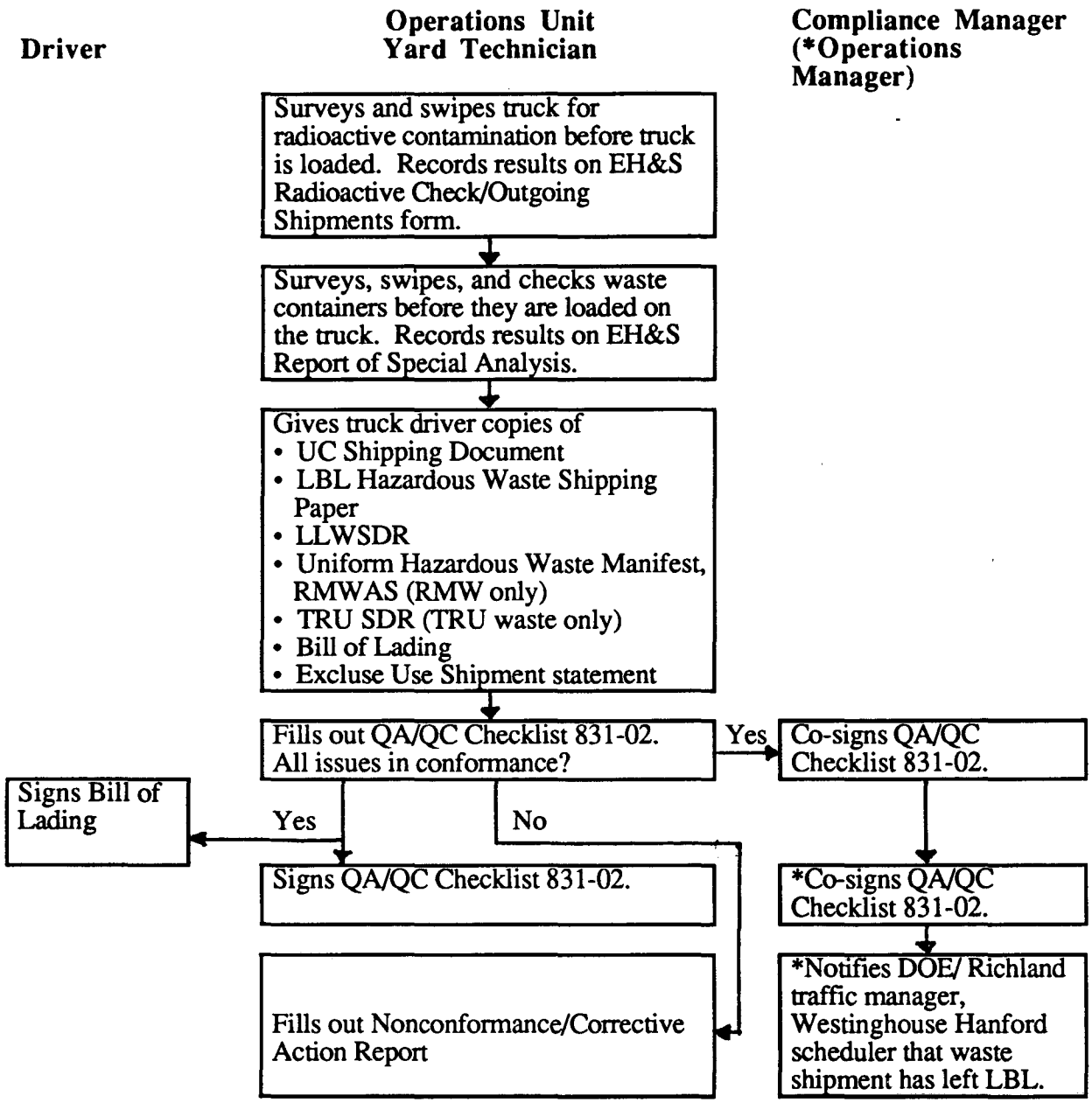

Figure 3-6. Documentation and release of radioactive waste to Hanford—after arrival of truck that will ship the waste.

RMW 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. The kinds and quantities of hazardous waste components are also estimated by using process knowledge of the researchers or chemical analysis by an independent laboratory according to the requirements of the *Guidelines for Generators* [12]. The generation and treatment of RMW-TRU and RMW-LLW at LBL is in compliance with DOE Order 5820.2A [3] and WHC-WAC [1].

To reduce the quantities of RMW produced, individual generators are instructed to

- 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 waste (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 waste 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 labeled container.
- Do not add radioactive waste to hazardous wastes.

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 [1], Section 5.3 and 6.3, "Waste Characterization." This includes the radionuclide distribution, concentration, and activity in the waste matrix. The characterization procedures ensures 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* [11] and specific Waste Management Program procedures.

LBL personnel using radionuclides are responsible for characterizing the waste generated in their work areas. Their responsibilities are outlined in the *Guidelines for Generators* [12]. 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. Radioactively 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 Technician. This information is recorded on the Radioactive Waste tag and Hazardous Waste Disposal Requisition attached to each package before the waste package is removed from the user's area. The Technician examines each waste package for accuracy before removing it from the user's area.

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 similar 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.

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

General

- Waste is not capable of generating toxic gases, vapors, fumes, or liquids.
- If the SDAR requires the use of catalyst packs, they are properly deployed.
- All packages containing volatile organic compounds are vented.

