U.S. Environmental Protection Agency

Office of Solid Waste

UNITED STATES · ENVIRONMENTAL PROTECTION AGENCY ·

Mixed Waste Training Course

1989/1990

MIXED WASTE TRAINING COURSE

Presented by:

Office of Solid Waste
U.S. Environmental Protection Agency

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MIXED WASTE TRAINING COURSE

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MIXED WASTE TRAINING COURSE - OBJECTIVES

- Familiarize EPA permit writers and inspectors with mixed waste issues
- Demonstrate that dual regulation is workable
- Emphasize that dealing with mixed waste sometimes calls for a departure from "business as usual"

MIXED WASTE TRAINING COURSE - TOPICS

I. Overview of Mixed Waste Regulation

II. Introduction to Basic Radiation Concepts

III. Potential Mixed Waste Universe

IV. Inspections, Health Physics, and On-Site Activities

V. Permitting Mixed Waste Facilities

OVERVIEW OF MIXED
WASTE REGULATION

OVERVIEW OF MIXED WASTE REGULATION

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OVERVIEW OF MIXED WASTE REGULATION - OBJECTIVES

- Define mixed waste and explain the regulatory history that lead to the current status of mixed waste
- Provide an explanation of:
  - EPA's role in regulating the hazardous portion of mixed waste
  - NRC's role in regulating the radioactive portion of mixed waste generated at commercial facilities
  - DOE's role in regulating the radioactive portion of mixed waste generated at DOE facilities
- Discuss the complexity involved in integrating the various regulatory programs

DEFINITION OF MIXED WASTE

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OVERVIEW OF MIXED WASTE REGULATION - DEFINITION OF MIXED WASTE

- RCRA mixed waste contains:
  - -- Hazardous component as defined by and regulated under RCRA
  - -- Radioactive component as defined by and regulated under the Atomic Energy Act (AEA)

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- Unless and until radioactivity becomes a hazardous waste characteristic, or unless specific radioactive wastes are listed, RCRA cannot regulate the radioactive component of mixed waste.

- Wastes containing a non-RCRA hazardous chemical component are not addressed in this training, nor are RCRA hazardous wastes containing a non-AEA radioactive component (e.g., Naturally Occurring or Accelerator Produced Radioactive Material (NARM)).

- NARM is radioactive material, but it is not regulated under the AEA. NARM waste could be regulated under RCRA because it was not excluded from RCRA regulation as were other radioactive materials. However, currently NARM is not regulated under RCRA.

- EPA is the only Federal agency with the authority to regulate NARM waste.

- States may regulate NARM waste under State-implemented regulations.

- Refer to Appendix A.

OVERVIEW OF MIXED WASTE REGULATION - DEFINITION OF MIXED WASTE

- Source, special nuclear, and by-product materials are radioactive materials regulated under the AEA
  - -- Source material includes uranium and thorium ores
  - -- Special nuclear material includes fresh uranium fuel in a reactor and plutonium
  - -- By-product material includes industrial and medical radionuclides, and uranium and thorium mill tailings

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- Source material is defined as uranium, thorium, or any other material that is determined pursuant to provisions of the AEA to be source material, as well as ores containing one or more of these materials in such concentration as may be determined.

- Special nuclear material is defined as (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material that is determined pursuant to the AEA to be special nuclear material but which does not include source material; or (2) any material that is artificially enriched by any of the above, but which does not include source material.

- By-product material is defined as (1) any radioactive material (except special nuclear material) yielded in, or made radioactive by exposure to, the radiation incident to the process of producing or utilizing special nuclear material; and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

- RCRA excludes from regulation source, special nuclear, and by-product material; these constituents are regulated under the AEA. However, when source, special nuclear, or by-product wastes also contain hazardous wastes, the "mixed waste" becomes subject to RCRA as well as the AEA.

OVERVIEW OF MIXED WASTE REGULATION - DEFINITION OF MIXED WASTE

- Subclasses of radioactive waste containing AEA materials:
  - -- Transuranic waste
  - -- High-level radioactive waste
  - -- Spent nuclear fuel
  - -- Low-level radioactive waste
  - -- Mill tailings waste

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- Subclasses of radioactive waste containing AEA materials do not alter RCRA's authority over the hazardous component of mixed waste.

- Transuranic waste is waste that is contaminated with alpha-emitting transuranic radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay, without regard to source or form.

- High-level radioactive waste is the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid that contains fission products in sufficient concentrations.

- Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

- Low-level radioactive waste is radioactive material that is not transuranic waste, high-level radioactive waste, spent nuclear fuel, or 11(e)2 by-product material (uranium or thorium mill tailings).

OVERVIEW OF MIXED WASTE REGULATION - DEFINITION OF MIXED WASTE

- Because of safety and technical reasons, it is usually not feasible to "physically" separate mixed waste into two components
- The different risks posed by each component must be addressed in a single waste management solution

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- The design of facilities, drafting of operating requirements for permits or licenses, and the development of cleanup solutions must be done in a manner that adequately addresses the different risks posed by each component.

HISTORY OF MIXED WASTE REGULATION

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OVERVIEW OF MIXED WASTE REGULATION - HISTORY

- Congress intentionally created a framework of dual regulation
- Consequently, EPA and NRC/DOE (or approved States) jointly regulate the same waste
- Much of the waste that is now regulated as mixed waste was previously regulated as radioactive waste under the AEA and is entering the RCRA regulatory program for the first time

OVERVIEW OF MIXED WASTE REGULATION - HISTORY

Atomic Energy Act

- AEA provides authority to govern the possession and use of special nuclear material, source material, and by-product material
  - -- Nuclear Regulatory Commission (NRC) is primarily responsible for exercising this authority over commercial facilities
  - -- Department of Energy (DOE) is primarily responsible for exercising this authority over Government-owned and -operated facilities

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- NRC has authority over several Federal facilities, such as the National Institutes of Health and the Bureau of Standards.

OVERVIEW OF MIXED WASTE REGULATION - HISTORY

Federal Register clarifications establishing dual regulation:

- EPA Clarification of RCRA Applicability to Mixed Waste, July 3, 1986
- DOE Clarification of the Definition of By-Product Material, May 1, 1987

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- EPA Clarification of RCRA Applicability to Mixed Waste, July 3, 1986 (51 FR 24504). The Notice provided EPA's legal interpretation of the source, special nuclear and by-product exclusion and required States to obtain authorization for mixed waste. (Refer to Appendix B)

- DOE Clarification of the Definition of By-Product Material, May 1, 1987 (52 FR 15937). For the purposes of determining the applicability of RCRA, "by-product material refers to the actual radionuclides dispersed or suspended in any radioactive waste substance (except special nuclear material) yielded in, or made radioactive by exposure to, the radiation incident to the process of producing or utilizing special nuclear material." This clarification applies only to 11(e)1 by-product material. According to this clarification, only the actual radionuclides, not the entire waste stream, are considered by-product material; and thus, RCRA has authority to regulate the hazardous portion of the waste stream. (Refer to Appendix C)

OVERVIEW OF MIXED WASTE REGULATION - HISTORY

- Hazardous waste treatment, storage, and disposal facilities (TSDFs) must obtain a RCRA permit; however, TSDFs may operate under interim status until a permit is issued
- EPA extended the interim status qualification deadline for facilities handling mixed waste
- Extension ensures that newly regulated mixed waste facilities can legally operate under RCRA

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- Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste, September 23, 1988 (53 FR 37045). (Refer to Appendix D)
- In unauthorized States, the deadline for facilities handling mixed waste was extended to March 23, 1989, which is six months after EPA issued the extension notice. (Refer to Appendix E)
- In authorized States, the deadline will be established by the State, but generally it will be six months after the effective date of the State's authorization for mixed waste.

ROLE OF EPA

AND EPA AUTHORIZED STATES

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OVERVIEW OF MIXED WASTE REGULATION - ROLE OF EPA AND EPA AUTHORIZED STATES

Office of Solid Waste (OSW)

- Authorized by RCRA
  - -- Regulates the handling of listed and characteristic hazardous waste
  - -- Primary implementation by the States through authorization
  - -- After a State has been authorized, EPA can enforce the State's regulations
- Source, special nuclear, and by-product material are exempt from RCRA

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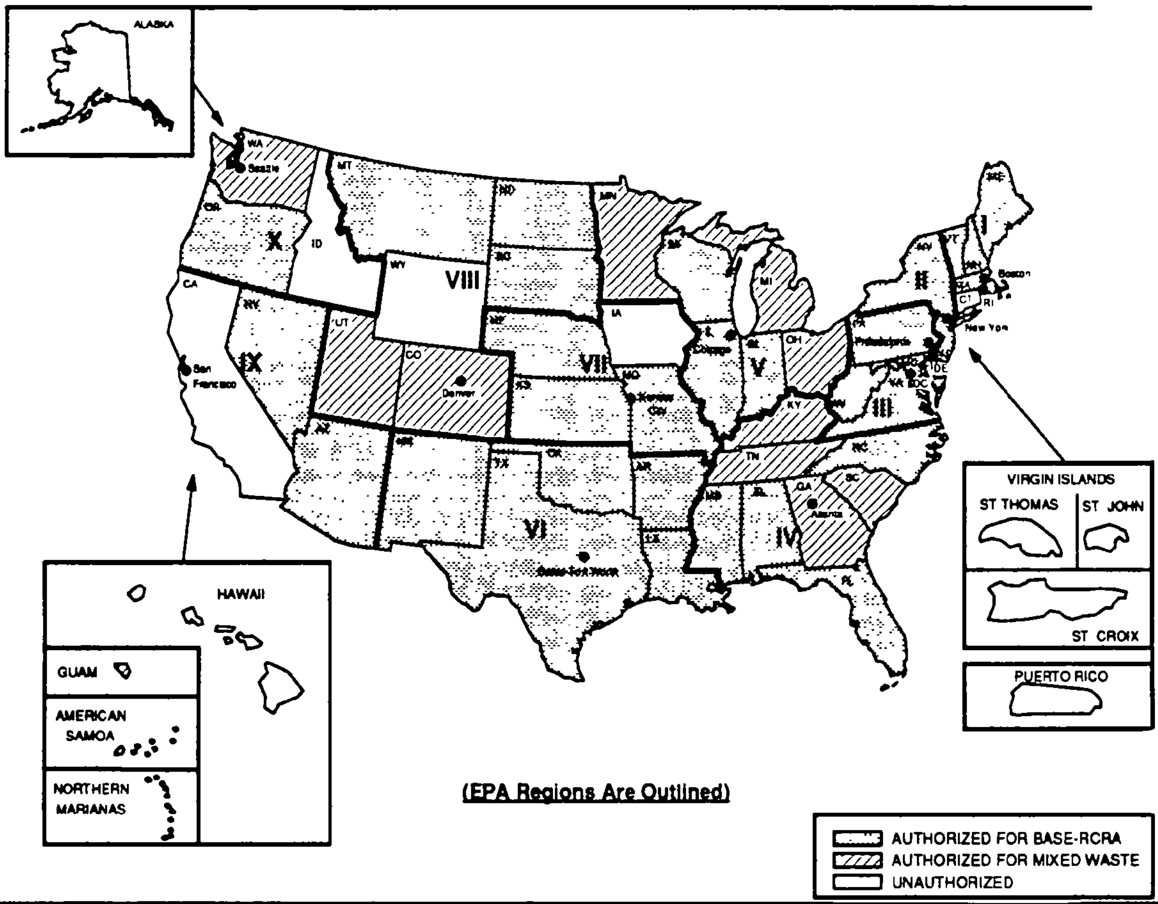
- RCRA authorized the establishment of OSW for the implementation of the hazardous waste program. The Office of Waste Programs Enforcement (OWPE) enforces RCRA.

- The RCRA program was designed to allow the States to take over implementation of all aspects of the program. States become authorized to implement the RCRA program by developing a program that is equivalent to (or more stringent than) EPA's RCRA program. Until a State receives base-authorization, the RCRA program is administered by EPA. The States must incorporate more stringent amendments or changes to the RCRA program into their own programs. Once a State has been authorized, it becomes the primary implementor of those aspects of the program for which it is authorized.

OVERVIEW OF MIXED WASTE REGULATION - ROLE OF EPA AND EPA AUTHORIZED STATES

- Authorized States must revise their programs to include mixed waste
- Agencies other than the hazardous waste agency may be involved in mixed waste regulation
- States may use a Memorandum of Understanding (MOU) to define the roles of State agencies in regulating hazardous and radioactive wastes

EPA AUTHORIZED STATES



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- **In States authorized only for base-RCRA, mixed waste is not regulated under RCRA, but may be regulated by the State through independent authority.**
  - **Thirty-four States and Territories have base-RCRA authorization, but have not yet received mixed waste authorization.**
- **In States authorized for mixed waste, mixed waste is regulated under RCRA, administered by the States.**
  - **To date, eleven States and Territories (Colorado, Georgia, Guam, Kentucky, Michigan, Minnesota, Ohio, South Carolina, Tennessee, Utah, and Washington) have been authorized to regulate mixed waste.**
- **In unauthorized States, mixed waste is regulated under RCRA, administered by EPA.**
  - **Eleven States and Territories have not received base-RCRA authorization.**
- **Refer to Appendix F.**

EPA'S OFFICE OF RADIATION PROGRAMS

AND ORP STANDARDS

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OVERVIEW OF MIXED WASTE REGULATION - ORP STANDARDS

Office of Radiation Programs (ORP)

- Authorized by AEA
  - -- Establishes Federal radiation guidance and standards
  - -- Advises Federal agencies on radiation standards
  - -- Assesses new technologies in the area of radiation
  - -- Monitors radiation in the environment

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- EPA also intends to regulate certain kinds of NARM waste in connection with a low-level waste standard that will be proposed by ORP. Section 6 of TSCA authorizes EPA to prohibit or regulate the disposal of chemical substances or mixtures.

OVERVIEW OF MIXED WASTE REGULATION - ORP STANDARDS

- ORP Spent Nuclear Fuel, High-Level, and Transuranic Waste Standards (40 CFR Part 191):
  - -- Operations Standard
  - -- Disposal Standard
- ORP Low-Level Standards to be proposed (40 CFR Part 193):
  - -- Low-Level Waste Pre-Disposal Exposure Limit
  - -- Post-Disposal Exposure Limit
  - -- Ground-Water Protection Criteria
  - -- Below Regulatory Concern (BRC) Criteria
  - -- Implementation Guidelines

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- The standards developed by ORP will be implemented by NRC and DOE through incorporation into their regulations and orders and will provide a minimum level of protection from radiological hazards for human health and the environment.

- Mixed waste that qualifies as below regulatory concern for the radiological hazard is still a mixed waste but may be managed as RCRA hazardous waste.

- ORP is revising high-level waste disposal standards following their remand by a Federal Court (40 CFR Part 191). The high-level waste disposal standards are expected to be proposed in early 1990.

- ORP is also planning to propose a generally applicable NARM waste disposal standard in the near future (40 CFR 764).

- Detailed information on the existing and proposed standards is provided in the supplementary material. (Refer to Appendix G)

ROLE OF THE NUCLEAR REGULATORY COMMISSION AND NRC AGREEMENT STATES

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OVERVIEW OF MIXED WASTE REGULATION - ROLE OF NRC AND NRC AGREEMENT STATES

- Authorized by AEA
  - -- Regulates the possession and use of source, special nuclear, and by-product material
  - -- Regulates primarily commercial radioactive materials
  - -- NRC may make an Agreement to relinquish to the State the authority to regulate certain materials and users
  - -- Once an Agreement is in place, NRC no longer exercises its jurisdiction in those areas covered by the agreement
  - -- NRC may reassert its authority if necessary to protect public health and safety

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- NRC may make an Agreement to relinquish to the State the authority to regulate source and by-product materials and the authority to regulate users of small quantities of special nuclear material.
- NRC will always retain jurisdiction over some Federal agencies (but generally not DOE), production and utilization facilities (e.g., reactors), exports and imports, consumer products, special nuclear material in quantities exceeding a critical mass, offshore waters, and certain aspects of mill tailings.

OVERVIEW OF MIXED WASTE REGULATION - ROLE OF NRC AND NRC AGREEMENT STATES

- Scope of Agreements between NRC and States may vary
- Federal government is responsible for the disposal of high-level waste
- States are responsible for the disposal of commercial low-level waste

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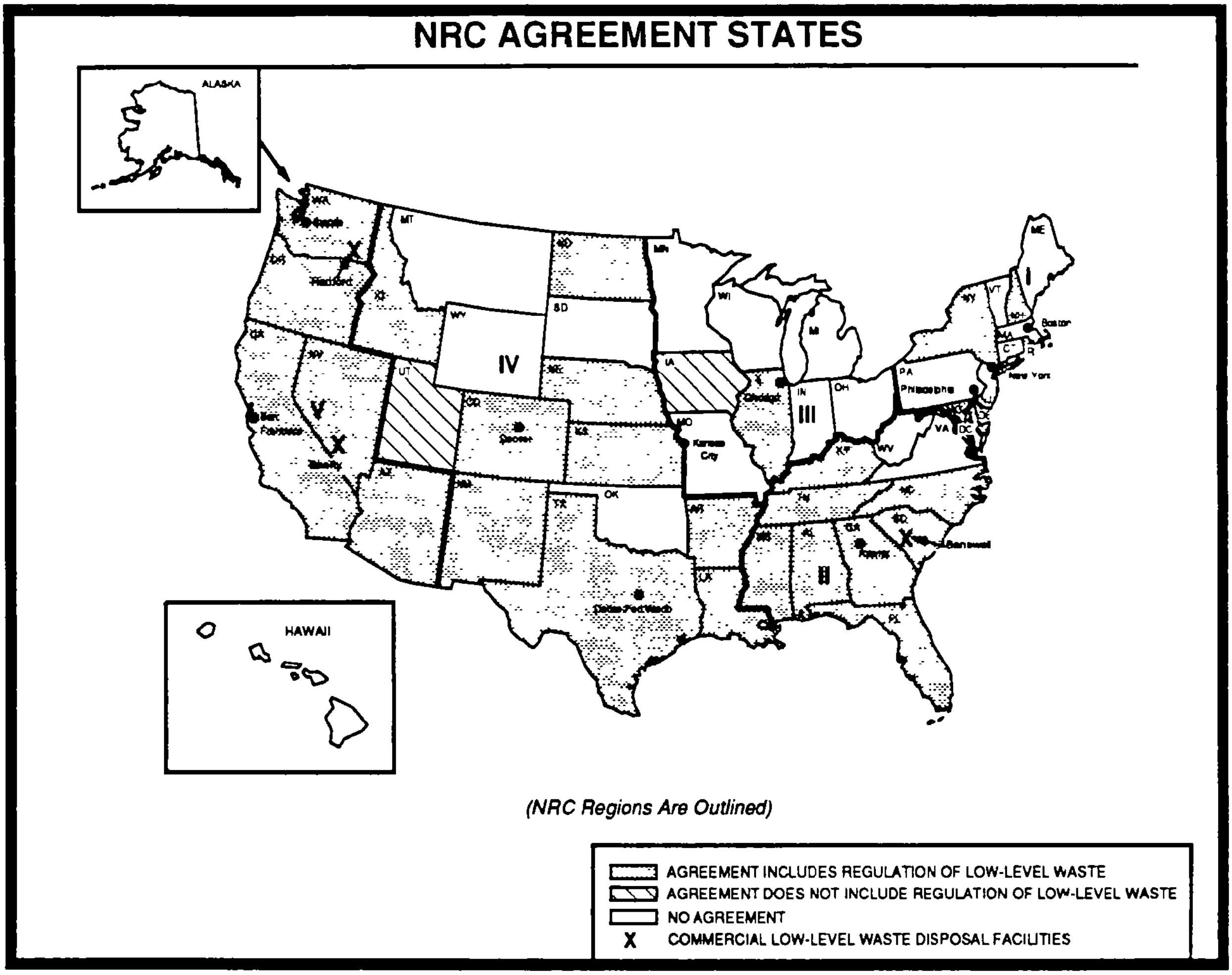
- The Nuclear Waste Policy Act of 1982, (Public Law 97-425) the Federal Government, primarily NRC and DOE, took responsibility for regulating the disposal of all highly radioactive waste, and the Low-Level Radioactive Waste Act of 1980 (Public Law 96-573) directed each State to provide disposal capacity for all commercial low-level waste generated within its borders either individually or through regional compacts. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) provides further impetus to this process.

- Unlike the hazardous portion of mixed waste regulated under RCRA, the radioactive portion of mixed waste is regulated under AEA regardless of whether a State has an Agreement with NRC.



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- NRC Agreement States (Agreement includes low-level waste disposal)
  - -- Regulated under AEA
  - -- Administered by State

- NRC Agreement States (Agreement does not include low-level waste disposal)
  - -- Regulated under AEA
  - -- Administered by NRC

- Non-Agreement States
  - -- Regulated under AEA
  - -- Administered by NRC

- NRC has formed agreements with 29 States. Of these agreement States all but two, Utah and Iowa, have authority to regulate low-level waste disposal facilities.

- Several States are developing new facilities for the disposal of low-level waste; some of these facilities will include disposal units for mixed low-level waste.

- For mixed waste contacts refer to Appendices H and J.

NRC REGULATIONS

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OVERVIEW OF MIXED WASTE REGULATION - NRC REGULATIONS

NRC licenses are issued for:

- Possession
- Use
- Receiving title
- Transfer
- Construction and operation of production and utilization facilities
- Disposal of waste

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- Possession and use of radioactive materials are confined to the location and purposes that are authorized in the license.

- NRC approved disposal methods

  -- Licensed land disposal (10 CFR Part 61)

  -- Licensed disposal by a method specifically approved by NRC (10 CFR 20.302 allows for on-site disposal of waste that is potentially higher than BRC but would not have a major health and safety impact from disposal; the dose objectives for this type of disposal would be well under those for Part 61)

  -- Disposal by release into sanitary sewerage system (10 CFR 20.303)

  -- Disposal by incineration (10 CFR 20.305)

  -- Disposal of specific wastes (10 CFR 20.306)

    - Scintillation fluids and animal carcasses containing less or equal to 0.05 microcuries per gram of H-3 or C-14 may be incinerated or disposed of without regard to radioactivity. Materials disposed of in this manner must still comply with all hazardous waste regulations.

OVERVIEW OF MIXED WASTE REGULATION - NRC REGULATIONS

NRC licenses are issued for:

- Possession
- Use
- Receiving title
- Transfer
- Construction and operation of production and utilization facilities
- Disposal of waste

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- Disposal emphasizes isolation of waste and long-term objectives. Site suitability must take into account minimum characteristics and suggested features. The design will minimize erosion and contact of water with waste, while operations and waste form emphasize stability. In addition, the facility must demonstrate commitment for a 100-year institutional control period.

OVERVIEW OF MIXED WASTE REGULATION - NRC REGULATIONS

Performance Objectives for Land Disposal

- Protection of the general population from releases
- Protection of individuals from inadvertent intrusion
- Protection of individuals during operations
- Stability after site closure
- Maintain radiation exposures and releases of radioactive material "as low as reasonably achievable" (ALARA)

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- Concentrations of radioactive material released to the general environment shall not exceed an annual dose equivalent of 25 mrem to the whole body, 75 mrem to the thyroid and 25 mrem to any other organ of any member of the public. Handlers should also maintain releases ALARA.

- Design, operation, and closure of the site must ensure protection of any individual inadvertently intruding into the disposal facility after active institutional controls over the facility have been removed.

- Except for off-site releases, operations at the disposal facility shall be conducted in compliance with the standards for radiation protection set out in 10 CFR 20. Disposal facilities should maintain exposures ALARA.

- The disposal facility shall be sited, designed, utilized, operated, and closed to achieve long-term stability of the site and to eliminate, to the extent practicable, the need for ongoing active maintenance of the site following closure.

- ALARA is not a statutory requirement; it is a policy statement that has been incorporated into the NRC regulations. ALARA is applicable to all NRC licensees.

OVERVIEW OF MIXED WASTE REGULATION - NRC REGULATIONS

Classification of Waste

- NRC classifies waste sent to near-surface disposal
- Classification is based on the concentration of long-lived and short-lived radionuclides
- Low-level radioactive waste is classified as either A, B, or C in increasing order of radiological hazard

Transportation

- Licensees transferring material are required to verify that the licensee receiving the material is authorized for the type, form, and quantity transferred
- A manifest must be prepared for each shipment of waste
- Waste receiver must acknowledge receipt within one week
- NRC licensees are also subject to DOT regulations

OVERVIEW OF MIXED WASTE REGULATION - NRC REGULATIONS

Enforcement

- NRC conducts both announced and unannounced inspections
- Licensees must allow inspections
- An injunction or court order may be obtained to prohibit any violation
- Violations are punishable by fine, imprisonment, or both

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- All licensees must allow inspection of materials, premises, facility, and records. NRC conducts routine inspections at all facilities.

- NRC has the authority to obtain an injunction or court order to prohibit any violation of the AEA or Title II of the Energy Reorganization Act of 1974. In some cases a court order may be obtained to enforce payment of a civil penalty.

ROLE OF THE DEPARTMENT OF ENERGY

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OVERVIEW OF MIXED WASTE REGULATION - ROLE OF DOE

- Authorized by AEA
  - -- Generally exempt from NRC regulations
  - -- Uses orders to carry out authority granted by the AEA
- Subject to EPA regulations

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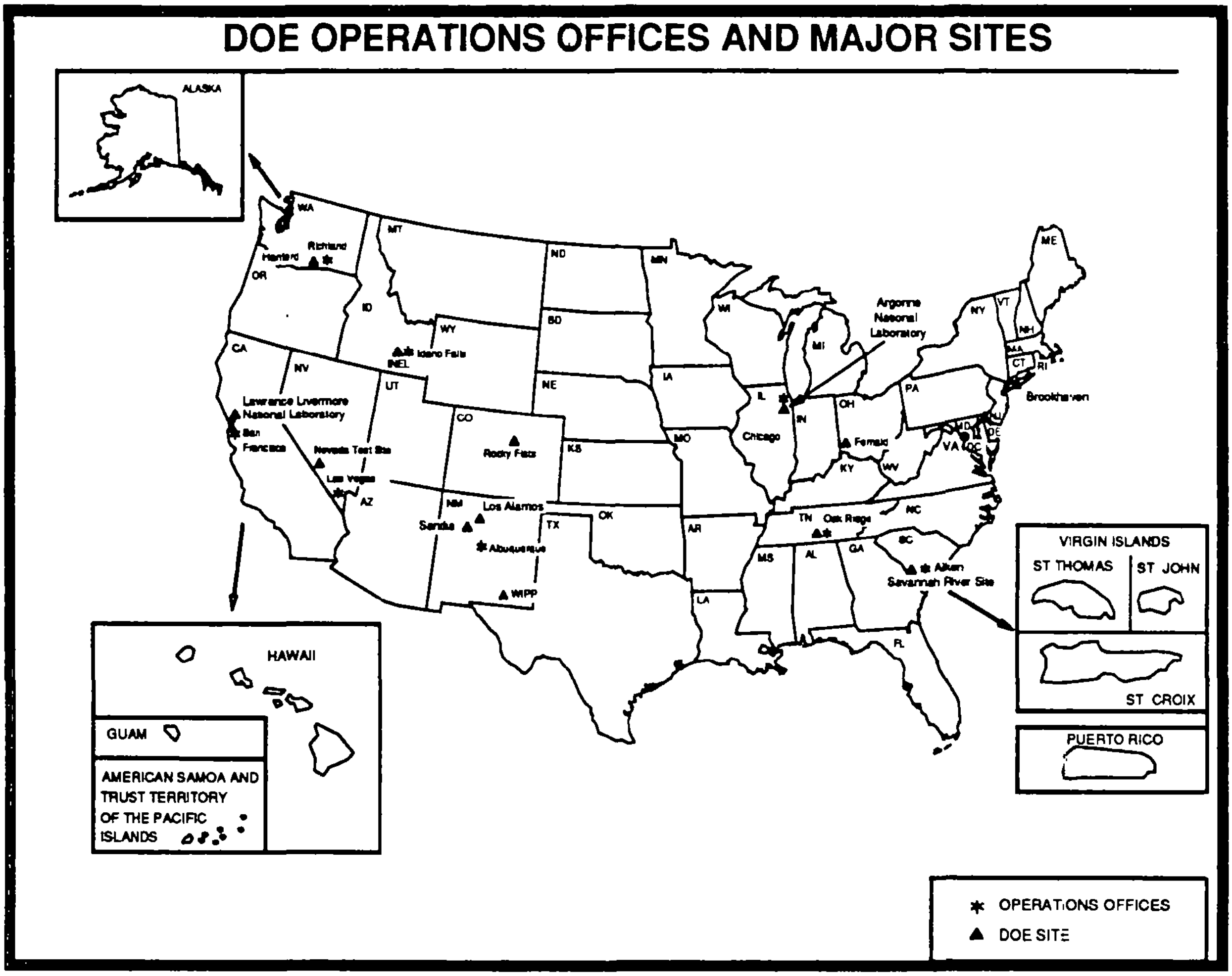
- DOE is authorized by the AEA and other Federal statutes to regulate radioactive material operations at many government-owned facilities and at several inactive sites that contain radioactive contamination. Non-DOE Federal facilities are regulated by other agencies, such as NRC or EPA.

- DOE is exempt from NRC regulations except as specified in Section 202 of the Energy Reorganization Act of 1974 (i.e., DOE facilities that accept commercial high-level waste are licensed by NRC).

- DOE develops "orders" to carry out the authority granted by the AEA. DOE Orders are legally enforceable against contractors that operate DOE installations.



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- Operations Offices are responsible for compliance at specific DOE sites.
- DOE maintains eight Operations Offices.
- DOE operates 17 major defense facilities.
- While DOE does not manage a large number of facilities they are a major player in mixed waste regulation because of the large volume and the high-level of radioactivity of the mixed waste that is generated. Regulating these facilities will be a significant portion of EPA's effort to regulate mixed waste.
- For mixed waste contacts refer to Appendices I and J.

DOE ORDERS

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OVERVIEW OF MIXED WASTE REGULATION - DOE ORDERS

- DOE operates under orders which regulate it internally; some of these orders are internal policy for compliance with environmental requirements at DOE facilities
- DOE orders apply to all DOE contractors and subcontractors
- Orders (in this section) provide requirements for the management of transuranic, high-level, and low-level radioactive waste in accordance with AEA
- Orders also require the hazardous portion of mixed waste to be managed according to RCRA

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- DOE operates under orders which regulate it internally. Several DOE orders are included in the supplemental materials. (Refer to Appendix K)
- DOE must still comply with all RCRA regulations; compliance simply with orders is not sufficient.
- The Nuclear Waste Policy Act of 1982, (Public Law 97-425) the Federal Government, primarily NRC and DOE, took responsibility for regulating the disposal of all highly radioactive waste, and the Low-Level Radioactive Waste Act of 1980 (Public Law 96-573) directed each State to provide disposal capacity for all commercial low-level waste generated within its borders either individually or through regional compacts. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) provides further impetus to this process.

OVERVIEW OF MIXED WASTE REGULATION - DOE ORDERS

General Requirements of Orders

- Minimize the generation of hazardous and radioactive wastes across program office functions
- Maintain radiation exposures and releases of radioactive material "as low as reasonably achievable" (ALARA)
- Limit exposure from all pathways to any member of the public from the land disposal of low-level waste to 25 mrem/yr

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- DOE must comply with the National Environmental Policy Act of 1969 for all significant Federal actions.

OVERVIEW OF MIXED WASTE REGULATION - DOE ORDERS

Transportation

- Generators and facilities receiving the waste are jointly responsible for assuring compliance with waste acceptance criteria
- DOE facilities are subject to DOT regulations
- DOE facilities are also subject to RCRA manifest and transportation requirements
- DOE is responsible for transportation of all waste to and from DOE facilities

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- Shipment of waste will be conducted according to the requirements established by the Operations Office managing the receiving facility.

OVERVIEW OF MIXED WASTE REGULATION - DOE ORDERS

Management of Transuranic Waste

- Planned for disposal in DOE's Waste Isolation Pilot Project (WIPP)
- This facility is being regulated by both DOE and EPA

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- The WIPP facility, located southeast of Carlsbad, New Mexico, will be used to demonstrate the safe and permanent disposal of DOE transuranic waste. Transuranic mixed waste will account for approximately 60 percent of the waste to be placed at the WIPP facility.

- DOE is currently applying for a RCRA land disposal restrictions no-migration petition. A decision on the no-migration petition is expected in 1990.

- Examples of WIPP's dual regulations:

  - -- DOE may determine, with the concurrence of the EPA Administrator, that transuranic waste not appropriate for disposal at the WIPP shall be disposed of by alternative methods approved by DOE and EPA.

  - -- Mixed transuranic waste generated at DOE facilities shall be treated, where possible and practical, to destroy the hazardous waste components.

OVERVIEW OF MIXED WASTE REGULATION - DOE ORDERS

Management of High-Level Waste

- Under DOE Order 5820.2A, all high-level waste is considered radioactive mixed waste unless demonstrated to the contrary
- DOE orders contain requirements pertaining to both the hazardous and radioactive components of mixed high-level waste
  - Design and operating requirements
  - Waste characterization
  - Storage and transfer
  - Monitoring, surveillance, and leak detection
  - Contingency actions
  - Waste treatment and minimization

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- DOE is required to accept all high-level waste and commercial spent fuel, and is estimating the feasibility of constructing a deep geological repository in Nevada.
- DOE orders contain high-level waste requirements for design and operation; waste characterization; storage and transfer; monitoring, surveillance, and leak detection; contingency actions; and waste treatment and minimization.
- Waste characterization may reflect knowledge of the waste generating processes, laboratory testing results, and/or the results of periodic sampling and analysis.

OVERVIEW OF MIXED WASTE REGULATION - DOE ORDERS

Management of Low-Level Waste

- **Low-level mixed waste regulated jointly under RCRA and AEA**
- **Waste shall be disposed of on-site if possible or at another DOE disposal site**
- **Liquid wastes or wastes containing free liquid must be converted to a solid form prior to disposal**

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- Disposal of liquid wastes or wastes containing free liquid is prohibited and must be converted into a solid form. Any freestanding and noncorrosive liquid that remains may not exceed 1 percent of the volume of the waste when the waste is in a disposal container, or 0.5 percent of the volume of the waste when the waste is processed to a stable form.

- Waste characterization information shall include:

  -- Physical and chemical characteristics
  -- Volume
  -- Weight
  -- Major radionuclides and their concentrations
  -- Packaging date, weight, and external volume

- Waste characterization will permit proper segregation, treatment, storage, and disposal, and includes information on the physical, chemical, and radionuclide content.

- The concentration of the radionuclides may be determined by indirect methods or according to certain criteria.

IMPLEMENTING THE DUAL FRAMEWORK

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OVERVIEW OF MIXED WASTE REGULATION - IMPLEMENTING THE DUAL FRAMEWORK

- Mixed waste must be handled according to regulations under RCRA and the AEA
- Section 1006 of the RCRA statute provides that for inconsistencies precedence should be given to AEA requirements

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- An inconsistency occurs when compliance with one set of regulations would cause non-compliance with the other. In addition, compliance with one set of regulations does not necessarily mean the facility will be in full compliance with both sets of regulations.
- To date EPA and NRC have not cited any inconsistencies between the two sets of regulations regarding low-level waste disposal.
- Refer to Appendix L.

OVERVIEW OF MIXED WASTE REGULATION - IMPLEMENTING THE DUAL FRAMEWORK

- EPA and NRC have developed several joint guidance documents for the regulation of mixed waste:
  - -- Definition of commercially generated low-level mixed waste
  - -- Siting of low-level mixed waste disposal facilities
  - -- Conceptual design of low-level mixed waste disposal units
- EPA and NRC are developing joint guidance documents for the regulation of mixed waste:
  - -- Sampling and testing
  - -- Inspections

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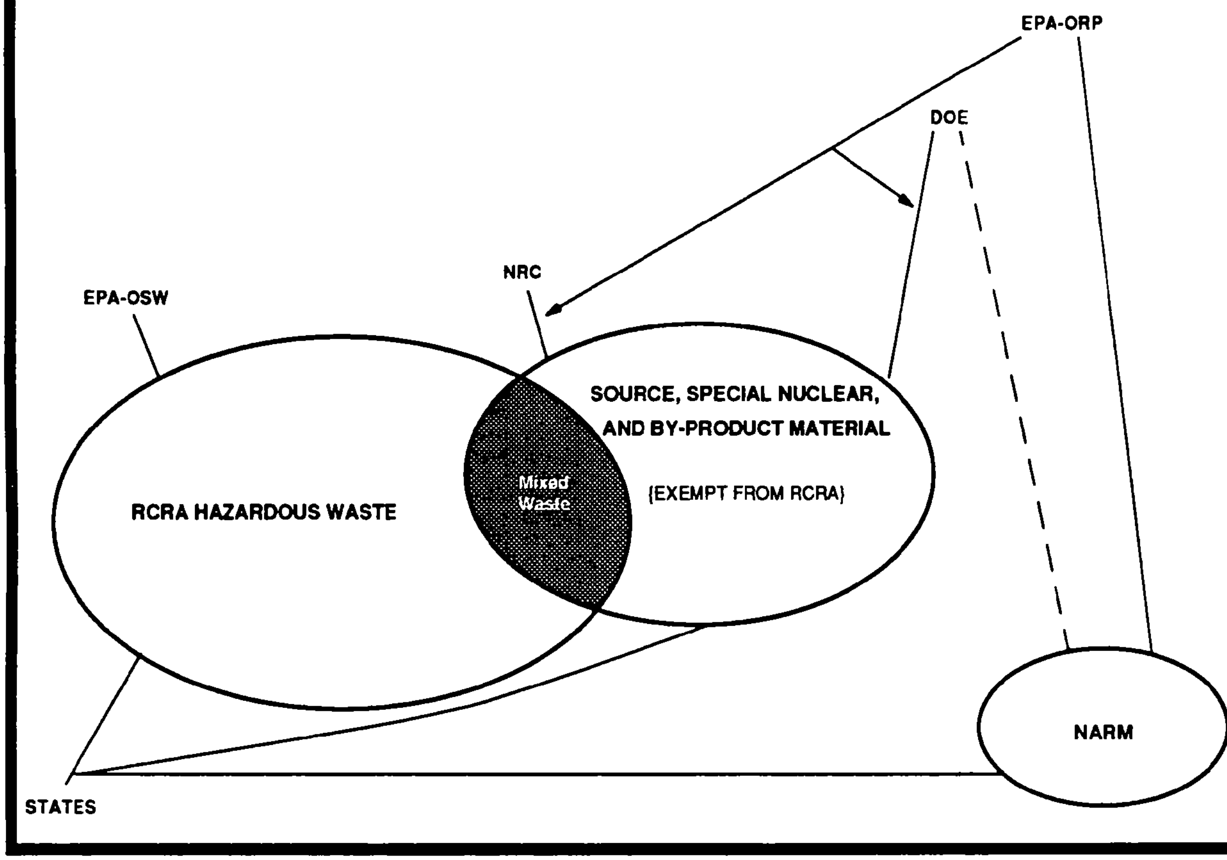
- A basic understanding of the various requirements is important for coordination between the various regulators. Coordination and communication are necessary for safe and effective regulation.

ROLE OF THE REGULATORS



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- ORP under authority of the AEA sets generally applicable standards for radioactive waste which are implemented by NRC and DOE.

- DOE under authority of the AEA regulates source, special nuclear, and by-product material at DOE operated government facilities. DOE implements this authority through eight Operations Offices.

- NRC under authority of the AEA regulates source, special nuclear, and by-product material at commercial facilities. NRC partially implements this authority through Agreement States.

- EPA's OSW under the authority of RCRA regulates RCRA hazardous waste. (Source, special nuclear, and by-product material are exempt from RCRA.) RCRA is implemented through authorized States.

- States may regulate RCRA hazardous waste through independent authority under State laws. No definitive court ruling has been issued on State authority to regulate AEA radioactive waste under independent laws.

- In summary, mixed waste regulation is complicated and involves many actors; no one has sole authority over mixed waste.

HEALTH PHYSICS
AND INSPECTIONS

INTRODUCTION TO
BASIC RADIATION

INTRODUCTION TO BASIC RADIATION CONCEPTS

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BASIC RADIATION CONCEPTS - TOPICS

- The Atom
- Modes of Radioactive Decay
- Units of Radiation Quantity, Dose, and Exposure
- Biological Effects of Radiation

THE ATOM

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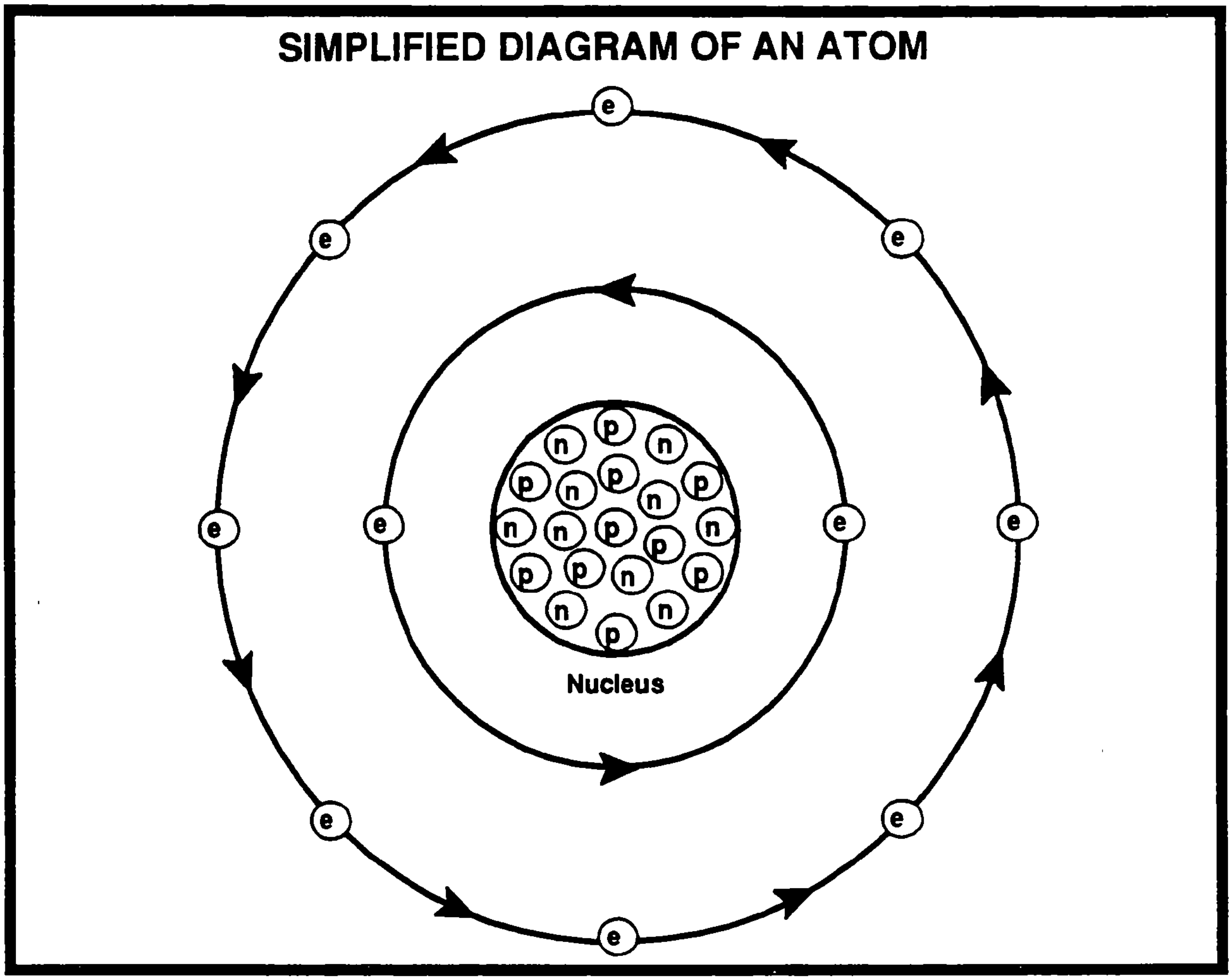

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- An atom is the smallest discrete unit of mass.
- The nucleus of an atom is a densely packed array of protons and neutrons.
- Electrons move around the nucleus in "paths" that govern the amount of energy that the electrons have.

BASIC RADIATION CONCEPTS - THE ATOM

Structure of the Atom

- The mass of an electron is roughly 1 x 10E-27 grams
- Protons and neutrons have approximately equal masses, almost 1,800 times the mass of an electron
- Electrons have a negative charge, protons have a positive charge, and neutrons have no charge (they are neutral)

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- Particles that have positive or negative charges display certain behaviors that are not seen among particles that have no charge (or "neutral" charge).
- A particle with a positive or negative charge will attract particles that have opposite charges (i.e., a particle with a positive charge attracts a particle with a negative charge, and vice-versa).
- A particle with a positive or negative charge will repel particles that have the same charge (i.e., a particle with a positive charge repels other particles with positive charges).

BASIC RADIATION CONCEPTS - THE ATOM

Elements

- All atoms of a given element have the same number of protons in their nuclei
- Each element has a unique "atomic number" which represents the number of protons in its atoms' nuclei
- There are at least 105 known elements, 92 of which are naturally occurring

Slide No. 52

- Examples of atomic numbers:
  - -- All neon atoms contain 10 protons; thus, the atomic number of neon is 10;
  - -- All radium atoms contain 88 protons; thus, the atomic number of radium is 88.

BASIC RADIATION CONCEPTS - THE ATOM

Nuclides

- The "mass number" is the sum of the number of protons and neutrons in the nucleus
- The sum of protons and neutrons in atoms of the same element may vary
- A "nuclide" is any species of atoms whose nuclei contain a specified number of protons and neutrons

Slide No. 53

- A nuclide is commonly denoted by the name of the nuclide's element followed by the mass number
- For example, one common nuclide is radon-222, which has 86 protons and 136 neutrons. The mass number can be used to distinguish between nuclides of an element.