Liquids

- Liquid RMW is accepted only if absorbed or bound by inert materials. The waste matrix cannot spontaneously combust, explode, undergo liquid desorption, or affect containment barrier integrity.
- Liquid RMW is not absorbed or solidified in concrete or grout, unless approved by WHC.
- If absorption is used, it is according to WHC-WAC Section 5.5.1.
- Liquids are not packaged without the approval of WHC.
- Liquids that are not absorbed and do not have SDAR instructions are packaged as specified in WHC-WAC Section 5.5.1.
- Nonorganic liquids are packaged as specified in WHC-WAC Section 5.5.1. They are accepted only on a very limited case-by-case basis.

PCBs

- PCB oils are packaged in liquid form as specified in WHC-WAC Section 5.5.1.
- Solids contaminated with PCB are packaged as specified in WHC-WAC Section 5.4.

Scintillation Liquids

- Scintillation liquids are packaged in lab packs (40 CFR 264.316) to comply with 49 CFR 173.12. Scintillation liquids that are land-disposal-restricted are accepted only on a case-by-case basis.
- Scintillation vials are packaged as described in WHC-WAC Section 5.5.3.
- Additional restrictions for scintillation liquids in the SDAR are followed.

Metals

- Alkali metals are packaged according to requirements in the SDAR. They are accepted only on a very limited case-by-case basis.
- RMW 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 is approved by WHC.

Mercury

- Mercury is solidified before packaging by an amalgamation with zinc powder, as specified in WHC-WAC Section 5.5.7.
- Solid waste containing mercury is packaged as normal solid RMW.
- Case-by-case criteria for mercury as specified in the SDAR are met.

Asbestos

- If asbestos is included, the waste is packaged according to WHC-WAC Section 4.5.3, including the requirements of 40 CFR 61.152.
- Waste containing asbestos has an approved warning label on the outer packaging.

For RMW-LLW 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 in 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.
- RMW 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 explosives or compressed gas cylinders adhere to WHC-WAC Section 6.5.6.
- Pyrophoric materials are rendered safe by mixing with chemically stable materials or by processing to remove hazardous properties.

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 Section 6.5.1.
- Liquids are not packaged without approval of WHC.

Asbestos

- If asbestos is included, the waste is packaged according to WHC-WAC Section 4.5.3.

Metals

- If the waste contains alkali metals, it is packaged according to WHC-WAC Section 4.5.5.
- RMW containing lead is treated according to 40 CFR 268. Lead used as shielding is reviewed on a case-by-case basis by WHC.

Mercury

- Mercury is amalgamated and treated according to 40 CFR 268. Specific criteria in the SDAR are met.

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.

For RMW 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 (RMW-LLW only) steel 55-gallon drums are used, unless alternate packages are approved.
- Drum exterior surfaces comply with WHC specification HS-V-P-0010-A [1]. For other than 55-gallon drums, the SDAR specifies protective coatings.
- 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 Sections 5.4.3 and 6.4.2.
- Containers meet the handling criteria specified in WHC-WAC Section 5.4.4.
- 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:

  220 dpm/100 cm^2 for alpha-contaminated RMW-LLW

  2200 dpm/100 cm^2 for beta/gamma-contaminated RMW-LLW

  111 dpm/100 cm^2 for alpha-contaminated RMW-TRU

  999 dpm/100 cm^2 for beta/gamma-contaminated RMW-TRU

- There is no fixation of surface contamination on returnable overpacks.

- The nuclear criticality limits are met. These are specified in WHC-WAC Section 3.6.3 for RMW-TRU and in Section 4.6.6 for RMW-LLW.

- Thermal power acceptance criteria included in the SDAR are met.

- Catalysts or vents required by the SDAR are properly used.

- The void space within the container does not exceed 10% of the container volume.

For RMW-LLW 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 are met.

- 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:

  220 dpm/100 cm^2 for alpha contamination

  2200 dpm/100 cm^2 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 properly used.
- Interior void spaces are minimized to the maximum extent practical.
- The void space within the container does not exceed 10% of container volume.

Labeling and marking requirements are the same for RMW 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 RMW-TRU, the labeling and marking requirements of WHC-WAC Sections 3.7, 5.7, and 6.7 are met.
- For RMW-LLW, the labeling and marking requirements of WHC-WAC Sections 4.7, 5.7, and 6.7 are met.
- For self-contained packages, remote-handled packages, and waste packages other than 55-gallon drums, the SDAR requirements are met.
- The general criteria of WHC-WAC Section 5.7.1 are met.
- The labeling and marking character size criteria of WHC-WAC Section 5.7.2 are met.
- The location criteria of WHC-WAC Section 5.7.3 are met.
- Packages are labeled with the following information:
  - WRM number
  - Package Identification Number (PIN)
  - Gross weight (lbs or kg)
  - DOT "RADIOACTIVE" hazard class label
  - "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, and the 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 RMW container, the LLWSDR, and the Uniform Hazardous Waste Manifest form.

- The transporting vehicle is placarded according to 49 CFR 172, Subpart F [8].

3.1.3 *Procedures and Processes Common to All Waste Streams*

Qualification and Training: All users of radioactive materials are required to attend EH&S courses 430 (Radiation Protection), 343 (Hazardous Waste Generators), and 347 (Radioactive and Mixed Waste). All attendees of courses 343 and 347 receive copies of the *Guidelines for Generators*.

HWHF personnel receive extensive training on the handling of hazardous wastes, as well as handling of radioactive wastes. A complete list of training received by HWHF personnel is maintained by the Operations Unit.

Management Assessment: The Waste Management QAIMP [14] provides the oversight for HWHF certification activities to assure that these activities result in the management of waste in accordance with WHC-WAC [1]. This oversight is accomplished through the use of audits, quality surveillances, and reviews of related activities. Corrective actions and control of nonconforming items are addressed in the QAIMP and Section 4 of this document.

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

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 EH&S. 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.
- 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 and Hazardous Waste Disposal Requisition.
- HWHF personnel prepare, package, store, and arrange for offsite disposal of the waste.
- No liquid radioactive waste is poured down the sanitary drains. The HWHF 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 radionuclide releases well below DOE guidelines.

3.2 RMW-LLW, Solid Compacted

3.2.1 *Description*

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

3.2.2 *Characterization Methodology*

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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.

3.2.3 *Segregation Methodology*

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

3.2.4 *Waste Handling, Packaging, and Shipping Procedure*

The wastes are packaged at the generator's area in cement sacks inside a 24" x 38" polyethylene bag, and 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 Program procedures listed in Appendix A.

3.3 RMW-LLW, Liquid

3.3.1 *Description*

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

3.3.2 *Characterization Methodology*

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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.

3.3.3 *Segregation Methodology*

Researchers are trained to separate the materials that are contaminated with hazardous substances. They separate RMW from other LLW and hazardous wastes. Segregation methodology is provided in the *Guidelines for Generators.*

3.3.4 *Waste Handling, Packaging, and Shipping Operations*

The waste is contained in the generator areas in plastic 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 absorbant in drums. Specific handling, packaging, and shipping procedures are provided under the Waste Management Program procedures listed in Appendix A.

3.4 RMW-LLW, Solid Noncompacted

3.4.1 *Description*

This waste 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.

3.4.2 *Characterization Methodology*

The generator is responsible for characterizing the radioactive and hazardous material content of the waste and accurately completing the Radioactive Waste tag and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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.

3.4.3 *Segregation Methodology*

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

3.4.4 *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 disposal. Specific handling, packaging and shipping procedures are provided under the Waste Management Program procedures listed in Appendix A.

3.5 RMW-LLW, Induced Metals and Materials

3.5.1 *Description*

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

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 and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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*

Generators separate hazardous induced materials from other LLW and hazardous substances. Segregation methodology is provided in the *Guidelines for Generators.*

3.5.4 *Waste Handling, Packaging, and Shipping Operations*

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

3.6 RMW-LLW, Liquid Organics

3.6.1 *Description*

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

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 and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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*

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

3.6.4 *Waste Handling, Packaging, and Shipping Operations*

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

3.7 RMW-TRU, Liquid

3.7.1 *Description*

This waste is made up of small amounts of material from glove box operations. No RMW-TRU is currently being produced. However, future operations could result in small quantities of RMW-TRU liquid.

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 and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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*

Segregation methodology is provided in the *Guidelines for Generators*.

3.7.4 *Waste Handling, Packaging, and Shipping Procedure*

The wastes are stored in drums until they are shipped for disposal. Specific handling, packaging, and shipping procedures are provided under the Waste Management Program procedures listed in Appendix A.

3.8 RMW-TRU, Solid

3.8.1 *Description*

This waste is made up of small amounts of material from glove box operations. LBL researchers generate very small quantities of transuranic waste in the radiochemical research laboratories, amounting to approximately one 55-gallon drum containing trace

amounts over a three-year period. This TRU waste is in two forms: (1) contaminated laboratory items, which include small articles of adsorbent paper, metal, plastic, rubber, and glass; and (2) TRU wastes that have been stored for over 20 years, including dried salt crystals or oxide solids contained in laboratory glassware or metal capsules. This waste has not yet been characterized as being mixed with hazardous constituents, but is included here as a possible RMW-TRU stream.

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 and Hazardous Waste Disposal Requisition for each package of RMW. This waste stream is characterized in accordance with the requirements of the SDAR and the guidance provided in the *Guidelines for Generators* [12]. 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*

Segregation methodology is provided in the *Guidelines for Generators*.

3.8.4 *Waste Handling, Packaging, and Shipping Procedure*

The wastes are stored in drums until they are shipped for disposal. Specific handling, packaging, and shipping procedures are provided under the Waste Management Program procedures listed in Appendix A.

3.9 Minimization

The *Waste Minimization and Pollution Prevention Awareness Plan* [13] 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 Plan. Tracking and reporting systems and the Waste Management QAIMP [14] 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 materials whenever possible
- disposing of explosive, flammable, or highly toxic chemical wastes separately from radioactive waste (no mixing)
- requiring all employees to take EH&S courses 430 (Radiation Protection), 343 (Hazardous Waste Generators), and 347 (Radioactive and Mixed Waste), which include training in waste minimization and disposal procedures

- keeping buildup of all wastes to a minimum

3.10 Segregation

Specific segregation instructions are contained in the *Guidelines for Generators* [12]. RMW is treated or segregated to reduce any hazardous waste components using standardized treatment processes and methods. RMW-TRU waste and RMW-LLW is segregated into separate waste containers to avoid mixing with other LLW or TRU streams. All RMW is transported separately and complies with WHC-WAC [1] packaging and segregation requirements.

The HWHF establishes the policies and procedures for the minimization and segregation of RMW in the *Waste Minimization and Pollution Prevention Awareness Plan* [13] and the Waste Management Program procedures listed in Appendix A.