EXCERPT FROM THE CHART OF THE NUCLIDES

Number of Protons											
92							U-226	U-227	U-228	U-229	
91				Pa-222	Pa-223	Pa-224	Pa-225	Pa-226	Pa-227	Pa-228	
90	Th-218	Th-219	Th-220	Th-221	Th-222	Th-223	Th-224	Th-225	Th-226	Th-227	
89	Ac-217	Ac-218	Ac-219	Ac-220	Ac-221	Ac-222	Ac-223	Ac-224	Ac-225	Ac-226	
88	Ra-216	Ra-217	Ra-218	Ra-219	Ra-220	Ra-221	Ra-222	Ra-223	Ra-224	Ra-225	
87	Fr-215	Fr-216	Fr-217	Fr-218	Fr-219	Fr-220	Fr-221	Fr-222	Fr-223	Fr-224	
86	Rn-214	Rn-215	Rn-216	Rn-217	Rn-218	Rn-219	Rn-220	Rn-221	Rn-222	Rn-223	Isotopes of Radon
85	At-213	At-214	At-215	At-216	At-217	At-218	At-219				
84	Po-212	Po-213	Po-214	Po-215	Po-216	Po-217	Po-218				
83	Bi-211	Bi-212	Bi-213	Bi-214	Bi-215						
82	Pb-210	Pb-211	Pb-212	Pb-213	Pb-214						
	128	129	130	131	132	133	134	135	136	137	

Number of Neutrons

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- The term "isotope" refers to nuclides of one specific element.
- The terms "isotope" and "nuclide" can be used interchangeably, but the term "isotope" often refers to a particular nuclide of an element.
- Three isotopes of the element radon are: Radon-220, which contains 134 neutrons; Radon-221, which contains 135 neutrons; and Radon-222, which contains 136 neutrons. Each of these isotopes contains 86 protons.
- Roughly 80 percent of all naturally occurring elements exist as a mixture of two or more isotopes.

BASIC RADIATION CONCEPTS - THE ATOM

<u>Structure of the Atom</u>

- A variety of forces exist in an atom:
  - -- Repulsive forces (proton-proton)
  - -- Short-range attractive forces (neutron-proton)
  - -- Attractive forces (nucleus-electron cloud)
- In a stable atom all of these forces are balanced

Slide No. 55

- Repulsive forces exist between the protons (i.e., a positive-positive repulsion).
- Short-range attractive forces between neutrons and protons overcome these repulsive forces and hold the nucleus together.
- Attractive forces exist between electrons and the nucleus (i.e., a positive-negative attraction).

BASIC RADIATION CONCEPTS - THE ATOM

Radionuclides

- Competing forces exist within the nucleus of an atom
- The balance of these forces depends on, among other factors, the ratio of neutrons to protons
- A "radionuclide" is an atom with an unstable ratio of neutrons to protons

Slide No. 56

- For a nucleus to remain stable, attractive forces between neutrons and protons must be strong enough to overcome repulsive forces between protons.
- The balance of forces within the nucleus is manifested in the ratio of neutrons to protons: the higher the neutron-to-proton ratio in the nucleus, the stronger the attractive forces; the lower the ratio, the stronger the repulsive forces.
- Usually, stable ratios of neutrons to protons range from 1:1 to 3:2, depending on the size of the nucleus.

DECAY OF A RADIONUCLIDE

Polonium - 212 $\xrightarrow{\text{Alpha Particle}}$ Lead - 208

Polonium - 212	Lead - 208
Neutrons: 128 Protons: 84	Neutrons: 126 Protons: 82
Ratio of Neutrons to Protons: 1.52	Ratio of Neutrons to Protons: 1.54
Radioactive	Stable

Slide No. 57

- In order to achieve a more stable configuration the nucleus of a radionuclide releases energy in the form of subatomic particles or electromagnetic rays by a process called <u>radioactive decay</u>. This release may change the ratio of neutrons to protons.

COMMON RADIONUCLIDES

Radionuclide	Half-life	Mode of Decay	Occurrence/ Use
Americium-241	458 years	Alpha, Gamma	Calibration or Reference Sources
Carbon-14	5,730 years	Beta	Laboratory Testing Apparatı
Cesium-137	30 years	Beta, Gamma	Calibration or Reference Sources
Cobalt-60	5 years	Beta, Gamma	Pharmaceuticals
Iodine-131	8 days	Beta, Gamma	Pharmaceuticals
Iron-59	46 days	Beta, Gamma	Laboratory Testing Apparatı
Krypton-85	11 years	Beta, Gamma	Luminous Devices
Plutonium-239	24 thousand years	Alpha, Gamma	Atomic or Nuclear Weapons
Potassium-40	1 billion years	Beta, Gamma	Naturally Occurring (Rocks and Soils)
Promethium-147	3 years	Beta	Luminous Safety Devices
Radium-226	1,600 years	Alpha, Gamma	Naturally Occurring (Soils)
Scandium-46	84 days	Beta, Gamma	Resins for Oil Wells
Selenium-75	120 days	Gamma	Clinical or Laboratory Testing Apparat
Sodium-22	3 years	Beta, Gamma	Naturally Occurring (Cosmic Rays)
Strontium-90	28 years	Beta	Ice Detection Devices
Tritium (Hydrogen-3)	13 years	Beta	Nuclear Weapons, Luminous Devices
Uranium-235	710 million years	Alpha, Gamma	Nuclear Fuels
Uranium-238	5 billion years	Alpha	Nuclear Fuels

Slide No. 58

- There are roughly 1,700 different radionuclides.
- Each radionuclide exhibits a unique pattern of decay characterized by:
  - -- Radioactive half-life (the time it takes for any quantity of a radionuclide to diminish by one-half);
    - For example, iodine-131 has a half-life of eight days; 100 grams of iodine-131 would require eight days to decay to 50 grams of iodine-131. The resulting 50 grams would require eight days to decay to 25 grams of iodine-131, etc.
  - -- Mode of decay (the type of particle or ray that is emitted as a result of the decay of a given radionuclide); and
  - -- Energy of emissions.

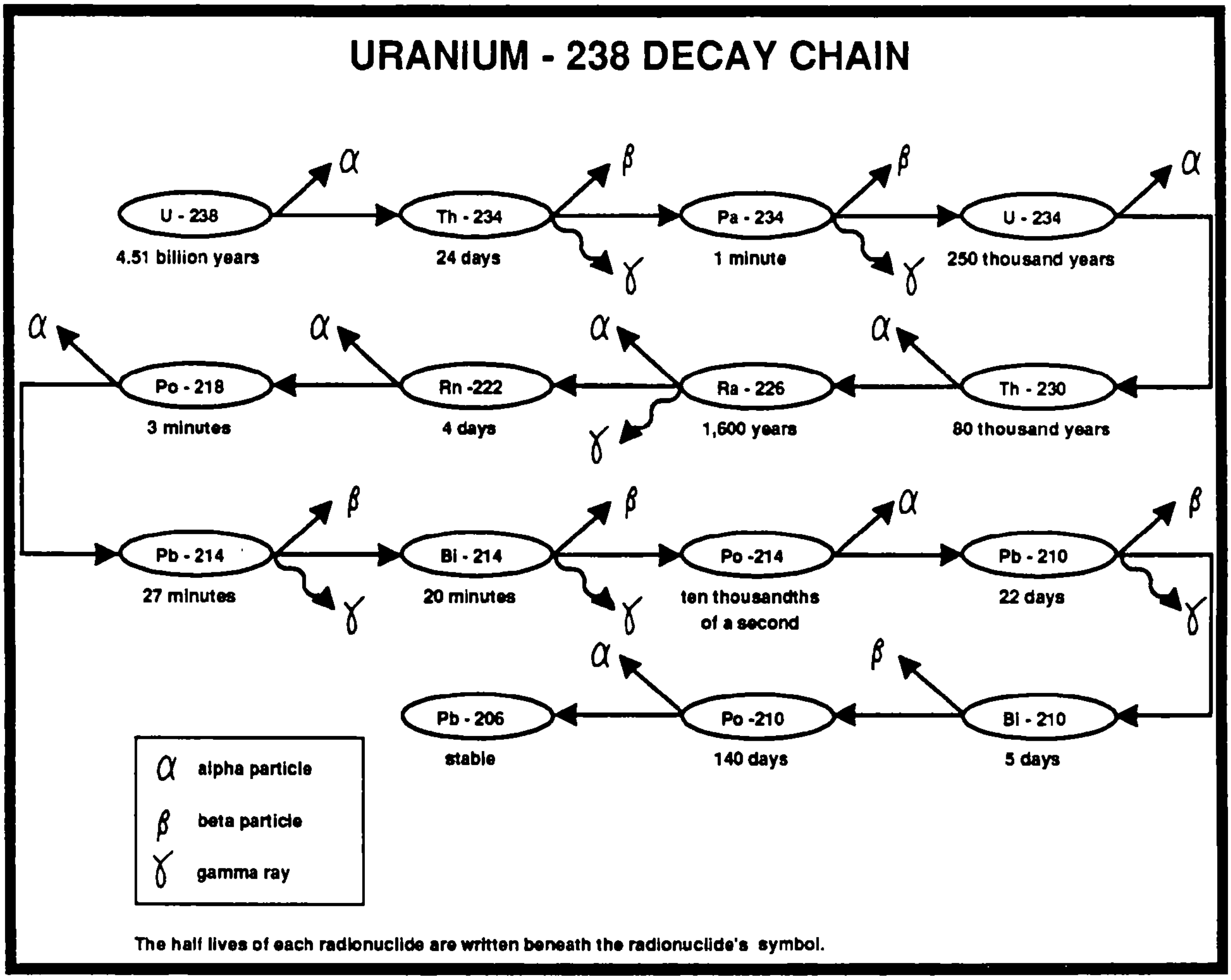
BASIC RADIATION CONCEPTS - THE ATOM

Decay Chains

- Often, the decay product is also radioactive and decays with its own characteristic pattern
- The radiation from a radioactive material may be a mixture of the characteristic radiation from the decay of each radionuclide in the chain

Slide No. 59

- The concept of decay chains is important because it implies that many different radionuclides may be present in a material that has decayed over time. For example, if radium-226 is found in a waste, other radionuclides in the uranium decay chain are likely to be present.



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- Most radionuclides do not decay directly to form a stable isotope.

- In an individual decay event, the nucleus of a radionuclide called a "parent" releases subatomic particles, beta particles, or rays.

- The remnant of the nucleus usually has a different number of protons and/or neutrons than the parent. Therefore, the remnant forms the nucleus of a different radionculide, called a "daughter" or "decay product."

- A series of daughters generated from an initial parent is called a "decay chain." Therefore, all of the daughters shown above will be encountered when U-238 is present.

MODES OF RADIOACTIVE DECAY

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BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

- The three primary modes of radioactive decay are emission of:
  - Alpha particles
  - Beta particles
  - Gamma rays

Slide No. 62

- Alpha and beta particles have mass; gamma rays are a form of energy.
- Alpha particles, beta particles, and gamma rays are different in terms of their basic properties, their interaction with matter, their rate of energy transfer, and their range of travel.

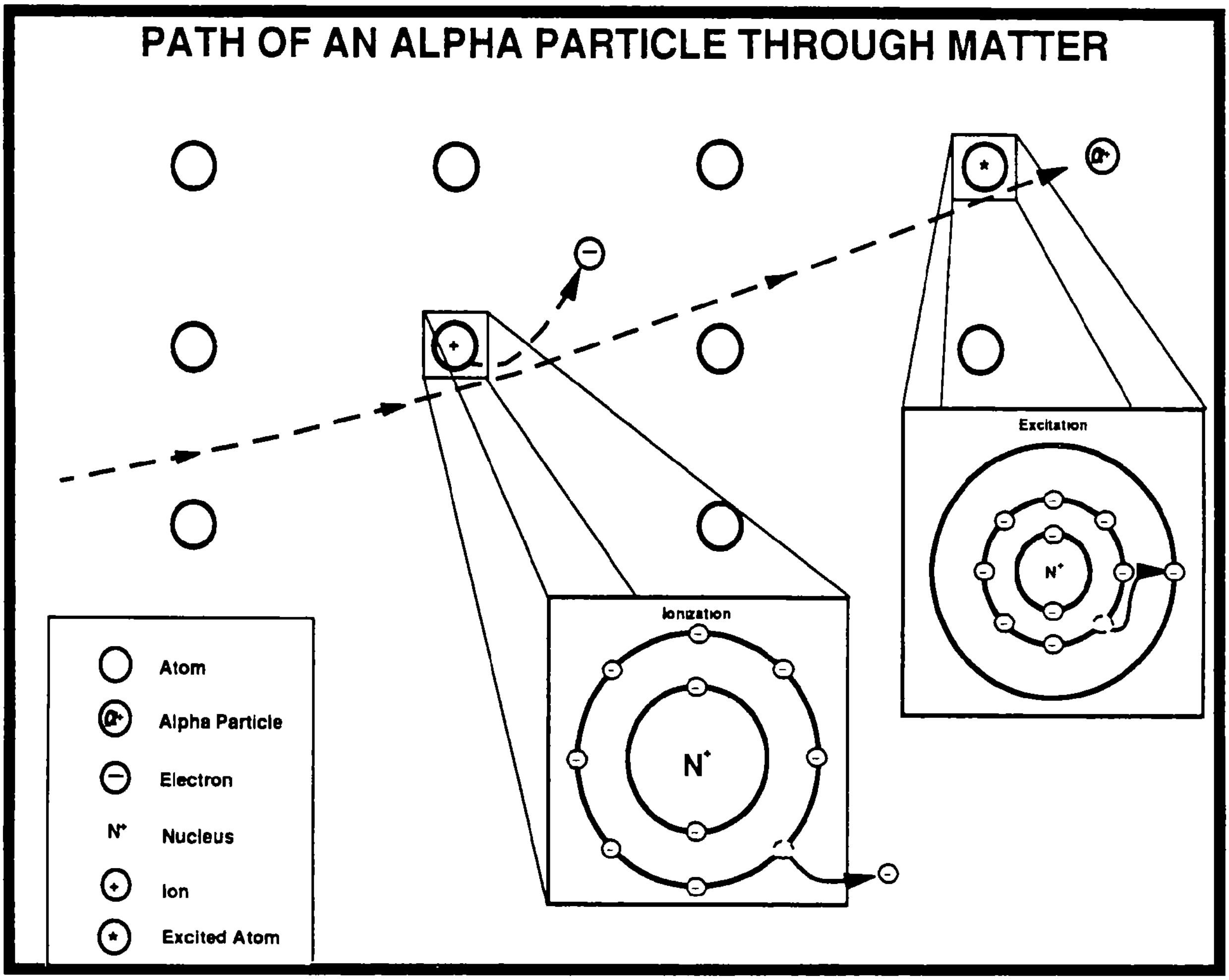
BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Alpha Particles - Basic Properties

- Contain two protons and two neutrons
- Have a mass equal to approximately four times the mass of a proton
- Have a charge of +2
- Typically range in energy from 4 to 9 MeV

Slide No. 63

- Alpha particles consist of two protons and two neutrons, which is equivalent to the nucleus of a helium atom.
- Alpha particles typically range in energy from 4 to 9 MeV (where 1 MeV is one million electron volts), although they may range from 2 to 12 MeV. The higher the alpha particle's energy, the greater its speed.
- A "MeV" represents an extremely small amount of energy. For comparison, one trillion MeV will power a 50-Watt light bulb for only 2 thousandths of a second.



Slide No. 64

- Alpha particles move through matter in a relatively straight path because their large mass prevents them from being deflected by other atomic particles.

- As the alpha particle passes, the electrons in nearby atoms can do one of two things:

  -- Ionization. An electron can break away from its associated nucleus if the attractive force between the electron and the alpha particle is strong enough. The removal of a negatively charged electron will cause an increase in the positive charge of the atom.

  -- Excitation. An electron may remain in the affected atom, but at a farther distance from the atom's nucleus. In this instance, the charge of the atom will remain the same; upon return to the ground state of the excited electron, the excess energy is released.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Alpha Particles - Range of Travel

- The path of an alpha particle causes many ionizations and excitations, but is very short
- An instrument must be very close to a source in order to detect an alpha particle
- Exposure occurs only at short ranges
- Alpha particles present an internal threat only

Slide No. 65

- Because there are usually many types of radiation present, it is likely that other types of radiation, which can be detected further from the source, will be detected before alpha radiation is detected.
- The range in air of an 8 MeV alpha particle is roughly 7 cm.
- The range in soft tissue of an 8 MeV alpha particle is about 90 um, or about the thickness of human skin.
- Since skin is sufficiently thick to stop alpha particles, exposure to alpha particles from sources outside the body is relatively harmless. However, alpha particles present a health hazard when their sources are taken into the body.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Alpha Particles - Transfer of Energy

- Each ionization and excitation interaction removes energy from the alpha particle, reducing its velocity until it eventually stops
- Alpha particles have a high linear energy transfer (LET)
- For particles delivering equivalent amounts of energy, particles with higher LET generally cause more severe biological injuries

Slide No. 66

- In each ionization and excitation interaction, the attraction of the alpha particle with electrons in stationary atoms reduces both the energy and the velocity of the alpha particle until it eventually stops. The energy lost by the alpha particle is transferred to atomic electrons.
- The average amount of energy that radiation loses to surrounding atoms per length that the radiation travels is called the linear energy transfer (LET). Particles with a high LET transfer a relatively large amount of energy over a short path length.

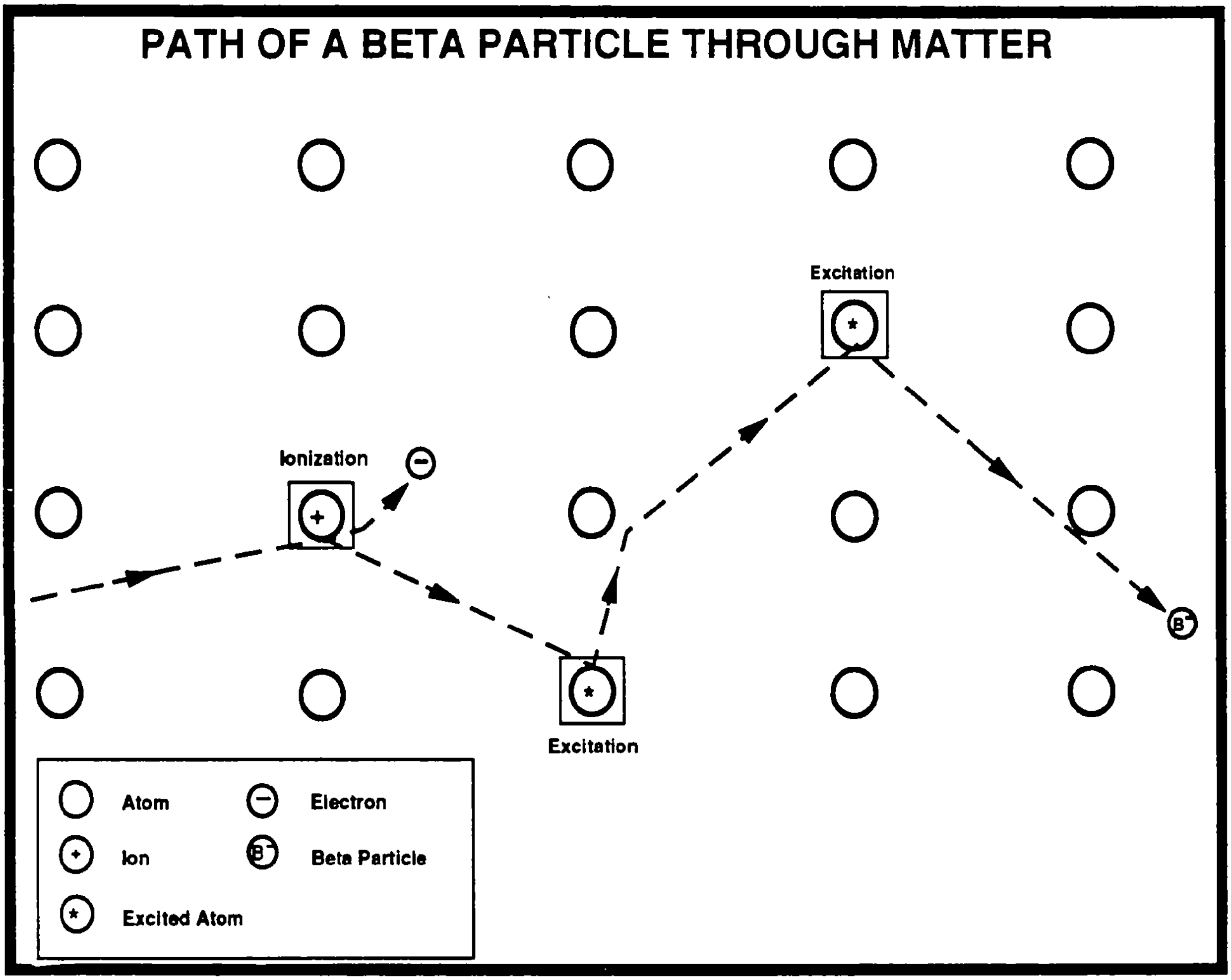
BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Beta Particles - Basic Properties

- Have the same mass as an electron
- Have a charge of -1
- Typically range in energy from 0.04 to 6 MeV

Slide No. 67

- The range in energy of beta particles, typically from 0.04 to 6 MeV, is usually less than that of alpha particles.
- Physically identical to an electron, a beta particle differs from an electron in that it originates in the nucleus, while an electron originates in the cloud surrounding the nucleus.



Slide No. 68

- Beta particles do not move through matter in a straight path. Because of their low mass they are deflected when they collide with atomic electrons.

- As with alpha particles, beta particles can cause ionization and excitation in atoms.

- Ionizations and excitations are caused by repulsive forces between beta particles and atomic electrons, which both have negative charges.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Beta Particles - Range of Travel

- Cause less ionizations and excitations than alpha particles, but are more penetrating
- Can be detected by instruments at a farther range than alpha particles
- Primarily an internal threat of biological damage, although may pose an external threat in some cases

Slide No. 69

- The range in air of an 8 MeV beta particle is roughly 31 m.
- The range in soft tissue of an 8 MeV beta particle is about 3 to 5 cm.
- Beta particles penetrate deep into the skin. Consequently, beta particles from sources outside the body as well as from sources taken into the body present a radiation threat. However, the external threat of beta particles is considered slight.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Beta Particles - Transfer of Energy

- Much less efficient in causing ionizations and excitations than alpha particles
- Have a low LET
- Biological injury caused by a beta particle will be less severe than that caused by an alpha particle

Slide No. 70

- Because beta particles have half the charge of alpha particles, beta particles are much less efficient in causing ionizations and excitations.
- As a result, beta particles give up energy over a longer distance of travel; thus, they have a low LET.
- Even if a beta particle delivers the same amount of energy as an alpha particle, the biological injury caused by a beta particle will be less severe.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Gamma Rays - Basic Properties

- Have no mass
- Are a form of electromagnetic radiation similar to light but of much greater energy
- Have no net charge
- Typically range in energy from 0.01 MeV to 10 MeV

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- Gamma rays are a form of electromagnetic radiation, like light and radiowaves, but have much greater energy. Unlike subatomic particles, gamma rays travel as a series of propagating or oscillating waves. The energy of a ray depends on its frequency of oscillation. The higher the frequency, the greater the energy.

- Gamma rays have no net charge. However, in each oscillation an electrical field is formed which can influence electrons.

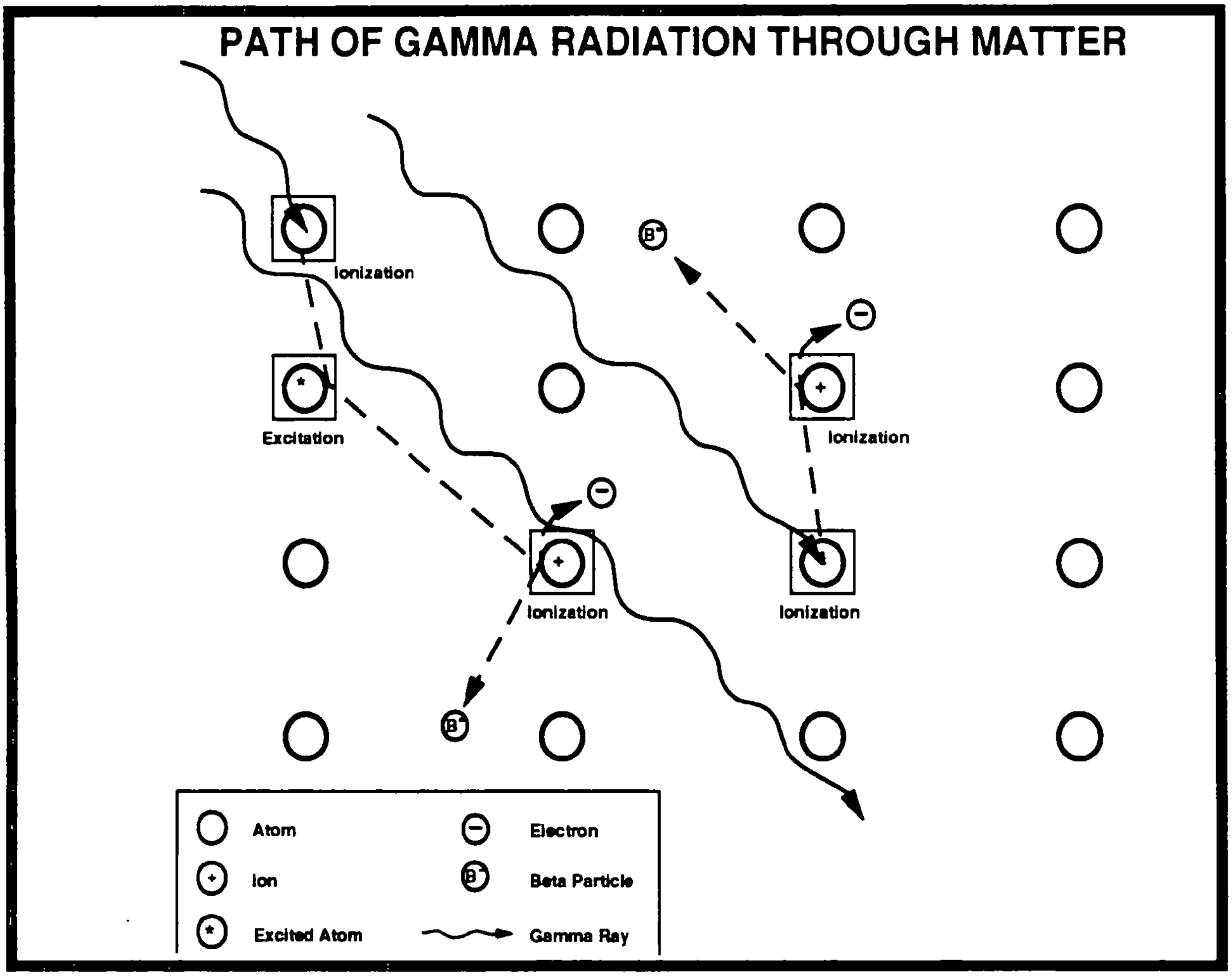
BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

Gamma Rays - Interaction With Matter

- Some gamma rays pass through matter
- Absorbed gamma rays can cause ionizations and excitations
- Non-absorbed gamma rays also can collide with (and transfer energy to) both free and atomic electrons to set the electrons in motion

Slide No. 72

- Because gamma rays behave as waves, some gamma rays are neither deflected nor slowed by atoms in matter; they pass right through matter. Some gamma rays, however, are completely absorbed by the atoms.
- The amount of gamma radiation absorbed depends on the number of rays entering the material and the thickness and chemical composition of the material.



Slide No. 73

- If a gamma ray interacts with an atom, ionizations or excitations occur. When a gamma ray ionizes an atom, some or all of the energy not consumed in the ionization will impart kinetic energy to the removed electron.

- In addition, if a gamma ray collides with either atomic or free electrons it will set the electrons in motion. The electrons will then behave as beta particles. The gamma ray itself will be deflected and its waves will oscillate at a lower frequency (i.e., the gamma ray will lose energy).

- Ultimately, almost all absorbed gamma rays form high-speed electrons that behave as beta particles.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

<u>Gamma Rays - Range of Travel</u>

- Travel relatively large distances
- Readily detectable
- Potential for exposure from distant sources
- External and internal threat of biological damage

Slide No. 74

- Gamma rays travel relatively large distances and are quite penetrating compared with alpha and beta particles.
- Like beta particles, gamma rays from sources outside the body may inflict biological damage both internally and externally. The magnitude of the health hazard depends on the number of rays entering the body.
- Gamma rays will penetrate the entire body. While some ionizations and excitations will occur in the outer layers of the skin, others will occur internally.
- Furthermore, the electrons released from internal ionizations behave as internally ingested/absorbed beta particles.

BASIC RADIATION CONCEPTS - MODES OF RADIOACTIVE DECAY

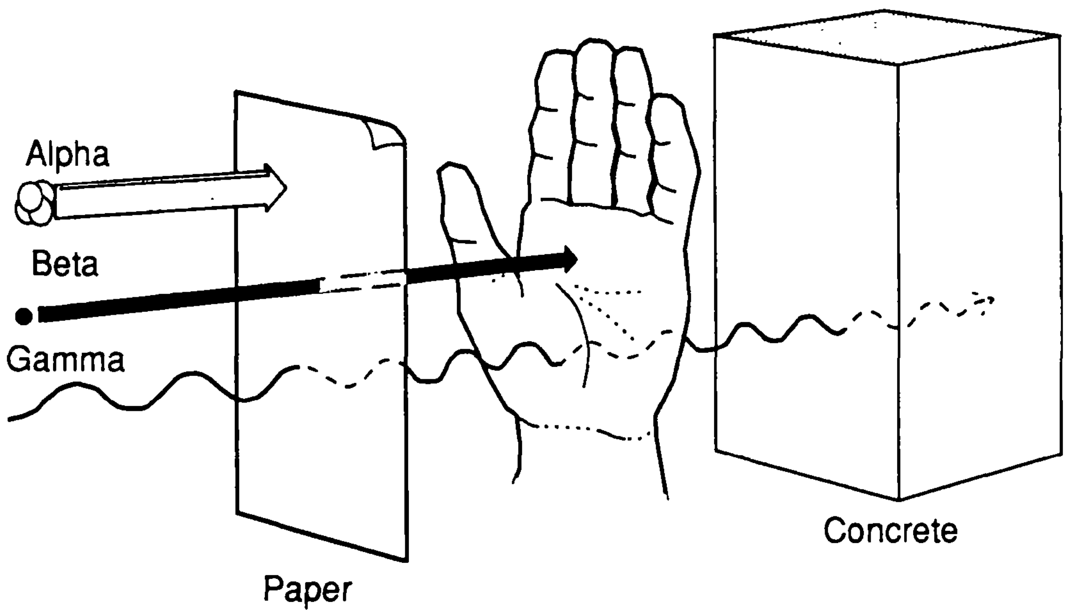
Gamma Rays - Transfer of Energy

- Are harmless if they pass through the body
- Produce high-speed electrons

Slide No. 75

- A particular gamma ray releases no energy until it is absorbed in an atom or an electron.
- Gamma rays passing through the body without interacting with atoms or electrons release no energy and are harmless.
- However, the high-speed electrons produced by gamma ray interactions have a LET similar to that of beta particles, and can cause biological damage.

RADIATION PENETRATION PROPERTIES



Slide No. 76

UNITS OF QUANTITY, DOSE, AND EXPOSURE

Slide No. 77

BASIC RADIATION CONCEPTS - UNITS OF QUANTITY, DOSE, AND EXPOSURE

Units of Quantity

- The quantity of a radionuclide can be measured in several different units
- Units of mass or radioactivity
- Units of dose

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- The choice of units depends on the property of interest. Like other substances, the mass of a radionuclide may be expressed in grams, kilograms, pounds, etc. However, the mass alone provides no indication of the quantity of radiation emitted from a given radionuclide.
- Units of quantity measure the amount of a radionuclide in terms of mass or radioactivity, whereas units of dose measure the amount of radiation absorbed by a receptor (such as people).

BASIC RADIATION CONCEPTS - UNITS OF QUANTITY, DOSE, AND EXPOSURE

Units of Quantity

- A curie (Ci) is a unit rate of radioactive decay
- A becquerel (Bq) is the international unit of radioactive decay
- A working level (WL) is a special unit of radioactivity used for radon

Slide No. 79

- A curie (Ci) is a unit rate of radioactive decay representing the quantity of any radionuclide that undergoes 3.7×10^{10} decays per second.
- The number of curies can be determined for a given mass of radionuclide if the half-life and atomic mass of the radionuclide are known:

$$\text{Activity (Ci)} = \frac{(1.128 \times 10^{13} \text{ decays/mole}) \times M}{H \times A}$$

M = Mass of the radionuclide (grams);
H = Half-life of the radionuclide (seconds);
A = Atomic mass of the radionuclide (grams/mole).

- A becquerel (Bq) is the international unit of radioactive decay where 1 Bq = 1 decay per second = 2.7×10^{-11} Ci.
- One WL = any combination of short-lived radon-222 decay products in one liter of air that will result in alpha particle discharging 1.3×10^{5} MeV of alpha particle energy.
- Refer to Appendix M for debate over adopting international units for radioactivity.

BASIC RADIATION CONCEPTS - UNITS OF QUANTITY, DOSE, AND EXPOSURE

Units of Dose and Exposure

- A basic unit of dose is a "radiation absorbed dose" (rad) which measures absorbed radiation per mass of tissue (100 ergs/gram)
- The international unit of absorbed dose is the Gray (Gy) (100 rad)
- A commonly used unit of radiation exposure is the Roentgen (R) (86.9 ergs/gram of air)
  - -- The Roentgen refers to the amount of gamma energy discharged in air only

Slide No. 80

- An erg is a unit of energy equal to 625,000 MeV.

BASIC RADIATION CONCEPTS - UNITS OF QUANTITY, DOSE, AND EXPOSURE

Units of Dose/Dose Equivalent

- Biological responses to radiation depend on:
  - -- The quantity of radiation absorbed
  - -- The type of radiation
  - -- Other factors (e.g., time sequence of exposure)
- To account for these differences, a unit of "dose equivalent" called the "radiation equivalent man" (rem) is used

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- Dose equivalent (in rems) = Dose (in rads) x Quality Factor x Any Additional Modifying Factors
- Quality factors adjust an absorbed dose of radiation to account for the relative biological effectiveness of the different types of radiation. Alpha particles have a quality factor of 20, and beta particles and gamma rays have a quality factor of 1. Additional modifying factors, which include distribution factors that correct for a nonuniform distribution of absorbed radiation, are equal to 1 for all types of radiation.
- In effect, then:

  -- Rem = Rad; for beta particles and gamma rays, and

  -- Rem = 20 x Rad; for alpha particles.

BASIC RADIATION CONCEPTS - UNITS OF QUANTITY, DOSE, AND EXPOSURE

Units of Dose

- The international unit of dose equivalent is the sievert (Sv), where
  1 Sv = 100 rems
- A special unit used to assess doses of radon daughters is the working level month (WLM)

Slide No. 82

- 1 WLM = the exposure to 1 WL for 1 working month (170 hours).

BIOLOGICAL EFFECTS OF RADIATION

Slide No. 83

BASIC RADIATION CONCEPTS - BIOLOGICAL EFFECTS OF RADIATION

- Ionized atoms in the body may react with other atoms disrupting the normal operations of organs
- The actual biological effect created by radiation is a function of:
  - -- Type of radiation
  - -- Magnitude of the absorbed dose
  - -- Dose distribution
  - -- Age of exposed individual
  - -- Time distribution (i.e., chronic vs. acute)

Slide No. 84

- When atoms of a cell are ionized or excited, they may readily react with other atoms to cause deficiencies in the cell. Deficiencies in enough cells in an organ to cause organ malfunction or failure.
- A whole body dose of radiation is potentially more damaging because several organs may be affected causing a variety of symptoms.

BASIC RADIATION CONCEPTS - BIOLOGICAL EFFECTS OF RADIATION

- Chronic exposures to radiation lead to three major types of long-term health effects:
  - -- Increased risk of cancer
  - -- Hereditary effects
  - -- Developmental effects
- Acute health effects will not occur when exposed to radioactive contamination in the environment

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- Increased risk of cancer. According to recent EPA figures, the lifetime risk of fatal cancer associated with whole-body exposures generally ranges from $1x10^{-2}$ per SV to almost 1 per SV.

- Hereditary effects, such as a mutation or chromosomal aberration, are transmitted to a child conceived after the radiation exposure. The risk of radiation-induced genetic effects is smaller than, or comparable to, the risk of cancer.

- Developmental effects on fetuses, include mental retardation and other birth defects. The risks per unit exposure of serious developmental effects are somewhat greater than the risks of cancer, but the period that an individual is vulnerable to damage is much briefer.

- For any conceivable scenario of human exposure to radiation during routine operations at mixed waste facilities, radiation doses and dose rates are too low to cause acute health effects.

POTENTIAL MIXED
WASTE UNIVERSE

POTENTIAL MIXED WASTE UNIVERSE

Slide No. 86

POTENTIAL MIXED WASTE UNIVERSE - OBJECTIVES

- Universe
    - Who generates mixed waste
    - What industry operations generate mixed waste
- Types of Mixed Waste Streams and Management
    - How various mixed waste streams are generated
    - Waste management practices
    - Waste minimization techniques

THE UNIVERSE

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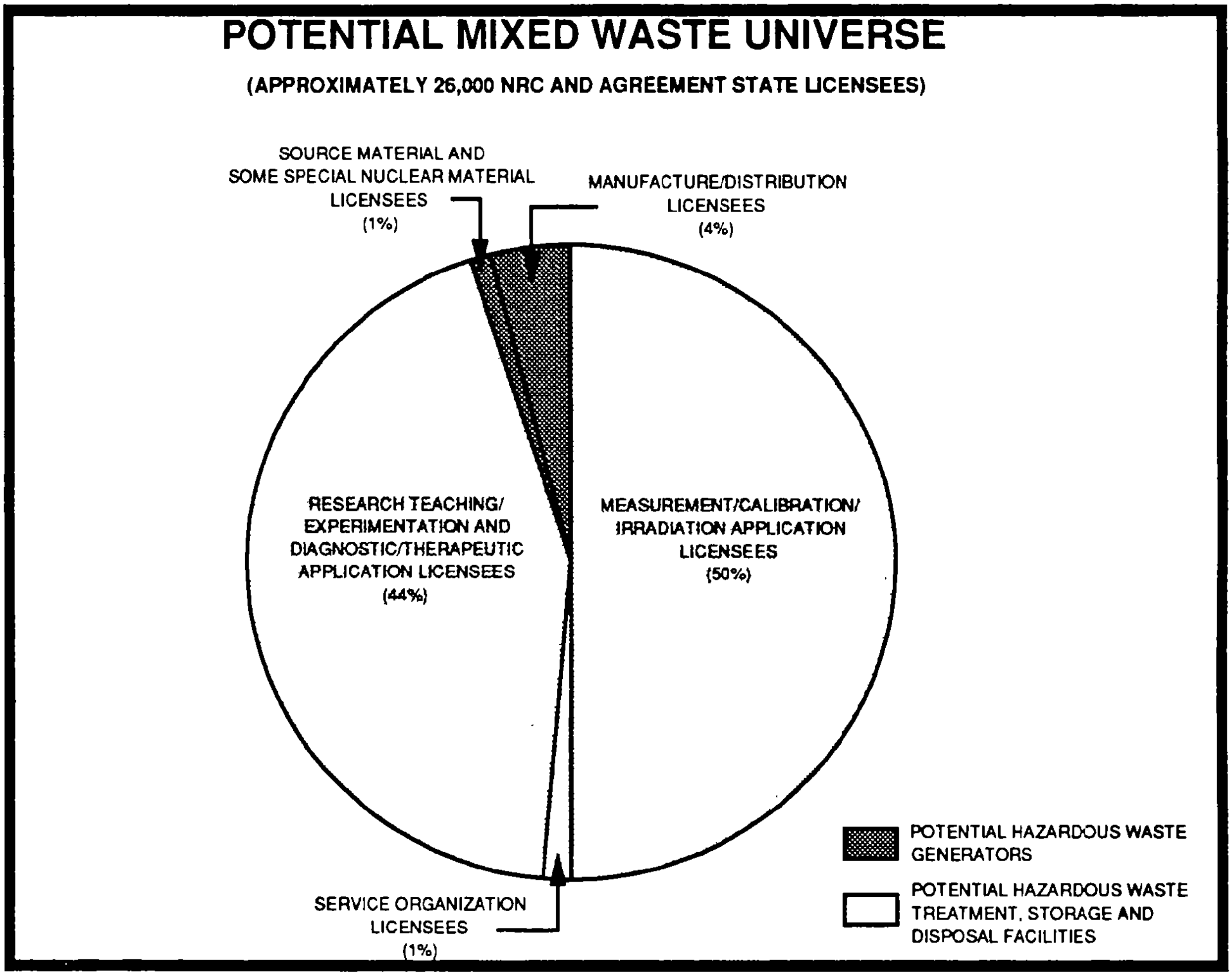
POTENTIAL MIXED WASTE UNIVERSE - THE UNIVERSE

- Approximately 26,000 NRC and Agreement State licensees
  - Many facilities
  - Small volumes of waste
  - Mixed waste is a small fraction of commercial low-level waste generation in the commercial sector
- DOE facilities
  - Few facilities
  - Large volumes of waste

Slide No. 89

- Of the 26,000 NRC and Agreement State licenses, 8,000 are specific licenses; the rest are general licenses which are automatically granted to facilities that meet certain specifications.
- Most non-Federal generators are likely to be small quantity generators (SQGs).
- Some commercial facilities may already have RCRA permits; however, initially many licensees may need to apply for storage permits because currently no off-site facility is accepting mixed waste for disposal.
- The mixed waste universe is estimated to be approximately 3 to 10 percent of all low-level waste.



Slide No. 90

Estimated percentage of NRC licensee universe:

- Manufacture/distribution licensees - 4%
  - -- May handle large quantities of nonencapsulated or nonsealed source materials which could be in readily dispersible forms.
- Source material and some special nuclear material licensees - 1%
- Service organization licensees - 1%
- Research/teaching/experimentation and diagnostic/therapeutic application licensees - 44%
  - -- The type of isotopes used by these licensees are in similar physical forms and are used in similar manners.
- Measurement/calibration/irradiation application licensees - 50%
  - -- These handlers may not need a RCRA permit because the radioactive material may not come into contact with the hazardous material.
- The NRC licensees shown above do not include 110 nuclear power plants with NRC operating licenses or NRC general licenses.

POTENTIAL MIXED WASTE STREAMS

Industries Generating Mixed Waste	Used Liquid Scintillation Cocktails	Organic Chemicals	Lead Wastes	Chromium and Cadmium Wastes	CFC Wastes	Aqueous Corrosive Liquids	Waste Oil
Nuclear Power Plants	X	X	X	X	X	X	X
Academic Institutions	X	X	X				
Medical Institutions	X	X	X				
Industry	X	X	X		X	X	X
Federal Facilities	X	X	X	X	X	X	X

Slide No. 91

- *Liquid scintillation fluids are used in a wide range of research and industrial production practices, and are sometimes classified together with organic liquids under the organic chemical heading.*

- Equipment cleanup can lead to contaminated organic chemicals as well as radiologically contaminated rags and cloths that are also contaminated with organic chemicals. Colleges and universities may be the largest producers (greatest annual volume) of organic liquid mixed waste.

- Lead shields are used to enclose experiments and may be contaminated with wheatever radionuclide was being used. Lead shielding and container waste is also generated from pharmaceutical manufacturing.

- Chromate and cadmium wastes are generated primarily at power plants.

- CFC wastes are generated during some drycleaning operations.

- Waste oil, if deemed RCRA hazardous by EPA (or authorized States), could constitute a major mixed waste category (in terms of volume).

POTENTIAL MIXED WASTE UNIVERSE - THE UNIVERSE

Nuclear Power Plants

- Currently 110 operating power plants licensed by NRC
- Operations producing mixed waste include:
  - Routine maintenance
  - Outage maintenance
  - Health physics activities
  - Radiochemical laboratory activities
  - Plant operations

Slide No. 92

Nuclear power plants generate hazardous waste during:

- Routine maintenance -- cleaning and replacing parts -- generates cloths, compactable trash contaminated with acetone, CFC, solvents, and concentrates.
- "Off-line" refueling, more thorough maintenance -- generates cloths contaminated with solvent and oil, waste oil, welding rod stubs (high cadmium content), spent trichloroethylene solvent, and blast grit (possible high concentations of cadmium and heavy metals).
- Health physics activities -- decontamination of tools, equipment and other devices, and area decontamination generates acetone and methanol contaminated clothes and spent dichlorobenzene.
- Radionuclide analyses of reactor water -- generates spent scintillation cocktails containing toluene and xylene.
- Plant operation -- generates chromate-containing waste, decontamination acids, drycleaning sludges, and tool decontamiantion sludges which may contain CFCs.

POTENTIAL MIXED WASTE UNIVERSE - THE UNIVERSE

Academic and Medical Institutions

- Academic institutions conduct research involving many different radionuclides
- Medical institutions conduct laboratory research using radionuclides
  - -- In vitro radiolabelling is frequently used to test drug metabolism
  - -- Radiolabelling is also used to map physiological functions

POTENTIAL MIXED WASTE UNIVERSE - THE UNIVERSE

Industry

- Industrial mixed waste generators include:
  - -- Pharmaceutical manufacturers and isotope suppliers
  - -- Sealed source and irradiator manufacturers
  - -- Biotechnology manufacturing
  - -- Providers of analytical services
  - -- Fuel fabrication
  - -- Waste processors

POTENTIAL MIXED WASTE UNIVERSE - THE UNIVERSE

Federal Facilities

- Defense and government research facilities operated by DOE are the primary Federal generators of mixed waste
- Unit operations vary greatly within each facility and from facility to facility
- Federal facilities include:
  - Large facilities that generate large amounts of radioactive waste
  - Production and laboratory facilities that generate smaller volumes and a greater variety of waste

Slide No. 95

POTENTIAL MIXED WASTE UNIVERSE - THE UNIVERSE

Federal Facilities (Cont'd)

- DOE has identified several sources of mixed waste:
  - Production reactors
  - Test reactors
  - Certain Navy vessels
  - Weapons manufacturing

Slide No. 96

- Many Federal facilities generate mixed waste through processes similar to those outlined for commercial facilities.