3.11 Onsite Treatment and Storage

LBL has submitted the Part B Permit Application for all LBL treatment processes to Cal-EPA for approval. Various treatment processes are included. For example, liquid radioactive material is evaporated in glove boxes, if practicable, and packaged in LBL-certified containers. The generator is required to chemically, radiologically, and physically characterize the RMW prior to any waste pickup and transport to the HWHF by the technician. The waste is stored at the HWHF in DOE approved 55-gallon drums (17H or 17C).

3.12 Waste Characterization, Sampling, and Analysis

3.12.1 *Characterization*

All RMW is properly characterized chemically, radiologically, and physically. Prior to HWHF approval of any waste for transfer to HWHF, the generator is required to estimate the radioactive and chemical concentrations or amounts of contaminating radionuclides using process knowledge or chemical analysis as defined in *Guidelines for Generators* [12]. Upon completion, the generator certifies that the waste has been accurately and completely characterized. The HWHF 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.

The generator, with assistance from HWHF personnel, reviews each waste stream against the lists of hazardous wastes 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 is characterized, either by generator certification or by hazard categorization, to identify its hazardous waste characteristics:

- ignitability, as defined in 40 CFR 261.22;
- corrosivity, as defined in 240 CFR 261.22;
- reactivity, as defined in 40 CFR 261.23;
- toxicity, as defined in 40 CFR 261.24; and
- biologic (infectious) nature as defined in the California Health and Safety Code, Section 25117.5.

All RMW is characterized to demonstrate that it is RMW-LLW or RMW-TRU as defined in accordance with DOE Order 5820.2A [3]. Radionuclide constituents are individually identified by isotope and their concentrations are determined. The method used to determine isotope concentration is documented on the HWHF Radioactive Waste tag.

In addition, all RMW is physically characterized to demonstrate that it meets the specifications required by WHC-WAC [1]. Any deficiencies are 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
- particulates: percent by weight less than 10 μm diameter, percent by weight less than 200 μm diameter, and percent by weight greater than 200 μm diameter
- 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. Laboratory analytical methods listed in Appendix J of WHC-WAC are acceptable per RCRA and Washington State regulations.

3.12.2 *Waste Sampling and Analysis*

RMW sampling and analysis is performed in accordance with recognized industry methods and standards. A compilation of all of the sampling procedures used by the HWHF to characterize radioactive waste is presented in the *Waste Analysis Plan* [16]. Sampling and analysis provides for an accurate representation of the waste in accordance with statistically valid or EPA-approved methods. It is the policy of the HWHF that ten percent of the waste packages accepted for disposal are verified by an independent laboratory for the accuracy of information provided on the Radioactive Waste tags. Generators should refer to the *Guidelines for Generators* [12] 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 hazardous or 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.

3.13 Waste Form Criteria

RMW capable of generating toxic gases, vapors, fumes, or liquids is not accepted as specified in DOE Order 5820.2A [3], Chapter III. Any RMW generated at LBL is identified as one of the waste streams described earlier in this section. The following waste categories are also packaged in accordance with the waste form requirements specified in WHC-WAC [1] and the Washington State Dangerous Waste Regulations, Chapter 173-303, Washington Administration Code [2]:

- Liquid Waste: If practicable, liquid RMW is bound in 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.

- Polychlorinated Biphenyl–Contaminated Organic Liquids: 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.

- Scintillation Liquids: Scintillation liquids are packaged in lab packs, as defined in 40 CFR 264.316 [7] for storage at WHC in compliance with the requirements of 49 CFR 173.12 [8]. Scintillation vials are sealed and placed in glass containers not to exceed 1 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.

- Nonorganic Liquids: Nonorganic liquids are accepted only if absorption or solidification are not acceptable packaging alternatives.

- Alkali Metals: Acceptance of alkali metals at the disposal site is on a case-by-case basis, and the metals are treated or processed prior to disposal. The treatment process is specified in the Part B Permit Application.

- Lead Waste: Elemental lead is classified as extremely hazardous waste based on toxicity tests [2]. 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.

- Mercury: Mercury is amalgamated with zinc powder to prevent migration from the package in event of a leak. The solid amalgam is sealed inside a wide-mouthed plastic container compatible with the waste amalgam, or lab-packed in bottles for future treatment.

- Asbestos: Asbestos is prepackaged in accordance with Section 4.5.3 of WHC-WAC and the requirements of 40 CFR 61.152 [7].

- Waste Rags: 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.

3.14 Waste Package Criteria

3.14.1 *Packaging*

All RMW packages accepted for disposal by WHC meet or exceed the criteria listed in the following sections.

3.14.2 *Surface Dose Rates*

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.

HWHF personnel measure surface dose rates according to the relevant 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.

3.14.3 *Surface Contamination*

RMW-LLW waste packages have no removable surface contamination exceeding 220 dpm/100 cm^2 for alpha contamination and 2,200 dpm/100 cm^2 for beta-gamma contamination. RMW-TRU waste packages have no surface contamination exceeding 111 dpm/100 cm^2 for alpha contamination and 999 dpm/100 cm^2 for beta-gamma contamination.

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

3.14.4 *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.

An Operations Unit technician performs plutonium-equivalent curie (PE-Ci) calculations on the waste drum in accordance with methods and conversion factors provided in Appendix D of WHC-WAC [1].

3.14.5 *Thermal Power*

The acceptance criteria for waste packageS exceeding 0.1 W/ft^3 are included in the applicable SDAR. Each waste package meets the requirements of 49 CFR 173.442 for heat generation and temperature [8]

An Operations Unit technician performs calculations for thermal power output in accordance with procedures specified in Appendix D of WHC-WAC.

3.14.6 *Gas Generation*

When the use of catalysts or vents is required for RMW packages, it is specified in the applicable SDAR. Liners other than plastic bags are provided with positive gas communication to the outer container.

3.14.7 *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.

3.15 Containers

3.15.1 *Types and Specifications*

Type A RMW shipments are packaged in DOT 17H drums. Monsanto Research Co. Document MLM-3245 provides part of the documentation required to meet DOT test specification in 49 CFR 173.4.5(a) [8]. All RMW-TRU waste containers are equipped with a method to prevent hydrogen or pressure buildup using an approved device as specified in the applicable SDAR. RMW-TRU 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 RMW-TRU waste container volumes use the value of 7.35 ft^3 (or 0.208 m^3) for a 55-gallon drum, as specified in the requirements of WHC-WAC.

3.15.2 *Procurement*

Containers procured and used for packaging of RMW for disposal are of DOT specification Type 17H or 17C and meet the requirements specified in 49 CFR 178.115 [8]. 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.*

3.15.3 *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, lack of imperfections
- rust and nicks

The results of this inspection, as well as the name of the person conducting the inspection, is 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 of tests conducted on drums to qualify them as DOT Specification Type A container are filed with the HWHF.

3.15.4 *Control*

Containers used for onsite transfer of RMW 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 RMW from LBL to the disposal site are controlled to assure that the integrity of the container has not been affected

during packaging or handling. EH&S Procedure 822 is used to assure 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 RMW for disposal.

3.15.5 *Containment*

All RMW 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 RMW waste.

3.16 Shipping

3.16.1 *Labeling and Marking*

All RMW packages shipped to WHC for storage or disposal meet the labeling and marking criteria specified in 49 CFR 171, 172, and 173 [8] and those of WHC-WAC [1].

3.16.2 *Packaging*

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

3.16.3 *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.

3.16.4 *Manifests*

Wastes shipped offsite are manifested. The driver is given copies of

(1) University of California shipping document

(2) LBL Hazardous Materials Shipping Paper

(3) California Uniform Hazardous Waste Manifest

(4) Hanford Low-Level Waste Storage/Disposal Record

(5) Bill of Lading

(6) Exclusive Use Shipment Statement

(7) Land Disposal Restriction form (if applicable)

(8) Radioactive Mixed Waste Attachment Sheet

The driver signs the Bill of Lading. The details for a waste manifest are delineated in EH&S Procedure 831.

3.16.5 *Transportation*

Onsite transportation of RMW is described in EH&S Procedure 827. RMW is not transferred from offsite locations to the HWHF.

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.

3.17 Certification, Data Collection, and Record-Keeping

3.17.1 *Certification Procedure*

Certified waste is waste that has been confirmed to comply with disposal/storage 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 [1] and Washington State [2] 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 subparagraphs, are met. For further details, refer to WHC-WAC [1].

3.17.2 *RMW 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

insufficient process knowledge to characterize the waste, are analyzed using the methods given in Appendix J of WHC-WAC [1].

Packaging. The Waste Certification Specialist certifies that containers meet the handling and packaging criteria outlined in Section 3.1.2 of this Plan and detailed in WHC-WAC. The Waste Certification Specialist also certifies that the waste form criteria outlined in Section 3.1.2 of this Plan and detailed in WHC-WAC are met.

3.17.3 *RMW Disposal*

For disposal of RMW at Hanford, the waste must meet the criteria specified in 40 CFR 268 [7] and in Revised Code of Washington Title 70.105.150 [2]. Land-disposal-restricted hazardous wastes cannot be accepted for disposal at WHC, except as allowed according to 40 CFR 268. RMW-TRU cannot be accepted for disposal at the Hanford Site. Therefore, the following subparagraphs refer only to RMW-LLW 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 68, 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 Appendix J of WHC-WAC.

Packaging. The Waste Certification Specialist certifies that containers meet the handling and packaging criteria outlined in Section 3.1.2 of this Plan and detailed in WHC-WAC. The Waste Certification Specialist also certifies that the waste form criteria outlined in Section 3.1.2 of this Plan and detailed in WHC-WAC are met.

3.17.4 *Labeling and Marking*

Labeling and marking requirements are the same for RMW 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 3.1.2 of this Plan and detailed in WHC-WAC are met.

3.17.5 *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 Radioctive 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 RMW 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.
- Any LBL employees authorized to sign a California Uniform Hazardous Waste Manifest must have completed training as specified in 40 CFR 264.16. Records of the initial training and annual reviews (or retraining) are established and maintained for each authorized individual.

- 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 the following for at least three years:

  - all test results

  - all waste analyses

  - all other determinations made to designate hazardous waste

  - copies of all manifests (including the signed facility receipt)

  - copies of each annual report

  - copies of each exception report

Section 4: Quality Assurance

4.1 QA Organization, Duties, and Responsibilities Summary

The LBL Waste Management Quality Assurance Implementing Management Plan (QAIMP) [14] describes the Quality Assurance organization, duties, and responsibilities for the management of activities required to handle, store, and prepare for shipment RMW waste at LBL. The program has been designed to assure that generated waste meets the following:

- WHC-WAC [1]
- NQA-1-1989, *Quality Assurance Program Requirements for Nuclear Facilities*
- DOE Order 5700.6C, *Quality Assurance* [17]
- DOE Order 5820.2A, *Radioactive Waste Management* [3]
- Title 40 CFR 264 [7]

The Waste Management QAIMP is the written quality assurance program plan required by the University of California Lawrence Berkeley Laboratory Institutional Quality Assurance Program Plan (IQAPP) for EH&S activities related to the HWHF.