TYPES OF MIXED WASTE STREAMS AND MANAGEMENT

Slide No. 97

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

<u>Liquid Scintillation Fluids</u>

- Used during laboratory procedures involving the counting of radioactive samples
- The principal radionuclide associated with scintillation cocktails is tritium
- Principal hazardous constituents:
  - -- Toluene
  - -- Xylene

Slide No. 98

- "Scintillation cocktails" refers to vials containing spent scintillation liquid. The cocktails or fluids are mixed waste only if the solvent is hazardous <u>and</u> the radionuclides are not below regulatory concern. If the radioactive portion of the waste is below regulatory concern, only the hazardous waste regulations apply.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Liquid Scintillation Fluids

- Waste minimization generally involves replacing the hazardous liquid with non-hazardous substitutes
- Liquid scintillation cocktails and fluids are currently managed through incineration

Slide No. 99

- NRC allows the incineration or disposal of licensed material without regard to radioactivity if it contains 0.05 microcuries or less of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting.
- If all scintillation fluids and animal carcasses containing C-14 and H-3 generated annually were incinerated, 8 Ci of these radionuclides would be released. This is extremely small relative to C-14 and H-3 in the natural environment.
- Incinerators that burn spent scintillation fluids as a fuel additive do not currently need an EPA permit to do so. EPA is considering requiring the permitting of facilities that burn these types of wastes.
- Storage for decay is sometimes used for scintillation cocktails containing other than BRC concentrations of tritium or C-14.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Organic Chemicals

- Mixed wastes contaminated with organic chemicals are generated during:
  - -- Academic and medical research
  - -- Industrial manufacturing (e.g., radiopharmaceuticals, sealed sources, diagnostics)
  - -- Nuclear power plant activities

Slide No. 100

- Academic institutions generate the largest amount of organic chemical mixed wastes (scintillation liquids included) according to a 1984 Brookhaven National Laboratory survey.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Organic Chemicals

- The primary process generating radioactive organic chemicals is the cleaning or degreasing of equipment at these facilities (i.e., organic solvents are used)

- The most common radionuclides found mixed with organic chemicals are tritium and carbon-14

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Organic Chemicals (Cont'd)

- Waste minimization of organic chemicals generally involves encouraging use of alternative methods and chemicals through:
  - Education
  - Justification
  - Notification

Slide No. 102

- Education should sensitize users to disposal problems and encourage people to use the minimum amount of materials needed to complete the job (this is especially true for cleanups).

- Under a justification system, individuals must explain why the use of hazardous chemicals is necessary to their project in order to gain approval.

- Notification of large cleanups (e.g., large pieces of equipment) or other uses of large amounts of organic chemicals allows supervisors to ensure that proper management, minimization, and disposal take place.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Organic Chemicals (Cont'd)

- Organic chemicals and contaminated trash are managed in the following ways:
  - -- Storage for decay
  - -- Incineration

Slide No. 103

- Treatment technologies that render the waste non-hazardous are being developed, but are not yet available.
- Recycling methods for mixed waste organic liquids are being developed. These methods use distillation to separate useful solvents from radioactively contaminated wastes.
  - -- Recycling recovers useful materials and reduces the volume of the waste requiring disposal. Distillation residues must still be handled as mixed waste.
- Incineration is the most common method of destruction used for organic liquids.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Lead Wastes

- Contaminated lead wastes are generated by many facilities in the form of:
  - -- Shielding and/or containers
  - -- Solutions resulting from the chemical or water decontamination of lead

Slide No. 104

- Lead wastes are potentially EP toxicity characteristic wastes.
- Aluminum canisters are used to store neutron-activated stainless steel tubes (from pharmaceutical manufacture) in underwater pools. Lead is added to the aluminum to minimize buoyancy.
- Isotope shipping containers are usually solid lead coated with steel or paint.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Lead Wastes (Cont'd)

- Waste minimization programs:
  - -- Reduce amount of lead shielding and containers used
  - -- Encourage reuse of lead after it has been decontaminated
  - -- Use Herculon (a plastic-like material), plexiglass or other types of materials that are easily decontaminated

Slide No. 105

- The design of new equipment using as little lead as possible is a minimization option.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Lead Wastes (Cont'd)

- Lead waste with radioactive contamination is managed in the following ways:
  - Solid lead shielding (most problematic) is currently stored as bulk lead
  - Solidification of lead decontamination solutions to bring them below the EP toxicity limit for lead

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Chromate and Cadmium Wastes

- Chromates are often used as corrosion inhibitors in the reactor process at nuclear power plants:
  - Ion-exchange resins
  - Evaporator concentrates
  - Filter media
- Cadmium and other heavy metal wastes result from blasting and decontamination grit at nuclear power reactors
- Chromate and cadmium waste management generally consists of immobilization in chemical matrices

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Chlorinated Fluorocarbon (CFC) Wastes

- Contaminated CFC solvents, concentrates, and filters result from:
  - -- Laundering operations
  - -- Tool and equipment decontamination
- Waste minimization efforts include:
  - -- Research on chemical substitutes
  - -- Work to delist CFC concentrates
- CFC mixed wastes are currently stored

Slide No. 108

- CFC solvents may be F001 hazardous wastes.
- No treatment techniques are currently used to render CFC mixed wastes non-hazardous.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Aqueous Corrosive Liquids

- Various corrosive acids are used at nuclear power plants and in industry to:
  - -- Back-flush ion-exchange resins and
  - -- Clean used transportation containers

Slide No. 109

- The neutralization of aqueous corrosive liquids may constitute treatment and may be subject to RCRA treatment standards.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Aqueous Corrosive Liquids (Cont'd)

- Waste minimization efforts include changes in facility operations to reduce the generation of these wastes
- Possible treatment may involve neutralization (to render non-hazardous) and discharge through an NPDES outfall

Slide No. 110

- Neutralization and discharge through a NPDES permit may be exempt from RCRA if considered a wastewater treatment unit.
- Contaminated liquids may be stored in double-walled, underground, carbon-steel tanks as radioactive wastes. Leak detection systems are usually used.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Waste Oil

- Radioactive waste oils are primarily spent lubricants from radiologically contaminated equipment
- Contaminated waste oil management methods include:
  - -- Filtration
  - -- Solidification
  - -- Incineration
  - -- Long-term storage

Slide No. 111

- Several States currently regulate waste oil as hazardous waste.
- A hazardous waste classification of waste oil is under consideration by EPA, and this potential hazardous status creates significant mixed waste implications.
- Filtration involves the use of commercially available, multi-layer paper filters to remove particulate radioactive contamination. Filters are disposed of as non-hazardous radioactive waste.
- Waste oil solidified by approved methods are accepted for disposal at Richland, Washington, and Beatty, Nevada, disposal facilities (as of Spring 1989).
- Incineration takes place in auxiliary boilers or oil burners.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Summary of Waste Minimization

- Management practices to minimize mixed waste generation include:
  - -- Waste segregation
  - -- Material control programs
  - -- Waste processing
  - -- Volume reduction

Slide No. 112

- Waste segregation involves designing processes and materials management procedures to minimize the interaction of radioactive and hazardous wastes.
- Material control programs restrict access to materials and limit the amount of materials that workers are allowed to use for particular jobs.
- Waste processing techniques include recycling, recovery, and reclamation operations, as well as treatment.
- Compaction can be used for volume reduction to conserve storage space.
- Employee training encourages workers to use equipment and materials properly, familiarizes them with the hazards of working with particular substances, and keeps them informed of minimization and proper disposal practices.
- EPA or State staff should look for opportunities to encourage owner/operators to:
  - -- Segregate radioactive hazardous waste,
  - -- Minimize quantities of mixed waste, and then
  - -- Manage remaining waste appropriately.

POTENTIAL MIXED WASTE UNIVERSE - WASTE TYPES AND MANAGEMENT

Mixed Waste Management Options

- Rulemaking petitions
- Waste declared BRC
- Establish a licensed/permitted TSDF for mixed waste

Slide No. 113

- Rulemaking Petitions and delisting may result in exemptions from RCRA.
- If the radioactive component of the mixed waste can be declared BRC, then only the RCRA requirements must be met. This only an option for tritium and C-14 in scintillation cocktails at present.
- Mixed wastes containing radionuclides with short half-lives may be stored for decay and then disposed of as hazardous waste; however, this will require a RCRA permit.
- Generators of mixed waste could form a cooperative agreement to establish a licensed TSDF.

HEALTH PHYSICS AND INSPECTIONS

Slide No. 114

HEALTH PHYSICS AND INSPECTIONS - BACKGROUND

Objectives

- Describe the background and application of the ALARA principle
- Highlight distance, time, and shielding for personal protection and worker safety
- Introduce inspector to dosimetry equipment and decontamination practices

ALARA

Slide No. 116

HEALTH PHYSICS AND INSPECTIONS - ALARA

- Maintaining radiation exposures and releases of radioactive material "as low as reasonably achievable" (ALARA) is a very important concept for personal safety

HEALTH PHYSICS AND INSPECTIONS - ALARA

- ALARA takes into account:
  - -- State of technology
  - -- Economics
- In relation to:
  - -- Effect on public health
  - -- Use of atomic energy in the public interest

Slide No. 118

- "The term 'as low as is reasonably achievable' means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest." 10 CFR 20.1(c)

HEALTH PHYSICS AND INSPECTIONS - ALARA

- ALARA is described in NRC regulations and in ORP's Federal Guidance Report Number 11 on Limits to Occupational Exposure
- ALARA is not required by the AEA
- The ALARA concept requires facilities to achieve the lowest levels possible

  -- no specific numbers are associated with ALARA

Slide No. 119

- Office of Radiation Programs, "Federal Guidance Report Number 11"; September 1988; EPA-520/1-88-020.
- ALARA was adopted by DOE as an operating principle.
- Applicants for nuclear power reactor permits must employ all reasonable technology that will reduce radiation doses at a cost of $1,000 or less per man-rem. (10 CFR Part 50, Appendix I, Section II.D).

HEALTH PHYSICS AND INSPECTIONS - ALARA

- The ALARA concept embodies:
  - -- Thinking before acting
  - -- Exercising good judgment
  - -- Reducing exposure (while remaining cost efficient)
  - -- Not compromising personal safety
- For hazardous waste personnel this means being informed and contacting radiation officers to get support before proceeding

HEALTH PHYSICS AND INSPECTIONS - ALARA

- ALARA concept includes:
  - -- Meeting regulatory requirements
  - -- Then applying ALARA
- Facilities cannot use ALARA as a shield from regulatory requirements or to unnecessarily limit inspection activities

Slide No. 121

- In general, inspections should be both thorough and cost-efficient, while taking into account personal safety and worker exposure. Inspectors should exercise their best judgment.
- Facilities that handle radioactive materials usually have ALARA procedures in place, however, if EPA personnel are properly trained and prepared, ALARA practices will not hinder RCRA inspections.
- Inspectors should be aware of facility-specific procedures when planning mixed waste inspections.

HEALTH PHYSICS AND INSPECTIONS - ALARA

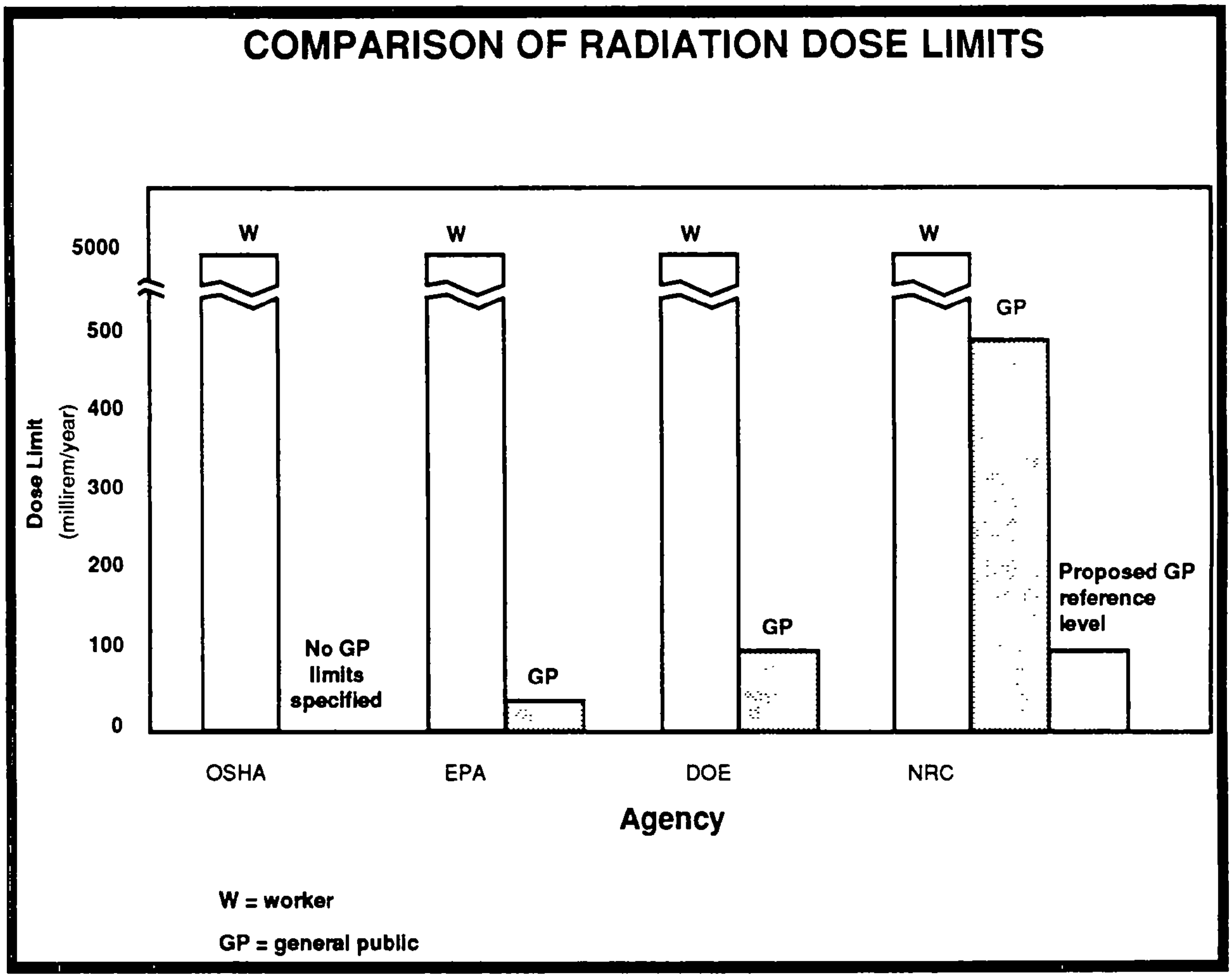
- ALARA concept is applied to all phases of a project:
  - Planning and design
  - Implementation and operation
  - Personal safety
- EPA personnel should consider how ALARA is incorporated into:
  - Training
  - Surveillance and monitoring
  - Recordkeeping
  - Waste management

HEALTH PHYSICS AND INSPECTIONS - ALARA

- Related to ALARA are action limits -- standards for the amount of radiation a person is allowed to be exposed to over long periods
  - There are different limits for workers and for members of the general public
  - NRC, DOE, and OSHA all specify dose limits

Slide No. 123

- Dose limits for workers are higher than those set for the general public.
- Private companies usually set their exposure limits below NRC levels.



Slide No. 124

- NRC has proposed a reference level of 100 millirem/year for the general public. This is not a dose limit, but rather a mechanism to keep annual doses as low as possible. The proposed NRC dose limit for the general public will remain 500 millirem/year.

- The proposed NRC dose limit for workers would remain at 5 rem/year, with some specific exceptions. For example, doses caused by external exposures would be limited to 3 rem/year, and doses greater than 5 rem/year would be permitted for "planned special exposures."

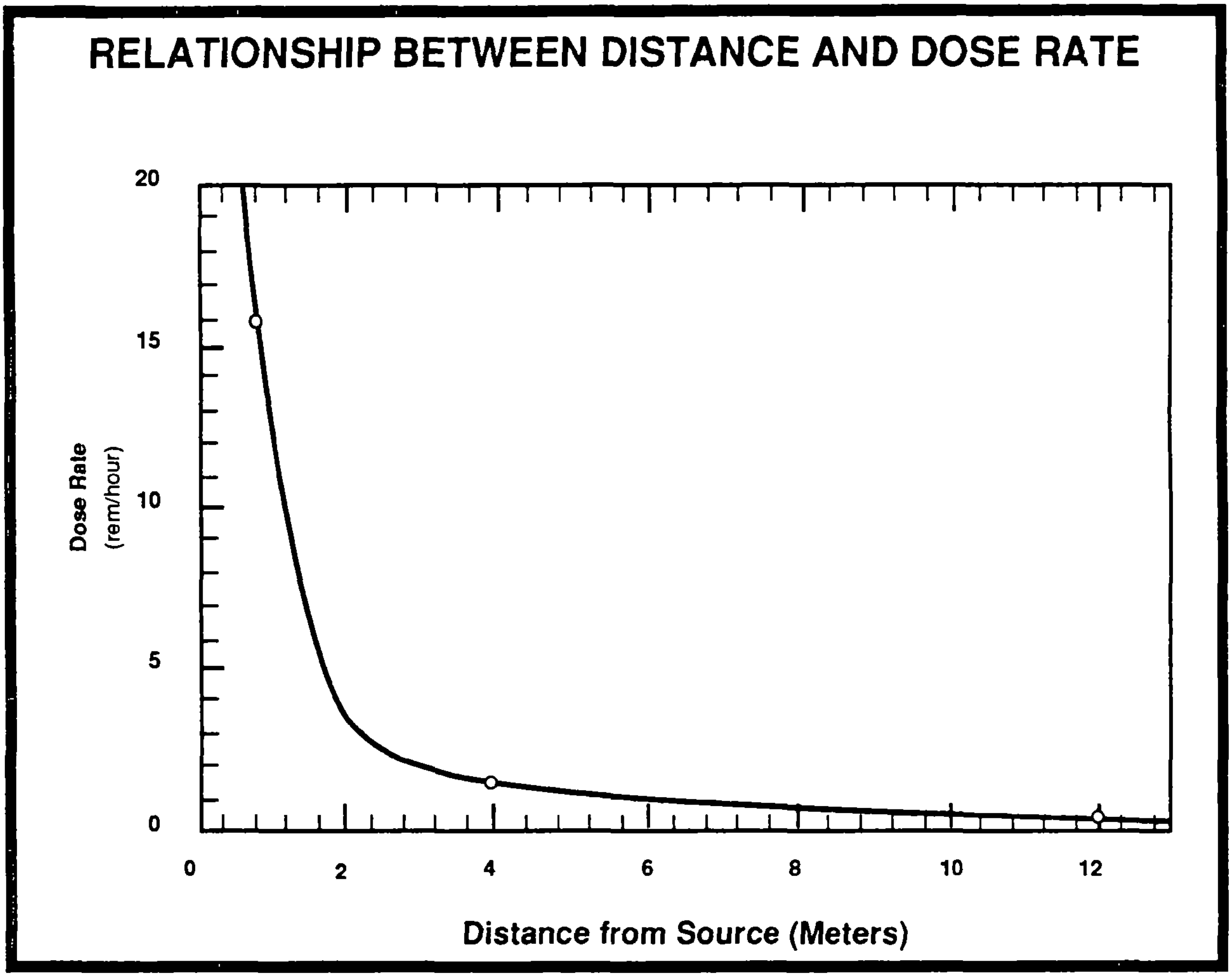
- EPA's recommendations concerning Federal radiation protection guidance for occupational exposure can be found in 52 FR 2822.

HEALTH PHYSICS AND INSPECTIONS - ALARA

- Exposure should first be minimized (ALARA) by:
  - -- Maximizing distance from source
  - -- Minimizing time spent near source
  - -- Maximizing external shielding (natural and artificial)
  - -- Using practices to avoid contamination
- Protective clothing and respiratory equipment provide additional protection against radiation

Slide No. 125

- Ideally, facilities should be designed to have sufficient aisle space for the inspector to maintain maximum distance from the source.
- Time spent on careful planning and preparation will allow the inspector to minimize time spent near the source during the actual inspection.
- Care should be taken to place shielding between a person and a radiation source.
- The use of dedicated equipment (i.e., separate equipment for radioactive wastes) will help the inspector avoid contamination.



Slide No. 126

- Dose is inversely proportional to the distance squared.

EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

Slide No. 127

HEALTH PHYSICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

- Protective clothing is designed to:
  - -- Prevent the entry of radioactive dust or particles into the body by absorption through skin
  - -- Prevent entry through openings like cuts and wounds
  - -- Prevent contamination of personal clothing and effects
- Protective clothing is removed when leaving radiation areas to prevent spread of contamination
- Respiratory equipment is designed to:
  - -- Prevent the inhalation of radioactive particles

HEALTH PHYSICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

- Inspectors can expect to use various types of instruments in a mixed waste inspection:
  - Dosimeters
  - Initial entry devices
  - Other survey instruments

Slide No. 129

- Proper detection instruments are of particular importance because radiation gives no warning (i.e., cannot be smelled, seen, or felt).
- Dosimeters are used to measure individual doses; initial entry devices are used for detection; and other survey instruments are used to measure real time exposure rates and surface contamination.
- EPA hazardous waste personnel should work with EPA and State radiation officers, as well as NRC or DOE personnel to determine equipment availability (e.g., Regional/State radiation offices have dosimeter badges that are available for EPA personnel).
- For a listing of mixed waste contacts refer to Appendix J.

HEALTH PHSYICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

<u>Dosimeters</u>

- Can measure either whole-body exposures or exposures to certain regions of the body (e.g., hand and foot counters)
- Can provide direct or indirect readings

Slide No. 130

- Dosimeters can be one of two types. Standard dosimeters detect gamma radiation. Special dosimeters can detect beta particles in addition to gamma radiation.

HEALTH PHYSICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

Survey Instruments

- Used to determine if a spot is contaminated or if an area is safe to enter
- Show a rate and give real-time readings
- Can be set up to sound an alarm if a release occurs
- Survey instruments are not used as analytical instruments

HEALTH PHSYICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

- Decontamination involves two different procedures:
  - -- Chemical decontamination
  - -- Radiation decontamination
- Common goal is to decontaminate individuals and equipment safely

Slide No. 132

- Although radioactivity poses an additional danger to the inspector, instrumentation often makes radioactive contamination easier to detect than chemical contamination.

HEALTH PHYSICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

Chemical Decontamination

- For individuals, the contamination is washed off with soap and water in most cases

- Chemical contamination is of particular concern because no instruments are readily available to determine occurrence

Slide No. 133

- All water disposed of at an NRC licensed facility is controlled either through accepted sewage disposal or is routed back to a rad-waste system.

HEALTH PHYSICS AND INSPECTIONS - EQUIPMENT, INSTRUMENTS, AND DECONTAMINATION

Radiation Decontamination

- Refers to removable surface contamination
- Instruments make it easy to determine if an item is radiologically contaminated
- Usually a dry removal process (tape, brush, etc.)
- Only after dry process fails will a wet decontamination practice be used

Slide No. 134

- Protective clothing is usually discarded and personal property that becomes radioactively contaminated must remain at the facility. EPA personnel should be aware that property, such as cameras used during inspections, that becomes radioactively contaminated must remain at the facility.
- Waste generated in decontamination is radioactive and must be appropriately managed.

INSPECTIONS

Slide No. 135

HEALTH PHYSICS AND INSPECTIONS - INSPECTIONS

Objectives

- Point out areas where mixed waste inspections will differ from RCRA hazardous waste inspections
- Supplement existing RCRA and NRC guidance and training on performing inspections
- Demonstrate how the ALARA concept is used in practice for personal safety

Slide No. 136

- It is assumed that the fine points of "normal" RCRA inspection procedures are already understood.

HEALTH PHYSICS AND INSPECTIONS - INSPECTIONS

- Due to the dual regulatory framework and the radioactive nature of the waste, the RCRA inspector will have to consider:
  - Additional health and safety issues
  - Need for additional training
  - More coordination with other offices and agencies
- Since most mixed wastes are currently managed on-site, many inspections will be combinations of generator and storage inspections

Slide No. 137

- Because of radioactive hazards, inspections may require additional safety planning, special equipment, and specialized training.
- Each Region has a Radiation Office that can provide support from within the Agency. Inspectors should coordinate with individuals in EPA Radiation Offices on a case-by-case basis as they determine how to safely handle the radioactive hazard at mixed waste facilities. (Refer to Appendix J)
- Coordination with other agencies will be necessary to ensure that the inspection activities are consistent with the various requirements they may impose.
- Combination generator/storage inspections will be particularly important to States with mixed waste authorization, because States have the primary responsibility for inspecting generators.

HEALTH PHYSICS AND INSPECTIONS - INSPECTIONS

Objectives of the Inspection

- Identify suspected violations
- Assist the facility owner/operator in understanding and complying with hazardous waste regulations
- Assess qualitatively any potential threat to human health or the environment
- Gather information on the hazardous and mixed waste management practices

Slide No. 138

- Inspections should be planned to minimize the risks associated with mixed waste and to avoid repetitive inspection procedures.

Overview of Mixed Waste Inspection Considerations

- Safety:
  - -- Understand all radioactive hazards
  - -- Obtain and review all safety guidelines
  - -- Contact the facility or review the inspection file for facility-specific safety requirements
  - -- Identify and become familiar with safety equipment for radiation

Slide No. 139

- These safety considerations are in addition to those normally addressed during a RCRA inspection.
- Radioactive materials pose safety considerations that must be addressed early in the planning process (i.e., before the site visit).

HEALTH PHYSICS AND INSPECTIONS - INSPECTIONS

Overview of Mixed Waste Inspection Considerations (Cont'd)

- Requirements for access:
  - -- Inspectors should obtain all required training for the type of inspection planned
    - Training requirements may vary
  - -- Check with facility and NRC/Agreement State contact for specific information
  - -- Inspectors should obtain the necessary security clearances for the type of inspection planned

Slide No. 140

- In addition to the 40-hour general health and safety training for RCRA inspections, more specific radiation training will be required.
- Depending on the need of the RCRA inspector the training requirements for facility inspections may vary. For example, less training will be required if the inspector has an escort at all times.
- See Appendix N for information on radiation training.

HEALTH PHYSICS AND INSPECTIONS - INSPECTIONS

Inspection Stages

- Preparing for the inspection
- On-site activities

Slide No. 141

- When preparing for the inspection each stage should be addressed separately in order to identify areas where mixed waste inspections may differ from RCRA hazardous waste inspections.

PREPARING FOR THE INSPECTION

Slide No. 142

HEALTH PHYSICS AND INSPECTIONS - PREPARING FOR THE INSPECTION

Coordinating with Other Offices and Agencies

- Several offices and agencies may be interested in the mixed waste inspection, including:
  - -- NRC and Agreement States
  - -- DOE
  - -- RCRA Authorized States
  - -- EPA Regional and State radiation contacts
  - -- Other EPA offices
- Joint inspections may be an option

Slide No. 143

- By consulting with these offices and agencies as part of the planning process, regulatory confusion can be minimized and plans can be established so the inspection benefits all regulatory agencies. These agencies or offices have resources that may be useful when preparing to conduct a RCRA inspection involving radioactive waste.

HEALTH PHYSICS AND INSPECTIONS - PREPARING FOR THE INSPECTION

Gathering Background Information

- Typical information sources include:
  - Inspection files
  - Applicable regulations and guidance documents
  - Facility descriptions
  - RCRA permits
  - Other permits
  - Process descriptions
- Inspectors should be innovative in identifying new information sources

Slide No. 144

- Mixed waste inspections may require different research than RCRA hazardous waste inspections because a radiation hazard exists and additional regulations are involved.

- General background research will involve reviewing applicable regulations and guidance documents from EPA as well as from DOE and NRC.

- Facility-specific research will involve looking at specific processes and unit operations. It will also include developing an understanding of handling, management, and disposal procedures.

  - For RCRA-permitted facilities, permit writers should be contacted for facility information.

  - Other existing permits (all Federal, State, and local permits) should be reviewed to help identify areas of potential mixed waste generation or management.

  - If the waste was historically labeled as radioactive waste and is now identified as mixed waste, check radioactive waste sources for information.

Developing Inspection Plans

- Objectives of the inspection plan:
  - Outline the steps for gathering the necessary waste generation and management information
  - Plan and prepare for each step in the inspection
  - Highlight specific areas of interest

HEALTH PHYSICS AND INSPECTIONS - PREPARING FOR THE INSPECTION

Developing Inspection Plans (Cont'd)

- When preparing an inspection plan, the inspector needs to consider:
  - Access and clearance requirements
  - Required training
  - Necessary safety equipment
  - The opening interview
  - The record review
  - The site inspection

Slide No. 146

- Notification considerations may be more extensive for mixed waste inspections, particularly at Federal facilities. In some cases, surprise inspections may not be possible.

- Supervisors are responsible for ensuring that all inspectors dealing with mixed waste have the appropriate health and safety training and the necessary clearances. This includes keeping records and ensuring staff receive annual updates.

- Inspectors should determine what safety equipment is available at the facility and what safety equipment is available through EPA.

- During the opening interview the inspector should identify site-specific issues and be prepared to answer RCRA regulatory questions.

- Familiarize yourself with processes and unit operations before the review; they may differ significantly from typical hazardous waste operations.

- RCRA facility checklists can be used for the actual mixed waste inspections, but they may need to be modified. The inspector may also be able to review NRC/DOE facility checklists.

ON-SITE ACTIVITIES

Slide No. 147

Entrance to Facility

- Inspectors that have obtained the necessary training and security clearance for access need to consider the following points before entering a facility
  - Inspectors should carry their training certificates
  - Special safety equipment may be required

Slide No. 148

- Since NRC always retains jurisdiction over power plants, the inspector need not worry about Agreement State requirements at commercial nuclear power plants.
- NRC licensed facilities may be required under NRC regulations to see the appropriate training certificates from inspectors.

Opening Discussion With Owner/Operator

- Outlines inspection objectives with the operator
- Helps the owner/operator understand and comply with RCRA regulations
- Identifies waste streams and mixed waste-generating processes

HEALTH PHYSICS AND INSPECTIONS - ON-SITE ACTIVITIES

Operations, Waste Handling, and Record Review

- Provides a more detailed understanding of operations
- Provides answers to questions the inspector assembled during background research
- Helps identify changes in operations
- Helps identify and reconcile discrepancies between described and actual procedures

Determining Sampling Needs

- As with "normal" RCRA inspections, sampling is usually part of a technical case development when non-compliance is suspected:
  - The inspector suspects that a waste handled only as radioactive is actually mixed waste
  - There is evidence of releases
- In most cases, sampling will not be performed during routine compliance evaluations

<u>Determining Sampling Needs</u> (Cont'd)

- RCRA gives inspectors the authority to obtain samples of hazardous waste
- However, inspectors cannot order owner/operators to take samples unless it is required by the permit or enforcement order

Slide No. 152

- From RCRA §3007: "Officers, employees, or representatives of the EPA are authorized --

  (1) to enter at reasonable times any establishment or other place where hazardous wastes are or have been generated, stored, treated, disposed of, or transported from;

  (2) to inspect and obtain samples from any person of any such waste and samples of any container or labeling for such wastes."

Determining Sampling Needs (Cont'd)

- Inspectors should think ahead when determining whether to conduct mixed waste sampling
- Mixed waste sampling is expensive and increases risks to the inspector
- Sampling should only be performed when necessary

Determining Sampling Needs (Cont'd)

- Inspectors must be aware of requirements that may apply to mixed waste samples
  - -- NRC or NRC Agreement State licenses
  - -- Department of Transportation and NRC transportation regulations for both the radioactive and hazardous components
- Normal RCRA sampling procedures may need to be revised for mixed waste

Slide No. 154

- Mixed waste samples can only be taken to a facility that has an NRC license, NRC Agreement State license, or an authorized DOE facility. In other words, samples must go to a facility that is authorized to receive it.

Determining Sampling Needs (Cont'd)

- Site-specific sampling considerations include:
  - Accessibility of the waste
  - Variations in generation and handling
  - Effect of transitory events such as start-up, shut-down, and maintenance activities
  - Anticipated and unanticipated hazards

HEALTH PHYSICS AND INSPECTIONS - ON-SITE ACTIVITIES

Site Inspection

- The inspection is similar to a "regular" RCRA inspection; it should focus on key aspects of the process and waste flow

- Inspectors will want to determine:

  -- Where mixed waste is generated and whether the operator handles it as mixed waste

  -- What management practices exist

  -- Whether mixed waste is misidentified or mishandled

  -- Unusual situations

Closing Discussion and Documentation

- Documentation and follow-up is similar to other RCRA inspections
- Follow-up for mixed waste inspections may differ from RCRA inspections:
  - -- Inspection reports -- format may vary
  - -- Other agencies may have interest in results
  - -- Other offices or agencies may be helpful in interpreting information obtained

ACCESS, NATIONAL SECURITY, AND CLEARANCES

Slide No. 158

HEALTH PHYSICS AND INSPECTIONS - ACCESS, NATIONAL SECURITY, AND CLEARANCES

<u>Access</u>

- Many of the processing activities that generate DOE mixed waste are defense related
- Access is also controlled at nuclear power plants and other nuclear facilities
- RCRA inspectors must be prepared to address access and national security issues and will have to obtain appropriate clearances

HEALTH PHYSICS AND INSPECTIONS - ACCESS, NATIONAL SECURITY, AND CLEARANCES

Access (Cont'd)

- Additional radiation training may be required to gain access to some of the larger facilities
- Regional and State inspectors should inquire, in advance, about access requirements
- Escorted access at NRC licensed facilities
  - -- No additional training beyond EPA or OSHA requirements
- Unescorted access at NRC licensed production and utilization facilities:
  - -- Two day generic NRC training, or
  - -- Two day site-specific training

Slide No. 160

- In some cases, radiation training required for access to many NRC regulated or DOE facilities is in addition to the training required for hazardous waste inspections.
- An EPA inspector may either complete the site specific training or complete NRC's generic training and supplement this with a short facility-specific briefing. It is recommended that EPA inspectors conduct initial inspections with an escort.
- When a facility notifies the State or EPA that it is a hazardous waste handler and the State or EPA has reason to believe the facility handles mixed waste, the State or EPA Region should send a letter to the facility stating that they will be conducting inspections and inquiring about training requirements and how to access the training.
- Refer Appendix N for information on radiation training.

HEALTH PHYSICS AND INSPECTIONS - ACCESS, NATIONAL SECURITY, AND CLEARANCES

Access (Cont'd)

- DOE facility inspections may require national security clearances (e.g., "L" and "Q" clearances)
- These are granted by DOE for DOE activities
- EPA personnel should contact Personnel Security staff at EPA Headquarters for clearances
- State personnel should contact DOE

Slide No. 161

- The type of clearance depends on the classification of the information required to be reviewed. Obtaining a security clearance will take a significant period of time and management should plan well in advance to ensure that inspectors have the necessary clearances.
- Inspectors should address access and clearance issues up-front as part of the planning process, so that efforts can be made to avoid situations where access is denied. Inspectors will have to coordinate with facility operators in advance to determine which areas are restricted.
- EPA's policy is to meet special security or access requirements to the maximum extent possible.
- Where information has been classified or restricted for national security or other reasons, it must be maintained in accordance with the originating agency's requirements.

Access Denial

- If access is denied for any reason the issue should be raised to the appropriate levels of EPA or State management
- If access is denied for reasons other than national security, standard denial of access procedures should be followed
- If the denial is based on national security, alternate procedures must be followed

Inspection Summary

- Mixed waste inspectors must consider additional factors beyond those of other RCRA inspections:
  - Health and safety
  - Coordination and information sources
  - Additional requirements (training, sampling, etc.)
- Best way to handle mixed waste inspections is to plan thoroughly and to utilize the resources available to become more familiar with the particulars of each type of mixed waste inspection

PERMITTING MIXED
WASTE FACILITIES

PERMITTING MIXED WASTE FACILITIES

Slide No. 164

PERMITTING MIXED WASTE FACILITIES - BACKGROUND

Objectives

- Identify similarities in objective and scope of the RCRA and AEA permit/license requirements
- Highlight areas of potential differences between RCRA and AEA requirements
- Encourage use of flexibility in applying RCRA permit standards

Slide No. 165

- This section compares NRC and EPA permitting/licensing requirements. DOE orders were not incorporated into this comparison:

  -- DOE orders are consistent with, but more general than NRC requirements, and

  -- DOE orders incorporate RCRA requirements.

PERMITTING MIXED WASTE FACILITIES - BACKGROUND

Overview of Regulatory Schemes

- NRC guidance specifies standards based on the potential radiological hazard contained in the system (i.e., low-level or high-level)
- RCRA regulatory standards are based on unit type (e.g., tanks or landfill)

PERMIT PROCEDURES

Slide No. 167

PERMITTING MIXED WASTE FACILITIES - PERMIT PROCEDURES

<u>Applicability</u>

- DOE facilities and NRC/Agreement State licensees must comply with all applicable Federal, State, and local regulations concerning any toxic or hazardous properties of the waste
- Owners/operators of mixed waste facilities must obtain RCRA permits

Slide No. 168

- NRC issues licenses for disposal facilities and production and utilization facilities, and for the possession and use of source, by-product, and special nuclear material. These licenses contain very specific requirements which are part of NRC's comprehensive program to ensure radioactive materials are handled safely. This section will simply highlight <u>some</u> of these requirements and compare them to EPA requirements to provide EPA personnel with information so they can prepare themselves for regulating mixed wastes.

PERMITTING MIXED WASTE FACILITIES - PERMIT PROCEDURES

The Application

- NRC license and EPA permit information requirements overlap to some extent; however, each serves a different purpose
- Specific information required for a RCRA Part A permit includes:
  - -- Type, annual quantity, and processes to be used for each hazardous waste
  - -- SIC codes
  - -- List of other permits received or applied for

PERMITTING MIXED WASTE FACILITIES - PERMIT PROCEDURES

The Application (Cont'd)

- Specific information required for a RCRA Part B permit application includes:
  - Chemical and physical analyses
  - Copy of the waste analysis plan
  - Description of precautions to prevent accidental ignition or reaction
  - Ground-water monitoring information
  - Information requirements for each type of process unit

Slide No. 170

- NRC's licensing procedures generally require an appropriate Environmental Monitoring Program and a Radiation Safety Program, which include monitoring of any radioactive effluents. These programs may not provide all the information necessary to satisfy RCRA's permit application requirement for ground-water monitoring information.
- The detailed and extensive Part B information requirements for each type of process unit are not included in NRC's regulatory requirements. NRC, however, has general authority to require additional information.

PERMITTING MIXED WASTE FACILITIES - PERMIT PROCEDURES

Public Participation

- Public participation requirements such as public notice, public comment, and public hearings are incorporated into both EPA and NRC regulations
- All NRC licensing actions are subject to requests for hearings by affected parties
- The processes are similar although the specific procedures and the timing differ

PERMITTING MIXED WASTE FACILITIES - PERMIT PROCEDURES

Timeframe for Permit Issuance

- **RCRA final permit decisions are issued after the close of the public comment period on the draft permit**
- **NRC final license decisions (for production and utilization facilities) are issued after formal evidentiary hearing**

Slide No. 172

- There are no specific timeframes for issuing final decisions under RCRA or NRC regulations.

TECHNICAL PROCESS REQUIREMENTS:

TANKS AND CONTAINER STORAGE

Slide No. 173

PERMITTING MIXED WASTE FACILITIES - TANKS AND CONTAINER STORAGE

Tank and Container Requirements

- EPA and NRC container requirements are consistent
- Compliance with NRC standards may yield tanks that are in compliance with RCRA

Slide No. 174

- NRC tanks have provisions to monitor liquid levels, raise alarms at high level setpoints, and withstand the corrosive nature of wet waste.
- RCRA secondary containment requirements include a combination of containment system and design to prevent uncontrolled releases.
- Storage structures at NRC licensed facilities and at EPA permitted facilities are required to have curbs or elevated thresholds with floor drains and sumps.
- NRC requirements may in many cases yield a facility that meets all applicable RCRA requirements; however, a separate evaluation for compliance with RCRA will be necessary in all cases.

PERMITTING MIXED WASTE FACILITIES - TANKS AND CONTAINER STORAGE

Tank and Container Requirements(Cont'd)

- Response to leaks or spills from tanks:
  - -- NRC storage areas are designed to handle accidents, and provisions are incorporated to route spilled wet waste to treatment systems
  - -- RCRA permit contingency plans must include procedures for response

Facility Self-Inspection Requirements

- NRC requires that storage facilities implement a range of inspection techniques designed to minimize occupational exposure:
  - -- Surveillance program capable of prompt detection of failure and measurement of releases
  - -- Quarterly visual inspections, TV monitors, walk-throughs, representative containers
- EPA requires that facilities implement specific self-inspection measures:
  - -- Inspection log
  - -- Daily and weekly inspections

PERMITTING MIXED WASTE FACILITIES - TANKS AND CONTAINER STORAGE

Consideration:

- EPA maintains a practice of conducting walk-through inspections, which may not be feasible when inspecting mixed waste facilities

Options to resolve differences:

- A mixed waste storage facility could be designed to accommodate RCRA walk-through inspections

- An owner/operator could obtain clarification from EPA that the types of inspections allowed by NRC are adequate for RCRA requirements

Slide No. 177

- The EPA practice of walk-through inspections may conflict with NRC policy; however, at many mixed waste facilities walk through inspections will not be a problem. In addition, walk-through inspections are not specifically required in RCRA. Other means of inspecting a facility will satisfy EPA regulations. The ALARA process should not be degraded.

- Before EPA personnel suggest an alternative design for a mixed waste storage facility, they should consider the rationale behind the original design. For example, low-level waste containers may be used as shielding for high-level waste containers, and thus, segregating the storage area may not be the most practical solution.

TECHNICAL PROCESS REQUIREMENTS:

INCINERATION

Slide No. 178

PERMITTING MIXED WASTE FACILITIES - INCINERATION

- Incineration is licensed by NRC and permitted by EPA on a case-by-case basis under national performance standards

Slide No. 179

- Biomedical wastes which meet the requirements of 10 CFR 20.306 may be incinerated without an NRC license. This provision allows disposal or incineration without regard to radioactivity, if the radioactivity of the waste is below regulatory concern.

- NRC licensees must comply with EPA regulations governing the incineration of any hazardous or toxic property of wastes that meet the 40 CFR Part 261 definition of hazardous waste.

PERMITTING MIXED WASTE FACILITIES - INCINERATION

Recordkeeping

- NRC and EPA require records of:
  - -- Waste disposal
  - -- Emission releases

Slide No. 180

- NRC requires that:
  - -- Records of disposal of licensed materials are to be maintained until NRC authorizes their disposition [10 CFR 20.401(c)(3)].
  - -- Records of the results of surveys used to evaluate the release of radioactive effluents to the environment must be maintained until NRC authorizes their disposition [10 CFR 20.401(c)(2)(iii)].

- EPA requires the owner or operator to keep a written operating record at the facility until closure. The operating record must include:
  - -- A description and quantity of the waste received with the methods and dates of its disposal;
  - -- The location and quantity of the waste within the facility;
  - -- Results of waste analysis;
  - -- Monitoring, testing, or analytical data, if required;
  - -- Notices to generators, for off-site facilities;
  - -- Summary reports and details of incidents that require contingency plan implementation; and
  - -- Closure cost estimates [40 CFR 264.73].

PERMITTING MIXED WASTE FACILITIES - INCINERATION

Performance Requirements

- NRC performance requirements specify maximum concentration levels in emission
- EPA's performance requirements generally are "percent reduction" standards

Slide No. 181

- EPA permitted incinerators must achieve a destruction and removal efficiency (DRE) of either 99.99% or 99.9999% depending on the constituents of concern.

PERMITTING MIXED WASTE FACILITIES - INCINERATION

Operating Requirements

- NRC and EPA specify license/permit operating requirements which will meet the performance requirements
  - -- NRC lists numerical guides for limiting conditions for operations in nuclear power plants
  - -- All other NRC licensees comply with ALARA on a case-specific basis
  - -- EPA lists specific operating requirements

- NRC lists numerical guides for limiting conditions for operations to meet ALARA (i.e., as low as reasonably achievable) criteria for radioactive material in nuclear power plant effluents. All other licensees comply with ALARA on a case-specific basis. [10 CFR Part 50, Appendix I]

- EPA lists specific operating requirements, including the requirement that the fugitive emissions from the combustion zone must be controlled by either keeping the combustion zone sealed against fugitive emissions, maintaining a combustion zone pressure lower than atmospheric pressure, or an alternative means of control. [40 CFR 264.345(d)]

PERMITTING MIXED WASTE FACILITIES - INCINERATION

<u>Monitoring</u>

- NRC requires each licensee to survey emissions to evaluate the extent of radiological hazards that may be present
- EPA requires the owner or operator to conduct continuous monitoring as well as sampling and analysis upon request of the Regional Administrator

Slide No. 183

- NRC requires that each licensee survey emissions to remain in compliance with the regulations in 10 CFR Part 20 and to evaluate the extent of radiological hazards that may be present. [§20.201]
  - -- NRC also has other specific requirements for certain types of licensees.
- EPA monitoring requirements include the requirement that the owner or operator must conduct the following monitoring:
  - -- Combustion temperature, waste feed rates, and gas velocity on a continuous basis;
  - -- Carbon monoxide at a point in the incinerator downstream of the combustion zone and prior to release to the atmosphere on a continuous basis; and
  - -- Sampling and analysis of the waste and exhaust emissions upon request of the Regional Administrator. [40 CFR 264.347(a)]

PERMITTING MIXED WASTE FACILITIES - INCINERATION

Consideration:

- EPA and NRC requirements for incinerators are developed on a case-by-case basis
  - Incorporating both sets of regulations is relatively easy

TECHNICAL PROCESS REQUIREMENTS:

DISPOSAL

Slide No. 185

NRC Licenses for Disposal

- Source, by-product, and special nuclear material licenses may allow for disposal:
  - On-site, if disposal process is approved by NRC, or
  - Into sanitary sewerage system, if the waste meets certain criteria
- Waste that meets certain quantity and type specifications may be disposed of without regard to its radioactivity
- Disposal of low-level radioactive waste received from other persons (i.e., commercial disposal) requires a separate disposal license

Slide No. 186

- On-site disposal is allowed if disposal process is approved by NRC. [10 CFR 20.302]
  - Licensee or applicant must submit an application for approval of the proposed disposal. The application must include a description of the licensed material, any other radioactive material involved, the proposed manner and conditions of disposal, an analysis and evaluation of pertinent information as to the environment, usage of ground and surface waters in the general area, the nature of other potentially affected facilities, and the procedures to be observed to minimize the risk of unexpected or hazardous exposures.
- Disposal into a sanitary sewerage system is allowed, if the waste is readily soluble or dispersible in water and meets specific quantity limitations. [10 CFR 20.303]

PERMITTING MIXED WASTE FACILITIES - DISPOSAL

<u>Typical NRC Disposal Practice</u>

- "Near surface" disposal involves disposal into the uppermost portion of the earth (i.e., within approximately 30 meters of the surface)
- High-integrity containers can be used
- Design and operating requirements minimize migration of radiological contamination

PERMITTING MIXED WASTE FACILITIES - DISPOSAL

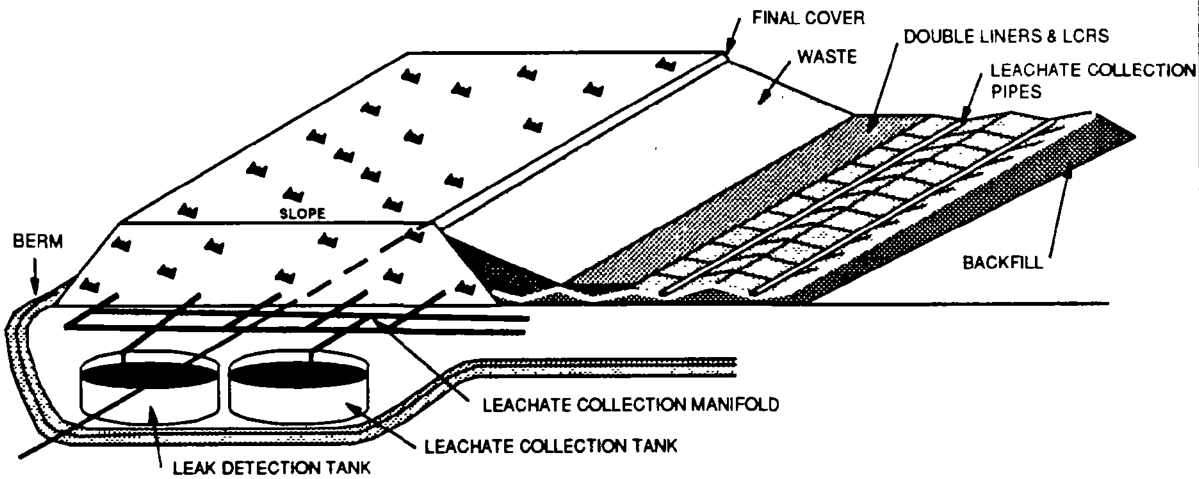
Objectives

- NRC - Water contact with radioactive waste should be minimized
- EPA - Contaminants should not leach from the unit

Slide No. 188

- NRC emphasizes the prevention of enterance of liquids into the unit.
- EPA emphasizes the prevention of release of hazardous constituents from the unit.

CONCEPTUAL DESIGN OF A MIXED WASTE DISPOSAL FACILITY



Slide No. 189

- The conceptual design of a mixed waste disposal facility requires that mixed low-level waste be placed above the original ground surface in tumulus and blended into topography. The conceptual design integrates two liners and a leachate collection system and minimizes contact between waste and water. The design also assures long-term stability while minimizing the need for active maintenance after site closure.

PERMITTING MIXED WASTE FACILITIES - DISPOSAL

Liners

- NRC regulations do not specify liner requirements
- NRC regulations do not specify leachate collection and removal requirements
- Emphasis is on eliminating infiltration of liquids into the unit

Slide No. 190

- Caution must be taken to prevent a "bathtub effect" from the use of RCRA liners in mixed waste units whereby the waste could become immersed in water within the disposal unit due to a low permeability bottom surface.
- RCRA systems for leachate collection and removal must be installed above and between double liners.
- NRC emphasizes eliminating the infiltration of liquids into the unit to create a passively protective system where the need for active maintenance is minimized.

PERMITTING MIXED WASTE FACILITIES - DISPOSAL

Consideration:

- EPA and NRC design and operating requirements are based on different objectives
- Incorporating both sets of objectives into one facility may be difficult

PERMITTING MIXED WASTE FACILITIES - DISPOSAL

Options to resolve differences:

- Exceptions to EPA's double liner and leachate collection system requirements allowed if:

  -- Alternate design and operating practices, and

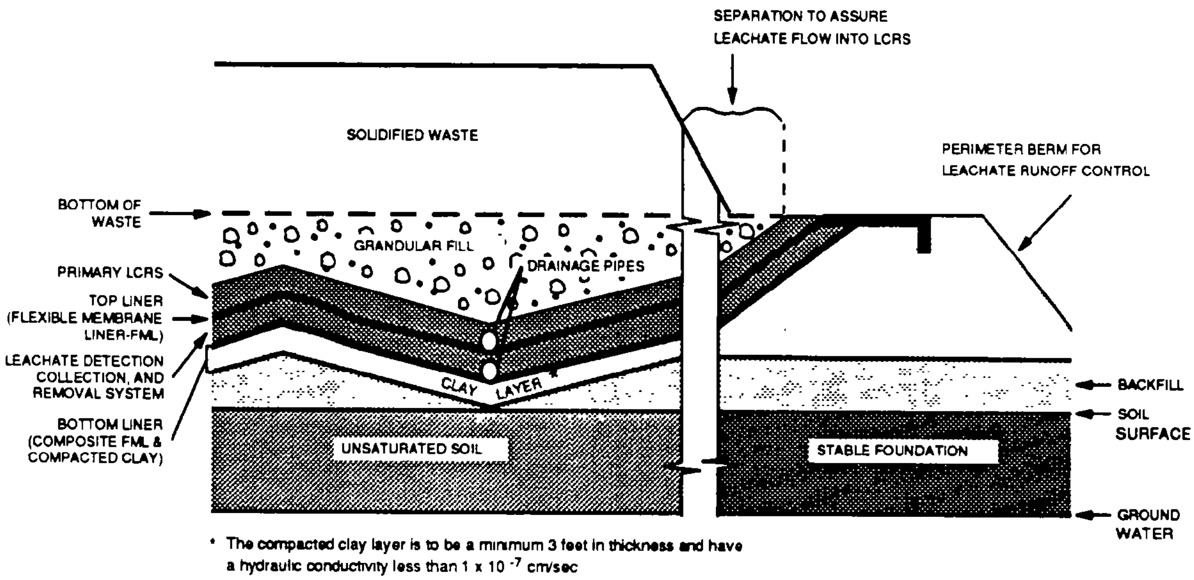
  -- Location characteristics are demonstrated to the Regional Administrator's satisfaction

Slide No. 192

- Alternatives are to be demonstrated to the Regional Administrator to be equally effective in preventing the migration of any hazardous constituents into the ground water or surface water. (Refer to Appendix O; OSWER Directive 9487.00-8: Joint NRC-EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities, August 3, 1987.)

- Also see Appendix P; OSWER Directive 9480.00-14: Combined NRC/EPA Siting Guidelines for Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Waste, June, 1987.

CONCEPTUAL DESIGN OF DOUBLE LINER AND LEACHATE COLLECTION SYSTEM AT A MIXED WASTE DISPOSAL FACILITY



Slide No. 193

- Perimeter berm for leachate runoff control assures that leachate is collected below waste. In addition, the bottom elevation of solidified waste is required to be above top of perimeter berm.
- Using this design for a double liner and leachate collection system will satisfy the NRC requirement to minimize contact of waste with water is fulfilled.

PERMITTING MIXED WASTE FACILITIES - DISPOSAL

Covers

- NRC covers must limit the radiation dose rate at the surface of the cover
- Mixed waste containing Class C waste must be under cover of sufficient thickness to protect against inadvertent intrusion

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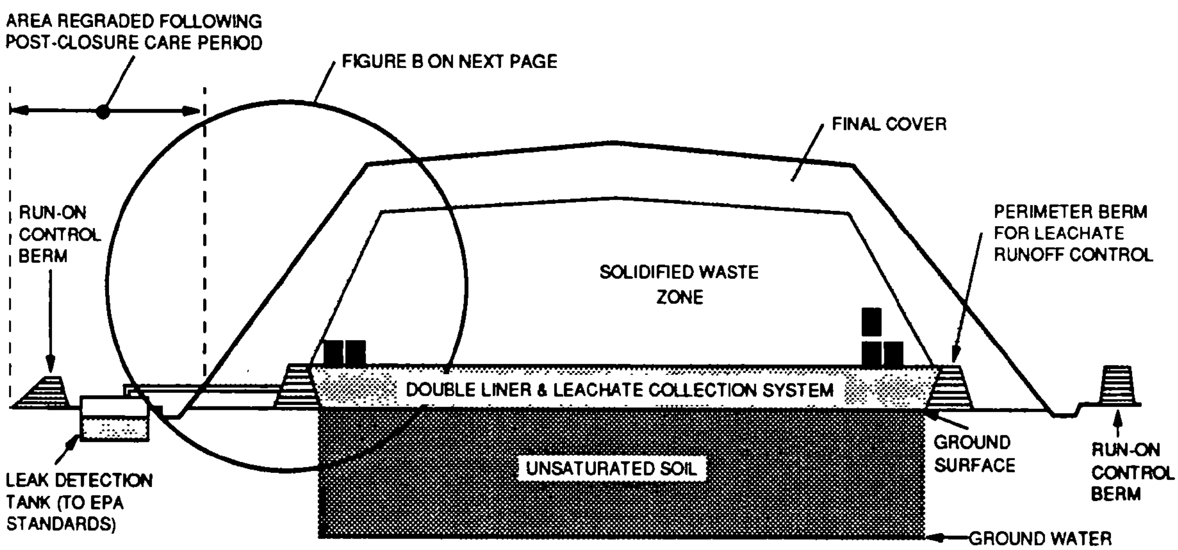
- NRC regulations (10 CFR 61.52) specify that waste must be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will permit the licensee to comply with the provisions of 10 CFR 20.105.
- 10 CFR 20.105 specifies the permissible levels of radiation in unrestricted areas.
- Both NRC and EPA covers are designed to:
  - -- Minimize infiltration,
  - -- Promote drainage,
  - -- Minimize erosion, and
  - -- Require minimum maintenance.

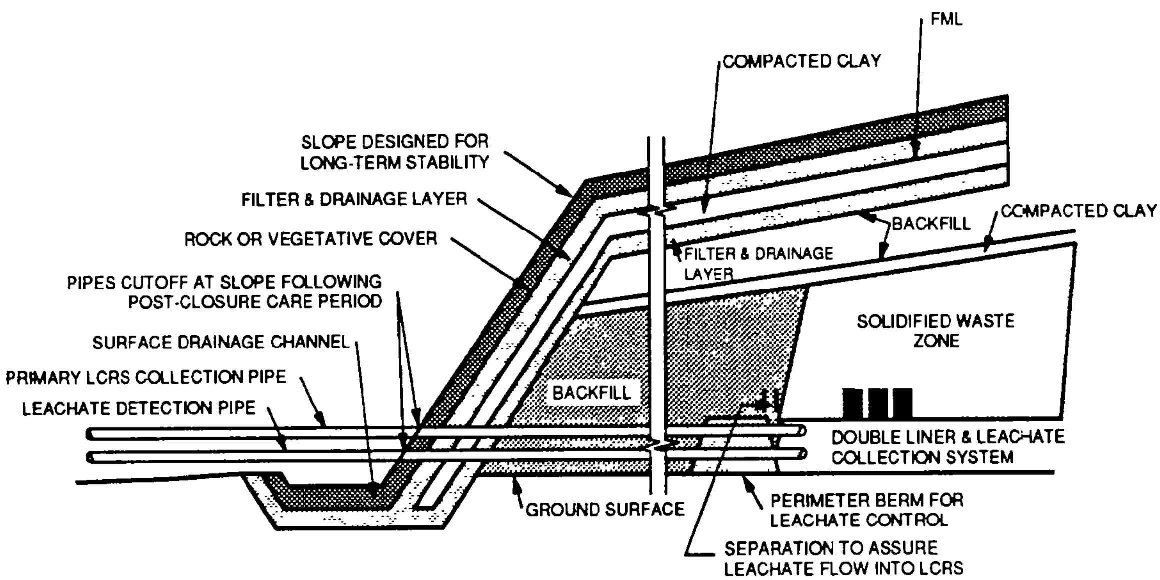
CONCEPTUAL DESIGN OF A COVER SYSTEM AT A MIXED WASTE DISPOSAL FACILITY -- FIGURE A



Slide No. 195

- Additional compacted clay liner should be placed immediately above emplaced waste if solidified waste zone does not consist of engineered vault structure with a top roof.

CONCEPTUAL DESIGN OF A COVER SYSTEM AT A MIXED WASTE DISPOSAL FACILITY -- FIGURE B



Slide No. 196

- Conceptual design of a cover system at a mixed waste disposal facility consists of:
  - -- An outer rock or vegetative layer,
  - -- A filter and drainage layer to transmit infiltrating water,
  - -- An impervious flexible membrane liner (FML) overlying a clay liner, and
  - -- A filter and drainage layer beneath the clay liner.

TECHNICAL PROCESS REQUIREMENTS:

MISCELLANEOUS UNITS

Slide No. 197

PERMITTING MIXED WASTE FACILITIES - MISCELLANEOUS UNITS

- Miscellaneous treatment units (Subpart X) may be used to treat mixed waste, provided the unit is authorized to treat radioactive material
- Subpart X units must prevent migration of waste constituents to:
  - ground water or subsurface environment
  - surface water, wetlands, or soil surface
  - air
- NRC design should minimize contact of water with waste

Slide No. 198

- There are several examples of miscellaneous units that may be applicable to mixed waste considerations.
  - Geological repositories -- includes salt mines, caves, and domes, as long as they are not underground injection wells.
  - Certain chemical, physical, or biological treatment units for which there are no standards, and certain types of thermal treatment units.
- EPA can apply any appropriate regulations to a Subpart X unit.

PERMITTING MIXED WASTE FACILITIES - MISCELLANEOUS UNITS

Consideration:

- In some cases, the unique design approaches used to treat, store, and dispose of mixed waste may be more appropriately identified as miscellaneous units

OTHER REGULATORY REQUIREMENTS

Slide No. 200

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

<u>Omnibus Provision</u>

- The omnibus provision of RCRA allows EPA to incorporate any requirements the Administrator determines to be necessary to protect human health and the environment

Slide No. 201

- Permit writers may incorporate any requirement linked to the management of hazardous constituents (but not broadening the regulated universe) if it is based on protection of human health and the environment (§3005(c)(3)).

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Location Standards

- Hydrologic criteria and long-term stability criteria are generally consistent between EPA and NRC programs
- Both EPA and NRC require that a disposal site be suitable for conducting analysis to determine whether performance standards can be met

Slide No. 202

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Ground-Water Protection Standards

- EPA and NRC both have the objective of minimizing contamination of the ground water
- EPA and NRC both require:
  - Ground-water monitoring
  - Evaluation of the impact and corrective measures
- EPA and NRC requirements differ in some respects
  - Point of compliance

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Corrective Action - Plans

- Commercial NRC disposal facilities must have plans for taking corrective measures as well as plans for decontamination
- Beyond the requirement to submit decommissioning plans in advance, remedial activities, if necessary, are developed and required on a site-specific basis

Slide No. 204

- Commercial NRC disposal facilities are required to submit plans at the time of license application to account for the possibility of needing corrective measures if migration of radionuclides indicates that performance objectives may not be met.
- Licensees of source, by-product, and special nuclear materials must submit plans when applying for site closure for decontamination, only as regards residual radioactive contamination remaining at the time the license expires. Licenses are not terminated until radioactivity levels are suitable for unrestricted use.
- There is a distinction between decommissioning and corrective action as used in the RCRA sense.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Consideration:

- Permit writers need to consider the extent of sampling to determine the rate and extent of releases, given the potential risk associated with radioactive mixed waste

Options to resolve differences:

- Limited sampling
- Model fate and transport

Slide No. 205

- Permit writers may require an NRC licensee (or DOE facility) to sample mixed waste; however, in determining the necessary level of sampling, they should consider the potential risks involved with such sampling and analysis due to radioactivity.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Waste Analysis

- EPA requires owners/operators to obtain a detailed physical and chemical analysis of a representative sample of their waste
- NRC requires the license application for disposal facilities include a description of the radioactive materials proposed to be received and disposed of at a land disposal facility

Slide No. 206

- Waste analysis is required to assure that owner/operators have sufficient information on the properties of the waste to be able to treat, store, or dispose of the waste in a safe and appropriate manner.
- The waste analysis may include data developed by the generator and existing published or documented data on the hazardous waste or on hazardous waste generated from similar processes.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Waste Analysis (Cont'd)

- RCRA waste analysis plans should incorporate information from applicable DOE or NRC requirements concerning sampling and testing
- If the owner/operator has to sample and analyze the waste, all necessary mixed waste testing must be conducted in laboratories licensed to handle radioactive waste
- Only testing of a representative sample of the waste is required to ensure proper waste management

Slide No. 207

- Note, for DOE facilities waste analysis may be conducted at a DOE facility approved for radioactive testing.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Considerations:

- Sample size
- Exposure

Options to resolve differences:

- Rely on knowledge of process to the extent possible
- Limit sampling activities to the minimum necessary
- Invoke alternative test methods as appropriate (40 CFR 260.21)

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Land Disposal Restrictions (LDRs)

- Mixed waste containing scheduled waste will not be restricted until the Third Third rule (i.e., May 8, 1990)
  - -- The EPA Administrator may grant a national capacity extension based on insufficient capacity nationwide
- Mixed waste containing California List waste and Solvent and Dioxin waste is restricted from land disposal unless treated

Slide No. 209

- The LDRs may restrict the storage of some mixed wastes.
- A treatability variance submitted by a generator because treatment of mixed waste containing a restricted waste is impractical must fulfill the requirements of 40 CFR 268.44.
- A petition submitted by a generator to demonstrate that there will be no migration of the hazardous constituents in mixed waste must comply with the requirements of 40 CFR 268.6.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Consideration:

- There are difficulties involved in treating mixed waste in order to comply with the LDRs

Options to resolve differences:

- The generator may submit petition for a treatability variance
- A facility may submit a no migration petition

Slide No. 210

- A facility may submit a no migration petition demonstrating that there will be no migration for as long as the waste remains hazardous. If this petition is approved by the Administrator the facility will be exempt from the LDRs.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Closure and Post-Closure - Planning

- Written closure plans are required for commercial NRC disposal facilities
- Written decommissioning plans are required for other source, by-product, and special nuclear material licensees
- Written closure plans are required for all processes under RCRA

Slide No. 211

- NRC decommissioning is comparable to RCRA closure.
- RCRA requirements and guidance for post-closure care are prescriptive.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Closure and Post-Closure - Planning (Cont'd)

- NRC closure is intended to prepare the facility so ongoing active maintenance is not required during the 100-year period of institutional control
- EPA closure is intended to minimize the need for further maintenance and to control or eliminate releases
- Prior licensing, facilities must make arrangements for State or Federal institutional control for responsibility for post-closure care
- RCRA post-closure plans must be submitted with permit application or submitted independently if closure occurs prior to permitting

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Closure

- Closure requirements for NRC disposal facilities address:
  - -- Maintenance of package integrity during waste emplacement
  - -- Minimization of void spaces between packages
  - -- Depth of waste emplacement
  - -- Covering the waste
  - -- Boundaries of the disposal unit
  - -- Buffer zones

Slide No. 213

- NRC closure concerns for disposal facilities are similar to RCRA's.
- Non-radioactive waste is not necessarily addressed in NRC closure plans.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Decommissioning

- Decommissioning requirements for NRC licensees of source, by-product, or special nuclear materials involve:
  - -- Removing facility safely from service
  - -- Reducing residual radioactivity levels so the area is suitable for unrestricted use

Slide No. 214

- Non-radioactive waste at an NRC facility is not subject to decommissioning requirements.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Closure - Plan Approval

- Detailed plans are approved by NRC just prior to final closure
- RCRA closure plans are approved as part of permit issuance proceedings and continually updated, as changes at the site necessitate

Slide No. 215

- RCRA also requires closure plans to be submitted independently if a facility plans to close before permit issuance.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

<u>Closure - Triggers</u>

- Final decommissioning or final closure of an NRC facility is triggered by:
  - -- License expiration if not renewed
  - -- Cessation of operations
- EPA closure period is triggered by the receipt of the final volume of hazardous waste, or
  - -- Permit is revoked or expires and not reissued
  - -- Cessation of operations

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Post-Closure Care

NRC requirements:

- Five years post-closure observation and maintenance by licensee
- Beyond this five-year period active ongoing maintenance is not required
- Transfer license to site owner (i.e., Federal or State government)
- In the license review a maximum of 100 years of institutional control may be considered

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Post-Closure Care/Long-Term Care Activities

- Institutional control requirements are not inconsistent with RCRA's post-closure care requirements
- Length of both the 100-year and the 30-year periods may be reduced
- The 30-year post-closure care period under RCRA may also be extended

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Financial Responsibility

- Commercial NRC disposal facilities must provide financial assurances for:
  - -- Closure and stabilization
  - -- Institutional control
- Source, by-product, and special nuclear licensees must provide financial assurances for:
  - -- Decommissioning

Slide No. 219

- Financial responsibility requirements do not apply to Federal facilities (DOE managed facilities).

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Financial Responsibility - Closure

- NRC (for commercial disposal facilities) and EPA both specify allowed mechanisms
    - -- NRC specifies many of the same mechanisms allowed under RCRA
    - -- NRC coverage amounts, like RCRA's, are based on required cost estimates

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- NRC specifies many of the same mechanisms as allowed under RCRA, including:
    - -- Surety bonds,
    - -- Irrevocable letters or lines of credit,
    - -- Trust funds, and
    - -- Combinations of the above.
- Similar to estimates of coverage amounts under RCRA, coverage amounts for NRC licenses are based on required cost estimates.
    - -- NRC cost estimates must reflect the activities in NRC-approved plan for disposal site closure and stabilization.
    - -- NRC cost estimates must take into account total capital costs that would be incurred if an independent contractor were hired to perform the closure and stabilization work.
- Coverage under NRC is for the five-year post-closure observation and maintenance period as well as for the site closure and stabilization.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Financial Responsibility - Long-Term Care

- Commercial NRC disposal license applicants must demonstrate a "binding agreement" with the site owner (i.e., Federal or State government):
  - -- Agreement must show that sufficient funds are available to cover cost of institutional controls
  - -- Mechanisms will be specified

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- Prior to the issuance of the license, commercial NRC disposal license applicants must demonstrate a "binding agreement," such as a lease, with the owner (i.e., the Federal or a State government) that ensures sufficient funds are available to cover the cost of monitoring and any required maintenance during the institutional control period.

- The binding agreement must be approved by NRC prior to license issuance and reviewed by NRC periodically to ensure that changes in inflation, technology, and disposal facility operations are reflected in the agreement.

- Amount of funds is not specified in the regulation but generally would be based on required cost estimates.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Financial Responsibility - Liability

- There are no NRC liability coverage requirements, although requirements are being considered
- The three licensed commercial disposal facilities have liability coverage
- Owner/operators of mixed waste facilities must obtain coverage for third-party liability

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- The liability coverage for the three operating commercial disposal facilities is applicable only to liability from radioactive hazards, and excludes claims resulting from hazardous waste.

- In Agreement States, low-level radioactive disposal facilities may be subject to State liability assurance regulations. However, coverage pursuant to such regulations may be limited to third-party claims resulting from exposure to radionuclides and would thus exclude claims resulting from hazardous waste.

PERMITTING MIXED WASTE FACILITIES - OTHER REGULATORY REQUIREMENTS

Consideration:

- NRC and EPA financial coverage requirements are similar, and in some cases NRC licensees may already have overlapping coverage

PERMITTING MIXED WASTE FACILITIES - CONCLUSION

Summary

- Similarities between NRC and EPA requirements are extensive
- Permitting objectives can be met with a flexible approach to detailed requirements

PERMITTING MIXED WASTE FACILITIES - SKJ FACILITY CASE STUDY
Provide explanation and resolution for four issues

GOALS

The goals of this case study are to:

- Highlight a few issues that may require special consideration when permitting mixed waste facilities.
- Point out specific instances where standard RCRA permitting procedures may need to be modified.
- Emphasize that there are no universal answers to many mixed waste permitting questions.

CONTENTS

- Portions of a Part B Permit Application (2 background pages)
  - -- Facility Description and Waste Acceptance Criteria
  - -- Facility Floor Plan
- Questions (4 issue/answer pages)
  - -- Waste Analysis Plan (3 Issues)
    - Waste Characterization
    - Sampling Procedures
    - Analytical Test Methods
  - -- Facility Self-Inspection and Monitoring Procedures (1 Issue)

INSTRUCTIONS

- Break up into small discussion groups.
- Review the background, assumptions, and reminders about the SKJ facility case study on pages 2 and 3.
- Review the map and facility schematic on page 3.
- Review the excerpts from the Part B Permit for the SKJ facility in the left column of pages 4-7.
- Evaluate whether or not the permit excerpts are appropriate for a mixed waste facility by focusing on the **Key Areas** identified in the text boxes. Discuss the issue in small groups and briefly write down in the right column of pages 4-7 <u>why</u> you think this issue is particularly important for mixed waste facilities and <u>how</u> the issue might be resolved.
- Keep in mind that there may be several "correct" answers.

BACKGROUND, ASSUMPTIONS, AND REMINDERS

- Everything needed is included in this packet. Do not consider the impact of other issues not addressed in the packet unless they are directly relevant to the specified issue.

- Assume the Part B permit application is complete.

- Remember, EPA's position is that the RCRA requirements are technically consistent with the AEA requirements. All RCRA regulations that apply to hazardous waste facilities apply to mixed waste facilities; facilities must meet AEA requirements as well as RCRA requirements.

- The design and operation of this facility is in compliance with both NRC and RCRA regulations.

- Permit writers should watch for provisions in the permit application that reflect standard RCRA procedures that do not take into account the unique aspects of mixed waste. Permit applications for mixed waste facilities should seek appropriate alternatives to "business as usual" operations.

Facility Description and Waste Acceptance Criteria

- SKJ Power Co. is a nuclear power plant with a design electric rating of 800 megawatt electric capacity (MWe). It is located in a non-residential area of a medium size southern city (Skalesville; population 150,000). SKJ Power Co. has been operating since 1973 and is one of the primary power suppliers for the city.

- The state is authorized for both corrective action and mixed waste. SKJ Power Co. holds an NRC license.

- SKJ Power Co. is submitting a permit application for the operation of a new, hazardous and low-level radioactive mixed waste storage facility. This is an on-site private storage site (i.e., no non-SKJ waste is received at the facility).

- The storage facility will be within the property confines and will include the reactor buildings, the turbine hall, the buildings housing the Waste Generation Office and the Waste Management Office, and a storage pad. The topography around the plant is relatively flat with grass and shrubs.

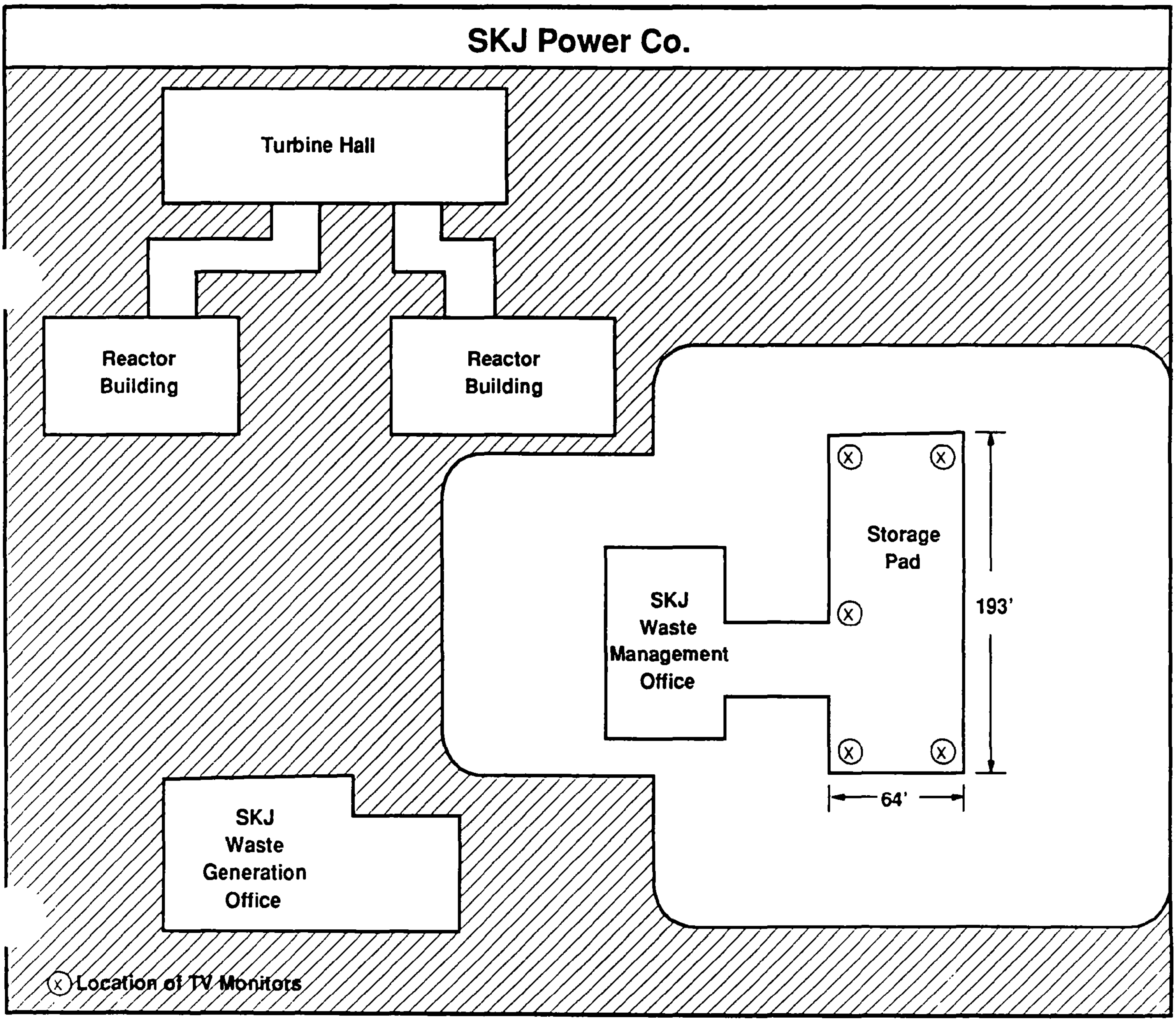
- The storage pad is an uncovered concrete pad measuring 64' x 193'. The storage facility may accept up to 125,000 gallons of waste, and the number of 55-gallon drums may not exceed 3,000. The storage area is sloped to drain and remove liquid resulting from precipitation. A 1,000 foot boundary around the storage site has been located on the attached drawings.

- The Waste Generation Office of SKJ Power Co., packages the waste, and ships it to SKJ's Waste Management Office, which operates the storage site.

- Wastes will be stored either in solid metallic forms (e.g., plates or blocks), granular or powdered solids, or as immobilized wastes in a cement matrix. The waste is packaged in metal disposal containers.

- Lead, cadmium, chromium, and organic liquids immobilized in a cement matrix are the principal hazardous constituents in the waste that will be sent to the SKJ storage facility.

- No liquid waste or waste containing free liquids will be stored at this site.
- None of the wastes accepted at this storage facility are incompatible. Adherence to the Waste Analysis Plan will ensure that no reactive, ignitable, or incompatible wastes will be stored at the facility. For this reason, no special precautions such as waste segregation and protection from sources of ignition or reaction will be required at the facility.
- The radiation level of the waste must be less than 300 mrem/hr at 3 inches to be received at the facility.
- All waste analysis will be conducted using an off-site NRC licensed laboratory in nearby Skalesville.



CASE STUDY WORKSHEET #1

EXCERPT FROM PART B PERMIT	ARE THE PART B PROVISIONS APPROPRIATE FOR MIXED WASTE? WHY/WHY NOT? WHAT PROVISIONS SHOULD BE DIFFERENT?
<u>Waste Analysis Plan</u> - Waste Characterization "The SKJ Waste Generation Office is required to complete a Hazardous Waste/Mixed Waste Storage Record Sheet for all hazardous and non-hazardous wastes. The Waste Generation Office must provide a detailed analysis of the waste based on composition of the products constituting the waste and its physical properties. The Waste Generation Office is not only required to identify hazardous wastes, it must also provide all information necessary for safe and appropriate storage of the waste and for assuring that all wastes meet or exceed applicable restrictions (e.g. land disposal restrictions). The Record Sheet will be completed by using the following steps: 1. Reviewing all available information on the raw materials used and actual or similar process(es) generating the waste material; and/or 2. Analyzing a representative sample of waste for specified physical and chemical parameters to identify the waste as either listed or characteristic hazardous waste. If the waste is determined to be ignitable, reactive, or corrosive, it is not a candidate for disposal at the SKJ storage facility."	KEY AREAS: 1. Scope of waste requiring analysis 2. SKJ Waste Generation Office responsibility

CASE STUDY WORKSHEET #2

EXCERPT FROM PART B PERMIT	ARE THE PART B PROVISIONS APPROPRIATE FOR MIXED WASTE? WHY/WHY NOT? WHAT PROVISIONS SHOULD BE DIFFERENT?
<u>Waste Analysis Plan</u> - Sampling Procedures "If the Waste Generation Office has insufficient knowledge to adequately characterize the waste, a representative sample is required from each waste source. Samples are to be obtained from all the containers containing a particular type of waste unless otherwise specified by the Waste Generation Office Operator. These samples will be bulked into a composite sample and an analysis will be made on a sample of the bulked composite." <u>Routinely Generated Waste</u> "Several of the wastes to be stored at the facility will be generated on an ongoing basis. After initial characterization, the physical and chemical characteristics of these wastes will be known within narrow limits. These wastes will be reanalyzed on an annual basis at a minimum to confirm the characteristics of these wastes. If a process change occurs, the waste will be reanalyzed before any additional waste is accepted for storage."	KEY AREAS: 1. Sampling frequency 2. Bulking samples 3. Method for review of routinely generated

CASE STUDY WORKSHEET #3

EXCERPT FROM PART B PERMIT	ARE THE PART B PROVISIONS APPROPRIATE FOR MIXED WASTE? WHY/WHY NOT? WHAT PROVISIONS SHOULD BE DIFFERENT?
Waste Analysis Plan - Analytical Test Methods "If waste analysis is required, representative samples will be analyzed by an NRC-licensed laboratory to determine the physical and chemical characteristics of the waste or its hazardous components using the analytical procedures specified in SW-846, 'Test Methods for Evaluation of Solid Waste,' or equivalent methods."	KEY AREAS: 1. Standard test procedures 3. Use of an NRC licensed laboratory

CASE STUDY WORKSHEET #4

EXCERPT FROM PART B PERMIT	ARE THE PART B PROVISIONS APPROPRIATE FOR MIXED WASTE? WHY/WHY NOT? WHAT PROVISIONS SHOULD BE DIFFERENT?
<u>Facility Self Inspections and Monitoring</u> "The weekly inspection of the containers in storage will be conducted using closed circuit TV monitors located as indicated in the **attached drawing**. These inspections should be documented in an inspection log, and should include the following information: • Condition of containers and pallets -- corrosion, other deterioration, physical damage, leakage, proper bungs. • Housekeeping -- area straight and orderly. • Proper containers used."	KEY AREAS: 1. Obtaining an EPA decision on the use of TV 2. Monitoring for proper labeling and storage

SUPPLEMENTAL
INFORMATION

MIXED WASTE TRAINING COURSE

Supplemental Information

Presented by:

Office of Solid Waste
U.S. Environmental Protection Agency

RCRA Mixed Waste Training Course
Supplemental Information

- Mixed Waste Training Course Summary Outline
- List of Relevant Acronyms

Appendices

A Joint EPA/NRC Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Directive Number 9432.00)

B State Authorization to Regulate the Hazardous Components of Radioactive Mixed Waste Under the Resource Conservation and Recovery Act, July 3, 1986. (51 FR 24504)

C Radioactive Waste; Byproduct, May 1, 1987. (52 FR 15937)

D Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste, September 23, 1988. (53 FR 37045)

E Fact Sheet and EPA Memorandum - Permitting Deadlines for Mixed Waste Storage and Treatment Units

F Fact Sheet and EPA Memorandum - Mixed Waste Regulation in Authorized States

G Fact Sheet - ORP Standards

H NRC Regional Offices - Addresses and Telephone Numbers

I DOE Operations Offices - Addresses and Telephone Numbers

J List of Mixed Waste Contacts

K DOE Orders: Hazardous and Radioactive Mixed Waste Program, February 22, 1989 (DOE 5400.3); Environment, Safety, and Health Program for Department of Energy Operations, September 23, 1986 (DOE 5480.1B); Radioactive Waste Management, September 26, 1989 (DOE 5820.24); General Environmental Protection Program, November 9, 1988 (5400.1)

L RCRA Section 1006; Application of Act and integration with other Acts

M "Nuclear Exchange Brewing at NRC; Becquerel, Gray and Sievert May Obliterate Curie, Rad and Rem," Washington Post; Tomas W. Lippman

N NRC Technical Training Center Syllabus of Courses, 1989-1990

O Joint NRC/EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities (Directive Number 9487.00-8)

P Combined NRC/EPA Siting Guidelines for Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Directive Number 9480.00-14)

Q Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste and Answers to Anticipated Questions (EPA, OSWER to all NRC licensees, October 4, 1989)

R States with Mixed Waste Authorization

S U.S. Environmental Protection Agency Regional Radiation Program Managers

MIXED WASTE TRAINING COURSE

Summary Outline

Presented by:

Office of Solid Waste
U.S. Environmental Protection Agency

OBJECTIVES OF THE MIXED WASTE TRAINING COURSE

Familiarize EPA permit writers and inspectors with mixed waste issues.

Demonstrate that dual regulation is workable.

Emphasize that dealing with mixed waste sometimes calls for a departure from "business as usual."

I. OVERVIEW OF MIXED WASTE REGULATION

The objectives of the overview section are to:

-- Define mixed waste and explain the regulatory history that lead to the current status of mixed waste;

-- Explain EPA's role in regulating the hazardous portion of mixed waste; NRC's role in regulating the radioactive portion of mixed waste generated at commercial facilities; and DOE's role in regulating the radioactive portion of mixed waste generated at DOE facilities; and

-- Discuss the complexity involved in integrating the various regulatory programs.

A. DEFINITION OF MIXED WASTE

RCRA mixed waste contains a hazardous component as defined by and regulated under RCRA, and a radioactive component as defined by and regulated under the Atomic Energy Act (AEA).

Unless and until radioactivity becomes a hazardous waste characteristic, or unless specific radioactive wastes are listed, RCRA cannot regulate the <u>radioactive component</u> of mixed waste.

Wastes containing a non-RCRA hazardous chemical component are not addressed in this training, nor are RCRA hazardous wastes containing a non-AEA radioactive component (e.g., Naturally Occurring or Accelerator Produced Radioactive Material (NARM)).

A.1. <u>The Radioactive Component of Mixed Waste</u>

- The radioactive component of mixed waste is defined by the AEA (42 U.S.C. Section 2014). Source, special nuclear, and by-product materials are radioactive materials regulated by the AEA.

    -- Transuranic, high-level, and low-level wastes are subclasses of waste containing AEA material. These subclasses do not alter RCRA's authority over the hazardous component of mixed waste.

- RCRA excludes from regulation source, special nuclear, and by-product material; these constituents are regulated under the AEA. However, when source, special nuclear, or by-product wastes also contain hazardous wastes, the "mixed waste" becomes subject to RCRA as well as the AEA.

  - NARM is radioactive material, but it is not regulated under the AEA or excluded from RCRA. NARM waste could be regulated under RCRA because it was not excluded from RCRA regulation as were other radioactive materials. However, currently NARM is not regulated under RCRA.

  - EPA is the only Federal agency with the authority to regulate NARM waste.

  - States may regulate NARM waste under State-implemented regulations.

- Source material is defined as uranium, thorium, or any other material that is determined pursuant to provisions of the AEA to be source material, or ores containing one or more of the above materials, in such concentration as may be determined.

- Special nuclear material is defined as (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material that is determined pursuant to the AEA to be special nuclear material, but which does not include source material; or (2) any material that is artificially enriched by any of the above, but which does not include source material, for example, fresh uranium fuel in a reactor.

- By-product material is defined as (1) any radioactive material (except special nuclear material) yielded in, or made radioactive by exposure to, the radiation incident to the process of producing or utilizing special nuclear material; and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. By-product material includes industrial and medical radionuclides, and uranium and thorium mill tailings.

A.2. Subclasses of Radioactive Waste Containing AEA Radioactive Waste

- Transuranic waste is waste that is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay; without regard to source or form.

- High-level radioactive waste is the highly radioactive material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid that contains fission products in sufficient concentrations.

- Spent nuclear fuel is fuel that has been withdrawn from a nuclear reactor following irradiation, the constituent elements of which have not been separated by reprocessing.

- Low-level radioactive waste is radioactive material that is not transuranic waste, high-level radioactive waste, spent nuclear fuel, or 11(e)2 by-product material (uranium or thorium mill tailings).

A.3. Handling Mixed Waste as One Waste

- Because of safety and technical reasons, it is usually not feasible to physically separate mixed waste into two components.

- The different risks posed by each component must be addressed in a single waste management solution.

- The design of facilities, drafting of operating requirements for permits or licenses, and the development of cleanup solutions must be done in a manner that adequately addresses the different risks posed by each component.

B. HISTORY OF MIXED WASTE REGULATION

Congress intentionally created a framework of dual regulation. Consequently, EPA and NRC/DOE (or approved States) jointly regulate the same waste. Much of the waste that is now regulated as mixed waste was previously regulated as radioactive waste under the AEA and is entering the RCRA regulatory program for the first time.

B.1. Atomic Energy Act

AEA provides authority to govern the possession and use of special nuclear material, source material, and by-product material. The Nuclear Regulatory Commission (NRC) is primarily responsible for exercising this authority over commercial facilities, and the Department of Energy (DOE) is primarily responsible for exercising this authority over Government-owned and -operated facilities.

- NRC has authority over several Federal facilities, such as the National Institutes of Health and the Bureau of Standards.

B.2. Federal Register Clarifications Establishing Dual Regulation

- EPA Clarification of RCRA Applicability to Mixed Waste, July 3, 1986 (51 FR 24504). The Notice provided EPA's legal interpretation of the source, special nuclear and by-product exclusion and required States to obtain authorization for mixed waste.

- DOE Clarification of the Definition of By-Product Material, May 1, 1987 (52 FR 15937). For the purposes of determining the applicability of RCRA, "by-product material refers to the actual radionuclides dispersed or suspended in any radioactive waste substance (except special nuclear material) yielded in, or made radioactive by exposure to, the radiation incident to the process of producing or utilizing special nuclear material." This clarification applies only to 11(e)1 by-product material. According to this clarification, only the actual radionuclides, not the entire waste stream, are considered by-product material; and thus, RCRA has authority to regulate any hazardous portion of the waste stream.

B.3. Clarification for Implementation in Authorized States

- Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste, September 23, 1988 (53 FR 30745). All hazardous waste treatment, storage and disposal facilities (TSDFs) must obtain a RCRA permit; however, TSDFs may operate under interim status until a permit is issued. EPA extended the interim status qualification deadline for facilities handling mixed waste in order to ensure that newly regulated mixed waste facilities can legally operate under RCRA.

-- In unauthorized States, the deadline for facilities handling mixed waste was extended to March 23, 1989, which is six months after EPA issued the extension notice.

-- In authorized States, the deadline will be established by the State, but generally will be six months after the effective date of the State's authorization for mixed waste.

C. ROLE OF EPA AND EPA AUTHORIZED STATES

C.1. Office of Solid Waste (OSW)

- OSW is authorized by RCRA to regulate the handling of listed and characteristic hazardous waste.

- RCRA authorized the establishment of OSW for the implementation of the hazardous waste program. The Office of Waste Programs Enforcement (OWPE) enforces RCRA.

- The RCRA program was designed to allow the States to take over implementation of all aspects of the program. States become authorized to implement the RCRA program by developing a program that is at least as stringent as EPA's RCRA program. Until a State becomes authorized, the RCRA program is administered by EPA. The States must incorporate more stringent amendments or changes to the RCRA program into their own programs. Once a State has been authorized, it becomes the primary implementor of those aspects of the program for which it is authorized.

- Source, special nuclear, and by-product material are exempt from RCRA.

C.2. EPA Authorized States

- RCRA authorized States must revise their programs to include mixed waste.

- State agencies other than the hazardous waste agency may be involved in mixed waste regulation.

- States may use a Memorandum of Understanding (MOU) to define the roles of State agencies regulating hazardous and radioactive wastes.

- In States authorized only for base-RCRA, mixed waste is not regulated under RCRA, but may be regulated by the State through independent authority.

  -- Thirty-six States and Territories have base-RCRA authorization, but have not yet received mixed waste authorization.

- In States authorized for mixed waste, mixed waste is regulated under RCRA, administered by the States.