4.2 Summary of the Facility Quality Assurance Program

The Waste Management QAIMP establishes the framework and requirements that are met in planning, implementing, documenting, and verifying HWHF activities. The sections 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 QAIMP. Figures 4-1 and 2-1 show the organizational relationships of positions.

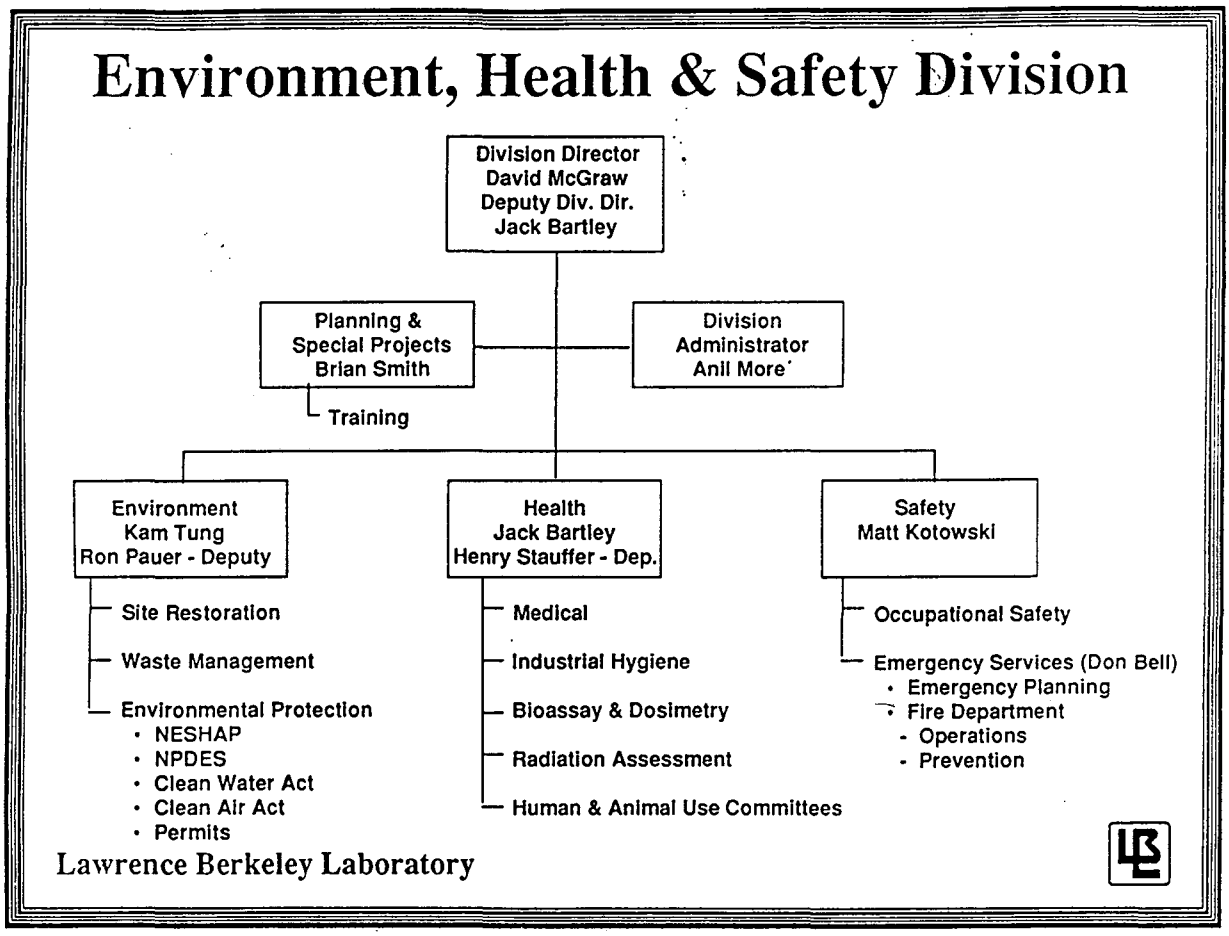

Figure 4-1. EH&S Organization

Functional Responsibilities

Associate Laboratory Director, Scientific and Technical Resources

- Has overall responsibility for the implementation of the QAIMP in the HWHF.
- Assures resources necessary to implement the QAIMP are provided.
- Approves the use of the QAIMP and any revisions.

Division Director, Environment, Health, and Safety (EH&S) Division

- Is responsible for directing and monitoring the implementation of the QAIMP.
- Reviews and concurs in the use of the QAIMP and any revisions.

Department Manager, Environment Department

- Is responsible for directing and monitoring the HWHF QA program.
- Issues the QAIMP and any revisions.
- Assures audits and reviews are conducted as specified in the QAIMP.
- Assures the necessary corrections, identified as a result of the QA audits and reviews, are accomplished in a timely manner.

Section Leaders, HWHF

- Are responsible for plans and supervision of the HWHF.
- Evaluate disposal work and issue assignments to members of the section.
- Organize training for members of the HWHF, as well as LBL waste generators.
- Assure that waste is properly analyzed and effective methods of minimizing and segregating waste are instituted.
- Assure that waste disposal files are maintained.

EH&S QA Management

- Reviews QA training to assure competence is attained as required by the LBL Institutional QA Plan.

EH&S QA Program Personnel

- Assure that quality is achieved and maintained by those who have responsibility for the work.
- Verify achievement of quality.
- May delegate work but not responsibility.
- Have the authority, access, and freedom to identify quality problems; initiate, recommend, or provide solutions to quality problems; verify implementation of solutions; and ensure proper disposition of nonconformances or unsatisfactory conditions.
- Have direct access to responsible management levels where appropriate action can be effected.

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.

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 [18].

4.2.4 *Procurement Document Control*

Quality-affecting procurement documents are controlled to assure that the procurement cycle has been implemented effectively.

4.2.5 *Instructions, Procedures, and Drawings*

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 *Document Control*

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 QAIMP and implementing procedures.

4.2.7 *Control of Purchased Items and Services*

Procurement and Work Order Requests are used to assure that materials, equipment, and services important to EH&S activities are procured to meet specific requirements.

4.2.8 *Identification and Control of Items*

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 *Control of Processes*

Waste handling activities are performed in accordance with procedures specified in the *Waste Management Plan* [11] and related implementing procedures. Waste certification is controlled by the applicable waste certification plan requirements.

4.2.10 *Inspection*

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 *Test Control*

Tests are performed by the Hazardous Waste Handling Facility to verify performance of treatment processes, characterization of waste and to demonstrate container and packaging adequacy. Tests are performed according to the DOT regulations [8] and WHC-WAC [1].

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 EH&S. The Environment Department Manager approves the development and use of calibration procedures and requirements for control of measuring and test equipment for RMW.

4.2.13 *Handling, Storage, and Shipping*

The handling, storage, and shipping of RMW 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 (i.e,. waste containers that do not meet approved standards, waste that cannot be accepted by WHC, etc.) as outlined in the Waste Management Program procedures listed in Appendix A.

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 QA 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, QA records are retained for the lifetime of the HWHF; however, the Environment Department Manager may limit or extend the retention period and may specify methods of disposal.

4.2.18 *Surveillance and Audits*

In accordance with the LBL IQAPP, 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 [17], 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 QAIMP sections.

Table 4-1. NQA-1 Criteria and Relevant WM QAIMP Sections

NQA 1 Criterion	WM QAIMP 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.

Section 5: References

1. Westinghouse Hanford Company (1991), *Hanford Site Radioactive Solid Waste Acceptance Criteria*, Richland, WA, WHC-EP-0063-3, September 1991.

2. Washington State (1991), *Dangerous Waste Regulations*, Chapter 173-303, Washington Administrative Code, Washington State Department of Ecology, Olympia, WA.

3. Department of Energy (1988), *Radioactive Waste Management*, U.S. Department of Energy, Washington, D.C., DOE Order 5820.2A.

4. Lawrence Berkeley Laboratory (1991), *Low Level Waste Certification Plan.*

5. Lawrence Berkeley Laboratory (1991), *Transuranic Waste Certification Plan.*

6. Waste Isolation Pilot Plan (1989), *TRU Waste Acceptance Criteria for the Waste Isolation Pilot Plant*, WIPP-DOE-069, Westinghouse Electric Corporation, Carlsbad, NM.

7. Environmental Protection Agency (1991), *Environment,* Code of Federal Regulations, Title 40, Washington, D.C.

8. Department of Transportation (1991), *Transportation,* Code of Federal Regulations, Title 49, Washington, D.C.

9. State of California (1991), *Toxics,* California Administrative Code, Title 26, California Code of Regulations, Sacramento, CA.

10. Lawrence Berkeley Laboratory (1990), *Health and Safety Manual*, LBL PUB-3000.

11. Lawrence Berkeley Laboratory (1991), *Waste Management Plan* .

12. Lawrence Berkeley Laboratory (1991), *Guidelines for Generators of Hazardous Chemical Waste at LBL and Guidelines for Generators of Radioactive and Mixed Waste at LBL*, LBL PUB-3092.

13. Lawrence Berkeley Laboratory (1991), *Waste Minimization and Pollution Prevention Awareness Plan.*

14. Lawrence Berkeley Laboratory (1992), *Waste Management Quality Assurance Implementation Management Plan.*

15. Department of Energy (1989), *Hazardous and Mixed Waste Program*, U.S. Department of Energy, Washington, D.C., DOE Order 5400.3.

16. Lawrence Berkeley Laboratory (1991), *Waste Analysis Plan, Hazardous Waste Handling Facility, LBL*, Berkeley, CA.

17. Department of Energy (1991), *Quality Assurance*, U.S. Department of Energy, Washington, D.C., DOE Order 5700.6C.

18. Department of Energy (1989), *General Design Criteria*, U.S. Department of Energy, Washington, D.C., DOE Order 6430.1A.