  -- To date, ten States (Colorado, Georgia, Guam, Kentucky, Minnesota, Ohio, South Carolina, Tennessee, Utah, and Washington) have been authorized to regulate mixed waste.

- In unauthorized States, mixed waste is regulated under RCRA, administered by EPA.
  - Eleven States and Territories have not received base-RCRA authorization.

D. EPA's OFFICE OF RADIATION PROGRAMS AND ORP STANDARDS

D.1. Office of Radiation Programs (ORP)

- ORP is authorized by the AEA to establish Federal radiation guidance and standards, advise Federal agencies on radiation standards, assess the new technologies in the area of radiation, and monitor radiation in the environment.
- The standards developed by ORP will be implemented by NRC and DOE through incorporation into their regulations and orders.
- ORP also intends to regulate certain kinds of NARM waste in connection with a low-level waste standard it is planning to propose. ORP's authority comes from Section 6 of TSCA which authorizes EPA to prohibit or regulate the disposal of chemical substances or mixtures.

D.2. ORP Standards

- ORP is publishing generally applicable standards for exposure to radionuclides that will apply at NRC-licensed facilities and DOE-owned facilities.
- ORP has already published generally applicable high-level waste, transuranic waste, and spent nuclear fuel standards (40 CFR 191).
  - Operations Standard
  - Disposal Standard
- ORP is revising high-level waste disposal standards following their remand by a Federal Court (40 CFR 191). The high-level waste disposal standards are expected to be proposed in early 1990.
- ORP is planning to propose generally applicable low-level waste standards (40 CFR PArt 193).
  - Low-Level Waste Pre-Disposal Exposure Limit
  - Post-Disposal Exposure Limit
  - Ground-Water Protection Criteria
  - Below Regulatory Concern (BRC) Criteria
  - Implementation Guidelines
- ORP is also planning to propose a generally applicable NARM waste disposal standard in the near future (40 CFR Part 764).
- These standards developed by EPA will provide a minimum level of protection from radiological hazards for human health and the environment.
- ORP standards as implemented by NRC and DOE, will be used to regulate radioactive waste and the radioactive portion of mixed waste.

- Mixed waste that qualifies as below regulatory concern for the radiological hazard is still a mixed waste but may be managed as RCRA hazardous waste.

E. ROLE OF THE NUCLEAR REGULATORY COMMISSION (NRC) AND NRC AGREEMENT STATES

E.1. Nuclear Regulatory Commission (NRC)

- NRC is authorized by the AEA to regulates the possession and use of source, special nuclear, and by-product material. NRC primarily regulates commercial radioactive materials.

- NRC may make an agreement to relinquish to the State the authority to regulate source and by-product materials, and the authority to regulate users of small quantities of special nuclear material. Once NRC has relinquished its authority to an Agreement State, NRC no longer exercises its jurisdiction in those areas covered by the agreement. NRC may reassert its authority if necessary to protect public health and safety.

- In forming agreements with States, NRC will always retain jurisdiction over some Federal agencies (but generally not DOE), production and utilization facilities (e.g., reactors), exports and imports, consumer products, special nuclear material in quantities exceeding a critical mass, offshore waters, and certain aspects of mill tailings.

E.2. Role of NRC Agreement States

- The scope of Agreements between NRC and States may vary.

- The Nuclear Waste Policy Act of 1982, (Public Law 97-425) the Federal Government, primarily NRC and DOE, took responsibility for regulating the disposal of all highly radioactive waste, and the Low-Level Radioactive Waste Act of 1980 (Public Law 96-573) directed each State to provide disposal capacity for all commercial low-level waste generated within its borders, either individually or through regional compacts. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) provides further impetus to this process.

- Unlike the hazardous portion of mixed waste regulated under RCRA, the radioactive portion of mixed waste is regulated under the AEA regardless of whether a State has an Agreement with NRC.

E.3. Authority Over Mixed Waste

- NRC Agreement States (Agreement includes low-level waste disposal) are:

  - regulated under the AEA, and
  - administered by State.

- NRC Agreement States (Agreement does not include low-level waste disposal) are:

  - regulated under the AEA, and
  - administered by NRC.

- Non-Agreement States are:

  - regulated under the AEA, and
  - administered by NRC.

- NRC has formed agreements with 29 States. Of these agreement States all but two, Utah and Iowa, have authority to regulate low-level waste disposal facilities.

- Several States are developing new facilities for the disposal of low-level waste; some of these facilities will include disposal units for mixed low-level waste.

F. NRC REGULATIONS

- NRC Licenses are issued for the possession, use, receiving title, transfer, construction and operation of production and utilization facilities, and disposal facilities.

- The possession and use of radioactive materials are confined to the location and purposes that are authorized in the license.

F.1. NRC Approved Disposal Methods

- The following methods of disposal are allowed under NRC regulations:

  - Licensed disposal pursuant to requirements for land disposal (10 CFR Part 61)

  - Licensed disposal pursuant to requirements for disposal by a method specifically approved by NRC (10 CFR 20.302). This method allows for on-site disposal of waste that is potentially higher than BRC but would not have a major health and safety impact from disposal. The dose objectives for this type of disposal would be well under those for Part 61.

  - Disposal by release into sanitary sewerage system (10 CFR 20.303)

  - Disposal by incineration (10 CFR 20.305)

  - Disposal of specific wastes (10 CFR 20.306); scintillation fluids and animal carcasses containing less or equal to 0.05 microcuries per gram H-3 or C-14.

F.2. Performance Objectives for Land Disposal

- Protection of the general population from releases. Concentrations of radioactive material released to the general environment shall not exceed an annual dose equivalent of 25 mrem to the whole body, 75 mrem to the thyroid and 25 mrem to any other organ of any member of the public. In addition, handlers should maintain releases ALARA.

- Protection of individuals from inadvertent intrusion. Design, operation, and closure of the site must ensure protection of any individual inadvertently intruding into the disposal facility after active institutional controls over the facility have been removed.

- Protection of individuals during operations. Except for off-site releases, operations at the disposal facility shall be conducted in compliance with the standards for radiation protection set out in 10 CFR 20. Disposal facilities should also maintain exposures ALARA.

- Stability after site closure. The disposal facility shall be sited, designed, utilized, operated, and closed to achieve long-term stability of the site and to eliminate, to the extent practicable, the need for ongoing active maintenance of the site following closure.

- ALARA. Maintain radiation exposures and releases of radioactive material "as low as reasonably achievable" (ALARA). ALARA is not a statutory requirement; it is a policy statement that has been incorporated into the NRC regulations. ALARA is applicable to all NRC licensees.

F.3. Classification of Waste

- NRC classifies waste for near surface disposal based on the concentration of long-lived and short-lived radionuclides.

- Low-level radioactive waste is classified as either A, B, or C in increasing order of radiological hazard. [10 CFR Part 61]

F.4. Waste Disposal Requirements

- The primary emphasis of NRC waste disposal requirements is on isolation of waste and long-term objectives. NRC regulations contain specific requirements regarding:

  -- Site suitability - minimum characteristics and suggested features;
  -- Design - minimize erosion and contact of water with waste;
  -- Operations - emphasize stability;
  -- Waste form - minimum stability requirements; and
  -- Institutional control - prior to licensing a low-level waste disposal site, an applicant must demonstrate that a State or Federal entity has committed to take responsibility for a 100-year period.

- Examples of measures to increase stability include minimizing voids in packages, careful emplacement, efficient backfill, and segregating unstable waste packages.

F.5. Transportation

- Licensees transferring material are required to verify that the licensee receiving the material is authorized for the type, form, and quantity transferred.

- A manifest must be prepared for each shipment of waste.

- The waste receiver must acknowledge receipt of waste within one week.

F.6. Disposal Without Regard to Radioactivity

- Licensed material in animal carcasses or scintillation fluids may be incinerated or disposed of without regard to radioactivity if it contains 0.05 microcuries or less of H-3 or C-14 per gram of medium used for liquid scintillation counting.

- Mixed waste that may be disposed of without regard to radioactivity must still comply with all hazardous waste regulations.

F.7. Enforcement

- NRC conducts both announced and unannounced inspections.
- All licensees must allow inspection of materials, premises, facility, and records. NRC conducts routine inspections at all facilities.
- An injunction or court order may be obtained to prohibit any violation.
- Violations are punishable by fine, imprisonment, or both.
- NRC has the authority to obtain an injunction or court order to prohibit any violation of the AEA or Title II of the Energy Reorganization Act of 1974. In addition, in some cases a court order may be obtained to enforce payment of a civil penalty.

G. ROLE OF THE DEPARTMENT OF ENERGY AND DOE ORDERS

G.1. Role of DOE

- DOE is authorized by the AEA and other Federal statutes to regulate radioactive material operations at many government-owned facilities and at several inactive sites that contain radioactive contamination. Non-DOE Federal facilities are regulated by other agencies, such as NRC or EPA.
- DOE is exempt from NRC regulations except as specified in Section 202 of the Energy Reorganization Act of 1974 (i.e., DOE facilities that accept commercial high-level waste are licensed by NRC).
- DOE is subject to EPA regulations.
- DOE develops "orders" to carry out the authority granted by the AEA. DOE Orders are legally enforceable against contractors that operate DOE installations.
- DOE maintains eight Operations Offices that are responsible for compliance at specific DOE sites.
- DOE operates 17 major defense facilities.
- While DOE does not manage a large number of facilities they are a major player in mixed waste regulation because of the large volume and the high-level of radioactivity of the mixed waste that is generated. Regulating these facilities will be a significant portion of EPA's effort to regulate mixed waste.

G.2. DOE Orders

- DOE operates under orders which regulate it internally. These orders include internal policy for compliance with environmental requirements at DOE facilities.

- Orders (in this section) provide requirements for the management of transuranic, high-level, and low-level radioactive waste in accordance with AEA.

- Orders also require the hazardous portion of mixed waste to be managed according to RCRA. Compliance simply with orders is not sufficient. Mixed waste will be managed under these orders in a manner consistent with RCRA.

- DOE orders apply to all DOE contractors and subcontractors.

- The Nuclear Waste Policy Act of 1982, (Public Law 97-425) the Federal Government, primarily NRC and DOE, took responsibility for regulating the disposal of all highly radioactive waste, and the Low-LEvel Radioactive Waste ACt of 1980 (Public Law 96-573) directed each State to provide disposal capacity for all commercial low-level waste generated within its borders either individually or through regional compacts. The Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) provides further impetus to this process.

G.3. General Requirements of Orders

- Minimize the generating of hazardous and radioactive wastes across program office functions.

- A Waste Management Plan is required for all DOE sites that treat, store, or dispose of mixed waste, for the purpose of compiling an annual report on waste management operations. This plan includes information on the management of both radioactive and hazardous constituents.

- DOE must comply with the National Environmental Policy Act of 1969 for all significant Federal actions.

- Maintain radiation exposures and releases of radioactive material "as low as reasonably achievable" (ALARA).

- DOE's performance objective for the land disposal of low-level waste is to limit exposure from all pathways to any member of the public to 25 mrem/yr.

G.4. Transportation

- Generators and facilities receiving the waste are jointly responsible for assuring compliance with waste acceptance criteria.

- Shipment of waste will be conducted according to the requirements established by the Operations Office managing the receiving facility.

- DOE facilities are subject to DOT regulations and RCRA manifest and transportation requirements.

- DOE is responsible for transportation of all waste to and from DOE facilities.

G.5. Management of Transuranic Waste

- Transuranic waste is planned to be disposed of in DOE's Waste Isolation Pilot Plant (WIPP). The WIPP facility, located southeast of Carlsbad, New Mexico, will be used to demonstrate the safe and permanent disposal of DOE transuranic waste.

- This facility is being regulated by both DOE and EPA. Examples of WIPP's dual regulations:

  -- DOE may determine, with the concurrence of the EPA Administrator, that transuranic waste not appropriate for disposal at the WIPP shall be disposed of by alternative methods approved by DOE and EPA.

  -- Mixed transuranic waste generated at DOE facilities shall be treated, where possible and practical, to destroy the hazardous waste components.

- Transuranic mixed waste will account for approximately 60 percent of the waste to be placed at the WIPP facility.

- DOE is currently applying for a RCRA land disposal restrictions (LDRs) no-migration petition.

- The determination of whether the transuranic waste exhibits any hazardous characteristics or contains listed hazardous compounds may be based on knowledge of the waste generating process.

G.6. Management of High-Level Waste

- According to DOE Order 5820.2A, all high-level waste shall be considered to be radioactive mixed waste unless demonstrated to the contrary.

- DOE orders contain requirements pertaining to both the hazardous and radioactive components of mixed high-level waste, including: design and operating requirements; waste characterization; storage and transfer; monitoring, surveillance, and leak detection; contingency actions; and waste treatment and minimization.

- DOE is required to accept all high-level waste and commercial spent fuel, and is estimating the feasibility of constructing a deep geological repository in Nevada.

- Waste characterization may reflect knowledge of the waste generating processes, laboratory testing results, and/or the results of periodic sampling and analysis.

G.7. Management of Low-Level Waste

- Low-level mixed waste is regulated jointly under RCRA and AEA.

- Solid low-level waste shall be disposed of on-site if possible or at another DOE disposal site.

- Disposal of liquid wastes or wastes containing free liquid is prohibited and must be converted into a solid form. Any freestanding and noncorrosive liquid or that remains may not exceed 1 percent of the volume of the waste when the waste is in a disposal container, or 0.5 percent of the volume of the waste when the waste is processed to a stable form.

- Waste characterization will permit proper segregation, treatment, storage, and disposal, and includes information on the physical, chemical, and radionuclide content.

- Waste characterization information shall include: physical and chemical characteristics; volume; weight; major radionuclides and their concentrations; and packaging date, weight, and external volume.

- The concentration of the radionuclides may be determined by indirect methods.

H. IMPLEMENTING THE DUAL FRAMEWORK

Mixed waste must be handled according to regulations under RCRA and the AEA. Section 1006 of the RCRA statute provides that for inconsistencies precedence should be given to the AEA requirements. An inconsistency occurs when compliance with one set of regulations would cause non-compliance with the other. In addition, compliance with one set of regulations does not necessarily mean the facility will be in full compliance with both sets of regulations.
To date EPA and NRC have not cited any inconsistencies between the two sets of regulations regarding low-level waste disposal.

H.1. Joint EPA/NRC Guidances

- EPA and NRC have developed three joint guidances for the regulation of mixed waste: (i) the definition of commercially generated low-level mixed waste; (ii) siting of low-level mixed waste disposal facilities; and (iii) the conceptual design of low-level mixed waste disposal units.

- EPA and NRC are developing two joint guidance documents for the regulation of mixed waste: (i) sampling and testing, and (ii) inspections.

- A basic understanding of the various requirements is important for coordination between the various regulators. Coordination and communication are necessary for safe and effective regulation.

H.2. Summary of the Role of the Regulators

- ORP under authority of the AEA sets generally applicable standards for radioactive waste which are implemented by NRC and DOE.

- DOE under authority of the AEA regulates source, special nuclear, and by-product material at DOE operated government facilities. DOE implements this authority through eight Operations Offices.

- NRC under authority of the AEA regulates source, special nuclear, and by-product material at commercial facilities. NRC partially implements this authority through Agreement States.

- EPA's OSW under the authority of RCRA regulates RCRA hazardous waste. (Source, special nuclear, and by-product material are exempt from RCRA.) RCRA is implemented through authorized STates.

- States may regulate RCRA hazardous waste through independent authority under State laws. No definitive court ruling has been issued on State authority to regulate AEA radioactive waste under independent laws.

- In summary, mixed waste regulation is complicated and involves many actors; no one has sole authority over mixed waste.

II. INTRODUCTION TO BASIC RADIATION CONCEPTS

A. THE ATOM

A.1. Structure of the Atom

- An atom is the smallest discrete unit of mass. The nucleus of an atom is a densely packed array of protons and neutrons. Around the nucleus, electrons move along paths that govern the amount of energy that the electrons have.

- The mass of an electron is roughly 1×10^{-27} grams, while protons and neutrons have approximately equal masses of almost 1,800 times the mass of an electron.

- Protons and electrons are charged particles. Electrons have a negative charge, protons have a positive charge, and neutrons have no charge (they are neutral).

- Particles that have positive or negative charges display certain behaviors that are not seen among particles that have no charge (or "neutral" charge). A particle with a positive or negative charge will attract particles that have opposite charges (i.e., a particle with a positive charge attracts a particle with a negative charge, and vice-versa), or will repel particles that have the same charge (i.e., a particle with a positive charge repels other particles with positive charges).

A.2. Elements

- All atoms of a given element have the same number of protons in their nuclei.

- Each element can be characterized by its "atomic number" which represents the number of protons in its atoms' nuclei; this number is unique for each element. For example, all neon atoms contain 10 protons; thus, the atomic number of neon is 10. All radium atoms contain 88 protons; the atomic number of radium is 88.

- There are at least 105 known elements, 92 of which are naturally occurring.

A.3. Nuclides

- The "mass number" is the sum of the number of protons and neutrons in the nucleus.

- The sum of protons and neutrons in atoms of the same element may vary.

- A "nuclide" is any species of atoms whose nuclei contain a specified number of protons and neutrons.

- A nuclide is commonly denoted by the name of the nuclide's element followed by the mass number. For example, one common nuclide is radon-222, which has 86 protons and 136 neutrons. The mass number can be used to differentiate between nuclides of an element.

A.4. Isotopes

- The term "isotope" refers to nuclides of one specific element; although the terms "isotope" and "nuclide" can be used interchangeably.

- For example, each of three isotopes of the element radon contains 86 protons; however, radon-220 contains 134 neutrons, radon-221 contains 135 neutrons, and radon-222 contains 136 neutrons.

- Roughly 80 percent of all naturally occurring elements exist as a mixture of two or more isotopes.

A.5. Structure of the Atom

- A variety of forces exist in an atom. Repulsive forces exist between the protons (i.e., a positive-positive repulsion). Short-range attractive forces between neutrons and protons overcome these repulsive forces and hold the nucleus together. In addition, attractive forces exist between electrons and the nucleus (i.e., a positive-negative attraction).

- In a stable atom all of these forces are balanced.

A.6. Radionuclides

- For a nucleus to remain stable, attractive forces between neutrons and protons must be strong enough to overcome repulsive forces between protons.

- The balance of forces within the nucleus is manifested in the ratio of neutrons to protons: the higher the neutron-to-proton ratio in the nucleus, the stronger the attractive forces; the lower the ratio, the stronger the repulsive forces. Usually, stable ratios of neutrons to protons range from 1:1 to 3:2, depending on the size of the nucleus.

- A "radionuclide" is an atom with an unstable ratio of neutrons to protons. In order to achieve a more stable configuration the nucleus of a radionuclide releases energy in the form of subatomic particles or electromagnetic rays by a process called radioactive decay. This release may change the ratio of neutrons to protons.

- There are roughly 1,700 different radionuclides. Each radionuclide exhibits a unique pattern of decay characterized by:

  - radioactive half-life (the time it takes for any quantity of a radionuclide to diminish by one-half),

  - For example, iodine-131 has a half-life of eight days; 100 grams of iodine-131 would require eight days to decay to 50 grams of iodine-131. The resulting 50 grams would require eight days to decay to 25 grams of iodine-131, etc.

  - mode of decay (the type of particle or ray that is emitted as a result of the decay of a given radionuclide), and

  - energy of emissions.

A.7. Decay Chains

- Often, the decay product is also radioactive and decays with its own characteristic pattern.

- The radiation from a radioactive material may be a mixture of the characteristic radiation from the decay of each radionuclide in the chain.

- The concept of decay chains is important because it implies that many different radionuclides may be present in a material that has decayed over time. For example, if radium-226 is found in a waste, other radionuclides in the uranium decay chain are likely to be found.

- Most radionuclides do not decay directly to form a stable isotope.

- In an individual decay event, the nucleus of a radionuclide called a "parent" releases subatomic particles, beta particles or rays. The remnant of the nucleus usually has a different number of protons and/or neutrons than the parent; therefore, the remnant forms the nucleus of a different radionuclide, called a "daughter" or "decay product."

- A series of daughters generated from an initial parent is called a "decay chain." Therefore, all of the daughters of uranium-228 will be encountered when uranium-228 is present.

B. MODES OF RADIOACTIVE DECAY

The three primary modes of radioactive decay are emission of alpha particles, beta particles, and gamma rays.

Alpha and beta particles have mass; gamma rays are a form of energy.

Alpha particles, beta particles, and gamma rays are different in terms of their basic properties, their interaction with matter, their rate of energy transfer, and their range of travel.

B.1. Alpha Particles

B.1.1. *Basic Properties*

- Alpha particles consist of two protons and two neutrons, which is equivalent to the nucleus of a helium atom.

- The mass of an alpha particle is equal to approximately four times the mass of a proton.

- Alpha particles have a charge of +2.

- Alpha particles typically range in energy from 4 to 9 MeV (where a MeV is one million electron volts), although they may range from 2 to 12 MeV. The higher the alpha particle's energy, the greater its speed. (A "MeV" is a unit of measurement representing an extremely small amount of energy. For comparison, one trillion MeV will power a 50-Watt light bulb for only 2 thousandths of a second.)

B.1.2. *Interaction with Matter*

- Alpha particles move through matter in a relatively straight path because their large mass prevents them from being deflected by other atomic particles.

- As the alpha particle passes, the electrons in nearby atoms can do one of two things:

  - Ionization. An electron can break away from its associated nucleus if the attractive force between the electron and the alpha particle is strong enough. The removal of a negatively charged electron will cause an increase in the positive charge of the atom.

  - Excitation. An electron may remain in the affected atom, but at a farther distance from the atom's nucleus. In this instance, the charge of the atom will remain the same; upon return to the ground state of the excited electron, the excess energy is released.

B.1.3. *Range of Travel*

- The path of an alpha particle causes many ionizations and excitations but is very short.

- The range in air of an 8 MeV alpha particle is roughly 7 cm. While the range in soft tissue of an 8 MeV alpha particle is about 90 um, or about the thickness of human skin.

- Since skin is sufficiently thick to stop alpha particles, exposure to alpha particles from sources outside the body is relatively harmless and occurs only at short ranges. However, alpha particles present a health hazard when their sources are taken into the body.

- An instrument must be very close to a source in order to detect an alpha particle. Because there are usually many times of radiation present, it is likely that other types of radiation, which can be detected further from the source, will be detected before alpha radiation is detected.

B.1.4. *Transfer of Energy*

- In each ionization and excitation interaction, the attraction of the alpha particle with electrons in stationary atoms reduces both the energy and the velocity of the alpha particle until it eventually stops. The energy lost by the alpha particle is transferred to atomic electrons.

- The average amount of energy that radiation loses to surrounding atoms per length that the radiation travels is called the linear energy transfer (LET). Particles with a high LET transfer a relatively large amount of energy over a short path length. For particles delivering equivalent amounts of energy, particles with higher LET generally cause more severe biological injuries.

- Because the high charge of alpha particles causes a relatively high number of ionizations and excitations, they transfer a relatively large amount of energy over a short path length. Thus, they have a high LET compared to other forms of radiation.

B.2. Beta Particles

B.2.1. *Basic Properties*

- Beta particles have the same mass as an electron.
- Beta particles have a charge of -1.
- The range in energy of beta particles, typically from 0.04 to 6 MeV, is usually less than that of alpha particles.
- Physically identical to an electron, a beta particle differs from an electron in that it originates in the nucleus , while an electron originates in the cloud surrounding the nucleus.

B.2.2. *Interaction with Matter*

- Beta particles do not move through matter in a straight path. Because of their low mass they are deflected when they collide with atomic electrons.
- As with alpha particles, beta particles can cause ionization and excitation in atoms. In the case of beta particles, ionizations and excitations are caused by repulsive forces between beta particles and atomic electrons, which both have negative charges.

B.2.3. *Range of Travel*

- Beta particles cause less ionizations and excitations than alpha particles, but are more penetrating. The range in air of an 8 MeV beta particle is roughly 31 m; the range in soft tissue of an 8 MeV beta particle is about 3 to 5 cm.
- Beta particles penetrate deep into the skin. Consequently, beta particles from sources outside the body as well as from sources taken into the body present a radiation threat. However, the external threat of beta particles is considered slight.
- Beta particles can be detected by instruments at a farther range than alpha particles can be detected.

B.2.4. *Transfer of Energy*

- Because beta particles have half the charge of alpha particles, beta particles are much less efficient in causing ionizations and excitations.
- As a result, beta particles give up energy over a longer distance of travel; thus, they have a low LET.
- Even if a beta particle delivers the same amount of energy as an alpha particle, the biological injury caused by a beta particle will be less severe.

B.3. Gamma Rays

B.3.1. *Basic Properties*

- Gamma rays have no mass.

- Gamma rays are a form of electromagnetic radiation, like light and radiowaves, but have much greater energy. Unlike subatomic particles, gamma rays travel as a series of propagating or oscillating waves. The energy of a ray depends on its frequency of oscillation. The higher the frequency, the greater the energy.

- Gamma rays have no net charge. However, in each oscillation an electrical field is formed which can influence electrons.

- Gamma rays typically range in energy from 0.01 MeV to 10 MeV.

B.3.2. *Interaction With Matter*

- Because gamma rays behave as waves, some gamma rays are neither deflected nor slowed by atoms in matter; they pass right through matter. Some gamma rays, however, are completely absorbed by the atoms.

- The amount of gamma radiation absorbed depends on the number of rays entering the material, and the thickness and chemical composition of the material.

- Absorbed gamma rays can cause ionizations and excitations. Non-absorbed gamma rays can collide with (and transfer energy to) both free and atomic electrons to set the electrons in motion.

- If a gamma ray interacts with an atom, ionizations or excitations occur. When a gamma ray ionizes an atom, some or all of the energy not consumed in the ionization will impart kinetic energy to the removed electron.

- In addition, if a gamma ray collides with either atomic or free electrons it will set the electrons in motion. The electrons will then behave as beta particles. The gamma ray itself will be deflected and its waves will oscillate at a lower frequency (i.e., the gamma ray will lose energy).

- Ultimately, almost all absorbed gamma rays form high-speed electrons that behave as beta particles.

B.3.3. *Range of Travel*

- Gamma rays travel relatively large distances and are quite penetrating compared to alpha and beta particles.

- Instruments can readily detect gamma rays, even if they are a considerable distance from the source.

- Like beta particles, gamma rays from sources outside the body may inflict biological damage both internally and externally. People can be exposed to gamma rays even though they are relatively far from a source. The magnitude of the health hazard depends on the number of rays entering the body.

- Gamma rays will penetrate the entire body. While some ionizations and excitations will occur in the outer layers of the skin, others will occur internally.
- Furthermore, the electrons released from internal ionizations behave as internally ingested/absorbed beta particles.

B.3.4. *Transfer of Energy*

- A particular gamma ray releases no energy until it is absorbed in an atom or an electron.
- Gamma rays passing through the body without interacting with atoms or electrons release no energy and are harmless.
- However, the high speed electrons produced by gamma ray interactions have a LET similar to that of beta particles, and can cause biological damage.

C. UNITS OF QUANTITY, DOSE, AND EXPOSURE

C.1. Units of Quantity

- The quantity of a radionuclide can be measured in several different units. The choice of units depends on the property of interest.
- Like other substances, the mass of a radionuclide may be expressed in grams, kilograms, pounds, etc. However, the mass alone provides no indication of the quantity of radiation emitted from a given radionuclide.
- Units of quantity measure the amount of a radionuclide in terms of mass or radioactivity. Units of dose measure the amount of radiation absorbed by a receptor (such as people).
- A curie (Ci) is a unit rate of radioactive decay representing the quantity of any radionuclide that undergoes $3.7\text{x}10^{10}$ decays per second. The number of curies can be determined for a given mass of radionuclide if the half-life and atomic mass of the radionuclide are known:

$$\text{Activity (Ci)} = \frac{(1.128\text{x}10^{13}\ \text{decays/mole}) \times M}{H \times A}$$

M = Mass of the radionuclide (grams);
H = Half-life of the radionuclide (seconds);
A = Atomic mass of the radionuclide (grams/mole).

- A becquerel (Bq) is another unit of radioactivity that is analogous to a Ci, where 1 Bq = 1 decay per second = $2.7\text{x}10^{-11}$ Ci.
- A working level (WL) is a special unit of radioactivity used for radon; one WL = any combination of short-lived radon-222 decay products in one liter of air that will result in alpha particle discharging $1.3\text{x}10^{5}$ MeV of alpha particle energy.

C.2. Units of Dose and Exposure

- A basic unit of dose is a "radiation absorbed dose" (rad) which measures absorbed radiation per mass of tissue (100 ergs/gram). (An erg is a unit of energy equal to 625,000 MeV.)

- The international unit of absorbed dose is the Gray (Gy) which is equal to 100 rad.

- A commonly used unit of radiation exposure is the Roentgen (R) which is equivalent to 86.9 ergs/gram of air. The Roentgen refers to the amount of energy, discharged in air only.

- A unit of "dose equivalent" called the "Roentgen equivalent man" (rem) is used to account for biological responses to radiation which depend on the quantity of radiation absorbed, the type of radiation, and other factors.

  Dose (in rems) = Dose (in rads) x Quality Factor x Any Additional Modifying Factors

  -- Quality factors adjust an absorbed dose of radiation to account for the relative biological effectiveness of the different types of radiation. Alpha particles have a quality factor of 20, and beta particles and gamma rays have a quality factor of 1.

  -- In effect, then:

    - Rem = Rad; for beta particles and gamma rays, and
    - Rem = 20 x Rad; for alpha particles.

  -- Additional modifying factors, which include distribution factors that correct for a nonuniform distribution of absorbed radiation, are equal to 1 for all types of radiation.

- The international unit of dose equivalent is the sievert (Sv), where 1 Sv = 100 rems.

- A special unit used to assess doses of radon daughters is the working level month (WLM) where 1 WLM = the amount of radiation taken in by a person exposed to 1 WL for 1 month (170 hours).

D. BIOLOGICAL EFFECTS OF RADIATION

Ionized atoms in the body may react with other atoms, disrupting the normal operations of organs.

The actual biological effect created by radiation is a function of several factors listed as follows: type of radiation; magnitude of the absorbed dose; dose distribution (i.e., whether the total body or only a specific organ is involved); age of exposed individual; and time distribution (i.e., chronic vs. acute exposures).

When atoms of a cell are ionized or excited, they may readily react with other atoms to cause deficiencies in enough cells in an organ to cause organ malfunction or failure.

A whole body dose of radiation is potentially more damaging because several organs may be affected causing a variety of symptoms.

D.1. Exposures to Radiation

- Chronic exposure to radiation increases the risk of cancer. According to recent EPA figures, the lifetime risk of fatal cancer associated with whole-body exposures generally ranges from $1x10^{-2}$ per Sv to almost 1 per Sv.
- Hereditary effects, such as a mutation or chromosomal aberration, are transmitted to a child conceived after the radiation exposure. The risk of radiation-induced genetic effects is smaller than, or comparable to, the risk of cancer.
- Chronic exposure to radiation can also have developmental effects on fetuses, including mental retardation and other birth defects. The risks per unit exposure of serious developmental effects are somewhat greater than the risks of cancer, but the period that an individual is vulnerable to damage is much briefer.
- Acute health effects will not occur when exposed to the radioactive contamination in the environment.

III. POTENTIAL MIXED WASTE UNIVERSE

This section will identify the generators of mixed waste and specifically which industry operations generate mixed waste. It will also describe the various potential mixed waste streams and the current waste management and minimization practices.

A. THE UNIVERSE

There are approximately 26,000 NRC and NRC Agreement State licensees. Of these, 8,000 are specific licenses and the rest are general licenses which are automatically granted to facilities that meet certain specifications. There are many commercial licensees, however, these facilities generate low volumes of waste. Most non-Federal generators are likely to be small quantity generators (SQGs).

In addition, mixed waste is only a small fraction of commercial low-level waste generation.

Commercial facilities may already have RCRA permits. Many licensees, however, may need to apply for storage permits because currently no off-site facility is accepting mixed waste for disposal.

The other component of the potential mixed waste universe is DOE facilities. There are only a few of these facilities, but they produce large volumes of waste.

The mixed waste universe is estimated to be approximately 2 to 3% of the total low-level waste volume, which is 1.4 million cubic feet/year.

A.1. Potential EPA Hazardous Waste Generators

- Manufacture/distribution licensees are estimated to be 4% of the NRC licensee universe. They may handle large quantities of nonencapsulated or nonsealed source materials which could be in readily dispersible forms.

- Source material and some special nuclear material licensees are estimated to be 1% of the NRC licensee universe.

A.2. Potential EPA Hazardous Waste Treatment, Storage, and Disposal Facilities

- Service organization licensees are estimated to be 1% of the NRC licensee universe.

- Research, teaching, experimentation, diagnostic, and therapeutic application licensees are estimated to be 44% of the NRC licensee universe. The type of isotopes used by these licensees are in similar physical forms and are used in similar manners.

- Measurement, calibration, and irradiation application licensees are estimated to be 50% of the NRC licensee universe. These handlers may not need a RCRA permit because it is likely that the radioactive material may not come into contact with the hazardous material.

- In addition to the NRC licensees shown above, there are currently 110 nuclear power plants with NRC operating licenses.

A.3. Potential Mixed Waste Streams

- Liquid scintillation fluids are used in a wide range of research and industrial production practices, and are sometimes classified together with organic liquids under the organic chemical heading.

- Equipment cleanup can lead to contaminated organic chemicals as well as radiologically contaminated rags and cloths that are also contaminated with organic chemicals. Colleges and universities may be the largest producers (greatest annual volume) of organic liquid mixed waste.

- Lead shields are used to enclose experiments and may be contaminated with whatever radionuclide was being used. Lead shielding and container waste is also generated from pharmaceutical manufacturing.

- Chromate and cadmium wastes are generated primarily at power plants.

- CFC wastes are generated during some drycleaning operations.

- Aqueous corrosive liquids are generated in industry and Federal facility operations.

- Waste oil, if deemed RCRA hazardous by EPA (or authorized States), could constitute a major mixed waste category (in terms of volume).

A.4. Nuclear Power Plants

- Currently 110 operating power plants are licensed by NRC.

- Nuclear power plants generate hazardous waste during routine maintenance. For example, cleaning and replacing parts generates cloths and compactable trash contaminated with acetone, CFC, solvents and concentrates.

- A more thorough maintenance job, called "off-line" refueling generates cloths contaminated with solvent and oil, waste oil, welding rod stubs (high cadmium content), spent trichloroethylene solvent, and blast grit (possible high concentrations of cadmium and heavy metals).

- Health physics activities involving the decontamination of tools, equipment, other devices, as well as area decontamination generates acetone, methanol-contaminated clothes, and spent dichlorobenzene.

- Radionuclide analyses of reactor water generates spent scintillation cocktails containing toluene and xylene.

- Plant operation activities generate chromate-containing waste, decontamination acids, drycleaning sludges, and tool decontamination sludges which may contain CFCs.

A.5. Academic and Medical Institutions

- Academic institutions conduct research involving many different radionuclides.

- Medical institutions conduct laboratory research using radionuclides. For example, in vitro radiolabelling is frequently used to test drug metabolism and radiolabelling is also used to map physiological functions.

A.6. Industry

- Industrial mixed waste generators include pharmaceutical manufacturers and isotope suppliers, sealed source and irradiator manufacturers, biotechnology manufacturing, providers of analytical services, fuel fabrication operations, and waste processors.

A.7. Federal Facilities

- Defense and government research facilities operated by DOE are the primary Federal generators of mixed waste.

- Unit operations vary greatly within each facility and from facility to facility.

- Federal facilities include large facilities that generate large volumes of radioactive waste, and production and laboratory facilities that generate smaller volumes and a greater variety of waste.

- DOE has identified several sources of mixed waste including, production reactors, test reactors, certain Navy vessels, and weapons manufacturing.

- Many Federal facilities generate mixed waste through processes similar to those outlined for commercial facilities.

B. TYPES OF MIXED WASTE STREAMS AND MANAGEMENT

B.1. Liquid Scintillation and Fluids

- "Scintillation cocktails" refers to vials containing spent scintillation liquid. The cocktails or fluids are mixed waste only if the solvent is hazardous, and the radionuclides are not below regulatory concern. If the radioactive portion of the waste is below regulatory concern, only the hazardous waste regulations apply.

- The principal radionuclide associated with scintillation cocktails is tritium.
- The principal hazardous constituents of scintillation cocktails are toluene and xylene.
- Waste minimization generally involves replacing the hazardous liquid with non-hazardous substitutes.
- Liquid scintillation cocktails are currently managed through incineration. NRC allows the incineration or disposal of licensed material without regard to radioactivity if it contains 0.05 microcuries or less of hydrogen-3 or carbon-14 per gram of medium used for liquid scintillation counting.
- If all scintillation fluids and animal carcasses containing C-14 and H-3 generated annually were incinerated, 8 Ci of these radionuclides would be released. This is extremely small relative to C-14 and H-3 in the natural environment.
- Incinerators that burn spent scintillation fluids as a fuel additive do not currently need an EPA permit to do so. However, EPA may soon require the permitting of such facilities.
- Storage for decay is sometimes used for scintillation cocktails containing other than BRC concentrations of tritium or C-14.

B.2. Organic Chemicals

- Mixed wastes contaminated with organic chemicals are generated during academic and medical research, industrial manufacturing (e.g., radiopharmaceuticals, sealed sources, diagnostics), and nuclear power plant activities.
- Academic institutions generate the largest amount of organic chemical mixed wastes (scintillation liquids included) according to a 1984 Brookhaven National Laboratory survey.
- The primary process generating radioactive organic chemicals is the cleaning or degreasing of equipment at these facilities (i.e., organic solvents are used).
- The most common radionuclides found mixed with organic chemicals are tritium and C-14.
- Waste minimization of organic chemicals generally involves encouraging the use of alternative methods and chemicals through education, justification, and notification.
    - Education should sensitize users to disposal problems and encourage people to use the minimum amount of materials possible to complete the job (especially true for cleanups).
    - Under a justification system, individuals would be required to explain why the use of hazardous chemicals is necessary to their project in order to gain approval.
    - Notification of large cleanups (e.g., large pieces of equipment) or other uses of large amounts of organic chemicals allows supervisors to ensure that proper management, minimization, and disposal takes place.

- Organic chemicals and contaminated trash are managed by storage for decay and incineration.

- Treatment technologies that render the waste non-hazardous are being developed but are not yet available.

- Recycling methods for mixed waste organic liquids are being developed. These methods use distillation to separate useful solvents from radioactively contaminated wastes. Recycling recovers useful materials and reduces the volume of the waste requiring disposal. Note that distillation residues must still be handled as mixed waste.

- Incineration is the most common method of destruction used for organic liquids.

B.3. Lead Wastes

- Radioactively contaminated lead wastes are generated by many facilities in the form of shielding and/or containers and solutions resulting from the chemical or water decontamination of lead.

  -- Lead wastes are potentially EP toxicity characteristic wastes.

- Aluminum canisters are used to store neutron-activated stainless steel tubes (from pharmaceutical manufacture) in underwater pools. Lead is added to the aluminum to minimize buoyancy.

- Isotope shipping containers are usually solid lead coated with steel or paint.

- Waste minimization programs for lead have been designed to reduce the amount of lead shielding and containers used and to encourage reuse of lead after it has been decontaminated. In addition, Herculon (a plastic-like material), plexiglass, or other types of materials that are easily decontaminated.

- The design of new equipment using as little lead as possible is a waste minimization option.

- Lead waste with radioactive contamination is managed in two ways: solid lead shielding (most problematic) is currently stored as bulk lead, and lead decontamination solutions are solidified to bring them below the EP toxicity limit for lead.

B.4. Chromate and Cadmium Wastes

- Chromates are often used as corrosion inhibitors in the reactor process at nuclear power plants. Potential chromate-containing wastes may include ion-exchange resins, evaporator concentrates, and filter media.

- Cadmium and other heavy metal wastes result from blasting and decontamination grit at nuclear power reactors.

- Chromate and cadmium waste management generally consists of immobilization in chemical matrices.

B.5. Chlorinated Fluorocarbon (CFC) Wastes

- Contaminated CFC solvents, concentrates, and filters result from tool and equipment decontamination, and laundering operations.

- CFC solvents may be F001 hazardous wastes.

- Waste minimization efforts include research on chemical substitutes for CFCs and work to delist CFC concentrates.

- No treatment techniques are currently used to render CFC mixed wastes non-hazardous. CFC mixed wastes are currently stored.

B.6. Aqueous Corrosive Liquids

- Various corrosive acids are used at nuclear power plants and in industry to back-flush ion-exchange resins and clean used transportation containers.

- The neutralization of aqueous corrosive liquids may be subject to RCRA treatment standards.

- Waste minimization efforts include changes in facility operations to reduce the generation of these wastes.

- Possible treatment may involve neutralization (to render non-hazardous) and discharge through an NPDES outfall. Neutralization and discharge through a NPDES permit may be exempt from RCRA if considered a wastewater treatment unit.

- Contaminated liquids may be stored in double-walled, underground, carbon-steel tanks as radioactive wastes. Leak detection systems are usually used.

B.7. Waste Oil

- Radioactive waste oils are primarily spent lubricants from radiologically contaminated equipment.

- Contaminated waste oil management methods include filtration, solidification, incineration, and long-term storage.

  - Filtration involves the use of commercially available, multi-layer paper filters to remove particulate radioactive contamination. Filters are disposed of as non-hazardous radioactive waste.

  - Waste oil solidified by approved methods are accepted for disposal at Richland, Washington and Beatty, Nevada disposal facilities (as of Spring 1989).

  - Incineration takes place in auxiliary boilers or oil burners.

- Several States currently regulate waste oil as hazardous waste.

- A hazardous waste classification of waste oil is under consideration by EPA, and this potential hazardous status creates significant mixed waste implications.

C. SUMMARY OF WASTE MINIMIZATION

Management practices to minimize mixed waste generation include waste segregation, material control programs, waste processing, and volume reduction.

- Waste segregation involves designing processes and materials management procedures to minimize the interaction of radioactive and hazardous wastes.
- Material control programs restrict access to materials and limit the amount of materials that workers are allowed to use for particular jobs.
- Waste processing techniques include recycling, recovery, and reclamation operations, as well as treatment.
- Compaction can be used for volume reduction to conserve storage space.

Employee training encourages workers to use equipment and materials properly, familiarizes them with the hazards of working with particular substances, and keeps them informed of minimization and proper disposal practices.

EPA or State staff should look for opportunities to encourage owner/operators to segregate radioactive hazardous waste, minimize quantities of mixed waste, and then manage remaining waste appropriately.

D. MIXED WASTE MANAGEMENT OPTIONS

Management options include rulemaking petitions, declaring waste BRC, and establishing a licensed/permitted TSDF for mixed waste.

- Rulemaking Petitions and delisting may result in exemptions from RCRA.
- If the radioactive component of the mixed waste can be declared BRC, then only the RCRA requirements must be met. This only an option for tritium and C-14 in scintillation cocktails at present.
- Generators of mixed waste could form a cooperative agreement to establish a licensed TSDF.

Mixed wastes containing radionuclides with short half-lives may be stored for decay and then disposed of as hazardous waste; however, this requires a RCRA permit.

IV. HEALTH PHYSICS AND INSPECTIONS

The objectives of this section are to describe the background and application of the ALARA principle; highlight the case of distance, time, and shielding for personal protection and worker safety; and introduce the inspector to the use of dosimetry equipment and decontamination practices.

A. ALARA

A.1. ALARA: As Low As Reasonably Achievable

- Maintaining radiation exposures and releases of radioactive material "as low as reasonably achievable" (ALARA) is a very important concept for personal safety. ALARA takes into account the state of technology and economics in relation to the effect on and use of atomic energy in the public interest.

- "The term 'as low as is reasonably achievable' means as low as is reasonably achievable taking into account the state of technology, and the economics of improvements in relation to benefits to the public health and safety, and other societal and socioeconomic considerations, and in relation to the utilization of atomic energy in the public interest." 10 CFR 20.1(c)

- ALARA is described in NRC regulations and in ORP's Federal Guidance Report Number 11 on limits to Occupational Exposure, 1988; EPA-520/1-88-020. In addition, ALARA was adopted by DOE as an operating principle. ALARA is not required by the AEA. The ALARA concept requires facilities to achieve lowest levels possible, but no specific numbers are associated with ALARA.

  -- Applicants for nuclear power reactor licenses must employ all reasonable technology that will reduce radiation doses at a cost of $1,000 or less per manrem. (10 CFR Part 50, Appendix 1, Section II.D)

- The ALARA concept embodies thinking before acting, exercising good judgment, reducing exposure (while remaining cost efficient), and not compromising personal safety. Before proceeding, hazardous waste personnel must be informed and should contact radiation Officers for support.

- The ALARA concept includes meeting regulatory requirements and <u>then</u> applying ALARA. Facilities cannot use ALARA as a shield from regulatory requirements or to <u>unnecessarily</u> limit inspection activities. Inspectors, however, should exercise their best judgment to ensure that EPA requirements are met safely.

- In general, inspections should be both thorough and cost-efficient, while taking into account personal safety and worker exposure.

- Facilities that handle radioactive materials usually have ALARA procedures in place. However, if EPA personnel are properly trained and prepared, ALARA practices will not hinder RCRA inspections. Inspectors should be aware of facility-specific procedures when planning mixed waste inspections.

- The ALARA concept is applied to all phases of a project: planning and design; implementation and operation; and personal safety.

- EPA personnel should consider how ALARA is incorporated into training, surveillance and monitoring, recordkeeping, and waste management.

A.2. Action Limits

- Related to ALARA are action limits, which are standards for the amount of radiation a person can safely be exposed to over long periods.

- There are different limits for workers and for members of the general public. Dose limits for workers are higher than those set for the general public.

- NRC, DOE, and OSHA all specify dose limits.

  – Industry usually sets their exposure limits below NRC levels.

- Dose limits for workers are set at 5,000 millirem/year in all cases. NRC limits for the general public are currently higher than those of DOE (500 millirem/year versus 100 millirem/year). OSHA does not specify limits for the general public.

- NRC has proposed a reference level of 100 millirem/year for the general public. This is not a dose limit, but rather is a mechanism to keep annual doses as low as possible. The proposed NRC dose limit for the general public will remain at 500 millirem/year.

- The proposed NRC dose limit for workers will remain at 5 rem/year, with some specific exceptions. For, example, doses caused by external exposures will be limited to 3 rem/year, and doses greater than 5 rem/year will be permitted for "planned special exposures."

- EPA's recommendations concerning Federal radiation protection guidance for occupational exposure can be found in 52 FR 2822.

A.3. Radiation Protection

- Protective clothing and respiratory equipment are not meant to be the primary protection against radiation.

- Exposure should first be minimized (ALARA) as follows:

  – Maximizing distance from source. Ideally, facilities should be designed to have sufficient aisle space for the inspector to maintain maximal distance from the source. Dose is inversely proportional to the distance squared.

  – Minimizing time spent near source. Time spent on careful planning and preparation will allow the inspector to minimize time spent near the source during the actual inspection.

  – Using external shields (natural and artificial). Care should be taken to place shielding between a person and a radiation source.

  – Using contamination-avoidance practices. The use of dedicated equipment (separate equipment for radioactive wastes) will help the inspector avoid contamination.

B. EQUIPMENT, INSTRUMENTS AND DECONTAMINATION

B.1. Equipment

B.1.1. *Clothing*

- Protective clothing is designed to prevent the entry of radioactive dust or particles into the body by absorption through the skin or through openings like cuts and wounds. Protective clothing also prevents contamination of personal effects.

- Protective clothing is removed when leaving radiation areas to prevent spread of contamination.

- Respiratory equipment is designed to prevent the inhalation of radioactive particles.

B.1.2. *Radiation Detection Equipment*

- Proper detection instruments are of particular importance because radiation gives no warning (i.e., cannot be smelled, seen, or felt).

- Equipment categories include dosimeters, initial entry devices, and other survey instruments.

- Dosimeters are used to measure individual doses; initial entry devices are used for detection; and other survey instruments are used to measure real time exposure rates and surface contamination.

- EPA hazardous waste personnel should work with EPA and State radiation officers, as well as NRC or DOE personnel to determine equipment availability (e.g., Regional/State radiation offices have dosimeter badges that are available for EPA personnel).

B.1.3. *Dosimeters*

- Dosimeters can be one of two types. Standard dosimeters can detect gamma radiation. Special dosimeters detect beta emissions in addition to gamma radiation. Both types can either measure whole-body exposures or exposures for certain regions of the body, and can provide direct or indirect readings.

B.1.4. *Survey Instruments*

- Survey instruments are used to determine if a spot is contaminated or if an area is safe to enter, but they are not used as analytical instruments. They show a rate and give real-time readings, and can be set up to sound an alarm if a release occurs.

B.2. Decontamination

- Different procedures are involved for chemical and radiation decontamination.

- The common goal is to safely decontaminate individuals and equipment.

- Although radioactivity poses an additional danger to the inspector, instrumentation often makes radioactive contamination easier to detect than chemical contamination.

B.2.1. *Chemical Decontamination*

- Individual contamination can be washed off with soap and water in most cases. All water disposed of at an NRC licensed facility is controlled either through accepted sewage disposal or is routed back to a rad-waste system.

- Chemical decontamination is of particular concern because no instruments are readily available to determine occurrence.

B.2.2. *Radiation Decontamination*

- This refers to removable surface contamination. Instruments make it easy to determine if an item is radiologically contaminated. It is usually a dry removal process (tape, brush, etc.), but if the dry process fails, a wet decontamination practice will be used.

- Protective clothing is usually discarded and personal property that becomes radioactively contaminated must remain at the facility. EPA personnel should be aware that property, such as cameras used during inspections, that becomes radioactively contaminated must remain at the facility.

- Waste generated in decontamination is radioactive and must be appropriately managed.

C. INSPECTIONS

The objectives of this section are to point out areas where mixed waste inspections will differ from RCRA hazardous waste inspections, to supplement existing RCRA and NRC guidance on performing inspections, and to demonstrate how the ALARA concept is used in practice for personal safety. It is assumed that the fine points of "normal" RCRA inspection procedures are already understood.

Due to the dual regulatory framework and the radioactive nature of the waste, the RCRA inspector will have to consider:

- Additional health and safety issues (associated with radioactive waste components);

- Need for additional training; and

- More coordination with other offices and agencies.

Since most mixed wastes are currently managed on-site, many inspections will be combinations of generator and (usually) storage inspections.

Each Region has a Radiation Office which can provide support from within the Agency. Inspectors should coordinate with individuals in EPA Radiation Offices on a case-by-case basis as they determine how to safely handle the radioactive hazard at mixed waste facilities.

Coordination with other agencies to ensure that the inspection activities are consistent with the various requirements they may impose.

Combination generator/storage inspections will be particularly important to States with mixed waste authorization, because States have the primary responsibility for inspecting generators.

C.1. Objectives of the Inspection

- The objectives of the inspection are to identify suspected violations, assist the facility owner/operator in understanding and complying with hazardous waste regulations, assess qualitatively any potential threat to human health or the environment, and gather information on the hazardous and mixed waste management practices.

- Inspections should be planned to minimize the risks associated with mixed waste, and to avoid repetitive inspection procedures.

C.2. Overview of Mixed Waste Inspection Considerations

- C.4.1. *Safety*

- In order to address all safety issues, the inspector must understand all radioactive hazards, obtain and review all safety guidelines, contact the facility or review the inspection file for facility-specific safety requirements, and identify and become familiar with safety equipment for radiation.

- These safety considerations are in addition to those normally addressed during a RCRA inspection.

- Radioactive materials pose safety considerations that must be addressed early in the planning process (i.e., before the site visit).

C.4.2. *Requirements for Access*

- Inspectors should:

  -- Obtain all required training for the type of inspection planned;
    - Training requirements for facility inspections may vary;

  -- Check with facility and NRC/Agreement State contacts for specific information;

  -- Obtain the necessary security clearances for the type of inspection planned.

- In addition to the 40-hour general health and safety training for RCRA inspections, more specific radiation training will be required.

- Depending on the need of the RCRA inspector the training requirements for facility inspections may vary. For example, less training will be required if the inspector has an escort at all times.

C.3. Inspection Stages

- The inspection stages fall into two categories, preparing for the inspection and on-site activities.

- When preparing for the inspection each stage should be addressed separately in order to identify areas where mixed waste inspections may differ from RCRA hazardous waste inspections.

D. PREPARING FOR THE INSPECTION

D.1. Coordinating with Other Offices and Agencies

- Several offices and agencies may be interested in the mixed waste inspection, including: NRC and Agreement States; DOE; RCRA Authorized States; EPA Regional and State radiation contacts; and other EPA offices.

- Joint inspections may be an option.

- By consulting with these offices and agencies as part of the planning process, regulatory confusion can be minimized and plans can be established so the inspection benefits all regulatory agencies. These agencies or offices have resources that may be useful when preparing to conduct a RCRA inspection involving radioactive waste.

D.2. Gathering Background Information

- Typical information sources include: inspection files, applicable regulations and guidance documents, facility descriptions, RCRA permits, other permits, and process descriptions.

- Inspectors should be innovative in identifying new information sources.
- Mixed waste inspections may require different research than RCRA hazardous waste inspections because a radiation hazard exists and additional regulations are involved.

- General background research will involve reviewing applicable regulations and guidance documents from EPA as well as from DOE and NRC.

- Facility-specific research will involve looking at specific processes and unit operations. It will also include developing an understanding of handling, management, and disposal procedures.

  - For RCRA-permitted facilities, permit writers should be contacted for facility information.

  - In addition, other existing permits (all Federal, State, and local permits) should be reviewed to help identify areas of potential mixed waste generation or management.

  - If the waste was historically labeled as radioactive waste and is now identified as mixed waste, check radioactive waste sources for information.

D.3. Developing Inspection Plans

- The objectives of the inspection plan are to outline the steps for gathering the necessary waste generation and management information, to plan and prepare for each step in the inspection, and to highlight specific areas of interest.

- When preparing an inspection plan, the inspector needs to consider the following:

- Access and clearance requirements. Notification considerations may be more extensive for mixed waste inspections, particularly at Federal facilities. In some cases, surprise inspections may not be possible.

- Required training. Supervisors are responsible for ensuring that all inspectors dealing with mixed waste have the appropriate health and safety training and the necessary clearances. This includes keeping records and ensuring staff receive annual updates.

- Necessary safety equipment. Inspectors should determine what safety equipment is available at the facility and what safety equipment is available through EPA.

- Opening interview. During the opening interview the inspector should identify site-specific issues and be prepared to answer RCRA regulatory questions.

- Record review. Familiarize yourself with processes and unit operations before the review; they may differ significantly from typical hazardous waste operations.

- Site inspection. RCRA facility checklists can be used for the actual mixed waste inspections, but may need to be modified. The inspector may also be able to review NRC/DOE facility checklists.

E. ON-SITE ACTIVITIES

E.1. Entrance to Facility

- Inspectors that have obtained the necessary training and security clearance for access need to consider the following points before entering a facility. Inspectors should carry their training certificates and should remember that special safety equipment may be required.

- NRC licensed facilities may be required under NRC regulations to see the appropriate training certificates from inspectors.

- Since NRC always retains jurisdiction over power plants, the inspector need not worry about Agreement State requirements at commercial nuclear power plants.

E.2. Opening Discussion With Owner/Operator

- The opening discussion with the owner/operator should outline the inspection objectives with the operator, help the owner/operator understand and comply with RCRA regulations, and identify waste streams and mixed waste-generating processes.

E.3. Operations, Waste Handling, and Record Review

- The operations, waste handling, and record review provides a more detailed understanding of operations, provides answers to questions the inspector assembled during background research, helps identify changes in operations, and helps identify and reconcile discrepancies between described and actual procedures.

E.4. Determining Sampling Needs

- As with "normal" RCRA inspections, sampling is usually part of a technical case development when the inspector suspects that a waste handled only as radioactive is actually mixed waste, or when there is evidence of releases. In most cases, sampling will not be performed during routine compliance evaluations.

- RCRA gives inspectors the authority to obtain samples of hazardous waste. Inspectors, however, cannot order owner/operators to take samples unless it is required by the permit or enforcement order.

- From RCRA §3007: "Officers, employees, or representatives of the EPA are authorized --

  (1) to enter at reasonable times any establishment or other place where hazardous wastes are or have been generated, stored, treated, disposed of, or transported from;

  (2) to inspect and obtain samples from any person of any such waste and samples of any container or labeling for such wastes."

- Inspectors should think ahead when determining whether to conduct mixed waste sampling. Mixed waste sampling is expensive and increases risks to the inspector, therefore, sampling should only be performed when necessary.

- Inspectors must also be aware of requirements that may apply to mixed waste samples. Requirements contained in NRC or NRC Agreement State licenses and Department of Transportation and NRC transportation regulations for both the radioactive and hazardous components.

  - Mixed waste samples can only be taken to a facility that has an NRC license, NRC Agreement State license, or an authorized DOE facility. In other words, samples must go to a facility that is authorized to receive it.

- Normal RCRA sampling procedures may need to be revised for mixed waste.

- Site-specific sampling considerations include accessibility of the waste, variations in generation and handling, effect of transitory events such as start-up, shut-down, and maintenance activities, and anticipated and unanticipated hazards.

E.5. <u>Site Inspection</u>

- The inspection is similar to a "regular" RCRA inspection; it should focus on key aspects of the process and waste flow.

- Inspectors will want to determine: where mixed waste is generated and whether the operator handles it as mixed waste; what management practices exist; whether mixed waste is mishandled or misidentified; and unusual situations.

E.6. <u>Closing Discussion and Documentation</u>

- Documentation and follow-up of a mixed waste facility inspection is similar to other RCRA inspections. Follow-up for mixed waste inspections, however, may differ from RCRA inspections in some aspects such as inspection reports (format may vary), other agencies may have interest in results, and other offices or agencies may be helpful in interpreting information obtained.

E.7. Inspection Summary

- Mixed waste inspectors must consider additional factors beyond those of other RCRA inspections in regards to health and safety, coordination and information sources, and additional requirements (training, sampling, etc.).

- The optimal approach to mixed waste inspections is to plan thoroughly and to utilize the resources available to become more familiar with the particulars of each type of mixed waste inspection.

F. ACCESS, NATIONAL SECURITY, AND CLEARANCES

F.1. Access

- Many of the processing activities that generate DOE mixed waste are defense related.

- Access is also controlled at nuclear power plants and other nuclear facilities

- RCRA inspectors must be prepared to address access and national security issues, and will have to obtain appropriate clearances.

- Additional radiation training may be required to gain access to some of the larger facilities.

- Regional and State inspectors should inquire, in advance, about access requirements.

- No additional training beyond EPA or OSHA requirements is necessary for escorted access at NRC licensed facilities.

- For unescorted access at production and utilization facilities EPA inspectors may either complete the two day site-specific training, or the two day generic NRC training.

- It is recommended that inspectors conduct initial inspections with an escort.

- When a facility notifies the State or EPA that it is a hazardous waste handler and the State or EPA has reason to believe the facility handles mixed waste, the State or EPA Region should send a letter to the facility stating that they will be conducting inspections and inquiring about training requirements and how to access the training.

- DOE facility inspections may require national security clearances (e.g., "L" and "Q" clearances). These are granted by DOE for DOE activities.

- EPA personnel should contact Personnel Security staff at EPA Headquarters for clearances, and State personnel should contact DOE.

- The type of clearance depends on the classification of the information required to be reviewed. Obtaining a security clearance will take a significant period of time and management should plan well in advance to ensure that inspectors have the necessary clearances.

- Inspectors should address access and clearance issues up-front as part of the planning process, so that efforts can be made to avoid situations where access is denied. Inspectors will have to coordinate with facility operators in advance to determine which areas are restricted.

- EPA's policy is to meet special security or access requirements to the maximum extent possible.

- Where information has been classified or restricted for national security or other reasons, it must be maintained in accordance with the originating agency's requirements.

F.2. Access Denial

- If access is denied for any reason the issue should be raised to the appropriate levels of EPA or State management.

- If access is denied for reasons other than national security, standard denial of access procedures should be followed. If the denial is based on national security, alternate procedures must be followed.

G. SUMMARY

ALARA is a very important concept for personal safety.

Distance, time, and shielding are the primary methods for reducing radiation exposure.

Preparation for mixed waste inspections includes emphasis on regulations and waste management practices associated with mixed waste, radiation training, and security clearances.

V. PERMITTING MIXED WASTE FACILITIES

This section will identify similarities in objective and scope of the RCRA and AEA permit/license requirements, highlight areas of potential differences between RCRA and AEA requirements, and encourage the use of flexibility in applying RCRA permit standards.

This section compares NRC and EPA permitting/licensing requirements. DOE orders were not incorporated into this comparison because DOE orders are consistent with, but more general than NRC requirements, and DOE orders incorporate RCRA requirements.

NRC and EPA use different regulatory schemes to achieve their common goal of protecting health and the environment.

- NRC guidance specifies standards based on the potential radiological hazard contained in the system (i.e., low-level or high-level).

- RCRA regulatory standards are based on unit type (e.g., tanks or landfill).

A. PERMIT PROCEDURES

A.1. Applicability

- DOE facilities and NRC/NRC Agreement State licensees must comply with all applicable Federal, State, and local regulations concerning any toxic or hazardous properties of the waste.

- Owners/operators of mixed waste facilities must obtain RCRA permits.

- NRC issues licenses for disposal facilities, production and utilization facilities, and for the possession and use of source, by-product, and special nuclear material. These licenses contain very specific requirements which are part of NRC's comprehensive program to ensure radioactive materials are handled safely. This section will simply highlight some of these requirements and compare them to EPA requirements to provide EPA personnel with information so they can prepare themselves for regulating mixed waste.

A.2. The Application

- NRC license and EPA permit information requirements overlap to some extent; however, each serves a different purpose. Specific information required for a RCRA Part A permit includes: information on the type, annual quantity, and processes to be used for each hazardous waste; SIC codes; and a list of other permits received or applied for by the facility.

- Specific information required for a RCRA Part B permit application includes: information on chemical and physical analyses; a copy of the waste analysis plan; a description of precautions to prevent accidental ignition or reaction; ground-water monitoring information; and information requirements for each type of process unit.

- NRC's licensing procedures generally require an appropriate Environmental Monitoring Program and a Radiation Safety Program, which include monitoring of any radioactive effluents. These programs may not provide all the information necessary to satisfy RCRA's permit application requirement for ground-water monitoring information.

- The detailed and extensive Part B information requirements for each type of process unit are not included in NRC's regulatory requirements. NRC, however, has a general authority to require additional information.

A.3. Public Participation

- Public participation requirements such as public notice, public comment, and public hearings are incorporated into both EPA and NRC regulations.

- All NRC licensing actions are subject to requests for hearings by affected parties.

- The processes are similar although the specific procedures and the timing differ.

A.4. Timeframe for Permit Issuance

- RCRA final permit decisions are issued after the close of the public comment period on the draft permit.
- NRC final license decisions (for production and utilization facilities) are issued after a formal evidentiary hearing.
- There are no specific timeframes for issuing decisions under RCRA or NRC regulations.

B. TECHNICAL PROCESS REQUIREMENTS: TANKS AND CONTAINER STORAGE

B.1. Tank and Container Requirements

- EPA and NRC container requirements are consistent.
- NRC tanks have provisions to monitor liquid levels, raise alarms at high level setpoints, and withstand the corrosive nature of wet waste.
- RCRA secondary containment requirements include a combination of containment system and design to prevent uncontrolled releases.
- Storage structures at NRC licensed facilities and at EPA permitted facilities are required to have curbs or elevated thresholds with floor drains and sumps.
- NRC requirements may in many cases yield a facility that meets all applicable RCRA requirements; however, a separate evaluation for compliance with RCRA will be necessary in all cases.
- Response to leaks or spills from tanks:
  - NRC storage areas are designed to handle accidents, and provisions are incorporated into NRC licenses to route spilled wet waste to treatment systems.
  - The contingency plans in RCRA permits must include procedures for response to leaks or spills from tanks.

B.2. Facility Self-Inspection Requirements

- NRC requires that storage facilities implement a range of inspection techniques designed to minimize occupational exposure including: surveillance programs capable of prompt detection of failure and measurement of releases; and quarterly visual inspections (conducted through the use of TV monitors, walk-throughs, or representative containers).
- EPA requires that facilities implement specific self-inspection measures, such as use of an inspection log, and daily and weekly inspections.
- Consideration:
  - EPA maintains a practice of walk-through inspections, which may not be feasible when inspecting mixed waste facilities and may conflict with NRC policy; however, at many mixed waste facilities walk through inspections will not be a problem. In addition, walk-through inspections are not

specifically required in RCRA. Other means of inspecting a facility will satisfy EPA regulations. The ALARA process should not be degraded.

- Options to resolve differences:

  - A mixed waste storage facility could be designed to accommodate RCRA walk-through inspections.

  - An owner/operator could obtain clarification from EPA that the types of inspections allowed by NRC are adequate for RCRA requirements.

- Before EPA personnel suggest an alternative design for a mixed waste storage facility, they should consider the rationale behind the original design. For example, low-level waste containers may be used as shielding for high-level waste container, and thus, segregating the storage area may not be the most practical solution.

C. TECHNICAL PROCESS REQUIREMENTS: INCINERATION

- Incineration is licensed by NRC and permitted by EPA on a case-by-case basis under national performance standards.

- Biomedical wastes which meet the requirements of 10 CFR 20.306 may be incinerated without an NRC license. This provision allows disposal or incineration without regard to radioactivity, if the radioactivity of the waste is below regulatory concern.

- NRC licensees must comply with EPA regulations governing the incineration of any hazardous or toxic property of wastes that meet the 40 CFR Part 261 definition of hazardous waste.

C.1. Recordkeeping

- NRC and EPA require records of waste disposal and emission releases.

- NRC requires that records of disposal of licensed materials are to be maintained until NRC authorizes their disposition [§20.401(c)(3)]. NRC also requires that records of the results of surveys to evaluate the release of radioactive effluents to the environment must be maintained until NRC authorizes their disposition [§20.401(c)(2)(iii)].

- EPA requires the owner or operator to keep a written operating record at the facility until closure. The operating record must include:

  - a description and quantity of the waste received with the methods and dates of its disposal;
  - the location and quantity of the waste within the facility;
  - results of waste analysis;
  - monitoring, testing, or analytical data, if required;
  - notices to generators, for off-site facilities;
  - summary reports and details of incidents that require contingency plan implementation; and
  - closure cost estimates [§264.73].

C.2. Performance Requirements

- NRC performance requirements specify maximum dose levels in emission.

- EPA's performance requirements generally are "percent reduction" standards.

  -- EPA permitted incinerators must achieve a destruction and removal efficiency (DRE) of either 99.99% or 99.9999% depending on the constituents of concern.

C.3. Operating Requirements

- NRC and EPA specify license/permit operating requirements which will meet the performance requirements.

- NRC lists numerical guides for limiting conditions for operations to meet ALARA (i.e., as low as reasonably achievable) criteria for radioactive material in nuclear power plant effluents. All other licensees comply with ALARA on a case-specific basis. [10 CFR Part 50, Appendix I]

- EPA lists specific operating requirements, including the requirement that the fugitive emissions from the combustion zone must be controlled by either keeping the combustion zone sealed against fugitive emissions, maintaining a combustion zone pressure lower than atmospheric pressure, or an alternative means of control. [40 CFR 264.345(d)]

C.4. Monitoring

- NRC requires that each licensee survey emissions to remain in compliance with the regulations in 10 CFR Part 20 and to evaluate the extent of radiation hazards that may be present. [§20.201]

  -- NRC also has other specific requirements for certain types of licensees.

- EPA monitoring requirements include the requirement that the owner or operator must conduct the following monitoring.

  -- Monitoring of combustion temperature, waste feed rates, and gas velocity on a continuous basis.

  -- Carbon monoxide monitoring at a point in the incinerator downstream of the combustion zone and prior to release to the atmosphere on a continuous basis.

  -- Sampling and analysis of the waste and exhaust emissions upon request of the Regional Administrator. [40 CFR 264.347(a)]

C.5. Consideration

- EPA and NRC requirements for incinerators are developed on a case-by-case basis; thus incorporating both sets of regulations is relatively easy.

D. TECHNICAL PROCESS REQUIREMENTS: DISPOSAL

D.1. Licenses for Disposal

- Source, by-product, and special nuclear material licenses may allow for on-site disposal if disposal process is approved by NRC. [10 CFR 20.302]

  -- Licensee or applicant must submit an application for approval of the proposed disposal. The application must include a description of the licensed material, any other radioactive material involved, the proposed manner and conditions of disposal, an analysis and evaluation of pertinent information as to the environment, usage of ground and surface waters in the general area, the nature of other potentially affected facilities, and the procedures to be observed to minimize the risk of unexpected or hazardous exposures.

- Source, by-product, and special nuclear licensees may disposal of waste into a sanitary sewerage system, if the waste is readily soluble or dispersible in water and meets specific quantity limitations. In addition, waste that meets certain quantity and type specifications may be disposed of without regard to its radioactivity. [10 CFR 20.303]

- Disposal of low-level radioactive waste received from other persons (i.e., commercial disposal) requires a separate disposal license.

D.2. Typical NRC Disposal Practice

- "Near surface" disposal involves disposal into the uppermost portion of the earth (i.e., within approximately 30 meters of the surface).

- High-integrity containers can be used for disposal.

- Design and operating requirements minimize migration of radiological contamination.

D.3. Objectives of the Conceptual Design of a Mixed Waste Disposal Facility

- NRC emphasizes the prevention of entrance of liquids into the unit (i.e., water contact with radioactive waste should be minimized).

- EPA emphasizes the prevention of release of hazardous constituents from the unit (i.e., contaminants should not leach from the unit).

- The conceptual design of a mixed waste disposal facility requires that mixed low-level waste be placed above the original ground surface in tumulus and blended into topography. The conceptual design integrates two liners and a leachate collection system and minimize contact between waste and water. The design also assures long-term stability while minimizing the need for active maintenance after site closure.

D.4. Liners and Leachate Collection Systems

- NRC regulations do not specify liner or leachate collection and removal requirements. NRC emphasizes eliminating the infiltration of liquids into the unit to create a passively protective system where the need for active maintenance is minimized.

- Caution must be taken to prevent a "bathtub effect" from the use of RCRA liners in mixed waste units whereby the waste could become immersed in water within the disposal unit due to a low permeability bottom surface.

- RCRA systems for leachate collection and removal must be installed above and between double liners.

- Consideration:

  - EPA and NRC design and operating requirements are based on different objectives.

  - Incorporating both sets of objectives into one facility may be difficult.

- Options to resolve differences:

  - Exceptions to EPA's double liner and leachate collection system requirements are allowed if alternate design and operating practices, and location characteristics are demonstrated to the Regional Administrator's satisfaction.

  - Alternatives are to be demonstrated to the Regional Administrator to be equally effective in preventing the migration of any hazardous constituents into the ground water or surface water. (Refer to Appendix O; OSWER Directive 9487.00-8: Joint NRC-EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities, August 3, 1987.)

  - Also see Appendix P; OSWER Directive 9480.00-14: Combined NRC/EPA Siting Guidelines for Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Waste, June 1987.

- In the conceptual design of a double liner and leachate collection system at a mixed waste facility the perimeter berm for leachate runoff control assures that leachate is collected below the waste. In addition, the bottom elevation of solidified waste is required to be above top of the perimeter berm.

- Using this design for a double liner and leachate collection system will satisfy the NRC requirement to minimize contact of waste with water.

D.5. Covers

- NRC covers must limit the radiation dose rate at the surface of the cover.

  - Mixed waste containing Class C waste must be under cover of sufficient thickness to protect against inadvertent intrusion.

- NRC regulations (10 CFR 61.52) specify that waste must be placed and covered in a manner that limits the radiation dose rate at the surface of the cover to levels that at a minimum will permit the licensee to comply with the provisions of 10 CFR 20.105. NRC regulation 10 CFR 20.105 specifies the permissible levels of radiation in unrestricted areas.

- Both NRC and EPA covers are designed to minimize infiltration, promote drainage, minimize erosion, and require minimum maintenance.

- According to the conceptual design additional compacted clay liner should be placed immediately above emplaced waste if the solidified waste zone does not consist of engineered vault structure with a top roof.

- Conceptual design of a cover system at a mixed waste disposal facility consists of an outer rock or vegetative layer, a filter and drainage layer to transmit infiltrating water, an impervious flexible membrane liner (FML) overlying a clay liner, and a filter and drainage layer beneath the clay liner.

E. TECHNICAL PROCESS REQUIREMENTS: OTHER TREATMENT TECHNOLOGIES (SUBPART X)

Miscellaneous treatment units regulated under Subpart X may be used to treat mixed waste.

Subpart X units must prevent migration of waste constituents to ground water, subsurface environment, surface water, wetlands, soil surface, and air.

NRC design should minimize intrusion of water into waste.

There are several examples of miscellaneous units that may be applicable to mixed waste considerations.

- Geological repositories which includes salt mines, caves, and domes, as long as they are not underground injection wells.

- Certain chemical, physical, or biological treatment units for which there are no standards, and certain types of thermal treatment units.

EPA can apply any appropriate regulations to a Subpart X unit.

Consideration:

- In some cases, the unique design approaches used to treat, store, or dispose of mixed waste may be more appropriately identified as miscellaneous units.

F. OTHER REGULATORY REQUIREMENTS

F.1. Omnibus Provision

- The omnibus provision of RCRA allows EPA to incorporate any requirements the Administrator determines to be necessary to protect human health and the environment into permit conditions.

  - Permit writers may incorporate any requirement linked to the management of hazardous constituents (but not broadening the regulated universe) if it is based on protection of human health and the environment (§3005(c)(3)).

F.2. Location Standards

- Hydrologic criteria and long-term stability criteria are generally consistent between the RCRA and NRC programs.

- Both EPA and NRC require that a disposal site be suitable for conducting analysis to determine whether performance standards can be met.

F.3. Ground-Water Protection Standards

- EPA and NRC both have the objective of minimizing contamination of the ground water.
- EPA and NRC both require ground-water monitoring and evaluation of the impact and corrective measures.
- EPA and NRC requirements differ in some respects, for example in point of compliance.

F.2. Corrective Action - Plans

- Commercial NRC disposal facilities are required to submit plans at the time of license application to account for the possibility of needing corrective measures if migration of radionuclides indicates that performance objectives may not be met. Beyond the requirement to submit decommissioning plans in advance, remedial activities, if necessary, are developed and required on a site-specific basis.
- Licensees of source, by-product, and special nuclear materials must submit plans for decontamination when applying for site closure only as regards residual radioactive contamination remaining at the time the license expires. Licenses are not terminated until radioactivity levels are suitable for unrestricted use.
- There is a distinction between decommissioning and corrective action as used in the RCRA sense.
- Consideration:
  - -- Permit writers need to consider the extent of sampling to determine the rate and extent of releases, given the potential risk associated with radioactive mixed waste.
  - -- An NRC licensee (or DOE facility) may be required to take samples of mixed waste; however, in determining the necessary level of sampling, they should consider the potential risk involved with such sampling and analysis due to radioactivity.
- Options to resolve differences:
  - -- Limited sampling, and/or
  - -- Model fate and transport.

F.3. Waste Analysis

- EPA requires owners or operators to obtain a detailed physical and chemical analysis of a representative sample of their waste.
- NRC requires that the license application for disposal facilities include a description of the radioactive materials proposed to be received, possessed, and disposed of at a land disposal facility.

- Waste analysis is required to assure that owner/operators have sufficient information on the properties of the waste to be able to treat, store, or dispose of the waste in a safe and appropriate manner.

- The waste analysis may include data developed by the generator and existing published or documented data on the hazardous waste or on hazardous waste generated from similar processes.

- RCRA waste analysis plans should incorporate information from applicable DOE or NRC requirements concerning sampling and testing.

- If the owner/operator has to sample and analyze the waste, all necessary mixed waste testing must be conducted in laboratories licensed to handle radioactive waste.

- Only testing of a representative sample of the waste is required to ensure proper waste management.

- Note, for DOE facilities waste analysis may be conducted at a DOE facility approved for radioactive testing.

- Considerations:

  - Sample size, and

  - Exposure.

- Options to resolve differences:

  - Rely on knowledge of process to the greatest extent possible,

  - Limit sampling activities to the minimum necessary, and

  - Invoke alternative test methods as appropriate (40 CFR 260.21).

F.4. Land Disposal Restrictions (LDRs)

- Mixed waste containing scheduled waste will not be restricted until the Third Third rule (i.e., May 8, 1990); however, mixed waste containing California List waste and Solvent and Dioxin waste is restricted from land disposal unless treated.

  - The EPA Administrator may grant a national capacity extension based on insufficient capacity nationwide.

- LDRs may restrict the storage of some mixed wastes.

- If treatment of mixed waste containing a restricted waste is impractical, the generator may submit a treatability variance which fulfills the requirements of 40 CFR Part 268.44.

- A petition submitted by a generator to demonstrate that there will be no migration of the hazardous constituents in mixed waste must comply with the requirements of 40 CFR 268.6.

- Consideration:

  - There are difficulties in treating mixed waste in order to comply with the LDRs.

- Options to resolve differences:

  - The generator may submit a petition for a treatability variance, or
  - A facility may submit a no migration petition demonstrating that there will be no migration for as long as the waste remains hazardous. If this petition is approved by the Administrator the facility will be exempt from the LDRs.

F.5. Closure and Post-Closure - Planning

- Written closure plans are required for NRC disposal facilities, and written decommissioning plans are required for other source, by-product, and special nuclear material licensees. (NRC decommissioning is comparable to RCRA closure.

- Written closure plans are required for all processes under RCRA.

- RCRA requirements and guidance for post-closure care are prescriptive.

- NRC closure is intended to prepare the facility so ongoing active maintenance is not required during the 100-year period of institutional control. In comparison, EPA closure is intended to minimize the need for further maintenance and to control or eliminate releases.

- Prior to licensing facilities must make arrangements for State or Federal institutional control for responsibility for post-closure care. Similarly, RCRA post-closure plans must be submitted with permit application or submitted independently if closure occurs prior to permitting.

F.5.1. *Closure*

- Closure requirements for commercial NRC disposal licensees address maintenance of package integrity during waste emplacement, minimization of void spaces between packages, depth of waste emplacement, covering the waste, boundaries of the disposal unit, and buffer zones.

- Closure concerns for NRC disposal facilities are similar to RCRA's.

- Non-radioactive waste is not necessarily addressed in NRC closure plans.

F.5.2. *Decommissioning*

- Decommissioning requirements for NRC licensees of source, by-product, or special nuclear materials involve removing the facility safely from service, and reducing residual radioactivity levels so the area is suitable for unrestricted use.

- Non-radioactive waste at an NRC facility is not subject to decommissioning requirements.

F.5.3. *Closure Plan Approval*

- Detailed NRC closure plans are approved by NRC prior to final closure.

- RCRA closure plans must be submitted and approved as part of permit issuance proceedings, and are continually updated, as changes at the site necessitate. RCRA also requires closure plans to be submitted independently if the facility plans to close before permit issuance.

F.5.4. *Closure Triggers*

- <u>Final</u> decommissioning or <u>final</u> closure of an NRC facility is triggered by license expiration if not renewed or cessation of operations.

- EPA's closure period is triggered by the receipt of the final volume of hazardous waste, the permit is revoked or expires and is not reissued, or operation ceases.

F.5.5. *Post-Closure Care*

- NRC requirements:

  - Five years post-closure observation and maintenance by licensee, after completing closure, to ensure that closure is stable.

  - Beyond this five-year period active ongoing maintenance is not required to maintain stability after closure.

  - Transfer license to site owner (i.e., the Federal or a State government) after post-closure observation and maintenance period.

  - In the license review a maximum 100 years institutional control may be considered.

F.5.6. *Post-Closure Care/Long-Term Care Activities*

- Institutional control requirements are not inconsistent with RCRA's post-closure care requirements.

- The length of both the 100-year and the 30-year periods may be reduced. (The 30 year post-closure care period under RCRA may also be extended (40 CFR 264.117).

F.6. <u>Financial Responsibility</u>

- Commercial NRC disposal facilities must provide financial assurances for closure and stabilization, as well as for institutional control.

- Source, by-product, and special nuclear licensees must provide financial assurance for decommissioning.

- Financial responsibility requirements do not apply to Federal facilities (DOE managed facilities).

F.6.1. *Financial Responsibility for Closure*

- NRC (for commercial disposal facilities) and EPA both specify allowed mechanisms.

- NRC specifies many of the same mechanisms as allowed under RCRA, including surety bonds, irrevocable letters or lines of credit, trust funds, and combinations of the above.

- Similar to estimates of coverage amounts under RCRA coverage amounts for NRC licensees are based on required cost estimates. NRC cost estimates must reflect the activities in NRC-approved plan for disposal site closure and stabilization, and must take into account total capital costs that would be incurred if an independent contractor were hired to perform the closure and stabilization work.

- Coverage under NRC is for the five-year post-closure observation and maintenance period, as well as for the site closure and stabilization.

F.6.2. *Financial Responsibility for Long-Term Care*

- Prior to the issuance of the license, commercial NRC disposal license applicants must demonstrate a "binding agreement," such as a lease, with the owner (i.e., the Federal or a State government) that ensures sufficient funds are available to cover the cost of monitoring and any required maintenance during the institutional control period.

- The binding agreement must be approved by NRC prior to license issuance and reviewed by NRC periodically to ensure that changes in inflation, technology, and disposal facility operations are reflected in the agreement.

- Financial mechanisms are specified, and the amount of funds is not specified in the regulation but generally would be based on required cost estimates.

F.6.3. *Liability*

- There are no NRC liability coverage requirements, although requirements are being considered.

- The liability coverage for the three commercial disposal facilities is applicable only to liability from radioactive hazards, and, excludes claims resulting from hazardous waste.

- Owner/operators of mixed waste facilities must obtain coverage for third-party liability.

- In Agreement States, low-level radioactive disposal facilities may be subject to State liability assurance regulations. However, coverage pursuant to such regulations may be limited to third-party claims resulting from exposure to radionuclides and would thus exclude claims resulting from hazardous waste.

F.6.4. *Consideration*

- NRC and EPA financial coverage requirements are similar, and in some cases NRC licensees may already have overlapping coverage.

F.7. Summary

- Similarities between NRC and EPA requirements are extensive.
- Permitting objectives can be met with a flexible approach to detailed requirements.

MIXED WASTE TRAINING COURSE

RELEVANT ACRONYMS

AEA	Atomic Energy Act of 1954, as amended
ALARA	As Low As Reasonably Achievable
BRC	Below Regulatory Concern
Bq	Becquerel (i.e., $2.7x10^{-11}$ Ci; unit rate of radioactive decay)
C-14	Carbon-14 (radioactive)
CFC	chlorinated fluorocarbon
CFR	Code of Federal Regulations
Ci	Curie (i.e., the amount of any radionuclide that undergoes $3.7x10^{10}$ decays/second; unit rate of radioactive decay)
DOE	Department of Energy
EP	Extraction Procedure
EPA	Environmental Protection Agency
ergs	erg (i.e., 625,000 MeV; unit of energy)
FML	flexible membrane liner
FR	Federal Register
Gy	Gray (i.e., 100 rad; international unit of absorbed dose)
H-3	Hydrogen-3 or Tritium (radioactive)
INEL	Idaho National Engineering Laboratory (DOE faciliity)
LDR	Land Disposal Restriction
LET	Linear Energy Transfer
MeV	Million electron volts (extremely small unit of energy)
MOU	Memorandum of Understanding
mrem	millirem (i.e., $1x10^{-3}$ rem)
NARM	Naturally occurring or Accelerator Produced Radioactive Material
nCi	nanoCurie (i.e., $1x10^{-9}$ Curies)
NPDES	National Pollutant Discharge Elimination System
NRC	Nuclear Regulatory Commission
ORP	Office of Radiation Programs (EPA)
OSHA	Occupational Safety and Health Administration
OSW	Office of Solid Waste (EPA)
R	Roentgen (i.e., 86.9 ergs/gram of air; unit of radiation exposure)
rad	radiation absorbed dose (i.e., 100 ergs/gram; absorbed radiation per mass of tissue)
RCRA	Resource Conservation and Recovery Act of 1976, as amended
rem	Roentgen equivalent man; a unit for dose equivalent

RFI	RCRA Facility Inspection
SIC	Standard Industrial Classification
SRS	Savannah River Site (DOE facility)
SQG	Small Quantity Generators
Sv	Sievert (i.e., 100 rems; unit of dose equivalent)
TC	Toxicity Characteristic
TSCA	Toxic Substance Control Act of 1976
TSDF	Treatment Storage and Disposal Facility
WIPP	Waste Isolation Pilot Plant (DOE facility)
WL	Working Level (i.e., a unit of radioactivity used for radon)
WLM	Working Level Month (i.e., amount of radiation taken in by a person exposed to 1 WL for 1 month (170 hours))
VSI	Visual Site Inspection (RCRA)

Appendix A

Joint EPA/NRC Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Directive Number 9432.00)

United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

EPA

DIRECTIVE NUMBER: 9432.00-2

TITLE: Joint EPA/NRC Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste

APPROVAL DATE: January 8, 1987

EFFECTIVE DATE: NA

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REFERENCE (other documents):

OSWER OSWER OSWER

E DIRECTIVE DIRECTIVE D

TO ALL NRC LICENSEES:

SUBJECT: GUIDANCE ON THE DEFINITION AND IDENTIFICATION OF COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE AND ANSWERS TO ANTICIPATED QUESTIONS

Under the Resource Conservation and Recovery Act (RCRA), the U.S. Environmental Protection Agency (EPA) has jurisdiction over the disposal of solid wastes with the exception of source, byproduct, and special nuclear material, which are regulated by the U.S. Nuclear Regulatory Commission (NRC) under the Atomic Energy Act (AEA). Low-Level Radioactive Wastes (LLW) contain source, byproduct, or special nuclear materials, but they may also contain chemical constituents which are hazardous under EPA regulations in 40 CFR Part 261. Such wastes are commonly referred to as Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW).

NRC regulations exist to control the byproduct, source, and special nuclear material components of the Mixed LLW; EPA has the authority and continues to develop regulations to control the hazardous component of the Mixed LLW. Thus, all of the individual constituents of Mixed LLW are subject to either NRC or EPA regulations. However, when the components are combined to become Mixed LLW, neither agency has exclusive jurisdiction under current Federal law. This had led to a situation of dual regulation where both agencies, NRC and EPA, regulate the same waste.

The enclosed document, "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste," was developed jointly by the NRC and EPA to aid commercial LLW generators in assessing whether they are currently generating Mixed LLW. This guidance is based on NRC and EPA regulations in effect on December 1, 1986. In addition to the definition and the methodology for identifying Mixed LLW, which we hereby endorse, the staff has prepared answers to anticipated questions from generators which are also included.

Sincerely,

John G. Davis, Director
Office of Nuclear Material
Safety and Safeguards
U. S. Nuclear Regulatory Commission

J. Winston Porter
Assistant Administrator
Office of Solid Waste
and Emergency Response
U.S. Environmental
Protection Agency

Enclosures:
As Stated

GUIDANCE ON THE DEFINITION AND IDENTIFICATION OF COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE

(87/01/05)

Definition

Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW) is defined as waste that satisfies the definition of low-level radioactive waste (LLW) in the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA) and contains hazardous waste that either (1) is listed as a hazardous waste in Subpart D of 40 CFR Part 261 or (2) causes the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261.

Identification

The policy provided in this guidance is developed for commercial LLW jointly by the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA). LLW that contains hazardous wastes defined under the Resource Conservation and Recovery Act (RCRA) is Mixed LLW. Under current Federal law, such waste is subject to regulation by NRC under the Atomic Energy Act (AEA), as amended, and by EPA under the AEA and RCRA, as amended. In the absence of legislation to the contrary, management and disposal of this waste must be conducted in compliance with NRC and EPA or equivalent state regulations.

This guidance presents a methodology (Figure 1) that may be used by generators of commercial LLW to identify Mixed LLW. Implementation of the methodology should identify Mixed LLW and aid generators in assessing whether they are currently generating Mixed LLW. Generators are cautioned, however, that application of the methodology does not affect the need to comply with applicable NRC and EPA regulations. Because EPA's regulations for hazardous waste are currently changing, generators should use applicable regulations that are in effect at the time of implementation of the methodology. This guidance has been prepared based on NRC and EPA regulations in effect on December 1, 1986.

Application of this methodology to identify Mixed LLW will reveal the complexities of the definition of Mixed LLW. If generators have specific questions about whether LLW is Mixed LLW, they should promptly contact the agencies by writing to the persons listed below.

For questions about whether the waste is low-level radioactive waste, contact:

Dr. Sher Bahadur
Division of Waste Management
Mail Stop 623-SS
U. S. Nuclear Regulatory Commission
Washington, DC 20555

For questions about whether the waste is hazardous waste, contact:

Mr. Alan Corson
Deputy Director
Characterization and Assessment Division
Mail Code WH-562B
U. S. Environmental Protection Agency
401 M Street, S.W.
Washington, DC 20460

Methodology

Step 1. Identify LLW

Step 1 in the methodology requires that the generator determine whether the waste is LLW as defined in the LLRWPAA. This Act defines LLW as radioactive material that (A) is not high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in section 11e.(2) of the AEA (i.e., uranium or thorium mill tailings) and (B) the NRC classifies as LLW consistent with existing law and in accordance with (A). If the generator determines that the waste is LLW, the generator should proceed to step 2. If the determination is negative, then the waste cannot be Mixed LLW because it is not LLW. However, the waste may be another radioactive or hazardous waste regulated under AEA, RCRA, or both statutes.

Step 2. Identify Listed Hazardous Waste

In step 2, the generator determines whether the LLW contains any hazardous wastes listed in Subpart D of 40 CFR Part 261. Subpart D of Part 261 is reproduced in Appendix I of this guidance. LLW is Mixed LLW if it contains any hazardous wastes specifically listed in Subpart D of 40 CFR Part 261. Listed hazardous wastes include hazardous waste streams from specific and non-specific sources listed in 40 CFR Parts 261.31 and 261.32 and discarded commercial chemical products listed in 40 CFR Part 261.33. The generator is responsible for determining whether LLW contains listed hazardous wastes. The determination should be based on knowledge of the process that generates the waste. For example, if a process produces LLW that contains spent solvents that are specifically listed in the tables of Subpart D of Part 261, the generator should suspect that the waste is Mixed LLW.

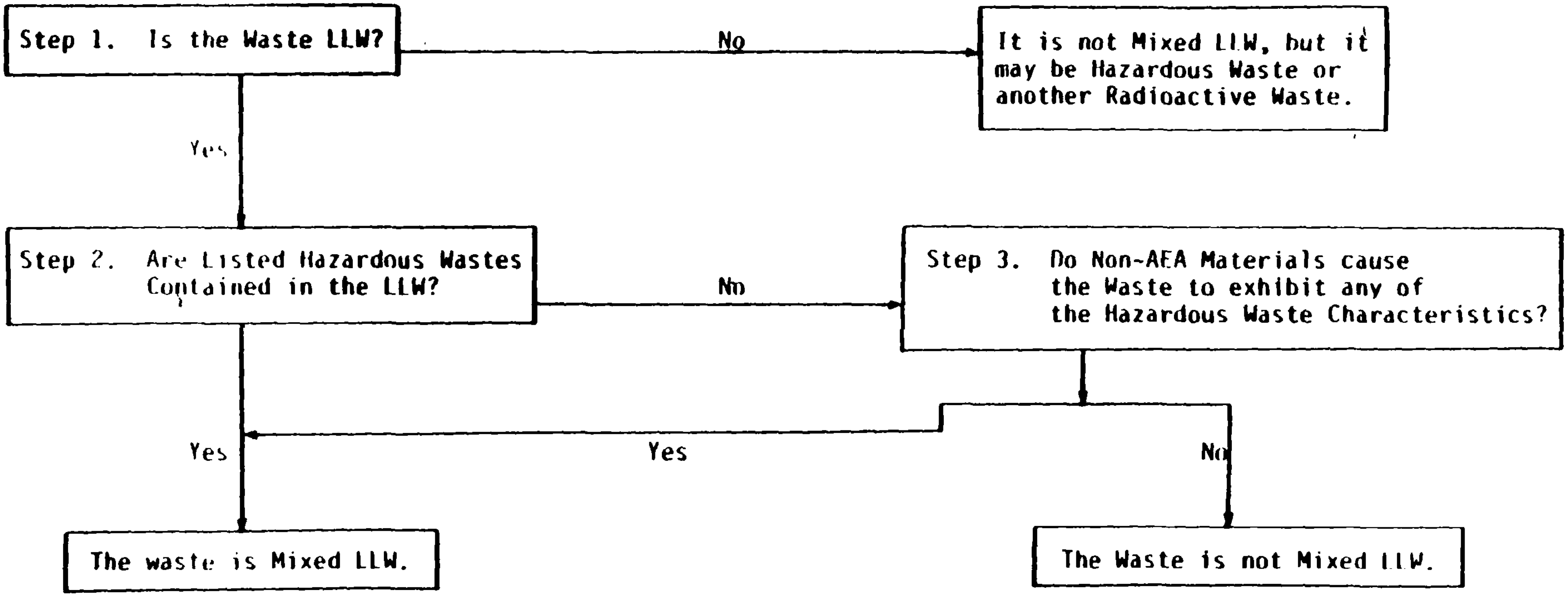

Figure 1. Identification of Mixed LLW.