Appendix A

MASTER PROCEDURE LIST
WASTE MANAGEMENT PROGRAM

Procedure #	Short Title	Old # (if changed)
800–819:	**General, Vendor Oversight, Quality Control**	
800	General Policy Statement (Rev. 1, 3/20/92)	
802	Waste Management Documentation and Guides (Rev. 0, 9/22/92)	
803	Document Control (Rev. 0, 9/22/92)	
804	Records Management (Rev. 0, 9/22/92)	
805	Procedure for Writing Procedures (Rev. 0, 7/17/91)	
808	Nonconformance Control (Rev. 0, 6/3/92)	
810	General Vendor Oversight Policy Statement (Rev. 0, 7/17/91)	
811	Oversight Procedures—Onsite Transportation (Draft, 1/92)*	
812	Oversight Procedures—Lab Packing (Rev. 1, 3/20/92)	
813	Control of Measuring and Test Equipment (Rev. 0, 9/22/92)	
814	Internal Audits and Quality Surveillances (Rev. 0, 9/22/92)	
815	Management Reviews (Self-Assessments) (Rev. 0, 9/22/92)	
818	Waste Management Training Program Plan (Rev. 0, 9/22/92)	
820–825:	**Work procedures applying to both hazardous and rad waste**	
820	Characterization Procedure (Rev. 0, 5/27/92)	806
820.1	Hazard Categorization (Draft, 7/92)	806.1
821	Sampling Procedure (Draft, 7/92)	816
822	Container Procurement, Receipt, and Control (Draft, 1/92)	807
823	Transfer of Waste from Inadequate Drums (Draft, 6/92)	817
826–859:	**Procedures applying to radioactive and mixed waste only**	
826	Basic Health/Safety for rad workers (Draft, 9/92)	820–827
827	Onsite Transportation of Radioactive Waste (Rev. 1, 9/22/92)	809
828	Offsite Transfer of Radioactive Waste (Rev. 1, 9/22/92)	809.1
829	Radwaste Tracking (Rev. 0, 6/15/92)	
830	SDARs (Rev. 0, 6/15/92)	
831	Radwaste Documentation/Release Procedures for Shipments to Hanford Burial Site (Rev. 0, 5/27/92)	
831.1	Instructions on Filling Out SWS/DRs (Rev. 0, 6/15/92)	
833	Labeling/Characterization/Segregation of Stored Radwaste (Draft, 1/92)	
835	Storage/Inspection of Radwaste at HWHF (Draft, 7/92)	
840	Compaction of Solid Low-Level Radioactive Waste (Rev. 1, 6/15/92)	

* Final version awaiting Part B Permit approval.
NOTE: All procedures have been implemented; procedures implemented in draft form are still undergoing independent review or field testing.

Appendix A (Continued)

MASTER PROCEDURE LIST
WASTE MANAGEMENT PROGRAM (p. 2)

Procedure #	Short Title	Old # (if changed)
841	Packaging of Noncompacted Solid Low-Level Radioactive Waste (Rev. 0, 6/15/92)	
842	Packaging of Noncompacted Solid Low-Level Radioactive Waste—Wooden Boxes (Rev. 0, 6/15/92)	
843	Packing of Induced Metals, Materials, and Equipment (Rev. 0, 6/15/92)	
844	Packing of Low-Level Animal Carcasses (Rev. 0, 6/15/92)	
845	Packing of Low-Level Absorbed Tritium (Rev. 0, 6/15/92)	
846	Scintillation Vial Crushing (Rev. 1, 9/22/92)	
847	Solidification of Low-Level Radioactive Waste Liquid (Rev. 1, 6/15/92)	
848	Consolidation Procedure—Low-Level Radioactive Mixed Waste (Draft, 6/92)	
855	Packaging of Transuranic Radioactive Waste (Draft, 6/92)	
860–889:	**Procedures applying to hazardous waste only**	
861	Manifesting and Shipping (Rev. 1, 5/27/92)	
862	Waste Container Request, Issuance, and Control (Draft, 1/92)	
863	Inspections (Draft, 1/92)	
865	Consolidation Procedure (Rev. 0, 2/20/92)	
867	Hazwaste Tracking (Rev. 0, 5/27/92)	
868	Release of RCRA/TSCA Waste from Uncontrolled Areas (Rev. 0, 5/27/92)	838
868.1	Release of RCRA/TSCA Waste (unknown origin) from HWHF (Rev. 0, 5/27/92)	838.1
[708	Release of Materials/Equipment from RMMAs (Rev. 0, 5/27/92)]	
871	Handling of Bulk Acids (Draft, 1/92)*	
872	Draining and Consolidation of Battery Acid (Draft, 1/92)*	
873	Consolidation of Mercury Wastes (Draft, 1/92)*	
874	Handling of Bulk Caustics (Draft, 1/92)*	
876	Consolidation of PCBs (Draft, 1/92)*	
877	Analysis and Consolidation of Waste Oils (Draft, 1/92)*	
878	Handling of Bulk Coolants (Draft, 1/92)*	
879	Organic Liquids—Flammable (Draft, 1/92)*	
880	Organic Liquids—Halogenated Solvents (Draft, 1/92)*	
881	Consolidation of Asbestos (Draft, 1/92)*	
882	Consolidation of Contaminated Soil (Draft, 1/92)*	
890–899:	**Emergency Procedures**	
890	Emergency Procedures (Draft, 1/92)*	801

* Final version awaiting Part B Permit approval.

Appendix B

Definitions

Dangerous Wastes: Dangerous waste means those solid wastes designated in WAC 173-303-070 through 173-303-103 (Washington State 1989) 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: Extremely hazardous waste means those dangerous wastes designated in WAC 173-303-070 through 173-303-103 (Washington State 1989) as extremely hazardous. (See also "dangerous waste" and "hazardous waste" definitions).

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

Low-Level Waste: Low-level waste is 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 Orders 5820.2A and 5400.3. 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 $\leq$100 nCi/g of the waste matrix. The mass of the waste container shall not be used in calculating the concentrations of radionuclides in the waste.

Radioactive Mixed Waste: Radioactive mixed waste is radioactive waste (LLW or TRU waste) that is co-contaminated with dangerous waste as defined in WAC 173-303-040(18) (Washington State 1989).

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 shall not be used in calculating the specific activity of the waste.

Packaged TRU waste with a surface dose rate that does not exceed 200 mrem/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 wastes with quantities of TRU radionuclides in concentrations of 100 nCi/g of the waste matrix or less is LLW.

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