Step 3. Identify Hazardous Characteristics

If the LLW does not contain a listed hazardous waste, Step 3 of the methodology requires the generator to determine whether the LLW contains hazardous wastes that cause the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261. This determination can be based on either (1) an assessment of whether the LLW exhibits one or more of the hazardous waste characteristics because it contains non-AEA materials (i.e., materials other than source, special nuclear, and byproduct materials) based on the generator's knowledge of the materials or processes used in generating the LLW or (2) testing of the LLW in accordance with the methods identified in Subpart C of Part 261. Except for certain ores containing source material, which are defined as source material in 10 CFR 40.4(h), and uranium and thorium mill tailings or wastes, NRC and EPA interpret the definitions of source, special nuclear, and byproduct materials to include only the radioactive elements themselves. Generators should identify non-AEA materials contained in the LLW by examining the process that generates the waste. For example, if the process mixes byproduct material (an AEA material) with a volatile organic solvent (a non-AEA material), the generator would test representative samples of the LLW that contain the solvent waste to determine if the waste exhibits any of the characteristics because it contains the solvent. If the generator selects testing as the basis for the determination, testing should be performed if there is reason to suspect that the waste contains non-AEA materials that may cause the LLW to exhibit the characteristics in Subpart C.

Under these circumstances, the generator should collect and test representative samples of the LLW to determine if the waste exhibits any of the characteristics identified in Subpart C because it contains the non-AEA materials. These characteristics include ignitability (§261.21), corrosivity (§261.22), reactivity (§261.23), and Extraction Procedure (EP) toxicity (§261.24). Waste testing should be conducted in a manner that is consistent with the worker protection requirements in 10 CFR Part 20. The purpose of the characteristics tests is to identify hazardous wastes that are not specifically listed in Subpart D of 40 CFR Part 261. Test methods to collect representative samples of wastes are described in Appendix I of 40 CFR Part 261. The samples should then be tested using the referenced testing protocols (e.g., ASTM Standard D-93-79 or D-93-80 for the Pensky-Martens Closed Cup Ignitability Test). EPA's testing requirements are reproduced in Appendix II of this guidance. It should be noted that on June 13, 1986, EPA proposed a modification to the EP Toxicity testing requirements to include organic constituents.

If LLW contains a listed hazardous waste or non-AEA materials that cause the LLW to exhibit any of the hazardous waste characteristics, the waste is Mixed LLW and must, therefore, be managed and disposed of in compliance with EPA's RCRA regulations in 40 CFR Parts 124, and 260 through 270, and NRC's regulations in 10 CFR Parts 20, 30, 40, 61, and 70. Management and disposal of Mixed LLW must be conducted in compliance with state requirements in states with EPA-authorized regulatory programs for the hazardous components of such waste and NRC agreement state radiation control programs for LLW.

Questions and Answers

As a supplement to the Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW), answers to anticipated questions are included to clarify obscure points and to stimulate additional questions from potential Mixed LLW generators.

1. Are my low-level radioactive wastes exempt from RCRA because they are source, special nuclear, or byproduct materials as defined under the AEA?

Except for certain ores containing source material, which are defined as source material in 10 CFR 40.4(h), and uranium and thorium mill tailings or wastes, NRC and EPA consider that only the radionuclides themselves are exempt from RCRA. Section 1004(27) of RCRA excludes source, special nuclear, and byproduct material from the definition of "solid waste." RCRA defines solid waste as:

> "any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, or from community activities, <u>but does not include</u> solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Water Pollution Control Act, as amended (86 Stat. 880), or <u>source, special nuclear, or byproduct material</u> as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923)." [emphasis added]

Since "hazardous waste" is a subset of "solid waste," RCRA also excludes source, special nuclear, and byproduct materials from the definition of hazardous waste and, therefore, from regulation under EPA's RCRA Subtitle C program. Section 11 of the Atomic Energy Act, as amended, defines these radioactive materials as follows:

> Source material means (1) uranium, thorium, or any other material which is determined by the Atomic Energy Commission (AEC) pursuant to the provisions of section 61 of the AEA to be source material, or (2) ores containing one or more of the foregoing materials, in such concentration as the AEC may by regulation determine from time to time.

> Special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the AEC, pursuant to the provisions of Section 51 of the AEA, determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

> Byproduct material means (1) any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to radiation incident to the process of producing or utilizing special nuclear

material, and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Source, special nuclear, and byproduct materials, however, may be mixed with other radioactive or non-radioactive materials that are not source, special nuclear, or byproduct materials. For example, tritium may be contained in toluene, a nonhalogenated aromatic solvent. Consistent with the definition of byproduct material, the tritium may be considered a byproduct material, while the toluene that contains the tritium would not be byproduct material. Mixtures of toluene and tritium could satisfy the definition of Mixed LLW because they contain listed hazardous waste (spent toluene) and tritium that may qualify as LLW if it has been produced by activities regulated by NRC under the AEA.

2. What are some examples of Mixed LLW?

A preliminary survey performed for the NRC identified two potential types of Mixed LLW:

- LLW containing organic liquids, such as scintillation liquids and vials; organic lab liquids; sludges; and cleaning, degreasing, and miscellaneous solvents.

- LLW containing heavy metals, such as discarded lead shielding, discarded lined containers, and lead oxide dross containing uranium oxide; light water reactor (LWR) process wastes containing chromate and LWR decontamination resins containing chromium; and mercury amalgam in trash.

The preliminary survey concluded that potential Mixed LLW comprises a small percentage of all LLW. For example, LLW containing organic liquids accounted for approximately 2.3% by volume of LLW reported in the preliminary survey (Bowerman, et al., 1985).

An earlier survey identified a more diverse universe of potential Mixed LLW including wastes that contained aldehydes, aliphatic halogenated hydrocarbons, alkanes, alkenes, amino acids, aromatic hydrocarbons, chelating agents, esters, ethers, ketones, nitrosamines, nucleotides, pesticides, phenolic compounds, purines, resins, steroids, and vitamins (General Research Corporation, 1980). NRC also anticipates that additional LLW may be identified as Mixed LLW in the future, as generators implement the definition of Mixed LLW and as EPA revises the definition of hazardous waste.

3. Could some "below regulatory concern" wastes be considered Mixed LLW?

A determination that radioactive wastes are below regulatory concern (BRC) for radioactivity may affect how the wastes are managed or discarded, but it does not affect the legal status of the wastes. Specifically, their status with respect to the definition of Mixed LLW does not change. BRC waste is still LLW because it satisfies the definition of LLW in the LLRWPAA and is within the NRC's jurisdictional authority under the AEA.

When radioactive waste contains sufficiently low concentrations or quantities of radionuclides, NRC may find that they do not need to be managed or disposed of as radioactive wastes. For NRC to make such a finding, management and disposal of the waste must not pose an undue radiological risk to the public and the environment. However, NRC's determination that the radioactive content of the wastes is below NRC regulatory concern does not relieve licensees from compliance with applicable rules of other agencies governing non-radiological hazards (e.g., regulations of EPA or the Department of Transportation).

Therefore, some BRC wastes may still be considered Mixed LLW if they contain hazardous wastes that have been listed in Subpart D of 40 CFR Part 261 or that cause the LLW to exhibit any of the hazardous characteristics described in Subpart C of 40 CFR Part 261. BRC Mixed LLW may be managed without regard to its radioactivity (but it must still be managed as a hazardous waste in compliance with EPA's regulations for hazardous waste generation, storage, transportation, treatment, and disposal (cf. 40 CFR Parts 262 through 266)).

4. If I use chemicals in my process that are identified by EPA as hazardous constituents, should I assume that my LLW is Mixed LLW?

No. Low-level radioactive waste that contains hazardous constituents may not necessarily be Mixed LLW. As defined above, Mixed LLW is LLW that contains a known hazardous waste (i.e., a listed hazardous waste) or that exhibits one or more of the hazardous characteristics because it contains non-AEA materials. For wastes that are not listed in Subpart D of 40 CFR Part 261, testing is not necessarily required to "determine" whether the LLW exhibits any of the hazardous characteristics. A generator may be able to determine whether the LLW is Mixed LLW based on knowledge of the waste characteristics or the process that generates the LLW.

Furthermore, if the generator normally segregates LLW from hazardous and other types of wastes, there is no need to assume that hazardous wastes may have been inadvertently mixed with LLW or to inspect each container or receptacle to ensure that inadvertent mixing has not occurred. Although the generator is subject to RCRA inspections and must follow the manifest, pre-transport, and other requirements of 40 CFR Part 262, the generator is not required to demonstrate that every LLW container does not contain hazardous waste.

5. What are EPA and NRC currently doing to address the Mixed LLW issue, and what should generators do in the interim before a regulatory program for Mixed LLW is established?

An incentive exists for generators to minimize the generation of Mixed LLW because Mixed LLW must currently be managed and disposed of in compliance with the regulatory controls of both EPA and NRC. These dual regulatory controls complicate management and disposal of the waste. NRC and EPA are presently working together to develop guidance for generators and disposal site operators on the management, treatment, and disposal of Mixed LLW. In the interim, generators are encouraged to minimize the generation of Mixed LLW through management practices such as waste segregation and materials tracking. Generators and waste handlers are also encouraged to consider treatment techniques to reduce the amount and hazards of Mixed LLW requiring licensed land disposal. Kempf et al (1986) prepared a preliminary evaluation of current practices and potential management options for Mixed LLW. Current disposal site operators must develop and operate facilities to dispose of Mixed LLW in compliance with both NRC and EPA requirements or cease disposing of Mixed LLW. Licensees should recognize that all of these activities must be performed in compliance with applicable NRC requirements in 10 CFR Parts 20, 30, 40, 50, 61, and 70, and applicable EPA requirements in 40 CFR Parts 124, and 260 through 270, or applicable State requirements.

6. What should I do if I believe that the RCRA regulations are inconsistent with the AEA regulations?

Section 1006 of RCRA states that, "Nothing in this Act shall be construed to apply to (or to authorize any state, interstate, or local authority to regulate any activity or substance which is subject to . . . the Atomic Energy Act of 1954 (42 U. S. C. 2011 and following) except to the extent that such application (or regulation) is not inconsistent with the requirements of such [Act]." This provision allows the modification of the RCRA requirements when they are found to be inconsistent with the AEA requirements. "Inconsistent" includes situations where satisfying both sets of regulations (RCRA and AEA regulations) would increase the radiation hazard, would be technically infeasible, or would violate national security interests. Variances from the RCRA requirements may be granted to generators, transporters, and facilities that treat, store, or dispose of Mixed LLW.

NRC licensees may petition for variances from RCRA requirements when they believe that application of one or more of these requirements would be inconsistent with the AEA. NRC licensees should first discuss the inconsistency with NRC prior to preparing the petition. NRC's review will ensure that the licensees' interpretations of the AEA requirements are correct and that the reasons for the variance petition are technically sound.

7. How can I obtain representative samples of heterogeneous trash included in LLW to perform the hazardous characteristics tests?

Before discussing the collection of representative samples of waste, generators are reminded that they are not required to test all LLW to determine if the waste contains hazardous wastes that cause the LLW to exhibit the hazardous waste characteristics. Such comprehensive testing of all LLW would likely violate the principle of keeping radiological exposures as low as is reasonably achievable. Generators should select testing as a basis for determining whether the LLW exhibits any of the hazardous waste characteristics if they cannot make the determination based on their knowledge of the process that generates the LLW.

Representative samples of waste should be collected for testing in accordance with EPA's regulations in 40 CFR Part 261.20(c), which state that waste samples collected using applicable methods specified in Appendix I of Part 261 will be considered as representative samples for hazardous characteristics testing. This appendix has been included in its entirety in Appendix II of this guidance. The sampling techniques described in Appendix I of Part 261 apply to extremely viscous liquids, fly ash-like material, containerized liquid wastes, and liquid wastes in pits, ponds, lagoons, and similar reservoirs. In the absence of guidance about sampling heterogeneous wastes, generators should use appropriate portions of the sampling methods described in Appendix I of Part 261 in combination with other methods to collect, to the maximum extent practicable, representative samples of the waste to be tested.

References

Bowerman, B. S., Kempf, C. R., MacKenzie, D. R., Siskind, B. and P. L. Piciulo, 1985, "An Analysis of Low-Level Wastes: Review of Hazardous Waste Regulations and Identification of Radioactive Mixed Wastes," NUREG/CR-4406, U. S. Nuclear Regulatory Commission.

General Research Corporation, 1980, "Study of Chemical Toxicity of Low-Level Wastes," NUREG/CR-1793, U. S. Nuclear Regulatory Commission.

Kempf, C. R., MacKenzie, D. R., and B. S. Bowerman, 1986, "Management of Radioactive Mixed Wastes in Commercial Low-Level Wastes," NUREG/CR-4450, U. S. Nuclear Regulatory Commission.

Appendix I

Subpart D—Lists of Hazardous Wastes

§ 261.30 General.

(a) A solid waste is a hazardous waste if it is listed in this subpart, unless it has been excluded from this list under §§ 260.20 and 260.22.

(b) The Administrator will indicate his basis for listing the classes or types of wastes listed in this Subpart by employing one or more of the following Hazard Codes:

Ignitable Waste	(I)
Corrosive Waste	(C)
Reactive Waste	(R)
EP Toxic Waste	(E)
Acute Hazardous Waste	(H)
Toxic Waste	(T)

Appendix VII identifies the constituent which caused the Administrator to list the waste as an EP Toxic Waste (E) or Toxic Waste (T) in §§ 261.31 and 261.32.

(c) Each hazardous waste listed in this subpart is assigned an EPA Hazardous Waste Number which precedes the name of the waste. This number must be used in complying with the notification requirements of Section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265 and Part 270 of this chapter.

(d) The following hazardous wastes listed in § 261.31 or § 261.32 are subject to the exclusion limits for acutely hazardous wastes established in § 261.5: EPA Hazardous Wastes Nos. FO20, FO21, FO22, FO23, FO26, and FO27.

[45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983; 50 FR 2000, Jan. 14, 1985]

§ 261.31 Hazardous wastes from non-specific sources.

The following solid wastes are listed hazardous wastes from non-specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Generic		
F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004 and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F002	The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and the still bottoms from the recovery of these solvents.	(T)
F003	The following spent non-halogenated solvents: Xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; and the still bottoms from the recovery of these solvents.	(I)*
F004	The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I, T)
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum.	(T)
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum.	(T)
F007	Spent cyanide plating bath solutions from electroplating operations.	(R, T)
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process.	(R, T)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process.	(R, T)
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process.	(R, T)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations.	(R, T)
F012	Quenching waste water treatment sludges from metal heat treating operations where cyanides are used in the process.	(T)
F024	Wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes. (This listing does not include light ends, spent filters and filter aids, spent dessicants, wastewater, wastewater treatment sludges, spent catalysts, and wastes listed in § 261.32.).	(T)
F020	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol.).	(H)
F021	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of Hexachlorophene from highly purified 2,4,5-trichlorophenol.).	(H)
F026	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing Hexachlorophene synthesized from prepurified 2,4,5-trichlorophenol as the sole component.).	(H)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.	(T)

[46 FR 4617, Jan. 16, 1981, as amended at 46 FR 27477, May 20, 1981; 49 FR 5312, Feb. 10, 1984; 49 FR 37070, Sept. 21, 1984; 50 FR 665, Jan. 4, 1985; 50 FR 2000, Jan. 14, 1985]

§ 261.32 Hazardous wastes from specific sources.

The following solid wastes are listed hazardous wastes from specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No	Hazardous waste	Hazard code
Wood preservation: K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol	(T)
Inorganic pigments:		
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments.	(T)
K003	Wastewater treatment sludge from the production of molybdate orange pigments	(T)
K004	Wastewater treatment sludge from the production of zinc yellow pigments	(T)
K005	Wastewater treatment sludge from the production of chrome green pigments	(T)
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated)	(T)
K007	Wastewater treatment sludge from the production of iron blue pigments	(T)
K008	Oven residue from the production of chrome oxide green pigments	(T)
Organic chemicals:		
K009	Distillation bottoms from the production of acetaldehyde from ethylene	(T)
K010	Distillation side cuts from the production of acetaldehyde from ethylene	(T)
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile	(R, T)
K013	Bottom stream from the acetonitrile column in the production of acrylonitrile	(R, T)
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile	(T)
K015	Still bottoms from the distillation of benzyl chloride	(T)
K016	Heavy ends or distillation residues from the production of carbon tetrachloride	(T)
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin	(T)
K018	Heavy ends from the fractionation column in ethyl chloride production	(T)
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production	(T)
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production	(T)
K021	Aqueous spent antimony catalyst waste from fluoromethanes production	(T)
K022	Distillation bottom tars from the production of phenol/acetone from cumene	(T)
K023	Distillation light ends from the production of phthalic anhydride from naphthalene	(T)
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene	(T)
K093	Distillation light ends from the production of phthalic anhydride from ortho-xylene	(T)
K094	Distillation bottoms from the production of phthalic anhydride from ortho-xylene	(T)
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene	(T)
K026	Stripping still tails from the production of methy ethyl pyridines	(T)
K027	Centrifuge and distillation residues from toluene diisocyanate production	(R, T)
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane	(T)
K029	Waste from the product steam stripper in the production of 1,1,1-trichloroethane	(T)
K095	Distillation bottoms from the production of 1,1,1-trichloroethane	(T)
K096	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane	(T)
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene	(T)
K083	Distillation bottoms from aniline production	(T)
K103	Process residues from aniline extraction from the production of aniline	(T)
K104	Combined wastewater streams generated from nitrobenzene/aniline production	(T)
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes	(T)
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.	(T)
Inorganic chemicals:		
K071	Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used.	(T)
K073	Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production	(T)
K106	Wastewater treatment sludge from the mercury cell process in chlorine production	(T)
Pesticides:		
K031	By-product salts generated in the production of MSMA and cacodylic acid	(T)
K032	Wastewater treatment sludge from the production of chlordane	(T)
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane	(T)
K034	Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane	(T)
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane.	(T)
K035	Wastewater treatment sludges generated in the production of creosote	(T)
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton	(T)
K037	Wastewater treatment sludges from the production of disulfoton	(T)
K038	Wastewater from the washing and stripping of phorate production	(T)
K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate	(T)
K040	Wastewater treatment sludge from the production of phorate	(T)
K041	Wastewater treatment sludge from the production of toxaphene	(T)
K098	Untreated process wastewater from the production of toxaphene	(T)

Industry and EPA hazardous waste No	Hazardous waste	Hazard code
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T	(T)
K043	2,6-Dichlorophenol waste from the production of 2,4-D	(T)
K099	Untreated wastewater from the production of 2,4-D	(T)
Explosives:		
K044	Wastewater treatment sludges from the manufacturing and processing of explosives	(R)
K045	Spent carbon from the treatment of wastewater containing explosives	(R)
K046	Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds	(T)
K047	Pink/red water from TNT operations	(R)
Petroleum refining:		
K048	Dissolved air flotation (DAF) float from the petroleum refining industry	(T)
K049	Slop oil emulsion solids from the petroleum refining industry	(T)
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry	(T)
K051	API separator sludge from the petroleum refining industry	(T)
K052	Tank bottoms (leaded) from the petroleum refining industry	(T)
Iron and steel:		
K061	Emission control dust/sludge from the primary production of steel in electric furnaces.	(T)
K062	Spent pickle liquor generated by steel finishing operations of plants that produce iron or steel.	(C,T)
Secondary lead:		
K069	Emission control dust/sludge from secondary lead smelting.	(T)
K100	Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting.	(T)
Veterinary pharmaceuticals:		
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
K101	Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
K102	Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
Ink formulation: K086	Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead.	(T)
Coking:		
K060	Ammonia still lime sludge from coking operations.	(T)
K087	Decanter tank tar sludge from coking operations.	(T)

[46 FR 4618, Jan. 16, 1981, as amended at 46 FR 27476-27477, May 20, 1981; 49 FR 37070, Sept. 21, 1984; 50 FR 42942, Oct. 23, 1985; 51 FR 5330, Feb. 13, 1986; 51 FR 19322, May 28, 1986]

EFFECTIVE DATE NOTE: At 51 FR 5330, Feb. 13, 1986, in § 261.32, waste streams "K117, K118, and K136" in the subgroup "Organic Chemicals" were added, effective August 13, 1986.

§ 261.33 Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof.

The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded, when they are mixed with waste oil or used oil or other material and applied to the land for dust suppression or road treatment, or when, in lieu of their original intended use, they are produced for use as (or as a component of) a fuel, distributed for use as a fuel, or burned as a fuel.

(a) Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section.

(b) Any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

(c) Any container or inner liner removed from a container that has been used to hold any commercial chemical product or manufacturing chemical intermediate having the generic names listed in paragraph (e) of this section, or any container or inner liner removed from a container that has been used to hold any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) of this section, unless the container is empty as defined in § 261.7(b)(3) of this chapter.

[*Comment:* Unless the residue is being beneficially used or reused, or legitimately recycled or reclaimed; or being accumulated, stored, transported or treated prior to such use, re-use, recycling or reclamation, EPA considers the residue to be intended for discard, and thus a hazardous waste. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commercial chemical product or manufacturing chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.]

(d) Any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section, or any residue or contaminated soil, water or other debris resulting from the cleanup of a spill, into or on any land or water, of any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

[*Comment:* The phrase "commercial chemical product or manufacturing chemical intermediate having the generic name listed in . . ." refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in paragraph (e) or (f). Where a manufacturing process waste is deemed to be a hazardous waste because it contains a substance listed in paragraph (e) or (f), such waste will be listed in either § 261.31 or § 261.32 or will be identified as a hazardous waste by the characteristics set forth in Subpart C of this part.]

(e) The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing chemical intermediates referred to in paragraphs (a) through (d) of this section, are identified as acute hazardous wastes (H) and are subject to be the small quantity exclusion defined in § 261.5(e).

[*Comment:* For the convenience of the regulated community the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), and R (Reactivity). Absence of a letter indicates that the compound only is listed for acute toxicity.]

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous waste No	Substance
P023	Acetaldehyde, chloro-
P002	Acetamide, N-(aminothioxomethyl)-
P057	Acetamide, 2-fluoro-
P058	Acetic acid, fluoro-, sodium salt
P066	Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-, methyl ester
P001	3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts, when present at concentrations greater than 0.3%
P002	1-Acetyl-2-thiourea
P003	Acrolein
P070	Aldicarb
P004	Aldrin
P005	Allyl alcohol
P006	Aluminum phosphide
P007	5-(Aminomethyl)-3-isoxazolol
P008	4-Aminopyridine
P009	Ammonium picrate (R)
P119	Ammonium vanadate
P010	Arsenic acid
P012	Arsenic (III) oxide
P011	Arsenic (V) oxide
P011	Arsenic pentoxide
P012	Arsenic trioxide
P038	Arsine, diethyl-
P054	Aziridine
P013	Barium cyanide
P024	Benzenamine, 4-chloro-
P077	Benzenamine, 4-nitro-
P028	Benzene, (chloromethyl)-
P042	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-
P014	Benzenethiol
P028	Benzyl chloride
P015	Beryllium dust
P016	Bis(chloromethyl) ether
P017	Bromoacetone
P018	Brucine
P021	Calcium cyanide
P123	Camphene, octachloro-
P103	Carbamimidoselenoic acid
P022	Carbon bisulfide
P022	Carbon disulfide
P095	Carbonyl chloride

Hazardous waste No	Substance
P033	Chlorine cyanide
P023	Chloroacetaldehyde
P024	p-Chloroaniline
P026	1-(o-Chlorophenyl)thiourea
P027	3-Chloropropionitrile
P029	Copper cyanides
P030	Cyanides (soluble cyanide salts), not elsewhere specified
P031	Cyanogen
P033	Cyanogen chloride
P036	Dichlorophenylarsine
P037	Dieldrin
P038	Diethylarsine
P039	O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate
P041	Diethyl-p-nitrophenyl phosphate
P040	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	Diisopropyl fluorophosphate
P044	Dimethoate
P045	3,3-Dimethyl-1-(methylthio)-2-butanone, O-[(methylamino)carbonyl] oxime
P071	O,O-Dimethyl O-p-nitrophenyl phosphorothioate
P082	Dimethylnitrosamine
P046	alpha, alpha-Dimethylphenethylamine
P047	4,6-Dinitro-o-cresol and salts
P034	4,6-Dinitro-o-cyclohexylphenol
P048	2,4-Dinitrophenol
P020	Dinoseb
P085	Diphosphoramide, octamethyl-
P039	Disulfoton
P049	2,4-Dithiobiuret
P109	Dithiopyrophosphoric acid, tetraethyl ester
P050	Endosulfan
P088	Endothall
P051	Endrin
P042	Epinephrine
P046	Ethanamine, 1,1-dimethyl-2-phenyl-
P084	Ethenamine, N-methyl-N-nitroso-
P101	Ethyl cyanide
P054	Ethylenimine
P097	Famphur
P056	Fluorine
P057	Fluoroacetamide
P058	Fluoroacetic acid, sodium salt
P065	Fulminic acid, mercury(II) salt (R,T)
P059	Heptachlor
P051	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,endo-1,4,5,8-dimethanonaphthalene
P037	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,exo-1,4,5,8-dimethanonaphthalene
P060	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo, endo-dimethanonaphthalene
P004	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo,exo-dimethanonaphthalene
P060	Hexachlorohexahydro-exo,exo-dimethanonaphthalene
P062	Hexaethyl tetraphosphate
P116	Hydrazinecarbothioamide
P068	Hydrazine, methyl-
P063	Hydrocyanic acid
P063	Hydrogen cyanide
P096	Hydrogen phosphide
P064	Isocyanic acid, methyl ester
P007	3(2H)-Isoxazolone, 5-(aminomethyl)-
P092	Mercury, (acetato-O)phenyl-
P065	Mercury fulminate (R,T)
P016	Methane, oxybis(chloro-

Hazardous waste No	Substance
P112	Methane, tetranitro- (R)
P118	Methanethiol, trichloro-
P059	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-
P066	Methomyl
P067	2-Methylaziridine
P068	Methyl hydrazine
P064	Methyl isocyanate
P069	2-Methyllactonitrile
P071	Methyl parathion
P072	alpha-Naphthylthiourea
P073	Nickel carbonyl
P074	Nickel cyanide
P074	Nickel(II) cyanide
P073	Nickel tetracarbonyl
P075	Nicotine and salts
P076	Nitric oxide
P077	p-Nitroaniline
P078	Nitrogen dioxide
P076	Nitrogen(II) oxide
P078	Nitrogen(IV) oxide
P081	Nitroglycerine (R)
P082	N-Nitrosodimethylamine
P084	N-Nitrosomethylvinylamine
P050	5-Norbornene-2,3-dimethanol, 1,4,5,6,7,7-hexachloro, cyclic sulfite
P085	Octamethylpyrophosphoramide
P087	Osmium oxide
P087	Osmium tetroxide
P088	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
P089	Parathion
P034	Phenol, 2-cyclohexyl-4,6-dinitro-
P048	Phenol, 2,4-dinitro-
P047	Phenol, 2,4-dinitro-6-methyl-
P020	Phenol, 2,4-dinitro-6-(1-methylpropyl)-
P009	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P036	Phenyl dichloroarsine
P092	Phenylmercuric acetate
P093	N-Phenylthiourea
P094	Phorate
P095	Phosgene
P096	Phosphine
P041	Phosphoric acid, diethyl p-nitrophenyl ester
P044	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl]ester
P043	Phosphorofluoric acid, bis(1-methylethyl)-ester
P094	Phosphorothioic acid, O,O-diethyl S-(ethylthio)methyl ester
P089	Phosphorothioic acid, O,O-diethyl O-(p-nitrophenyl) ester
P040	Phosphorothioic acid, O,O-diethyl O-pyrazinyl ester
P097	Phosphorothioic acid, O,O-dimethyl O-[p-((dimethylamino)-sulfonyl)phenyl]ester
P110	Plumbane, tetraethyl-
P098	Potassium cyanide
P099	Potassium silver cyanide
P070	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime
P101	Propanenitrile
P027	Propanenitrile, 3-chloro-
P069	Propanenitrile, 2-hydroxy-2-methyl-
P081	1,2,3-Propanetriol, trinitrate- (R)
P017	2-Propanone, 1-bromo-
P102	Propargyl alcohol
P003	2-Propenal
P005	2-Propen-1-ol
P067	1,2-Propylenimine
P102	2-Propyn-1-ol
P008	4-Pyridinamine

Hazardous waste No	Substance
P075	Pyridine, (S)-3-(1-methyl-2-pyrrolidinyl)-, and salts
P111	Pyrophosphoric acid, tetraethyl ester
P103	Selenourea
P104	Silver cyanide
P105	Sodium azide
P106	Sodium cyanide
P107	Strontium sulfide
P108	Strychnidin-10-one, and salts
P018	Strychnidin-10-one, 2,3-dimethoxy-
P108	Strychnine and salts
P115	Sulfuric acid, thallium(I) salt
P109	Tetraethyldithiopyrophosphate
P110	Tetraethyl lead
P111	Tetraethylpyrophosphate
P112	Tetranitromethane (R)
P062	Tetraphosphoric acid, hexaethyl ester
P113	Thallic oxide
P113	Thallium(III) oxide
P114	Thallium(I) selenite
P115	Thallium(I) sulfate
P045	Thiofanox
P049	Thioimidodicarbonic diamide
P014	Thiophenol
P116	Thiosemicarbazide
P026	Thiourea, (2-chlorophenyl)-
P072	Thiourea, 1-naphthalenyl-
P093	Thiourea, phenyl-
P123	Toxaphene
P118	Trichloromethanethiol
P119	Vanadic acid, ammonium salt
P120	Vanadium pentoxide
P120	Vanadium(V) oxide
P001	Warfarin, when present at concentrations greater than 0.3%
P121	Zinc cyanide
P122	Zinc phosphide (R,T)
P122	Zinc phosphide, when present at concentrations greater than 10%

(f) The commercial chemical products, manfacturing chemical intermediates, or off-specification commercial chemical products referred to in paragraphs (a) through (d) of this section, are identified as toxic wastes (T), unless otherwise designated and are subject to the small quantity generator exclusion defined in § 261.5 (a) and (g).

[*Comment:* For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), R (Reactivity), I (Ignitability) and C (Corrosivity). Absence of a letter indicates that the compound is only listed for toxicity.]

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous Waste No	Substance
U001	Acetaldehyde (I)
U034	Acetaldehyde, trichloro-
U187	Acetamide, N-(4-ethoxyphenyl)-
U005	Acetamide, N-9H-fluoren-2-yl-
U112	Acetic acid, ethyl ester (I)
U144	Acetic acid, lead salt
U214	Acetic acid, thallium(I) salt
U002	Acetone (I)
U003	Acetonitrile (I,T)
U248	3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts, when present at concentrations of 0.3% or less
U004	Acetophenone
U005	2-Acetylaminofluorene
U006	Acetyl chloride (C,R,T)
U007	Acrylamide
U008	Acrylic acid (I)
U009	Acrylonitrile
U150	Alanine, 3-[p-bis(2-chloroethyl)amino] phenyl-, L-
U328	2-Amino-1-methylbenzene
U353	4-Amino-1-methylbenzene
U011	Amitrole
U012	Aniline (I,T)
U014	Auramine
U015	Azaserine
U010	Azirino(2',3':3,4)pyrrolo(1,2-a)indole-4,7-dione, 6-amino-8-[((aminocarbonyl) oxy)methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-
U157	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-
U016	Benz[c]acridine
U016	3,4-Benzacridine
U017	Benzal chloride
U018	Benz[a]anthracene
U018	1,2-Benzanthracene
U094	1,2-Benzanthracene, 7,12-dimethyl-
U012	Benzenamine (I,T)
U014	Benzenamine, 4,4'-carbonimidoylbis(N,N-dimethyl-
U049	Benzenamine, 4-chloro-2-methyl-
U093	Benzenamine, N,N-dimethyl-4-phenylazo-
U158	Benzenamine, 4,4'-methylenebis(2-chloro-
U222	Benzenamine, 2-methyl-, hydrochloride
U181	Benzenamine, 2-methyl-5-nitro
U019	Benzene (I,T)
U038	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy, ethyl ester
U030	Benzene, 1-bromo-4-phenoxy-
U037	Benzene, chloro-
U190	1,2-Benzenedicarboxylic acid anhydride
U028	1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)] ester
U069	1,2-Benzenedicarboxylic acid, dibutyl ester
U088	1,2-Benzenedicarboxylic acid, diethyl ester
U102	1,2-Benzenedicarboxylic acid, dimethyl ester
U107	1,2-Benzenedicarboxylic acid, di-n-octyl ester
U070	Benzene, 1,2-dichloro-
U071	Benzene, 1,3-dichloro-
U072	Benzene, 1,4-dichloro-
U017	Benzene, (dichloromethyl)-
U223	Benzene, 1,3-diisocyanatomethyl- (R,T)
U239	Benzene, dimethyl-(I,T)
U201	1,3-Benzenediol
U127	Benzene, hexachloro-
U056	Benzene, hexahydro- (I)
U188	Benzene, hydroxy-
U220	Benzene, methyl-
U105	Benzene, 1-methyl-1-2,4-dinitro-
U106	Benzene, 1-methyl-2,6-dinitro-
U203	Benzene, 1,2-methylenedioxy-4-allyl-
U141	Benzene, 1,2-methylenedioxy-4-propenyl-

Hazardous Waste No	Substance
U090	Benzene 1,2-methylenedioxy-4-propyl-
U055	Benzene (1-methylethyl)- (I)
U169	Benzene nitro- (I T)
U183	Benzene pentachloro-
U185	Benzene pentachloro-nitro-
U020	Benzenesulfonic acid chloride (C R)
U020	Benzenesulfonyl chloride (C R)
U207	Benzene 1,2 4 5-tetrachloro-
U023	Benzene, (trichloromethyl)-(C R,T)
0234	Benzene 1,3 5-trinitro- (R T)
U021	Benzidine
U202	1 2 Benzisothiazolin-3-one 1,1-dioxide
U120	Benzo[j,k]fluorene
U022	Benzo[a]pyrene
U022	3,4-Benzopyrene
U197	p-Benzoquinone
U023	Benzotrichloride (C R T)
U050	1,2 Benzphenanthrene
U085	2,2 -Bioxirane (I T)
U021	(1 1 -Biphenyl)-4 4 -diamine
U073	(1 1 -Biphenyl)-4,4 -diamine 3 3'-dichloro-
U091	(1 1 -Biphenyl)-4 4 -diamine, 3,3 -dimethoxy-
U095	(1,1 -Biphenyl)-4 4 -diamine 3,3 -dimethyl-
U024	Bis(2-chloroethoxy) methane
U027	Bis(2-chloroisopropyl) ether
U244	Bis(dimethylthiocarbamoyl) disulfide
U028	Bis(2-ethylhexyl) phthalate
U246	Bromine cyanide
U225	Bromoform
U030	4-Bromophenyl phenyl ether
U128	1,3-Butadiene 1,1,2,3 4 4-hexachloro-
U172	1-Butanamine, N-butyl-N-nitroso-
U035	Butanoic acid 4-[Bis(2-chloroethyl)amino] benzene-
U031	1-Butanol (I)
U159	2-Butanone (I T)
U160	2 Butanone peroxide (R,T)
U053	2-Butenal
U074	2-Butene 1,4-dichloro- (I,T)
U031	n-Butyl alchohol (I)
U136	Cacodylic acid
U032	Calcium chromate
U238	Carbamic acid, ethyl ester
U178	Carbamic acid methylnitroso- ethyl ester
U176	Carbamide N-ethyl-N-nitroso-
U177	Carbamide N-methyl-N-nitroso-
U219	Carbamide, thio-
U097	Carbamoyl chloride dimethyl-
U215	Carbonic acid, dithallium(I) salt
U156	Carbonochloridic acid, methyl ester (I,T)
U033	Carbon oxyfluoride (R,T)
U211	Carbon tetrachloride
U033	Carbonyl fluoride (R,T)
U034	Chloral
U035	Chlorambucil
U036	Chlordane, technical
U026	Chlornaphazine
U037	Chlorobenzene
U039	4-Chloro-m-cresol
U041	1-Chloro-2,3-epoxypropane
U042	2-Chloroethyl vinyl ether
U044	Chloroform
U046	Chloromethyl methyl ether
U047	beta-Chloronaphthalene
U048	o-Chlorophenol
U049	4-Chloro-o-toluidine, hydrochloride
U032	Chromic acid, calcium salt
U050	Chrysene
U051	Creosote
U052	Cresols
U052	Cresylic acid
U053	Crotonaldehyde
U055	Cumene (I)
U246	Cyanogen bromide
U197	1 4-Cyclohexadienedione
U056	Cyclohexane (I)
U057	Cyclohexanone (I)
U130	1 3-Cyclopentadiene 1,2,3,4 5,5-hexa- chloro-
U058	Cyclophosphamide
U240	2,4-D salts and esters
U059	Daunomycin
U060	DDD
U061	DDT
U142	Decachlorooctahydro-1,3,4-metheno-2H-cyclobuta[c,d]-pentalen-2-one
U062	Diallate
U133	Diamine (R,T)
U221	Diaminotoluene
U063	Dibenz[a,h]anthracene
U063	1,2,5,6-Dibenzanthracene
U064	1,2 7,8-Dibenzopyrene
U064	Dibenz[a,i]pyrene
U066	1,2-Dibromo-3-chloropropane
U069	Dibutyl phthalate
U062	S-(2,3-Dichloroallyl) diisopropylthiocarbamate
U070	o-Dichlorobenzene
U071	m-Dichlorobenzene
U072	p-Dichlorobenzene
U073	3,3 -Dichlorobenzidine
U074	1 4-Dichloro-2-butene (I,T)
U075	Dichlorodifluoromethane
U192	3,5-Dichloro-N-(1,1-dimethyl-2-propynyl) benzamide
U060	Dichloro diphenyl dichloroethane
U061	Dichloro diphenyl trichloroethane
U078	1,1-Dichloroethylene
U079	1,2-Dichloroethylene
U025	Dichloroethyl ether
U081	2 4-Dichlorophenol
U082	2,6-Dichlorophenol
U240	2,4-Dichlorophenoxyacetic acid, salts and esters
U083	1,2-Dichloropropane
U084	1,3-Dichloropropene
U085	1,2 3 4-Diepoxybutane (I,T)
U108	1,4-Diethylene dioxide
U086	N N-Diethylhydrazine
U087	O O-Diethyl-S-methyl-dithiophosphate
U088	Diethyl phthalate
U089	Diethylstilbestrol
U148	1,2-Dihydro-3,6-pyridazinedione
U090	Dihydrosafrole
U091	3,3'-Dimethoxybenzidine
U092	Dimethylamine (I)
U093	Dimethylaminoazobenzene
U094	7,12-Dimethylbenz[a]anthracene
U095	3,3'-Dimethylbenzidine
U096	alpha,alpha-Dimethylbenzylhydroperoxide (R)
U097	Dimethylcarbamoyl chloride
U098	1,1-Dimethylhydrazine
U099	1,2-Dimethylhydrazine
U101	2,4-Dimethylphenol
U102	Dimethyl phthalate
U103	Dimethyl sulfate
U105	2,4-Dinitrotoluene
U106	2,6-Dinitrotoluene
U107	Di-n-octyl phthalate
U108	1,4-Dioxane
U109	1,2- Diphenylhydrazine
U110	Dipropylamine (I)
U111	Di-N-propylnitrosamine
U001	Ethanal (I)
U174	Ethanamine, N-ethyl-N-nitroso-
U067	Ethane, 1,2-dibromo-

Hazardous Waste No	Substance
U076	Ethane, 1,1-dichloro-
U077	Ethane, 1,2-dichloro-
U114	1,2-Ethanediylbiscarbamodithioic acid
U131	Ethane, 1,1,1,2,2,2-hexachloro-
U024	Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro-
U003	Ethanenitrile (I, T)
U117	Ethane,1,1'-oxybis- (I)
U025	Ethane, 1,1'-oxybis[2-chloro-
U184	Ethane, pentachloro-
U208	Ethane, 1,1,1,2-tetrachloro-
U209	Ethane, 1,1,2,2-tetrachloro-
U218	Ethanethioamide
U247	Ethane, 1,1,1-trichloro-2,2-bis(p-methoxyphenyl)
U227	Ethane, 1,1,2-trichloro-
U043	Ethene, chloro-
U042	Ethene, 2-chloroethoxy-
U078	Ethene, 1,1-dichloro-
U079	Ethene, trans-1,2-dichloro-
U210	Ethene, 1,1,2,2-tetrachloro-
U173	Ethanol, 2,2'-(nitrosoimino)bis-
U004	Ethanone, 1-phenyl-
U006	Ethanoyl chloride (C,R,T)
U359	2-Ethoxyethanol
U112	Ethyl acetate (I)
U113	Ethyl acrylate (I)
U238	Ethyl carbamate (urethan)
U038	Ethyl 4,4'-dichlorobenzilate
U359	Ethylene glycol monoethyl ether
U114	Ethylenebis(dithiocarbamic acid)
U067	Ethylene dibromide
U077	Ethylene dichloride
U115	Ethylene oxide (I,T)
U116	Ethylene thiourea
U117	Ethyl ether (I)
U076	Ethylidene dichloride
U118	Ethylmethacrylate
U119	Ethyl methanesulfonate
U139	Ferric dextran
U120	Fluoranthene
U122	Formaldehyde
U123	Formic acid (C,T)
U124	Furan (I)
U125	2-Furancarboxaldehyde (I)
U147	2,5-Furandione
U213	Furan, tetrahydro- (I)
U125	Furfural (I)
U124	Furfuran (I)
U206	D-Glucopyranose, 2-deoxy-2(3-methyl-3-nitrosoureido)-
U126	Glycidylaldehyde
U163	Guanidine, N-nitroso-N-methyl-N'nitro-
U127	Hexachlorobenzene
U128	Hexachlorobutadiene
U129	Hexachlorocyclohexane (gamma isomer)
U130	Hexachlorocyclopentadiene
U131	Hexachloroethane
U132	Hexachlorophene
U243	Hexachloropropene
U133	Hydrazine (R,T)
U086	Hydrazine, 1,2-diethyl-
U098	Hydrazine, 1,1-dimethyl-
U099	Hydrazine, 1,2-dimethyl-
U109	Hydrazine, 1,2-diphenyl-
U134	Hydrofluoric acid (C,T)
U134	Hydrogen fluoride (C,T)
U135	Hydrogen sulfide
U096	Hydroperoxide, 1-methyl-1-phenylethyl- (R)
U136	Hydroxydimethylarsine oxide
U116	2-Imidazolidinethione
U137	Indeno(1,2,3-cd)pyrene
U139	Iron dextran

Hazardous Waste No	Substance
U140	Isobutyl alcohol (I,T)
U141	Isosafrole
U142	Kepone
U143	Lasiocarpine
U144	Lead acetate
U145	Lead phosphate
U146	Lead subacetate
U129	Lindane
U147	Maleic anhydride
U148	Maleic hydrazide
U149	Malononitrile
U150	Melphalan
U151	Mercury
U152	Methacrylonitrile (I,T)
U092	Methanamine, N-methyl- (I)
U029	Methane, bromo-
U045	Methane, chloro- (I,T)
U046	Methane, chloromethoxy-
U068	Methane, dibromo-
U080	Methane, dichloro-
U075	Methane, dichlorodifluoro-
U138	Methane, iodo-
U119	Methanesulfonic acid, ethyl ester
U211	Methane, tetrachloro-
U121	Methane, trichlorofluoro-
U153	Methanethiol (I,T)
U225	Methane, tribromo-
U044	Methane, trichloro-
U121	Methane, trichlorofluoro-
U123	Methanoic acid (C,T)
U036	4,7-Methanoindan, 1,2,4,5,6,7,8,8-octachloro-3a,4,7,7a-tetrahydro-
U154	Methanol (I)
U155	Methapyrilene
U247	Methoxychlor
U154	Methyl alcohol (I)
U029	Methyl bromide
U186	1-Methylbutadiene (I)
U045	Methyl chloride (I,T)
U156	Methyl chlorocarbonate (I,T)
U226	Methylchloroform
U157	3-Methylcholanthrene
U158	4,4'-Methylenebis(2-chloroaniline)
U132	2,2'-Methylenebis(3,4,6-trichlorophenol)
U068	Methylene bromide
U080	Methylene chloride
U122	Methylene oxide
U159	Methyl ethyl ketone (I,T)
U160	Methyl ethyl ketone peroxide (R,T)
U138	Methyl iodide
U161	Methyl isobutyl ketone (I)
U162	Methyl methacrylate (I,T)
U163	N-Methyl-N'-nitro-N-nitrosoguanidine
U161	4-Methyl-2-pentanone (I)
U164	Methylthiouracil
U010	Mitomycin C
U059	5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxy]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-
U165	Naphthalene
U047	Naphthalene, 2-chloro-
U166	1,4-Naphthalenedione
U236	2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'-dimethyl-(1,1'-biphenyl)-4,4'-diyl)]-bis(azo)bis(5-amino-4-hydroxy)-, tetrasodium salt
U166	1,4-Naphthaquinone
U167	1-Naphthylamine
U168	2-Naphthylamine
U167	alpha-Naphthylamine
U168	beta-Naphthylamine

Hazardous Waste No	Substance
U026	2-Naphthylamine, N,N'-bis(2-chloromethyl)
U169	Nitrobenzene (I,T)
U170	p-Nitrophenol
U171	2-Nitropropane (I,T)
U172	N-Nitrosodi-n-butylamine
U173	N-Nitrosodiethanolamine
U174	N-Nitrosodiethylamine
U111	N-Nitroso-N-propylamine
U176	N-Nitroso-N-ethylurea
U177	N-Nitroso-N-methylurea
U178	N-Nitroso-N-methylurethane
U179	N-Nitrosopiperidine
U180	N-Nitrosopyrrolidine
U181	5-Nitro-o-toluidine
U193	1,2-Oxathiolane, 2,2-dioxide
U058	2H-1,3,2-Oxazaphosphorine, 2-[bis(2-chloroethyl)amino]tetrahydro-, oxide 2-
U115	Oxirane (I,T)
U041	Oxirane, 2-(chloromethyl)-
U182	Paraldehyde
U183	Pentachlorobenzene
U184	Pentachloroethane
U185	Pentachloronitrobenzene
See F027	Pentachlorophenol
U186	1,3-Pentadiene (I)
U187	Phenacetin
U188	Phenol
U048	Phenol, 2-chloro-
U039	Phenol, 4-chloro-3-methyl-
U081	Phenol, 2,4-dichloro-
U082	Phenol, 2,6-dichloro-
U101	Phenol, 2,4-dimethyl-
U170	Phenol, 4-nitro-
See F027	Phenol, pentachloro-
Do	Phenol, 2,3,4,6-tetrachloro-
Do	Phenol, 2,4,5-trichloro-
Do	Phenol, 2,4,6-trichloro-
U137	1,10-(1,2-phenylene)pyrene
U145	Phosphoric acid, Lead salt
U087	Phosphorodithioic acid, O,O-diethyl-, S-methylester
U189	Phosphorous sulfide (R)
U190	Phthalic anhydride
U191	2-Picoline
U192	Pronamide
U194	1-Propanamine (I,T)
U110	1-Propanamine, N-propyl- (I)
U066	Propane, 1,2-dibromo-3-chloro-
U149	Propanedinitrile
U171	Propane, 2-nitro- (I,T)
U027	Propane, 2,2'-oxybis[2-chloro-
U193	1,3-Propane sultone
U235	1-Propanol, 2,3-dibromo-, phosphate (3:1)
U126	1-Propanol, 2,3-epoxy-
U140	1-Propanol, 2-methyl- (I,T)
U002	2-Propanone (I)
U007	2-Propenamide
U084	Propene, 1,3-dichloro-
U243	1-Propene, 1,1,2,3,3,3-hexachloro-
U009	2-Propenenitrile
U152	2-Propenenitrile, 2-methyl- (I,T)
U008	2-Propenoic acid (I)
U113	2-Propenoic acid, ethyl ester (I)
U118	2-Propenoic acid, 2-methyl-, ethyl ester
U162	2-Propenoic acid, 2-methyl-, methyl ester (I,T)
See F027	Propionic acid, 2-(2,4,5-trichlorophenoxy)-
U194	n-Propylamine (I,T)
U083	Propylene dichloride
U196	Pyridine
U155	Pyridine, 2-[(2-(dimethylamino)-2-thenylamino]-
U179	Pyridine, hexahydro-N-nitroso-
U191	Pyridine, 2-methyl-
U164	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-
U180	Pyrrole, tetrahydro-N-nitroso-
U200	Reserpine
U201	Resorcinol
U202	Saccharin and salts
U203	Safrole
U204	Selenious acid
U204	Selenium dioxide
U205	Selenium disulfide (R,T)
U015	L-Serine, diazoacetate (ester)
See F027	Silvex
U089	4,4'-Stilbenediol, alpha,alpha'-diethyl-
U206	Streptozotocin
U135	Sulfur hydride
U103	Sulfuric acid, dimethyl ester
U189	Sulfur phosphide (R)
U205	Sulfur selenide (R,T)
See F027	2,4,5-T
U207	1,2,4,5-Tetrachlorobenzene
U208	1,1,1,2-Tetrachloroethane
U209	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethylene
See F027	2,3,4,6-Tetrachlorophenol
U213	Tetrahydrofuran (I)
U214	Thallium(I) acetate
U215	Thallium(I) carbonate
U216	Thallium(I) chloride
U217	Thallium(I) nitrate
U218	Thioacetamide
U153	Thiomethanol (I,T)
U219	Thiourea
U244	Thiram
U220	Toluene
U221	Toluenediamine
U223	Toluene diisocyanate (R,T)
U328	o-Toluidine
U222	O-Toluidine hydrochloride
U353	p-Toluidine
U011	1H-1,2,4-Triazol-3-amine
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethene
U228	Trichloroethylene
U121	Trichloromonofluoromethane
See F027	2,4,5-Trichlorophenol
Do	2,4,6-Trichlorophenol
Do	2,4,5-Trichlorophenoxyacetic acid
U234	sym-Trinitrobenzene (R,T)
U182	1,3,5-Trioxane, 2,4,5-trimethyl-
U235	Tris(2,3-dibromopropyl) phosphate
U236	Trypan blue
U237	Uracil, 5[bis(2-chloromethyl)amino]-
U237	Uracil mustard
U043	Vinyl chloride
U248	Warfarin, when present at concentrations of 0.3% or less
U239	Xylene (I)
U200	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxy-benzoyl)oxy]-, methyl ester
U249	Zinc phosphide, when present at concentrations of 10% or less.

(Approved by the Office of Management and Budget under control number 2050-0047)

[45 FR 78529, 78541, Nov. 25, 1980, as amended at 46 FR 27477, May 20, 1981; 49

Appendix II

Subpart C—Characteristics of Hazardous Waste

§ 261.20 General.

(a) A solid waste, as defined in § 261.2, which is not excluded from regulation as a hazardous waste under § 261.4(b), is a hazardous waste if it exhibits any of the characteristics identified in this subpart.

[*Comment:* § 262.11 of this chapter sets forth the generator's responsibility to determine whether his waste exhibits one or more of the characteristics identified in this subpart]

(b) A hazardous waste which is identified by a characteristic in this subpart, but is not listed as a hazardous waste in Subpart D, is assigned the EPA Hazardous Waste Number set forth in the respective characteristic in this subpart. This number must be used in complying with the notification requirements of section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265 and Part 270 of this chapter.

(c) For purposes of this subpart, the Administrator will consider a sample obtained using any of the applicable sampling methods specified in Appendix I to be a representative sample within the meaning of Part 260 of this chapter.

[*Comment:* Since the Appendix I sampling methods are not being formally adopted by the Administrator a person who desires to employ an alternative sampling method is not required to demonstrate the equivalency of his method under the procedures set forth in §§ 260 20 and 260.21.]

[45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983]

§ 261.21 Characteristic of ignitability.

(a) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has flash point less than 60°C (140°F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79 or D-93-80 (incorporated by reference, see § 260.11), or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78 (incorporated by reference, see § 260.11), or as determined by an equivalent test method approved by the Administrator under procedures set forth in §§ 260.20 and 260.21.

(2) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(3) It is an ignitable compressed gas as defined in 49 CFR 173.300 and as determined by the test methods described in that regulation or equivalent test methods approved by the Administrator under §§ 260.20 and 260.21.

(4) It is an oxidizer as defined in 49 CFR 173.151.

(b) A solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D001.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.22 Characteristic of corrosivity.

(a) A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

(1) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using either an EPA test method or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21 The EPA test method for pH is specified as Method 5.2 in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).

(2) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) as determined by the test method specified in NACE (National Association of Corrosion Engineers) Standard TM-01-69 as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11) or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21.

(b) A solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D002.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.23 Characteristic of reactivity.

(a) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has *any* of the following properties:

(1) It is normally unstable and readily undergoes violent change without detonating.

(2) It reacts violently with water.

(3) It forms potentially explosive mixtures with water.

(4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(8) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88.

(b) A solid waste that exhibits the characteristic of reactivity, but is not listed as a hazardous waste in Subpart D has the EPA Hazardous Waste Number of D003.

§ 261.24 Characteristic of EP toxicity.

(a) A solid waste exhibits the characteristic of EP toxicity if, using the test methods described in Appendix II or equivalent methods approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21, the extract from a representative sample of the waste contains any of the contaminants listed in Table I at a concentration equal to or greater than the respective value given in that Table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering, is considered to be the extract for the purposes of this section.

(b) A solid waste that exhibits the characteristic of EP toxicity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number specified in Table I which corresponds to the toxic contaminant causing it to be hazardous.

TABLE I—MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY

EPA hazardous waste number	Contaminant	Maximum concentration (milligrams per liter)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0

APPENDIX I—REPRESENTATIVE SAMPLING METHODS

The methods and equipment used for sampling waste materials will vary with the form and consistency of the waste materials to be sampled. Samples collected using the sampling protocols listed below, for sampling waste with properties similar to the indicated materials, will be considered by the Agency to be representative of the waste.

Extremely viscous liquid—ASTM Standard D140-70 Crushed or powdered material—ASTM Standard D346-75 Soil or rock-like material—ASTM Standard D420-69 Soil-like material—ASTM Standard D1452-65

Fly Ash-like material—ASTM Standard D2234-76 [ASTM Standards are available from ASTM, 1916 Race St., Philadelphia, PA 19103]

Containerized liquid wastes—"COLIWASA" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods," * U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460. [Copies may be obtained from Solid Waste Information, U.S. Environmental Protection Agency, 26 W. St. Clair St., Cincinnati, Ohio 45268]

Liquid waste in pits, ponds, lagoons, and similar reservoirs.—"Pond Sampler" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods." *

This manual also contains additional information on application of these protocols.

Appendix II—EP Toxicity Test Procedures

A. Extraction Procedure (EP)

1. A representative sample of the waste to be tested (minimum size 100 grams) shall be obtained using the methods specified in Appendix I or any other method capable of yielding a representative sample within the meaning of Part 260. [For detailed guidance on conducting the various aspects of the EP see "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).]

2. The sample shall be separated into its component liquid and solid phases using the method described in "Separation Procedure" below. If the solid residue [*] obtained using this method totals less than 0.5% of the original weight of the waste, the residue can be discarded and the operator shall treat the liquid phase as the extract and proceed immediately to Step 8.

3. The solid material obtained from the Separation Procedure shall be evaluated for its particle size. If the solid material has a surface area per gram of material equal to, or greater than 3.1 cm^2 or passes through a 9.5 mm (0.375 inch) standard sieve, the operator shall proceed to Step 4. If the surface area is smaller or the particle size larger than specified above, the solid material shall be prepared for extraction by crushing, cutting or grinding the material so that it passes through a 9.5 mm (0.375 inch) sieve or, if the material is in a single piece, by subjecting the material to the "Structural Integrity Procedure" described below.

4. The solid material obtained in Step 3 shall be weighed and placed in an extractor with 16 times its weight of deionized water. Do not allow the material to dry prior to weighing. For purposes of this test, an acceptable extractor is one which will impart sufficient agitation to the mixture to not only prevent stratification of the sample and extraction fluid but also insure that all sample surfaces are continuously brought into contact with well mixed extraction fluid.

5. After the solid material and deionized water are placed in the extractor, the operator shall begin agitation and measure the pH of the solution in the extractor. If the pH is greater than 5.0, the pH of the solution shall be decreased to 5.0 ± 0.2 by adding 0.5 N acetic acid. If the pH is equal to or less than 5.0, no acetic acid should be added. The pH of the solution shall be monitored, as described below, during the course of the extraction and if the pH rises above 5.2, 0.5N acetic acid shall be added to bring the pH down to 5.0 ± 0.2. However, in no event shall the aggregate amount of acid added to the solution exceed 4 ml of acid per gram of solid. The mixture shall be agitated for 24 hours and maintained at 20°-40°C (68°-104°F) during this time. It is recommended that the operator monitor and adjust the pH during the course of the extraction with a device such as the Type 45-A pH Controller manufactured by Chemtrix, Inc., Hillsboro, Oregon 97123 or its equivalent, in conjunction with a metering pump and reservoir of 0.5N acetic acid. If such a system is not available, the following manual procedure shall be employed:

(a) A pH meter shall be calibrated in accordance with the manufacturer's specifications.

(b) The pH of the solution shall be checked and, if necessary, 0.5N acetic acid shall be manually added to the extractor until the pH reaches 5.0 ± 0.2. The pH of the solution shall be adjusted at 15, 30 and 60 minute intervals, moving to the next longer interval if the pH does not have to be adjusted more than 0.5N pH units.

(c) The adjustment procedure shall be continued for at least 6 hours.

(d) If at the end of the 24-hour extraction period, the pH of the solution is not below 5.2 and the maximum amount of acid (4 ml per gram of solids) has not been added, the pH shall be adjusted to 5.0 ± 0.2 and the extraction continued for an additional four hours, during which the pH shall be adjusted at one hour intervals.

6. At the end of the 24 hour extraction period, deionized water shall be added to the extractor in an amount determined by the following equation:

$$V = (20)(W) - 16(W) - A$$

V = ml deionized water to be added

W = weight in grams of solid charged to extractor

A = ml of 0.5N acetic acid added during extraction

7. The material in the extractor shall be separated into its component liquid and solid phases as described under "Separation Procedure."

8. The liquids resulting from Steps 2 and 7 shall be combined. This combined liquid (or the waste itself if it has less than ½ percent solids, as noted in Step 2) is the extract and shall be analyzed for the presence of any of the contaminants specified in Table I of § 261.24 using the Analytical Procedures designated below.

Separation Procedure

Equipment: A filter holder, designed for filtration media having a nominal pore size of 0.45 micrometers and capable of applying a 5.3 kg/cm^2 (75 psi) hydrostatic pressure to the solution being filtered, shall be used. For mixtures containing nonabsorptive solids, where separation can be effected without imposing a 5.3 kg/cm^2 pressure differential, vacuum filters employing a 0.45 micrometers filter media can be used. (For

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"Hazardous Waste Streams," EPA 600/2-80-018, January 1980.

[*] The percent solids is determined by drying the filter pad at 80°C until it reaches constant weight and then calculating the percent solids using the following equation:

Percent solids =

$$\frac{(\text{weight of pad} + \text{solid}) - (\text{tare weight of pad})}{\text{initial weight of sample}} \times 100$$

further guidance on filtration equipment or procedures see "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" incorporated by reference, see § 260.11) Procedure [1]

(i) Following manufacturer's directions, the filter unit shall be assembled with a filter bed consisting of a 0.45 micrometer filter membrane. For difficult or slow to filter mixtures a prefilter bed consisting of the following prefilters in increasing pore size (0.65 micrometer membrane, fine glass fiber prefilter, and coarse glass fiber prefilter) can be used.

(ii) The waste shall be poured into the filtration unit.

(iii) The reservoir shall be slowly pressurized until liquid begins to flow from the filtrate outlet at which point the pressure in the filter shall be immediately lowered to 10–15 psig. Filtration shall be continued until liquid flow ceases.

(iv) The pressure shall be increased stepwise in 10 psi increments to 75 psig and filtration continued until flow ceases or the pressurizing gas begins to exit from the filtrate outlet.

(v) The filter unit shall be depressurized, the solid material removed and weighed and then transferred to the extraction apparatus, or, in the case of final filtration prior to analysis, discarded. Do not allow the material retained on the filter pad to dry prior to weighing.

(vi) The liquid phase shall be stored at 4°C for subsequent use in Step 8.

[1] This procedure is intended to result in separation of the "free" liquid portion of the waste from any solid matter having a particle size >0.45 μm. If the sample will not filter, various other separation techniques can be used to aid in the filtration. As described above, pressure filtration is employed to speed up the filtration process. This does not alter the nature of the separation. If liquid does not separate during filtration, the waste can be centrifuged. If separation occurs during centrifugation, the liquid portion (centrifugate) is filtered through the 0.45 μm filter prior to becoming mixed with the liquid portion of the waste obtained from the initial filtration. Any material that will not pass through the filter after centrifugation is considered a solid and is extracted.

B. Structural Integrity Procedure

Equipment: A Structural Integrity Tester having a 3.18 cm (1.25 in.) diameter hammer weighing 0.33 kg (0.73 lbs.) and having a free fall of 15.24 cm (6 in.) shall be used. This device is available from Associated Design and Manufacturing Company, Alexandria, VA 22314, as Part No. 125, or it may be fabricated to meet the specifications shown in Figure 1.

Procedure

1. The sample holder shall be filled with the material to be tested. If the sample of waste is a large monolithic block, a portion shall be cut from the block having the dimensions of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder. For a fixated waste, samples may be cast in the form of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder for purposes of conducting this test. In such cases, the waste may be allowed to cure for 30 days prior to further testing.

2. The sample holder shall be placed into the Structural Integrity Tester, then the hammer shall be raised to its maximum height and dropped. This shall be repeated fifteen times.

3. The material shall be removed from the sample holder, weighed, and transferred to the extraction apparatus for extraction.

Analytical Procedures for Analyzing Extract Contaminants

The test methods for analyzing the extract are as follows:

1. For arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D[2,4-dichlorophenoxyacetic acid] or 2,4,5-TP [2,4,5-trichlorophenoxypropionic acid], "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).

2. [Reserved]

For all analyses, the methods of standard addition shall be used for quantification of species concentration.

Appendix B

<u>State Authorization to Regulate the Hazardous Components of Radioactive Mixed Waste Under the Resource Conservation and Recovery Act,</u>

July 3, 1986. (51 <u>FR</u> 24504)

ENVIRONMENTAL PROTECTION AGENCY

[FRL-3041-3]

State Authorization To Regulate the Hazardous Components of Radioactive Mixed Wastes Under the Resource Conservation and Recovery Act

AGENCY: Environmental Protection Agency.

ACTION: Notice.

SUMMARY: The Environmental Protection Agency (EPA) is today publishing a notice that in order to obtain and maintain authorization to administer and enforce a hazardous waste program pursuant to Subtitle C of the Resource Conservation and Recovery Act (RCRA), States must have authority to regulate the hazardous components of "radioactive mixed wastes". "Radioactive mixed wastes" are wastes that contain hazardous wastes subject to RCRA and radioactive wastes subject to the Atomic Energy Act (AEA).

DATE: States which have received EPA authorization prior to the publicity date of this Notice must, within one year of the publication date of this notice (two years if a State statutory amendment is required) (i.e., by July 3, 1987 and July 5, 1988), demonstrate authority to regulate the hazardous components of radioactive mixed wastes. States initially applying for final authorization after July 3, 1987 must incorporate this provision in their application for final authorization.

FOR FURTHER INFORMATION CONTACT: Denise Hawkins, Office of Solid Waste (WH-563-B), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, (202) 382-2210.

SUPPLEMENTARY INFORMATION:

A. Authorization of State Hazardous Waste Programs

Section 3006(b) of RCRA provides that States may apply to EPA for authorization to administer and enforce a hazardous waste program pursuant to Subtitle C of RCRA. Authorized State programs are carried out in lieu of the Federal program. However, EPA is authorized to implement the Hazardous and Solid Waste Amendments to RCRA (HSWA) (Pub. L. 98-616) in authorized States until those States revise their programs to incorporate the HSWA requirements and receive EPA authorization to implement HSWA. Requirements for obtaining authorization are set forth in 40 CFR Part 271. To date, 41 States have received final authorization (not including HSWA).

B. Regulation of Radioactive Wastes

Section 1004(27) of RCRA excludes from the definition of "solid waste", "source, special nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended (AEA) (68 Stat. 923)." Since "hazardous waste" is defined by section 1004(5) as a subset of "solid waste", "source, special nuclear and byproduct material" are exempt from the definition of hazardous waste and thus from the Subtitle C program.

While source, special nuclear and byproduct material are clearly exempt from RCRA, the extent of the statute's applicability to wastes containing both hazardous waste and source, special nuclear or byproduct material has been les evident. The question of which wastes are encompassed by the term "byproduct material" has also been the subject of some controversy. We note that the definition of byproduct material is currently the subject of rulemaking by the Department of Energy (DOE). (50 FR 45736, November 1, 1985).

Given the lack of clarity on this issue, EPA did not previously require as a condition of State authorization that the State have regulatory authority over the hazardous components of radioactive mixed wastes. In authorizing States, EPA did not inquire into State authority over the hazardous components of radioactive mixed wastes and made no determination of whether States had authority over such wastes. Accordingly, the Agency has taken the position that currently authorized State programs do *not* apply to radioactive mixed wastes.

Thus, radioactive mixed wastes are not currently subject to Subtitle C regulations in authorized States.[1] EPA has now determined that wastes containing both hazardous waste and radioactive waste are subject to the RCRA regulation.

Today, we are hereby publishing notice that, pursuant to 40 CFR 271.9 (which requires State programs to regulate all wastes controlled under 40 CFR Part 261), radioactive mixed wastes are to be part of authorized State programs. States that already have authorized programs must revise their programs (if necessary) and must apply for authorization for hazardous components of radioactive mixed wastes. States must demonstrate to the appropriate EPA Regional Administrator that their program applies to all hazardous waste even if mixed with radioactive waste. This demonstration must be made within one year of the publication date of this notice.[2] States

[1] The exception to this is in the use of EPA's HSWA authorities in authorized States. EPA can use its HSWA authorities to supplement an authorized State's authority over RCRA-regulated units. Under § 3004(u), EPA can jointly issue a permit with the State and impose corrective action requirements on hazardous waste management units and solid waste management units (swmu's) at facilities that contain units subject to RCRA. Although hazardous components of radioactive mixed wastes are not RCRA-regulated under *authorized State RCRA programs*, radioactive mixed waste will be considered to be a "solid waste" for purposes of corrective action at solid waste management units. The Federal definition of "solid waste" is to be used in determining what units are swmu's, because State definitions were not scrutinized. Therefore, in order to obtain authorization for corrective action, States must obtain authorization for their definition of solid waste, which may not exclude hazardous components of radioactive mixed wastes. Because radioactive mixed waste is considered a solid waste under the Federal RCRA program, units containing radioactive mixed wastes are swmu's and are *subject to corrective action if there is another* unit requiring a RCRA permit at the facility. RCRA enforcement activities also apply.

[2] EPA is not promulgating a regulation today. However, in light of the Agency's previous policy, we believe it is appropriate to provide the time allowed by 40 CFR 271.21(e)(2) for State program modifications to conform to regulatory changes. Note that EPA has proposed to amend 40 CFR 271.21 to allow States until July 1 of each year to incorporate changes to the Federal program that occurred in the preceding 12 months. Where statutory changes are necessary, an additional year would be allowed (51 FR 496-504, January 6, 1986) EPA will allow States to use this "clustering" approach for radioactive mixed wastes if and when the revisions to § 271.21 are finally promulgated

initially applying for final authorization one year after the publication date of this notice must make this demonstration in their initial application.

In most cases, this will require only an interpretive statement by the State Attorney General, since most States have the same exception to the definition of "solid waste" as that contained in section 1004(27) of RCRA. Some States, however, may require statutory amendments in order to regulate the hazardous components of radioactive mixed wastes. Such States, if already authorized, must revise their programs within two years of the publication date of this notice. States initially applying that need a statutory amendment will have to obtain the amendment before submitting an application for final authorization.

In order to demonstrate regulation of the hazardous components of radioactive mixed wastes, States should submit to the appropriate Regional Administrator a copy of all applicable statutory and regulatory provisions, plus a statement by the State Attorney General to the effect that the State's hazardous waste program applies to wastes containing both hazardous waste and radioactive waste as defined by the AEA. If an agency other than the authorized hazardous waste agency will implement the radioactive mixed wastes program, the authorization application must include a description of the agency's functions (see 40 CFR 271.6(b)) and a Memorandum of Understanding between that agency and the authorized hazardous waste agency, describing the roles and responsibilities of each.

The DOE has proposed an interpretive definition of the term "byproduct material" (50 FR 45736, November 1, 1985), and is now evaluating public comment. Pending clarification of this issue, this matter will be addressed on a case-by-case basis.

We also note that section 1006 of RCRA precludes any regulation by EPA or a State which is inconsistent with the requirements of the Atomic Energy Act. EPA and the State may, therefore, on a case-by-case basis use the authority of § 1006 to modify hazardous waste requirements to address radioactive mixed wastes activities, pending issuance of EPA's regulation which will set forth procedures for addressing the inconsistency issue. In addition, EPA, the Nuclear Regulatory Commission (NRC), and DOE will be working together to develop guidance.

Notwithstanding any other provision of law, all requirements of the AEA and all Executive Orders concerning the handling of restricted data and national security information, including "need-to-know" requirements, shall be applicable to any grant of access to classified information under the provisions of RCRA.

Dated: June 30, 1986

J. Winston Porter,

Assistant Administrator for Solid Waste and Emergency Response.

[FR Doc. 86-15250 Filed 7-2-86; 12:10 pm]

BILLING CODE 6560-50-M

Appendix C

<u>Radioactive Waste; Byproduct</u>, May 1, 1987. (52 <u>FR</u> 15937)

Rules and Regulations

Federal Register
Vol. 52, No. 84
Friday, May 1, 1987

DEPARTMENT OF AGRICULTURE

Agricultural Marketing Service

7 CFR Part 910

[Lemon Regulation 559]

Lemons Grown in California and Arizona; Limitation of Handling

AGENCY: Agricultural Marketing Service, USDA.

ACTION: Final rule.

SUMMARY: Regulation 559 establishes the quantity of fresh California-Arizona lemons that may be shipped to market at 330,000 cartons during the period May 3–9, 1987. Such action is needed to balance the supply of fresh lemons with market demand for the period specified, due to the marketing situation confronting the lemon industry.

DATES: Regulation 559 (§ 910.859) is effective for the period May 3–9, 1987.

FOR FURTHER INFORMATION CONTACT: James M. Scanlon, Acting Chief, Marketing Order Administration Branch, F&V, AMS, USDA, Washington, DC 20250, telephone: (202) 447–5697.

SUPPLEMENTARY INFORMATION: This final rule has been reviewed under Executive Order 12291 and Departmental Regulation 1512–1 has been determined to be a "non-major" rule under criteria contained therein.

Pursuant to requirements set forth in the Regulatory Flexibility Act (RFA), the Administrator of the Agricultural Marketing Service has determined that this action will not have a significant economic impact on a substantial number of small entities.

The purpose of the RFA is to fit regulatory actions to the scale of business subject to such actions in order that small businesses will not be unduly or disproportionately burdened. Marketing orders issued pursuant to the Agricultural Marketing Agreement Act, and rules issued thereunder, are unique in that they are brought about through group action of essentially small entities acting on their behalf. Thus, both statutes have small entities orientation and compatibility.

This regulation is issued under Marketing Order No. 910, as amended (7 CFR Part 910) regulating the handling of lemons grown in California and Arizona. The order is effective under the Agricultural Marketing Agreement Act of 1937, as amended (7 U.S.C. 601–674). This action is based upon the recommendation and information submitted by the Lemon Administrative Committee and upon other available information. It is found that this action will tend to effectuate the declared policy of the Act.

This regulation is consistent with the marketing policy for 1986–87. The committee met publicly on April 28, 1987, in Los Angeles, California, to consider the current and prospective conditions of supply and demand and recommended by an 11 to 1 vote (with one abstention) a quantity of lemons deemed advisable to be handled during the specified week. The committee reports that the market is good for the larger sizes while the smaller sizes are moving slowly.

It is further found that it is impracticable and contrary to the public interest to give preliminary notice, engage in public rulemaking, and postpone the effective date until 30 days after publication in the **Federal Register** (5 U.S.C. 553), because of insufficient time between the date when information became available upon which this regulation is based and the effective date necessary to effectuate the declared purposes of the Act. Interested persons were given an opportunity to submit information and views on the regulation at an open meeting. It is necessary to effectuate the declared purposes of the Act to make these regulatory provisions effective as specified, and handlers have been apprised of such provisions and the effective time.

List of Subjects in 7 CFR Part 910

Marketing agreements and orders, California, Arizona, and Lemons.

For the reasons set forth in the preamble, 7 CFR Part 910 is amended as follows:

PART 910—LEMONS GROWN IN CALIFORNIA AND ARIZONA

1. The authority citation for 7 CFR Part 910 continues to read as follows:

Authority: Secs. 1–19, 48 Stat. 31, as amended; 7 U.S.C. 601–674.

2. Section 910.859 is added to read as follows:

§ 910.859 Lemon Regulation 559.

The quantity of lemons grown in California and Arizona which may be handled during the period May 3, 1987, through May 9, 1987, is established at 330,000 cartons.

Dated: April 29, 1987.

Ronald L. Cioffi,

Acting Deputy Director, Fruit and Vegetable Division, Agricultural Marketing Service.

[FR Doc. 87-10058 Filed 4-30-87; 8:45 am]

BILLING CODE 3410-02-M

DEPARTMENT OF ENERGY

10 CFR Part 962

Radioactive Waste; Byproduct Material

AGENCY: Department of Energy.

ACTION: Final rule.

SUMMARY: The Department of Energy (DOE) today is issuing a final interpretative rule under section 161p. of the Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*; hereinafter "the AEA") for the purpose of clarifying DOE's obligations under the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*; hereinafter "RCRA"). The purpose of this final rule is to interpret the AEA definition of the term "byproduct material," set forth in section 11e(1) of that Act (42 U.S.C. 2014(e)(1)), as it applies to DOE owned or produced radioactive waste substances which are also "hazardous waste" within the meaning of RCRA. The effect of this rule is that all DOE radioactive waste which is hazardous under RCRA will be subject to regulation under both RCRA and the AEA. This rule does not affect materials that are defined as byproduct material under section 11e(2) of the Atomic Energy Act.

EFFECTIVE DATE: June 1, 1987.

FOR FURTHER INFORMATION CONTACT: Henry K. Garson, Esq., Assistant

General Counsel for Environment, GC-11, Department of Energy, 1000 Independence Avenue SW., Washington, DC 20585, Telephone (202) 586-6947.

Raymond P. Berube, Acting Director, Office of Environmental Guidance and Compliance, EH-23, Department of Energy, 1000 Independence Avenue SW., Washington DC 20585, Telephone (202) 586-5680.

SUPPLEMENTARY INFORMATION:

Background

RCRA establishes a comprehensive regulatory scheme, administered by the Environmental Protection Agency (EPA) and EPA-authorized States, governing the generation, transportation, treatment, storage and disposal of hazardous waste. Federal agencies are required by section 6001 of RCRA (42 U.S.C. 6961) to comply with the requirements of that regulatory scheme in the same manner, and to the same extent, as any private person or entity. Under section 1004 of RCRA (42 U.S.C. 6903), the "hazardous waste" governed by RCRA is a subset of the statute's definition of "solid waste." The definition of "solid waste," however, expressly excludes "source, special nuclear, or byproduct material as defined by the Atomic Energy Act." Those materials, instead, continue to be regulated under the AEA either by the Nuclear Regulatory Commission (NRC) or by DOE.

The AEA's definitions of the terms "source material" and "special nuclear material" are specific in nature, and present no particular difficulty of interpretation. The AEA's definition of "byproduct material," in contrast, speaks only generally of "any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material." AEA section 11e(1), 42 U.S.C. 2014(e)(1). The lack of specificity in this definition, coupled with RCRA's exclusion of byproduct material from its hazardous waste regulatory scheme, has raised a question concerning which DOE radioactive waste streams, if any, should be considered byproduct material not subject to regulation under RCRA.

The Proposed Rule

On November 1, 1985, DOE published a notice of proposed rulemaking (50 FR 45736) in which it proposed to adopt an interpretative rule clarifying RCRA's applicability to DOE radioactive waste. Briefly summarized, that proposed rule would have established a distinction between "direct process" radioactive waste (*i.e.* waste directly yielded in, or necessary to, the process of producing and utilizing special nuclear material) and other radioactive waste less proximate to the physical process of producing or utilizing special nuclear material. Under the proposed rule, direct process waste, even if it contained hazardous material, would have been regarded as byproduct material, and thus would be regulated exclusively under the AEA. Any radioactive waste other than direct process waste, if it contained hazardous material, would have been considered "mixed waste" subject to regulation under both RCRA and the AEA.

As DOE noted the Federal Register preamble to the proposed rule, the legislative history of the AEA provides little guidance in interpreting the statutory definition of byproduct material, and application of the definition has not been clarified by judicial interpretation. Because the plain words of the definition are keyed to the process for producing and utilizing special nuclear material, however, it seemed that process must be regarded as a critical factor in determining whether particular radioactive materials fell within the definition. Accordingly, one significant feature of the "direct process" approach, as discussed in the preamble to the proposed rule, was its congeniality with the bare text of the statutory definition of byproduct material.

A major consequence of the "direct process" approach was the fact that it would result in the exclusive regulation of all direct process waste under the AEA. Just as the legislative history of the AEA provides little help in interpreting the statutory definition of byproduct material, the legislative history of RCRA is silent on the intended effect of RCRA's exclusion from its coverage of source, special nuclear and byproduct material. Nevertheless, DOE assumed that that exclusion was intended by the Congress to be applied to radioactive wastes in their real-world configuration. Virtually all radioactive waste substances are contained, dissolved or suspended in a nonradioactive medium from which their physical separation is impracticable. Accordingly, DOE noted in proposing the "direct process" approach that unless some radioactive waste streams were considered to be byproduct material *in their entirety*, RCRA's exclusion of byproduct material might reasonably be perceived to have little effect, because RCRA's application to a nuclear waste's nonradioactive medium would appear to entail at least the indirect regulation of the radionuclides dispersed in the medium.

Such a result, in DOE's view, presented substantial legal questions. Previous court decisions had settled the point that the AEA generally vests in DOE and the NRC exclusive regulatory authority over the radiation hazards associated with source, special nuclear and byproduct material, and generally preempts the States from regulating those materials.[1] It had also been held that when the radiation and nonradiation hazards of a waste containing byproduct material are inseparable, regulatory action under the AEA preempts the incompatible exercise of general state nuisance authority over the waste.[2] These decisions, read in conjunction with RCRA's affirmation of state regulation as an acceptable, indeed a favored, alternative to EPA regulation, were viewed by DOE as suggesting that an appropriate interpretation of byproduct material would, like the proposed "direct process" approach, exclude certain radioactive waste streams, in their entirety, from regulation under RCRA.

Development of the Final Rule

At the time of its publication of the proposed rule, DOE made available to the public reports provisionally identifying which of the waste streams generated at its facilities would be considered "direct process waste" subject only to AEA regulation under the proposed rule, and which of those waste streams would be considered "mixed waste" subject to regulation under both RCRA and the AEA. DOE sought and received public comments on those reports, and on the proposed rule itself.

During the period since the proposal was made, DOE has had the opportunity further to review the pertinent legal authorities, as well as to consider the comments received, the provisional waste stream identifications, DOE's additional operating experience, and related actions taken by other federal agencies. Based on the review, DOE is today publishing a final rule that adopts a narrower interpretation of byproduct material than the "direct process" approach that was originally proposed. For the reasons set forth below, the final rule provides that only the actual radionuclides in DOE waste streams

[1] *See* Northern States Power Co. v. Minnesota, 447 F 2d 1143 (8th Cir. 1971), *aff'd*, 405 U.S. 1035 (1972). *See also* Train v. Colorado Pub. Interest Research Group, 426 U S. 1 (1976).

[2] Brown v Kerr-McGee Chem Corp., 767 F 2d 1234, 1240 (7th Cir. 1985).

will be considered byproduct material. The nonradioactive components of those waste streams, under the final rule, will be subject to regulation under RCRA to the extent that they contain hazardous components.

Discussion

The overriding question raised by the public comments on the proposed rule was whether RCRA's exclusion of source, special nuclear and byproduct material from regulation under that Act was intended by the Congress to exempt entire waste streams, rather than exempting only the radionuclides dispersed or suspended in a waste stream. As discussed above, the proposed rule woud have treated any "direct process" waste as byproduct material in its entirety, even if the waste contained a nonradioactive chemically hazardous component that would otherwise have been subject to regulation under RCRA. Thus, the characterization of a waste stream as "direct process" waste would have foreclosed the application of RCRA to that stream irrespective of whether the associated non-radiological environmental hazard was significant. In the opinion of many commenters, this was a significant disadvantage to the "direct process" approach. In view of this concern, some commenters suggested that DOE instead adopt an alternative interpretative approach that would permit the application of each regulatory regime to the type of hazard that it was designed to control, *i.e.* that would apply the AEA to ensure protection against the radiological hazard of this waste, and apply RCRA to ensure protection against any associated chemical hazard.

DOE's operational experience since the publication of the proposed rule lends support to the concern expressed by these commenters. In its efforts provisionally to apply the "direct process" approach, DOE found a number of instances in which otherwise identical wastes were sometimes found subject to RCRA, and other times were found subject only to the AEA, due solely to the wastes' different proximity to the physical process of producing and utilizing special nuclear material. While distinctions of this type are not entirely incompatible with the process-oriented language employed by the Congress in the AEA to define byproducts material, DOE has concluded after further analysis that the better view of the law is one that avoids such artificial distinctions and that affords the greatest scope to the RCRA regulatory scheme, consistent with the requirements of the AEA. *See Legal Envtl. Assistance Found v. Hodel.* 586 F. Supp. 1163 (E.D. Tenn. 1984).

As noted in the foregoing discussion and in the preamble to the proposed rule, the legislative histories of both RCRA and the AEA provide little assistance in interpreting either the meaning of the term byproduct material or the intended effect of RCRA's exclusion of byproduct material from the hazardous waste regulatory program. The House Committee on Interstate and Foreign Commerce, in reporting its version of the bill that ultimately was enacted as RCRA, alluded to a 1973 leak of radioactive waste from a DOE underground storage tank at Richland, Washington as an "actual instance [ ] of damage caused by current hazardous waste disposal practices." H.R. Rep. No. 1491, 94th Cong., 2d Sess., pt. 1, at 17–19, *reprinted in* 1976 U.S. Code Cong. & Admin. News 6238, 6254–57. This reference is a less than certain indication that the Congress viewed such radioactive waste as "hazardous waste" subject to RCRA. Unlike RCRA as finally enacted, the bill [3] which this House Report accompanied contained no provision excluding source, special nuclear and byproduct material, thereby minimizing the probative value of the Committee's Richland reference in construing the statute that was ultimately enacted. Nevertheless, the Committee's reference should not be entirely discounted as evidence that the Congress in considering RCRA was concerned with unregulated hazards presented by radioactive waste, even though the AEA already provided sufficient regulatory control over the radiological hazards associated with such waste.

No court has addressed the specific question whether the entirety of a nuclear waste, or only its radioactive component, is byproduct material.[4] The decision in Brown v. Kerr-McGee Chem. Corp., supra note 2, clearly holds that the States cannot employ their general authority to abate nuisances to regulate even the nonradiation hazard of a waste incompatibly with regulation done under the AEA where the radiation and nonradiation hazards are inseparable. Nothing in that decision, however, is incompatible with concurrent regulation, by the States or EPA, of the nonradioactive component of a nuclear waste, subject to paramount requirements of the AEA.[5]

In this context, DOE notes that at the time the Congress was considering RCRA, the Supreme Court very recently had published its decision in Train v. Colorado Pub. Interest Research Group, 426 U.S. 1 (1976). That case decided whether the Federal Water Pollution Control Act, as amended in 1972, applied to source, special nuclear and byproduct material discharged into navigable waters by government-owned production facilities and commercial power reactors regulated by the AEA. After concluding that the Federal Water Pollution Control Act, properly construed, did not authorize EPA or the States to regulate source, special nuclear and byproduct material, the Court rejected the contention that the Water Act contemplated joint regulation of source, special nuclear or byproduct material effluents. 426 U.S. at 15. The practical effect of the Court's decision, however, was a regime of concurrent regulation, by different authorities, of effluent streams containing both radioactive and nonradioactive components. Specifically, the decision left EPA and the States free to regulate, under the Water Act, the nonradioactive component of liquid effluents from nuclear facilities, while reserving to the NRC and DOE's predecessor agency all regulatory authority over the source, special nuclear and byproduct materials contained in those same effluent streams.

The legislative history of RCRA contains no mention of the *Train* decision. However, the Congress is presumed to be aware of decisions of the Supreme Court,[6] and in fact employed in RCRA the same AEA terms, including byproduct material, that the Court had extracted from the Water Act's legislative history to emphasize in its analysis in *Train*. Thus it is at least equally logical to infer that the Congress, in selecting the AEA terms emphasized in *Train*, anticipated a similar result under RCRA as it is to posit—as did the proposed rule—that RCRA's exclusion of byproduct material must have been intended to exclude in their entirety some waste streams from regulation under RCRA.

In short, while the specific legal authorities relied upon by DOE in developing the proposed rule appeared consistent with the "direct process"

[3] H.R. 14496, 94th Cong., 2d Sess. (1976).

[4] Two decisions have upheld the authority of the NRC's predecessor agency, the Atomic Energy Commission, to license low level radioactive waste as byproduct material. Harris County v. United States, 292 F.2d 370 (5th Cir. 1961); City of New Britain v. Atomic Energy Comm'n, 308 F.2d 645 (D.C. Cir. 1962). In neither case, however, did the court reach the specific question whether the entirety of the waste, or only its radioactive component, is byproduct material.

[5] *See* discussion of RCRA section 1006(a), U.S.C. 6905(a), *infra*

[6] Cary v. Curtis, 44 U.S. (3 How.) 236, 240 (1845)

approach, those authorities are equally consistent with the narrower interpretation of byproduct material that was suggested by the majority of the commenters on the proposed rule. More importantly, DOE is now persuaded after further analysis that the "direct process" approach does not reflect the better view of the law.

RCRA is a remedial statute, and as such must be liberally construed to effectuate the remedial purpose for which it was enacted.[7] The intended comprehensiveness of RCRA's regulatory scheme is evident from the Act's legislative history. The principal sponsor of the legislation in the Senate emphasized that it represented "a major commitment of federal assistance to state and local government efforts to meet [hazardous and solid waste] problems in a comprehensive and effective manner." [8] The House Committee on Interstate and Foreign Commerce regarded the legislation as closing the "last remaining loophole" [9] in a framework of national environmental laws that already included the Clear Air Amendments of 1970, the Federal Water Pollution Control Act Amendments of 1972, and the Safe Drinking Water Act.

Moreover, interpretation of RCRA's exclusion of byproduct material must not focus solely on that exclusion, read in isolation. Instead, the exclusion can be viewed properly only in the context of the whole statute, as well as its object and policy.[10] In this connection, it seems apparent that RCRA was intended to have some applicability to materials that were already regulated under the AEA. Section 1006(a) of RCRA, 42 U.S.C. 6905(a), specifies that as to "any activity or substance" subject to the AEA, RCRA regulation must yield, but only to the extent of "inconsistent" requirements stemming from the AEA. The archetypal "substances" that can fairly be described as "subject to" the AEA are substances containing source, special nuclear and byproduct material, to which the AEA expressly is directed. Thus the language of section 1006(a) seems generally to contemplate complementary regulation under both statutes of substances that under prior law might have been regulated exclusively by the AEA.

[7] *See, e.g.,* Westinghouse Elec. Corp. v. Pacific Gas & Elec. Co., 326 F.2d 575 (9th Cir. 1964).

[8] 122 Cong. Rec. 21401 (1070) (remarks of Sen. Randolph).

[9] H.R. Rep. No. 94-1491, 94th Cong., 2d Sess., pt. 1, at 4, *reprinted in* 1976 U.S. Code Cong. & Ad. News 6238, 6241.

[10] *See, e.g.,* Richards v. United States, 369 U.S. 1, 11 (1962).

Viewed in this light, RCRA's definitional exclusion of source, special nuclear and byproduct material assumes a narrower significance than was suggested in the proposed rule. Instead of referring to any waste stream in its entirety, the exclusion appears directed only to the readioactive component of a nuclear waste. The result, however, is a more harmonious view of the statute as a whole. Read together, DOE believes that the definitional exclusion and the language of section 1006(a) are correctly understood to provide for the regulation under RCRA of all hazardous waste, including waste that is also radioactive. RCRA does not apply to the radioactive component of such a waste, however, if it is source, special nuclear or byproduct material. Instead, the AEA applies to that radioactive component. Finally, if the application of both regulatory regimes proves conflicting in specific instances, RCRA yields to the AEA.

In addition to construing the whole of RCRA in harmony, this interpretation results in according both RCRA and the AEA the greatest capacity to regulate effectively the special type of hazard that each statute was designed to control. Since the two statutes are not in irreconcilable conflict, but are capable of co-existence, they should be interpreted such that the operation and objectives of each are facilitated. *See Radzanower* v. *Touche Ross & Co.,* 426 U.S. 148, 155 (1976). However, in issuing today's final rule, DOE emphasizes the importance of section 1006(a) in resolving any particular inconsistencies that may occur between the requirements of RCRA and those of the AEA. DOE is the federal agency responsible for authoritatively construing the requirements of the AEA, as that Act applies to DOE activities. While DOE does not anticipate that adoption of today's final rule will lead to frequent cases of "inconsistency," section 1006(a) provides critical assurance that the implementation of the final rule will present no impediment to the maintenance of protection from radiological hazards as well as DOE's accomplishment of its other statutory responsibilities under the AEA.

A final consideration in adopting today's final rule is the rule's consistency with the legal position adopted by EPA and the NRC in resolving questions concerning RCRA's application at NRC-licensed commercial nuclear facilities. In a recent guidance document developed jointly by EPA and the NRC,[11] the two agencies stated that for commercial low-level radioactive waste containing a hazardous component, they will regard only the actual radionuclides in the waste as being exempt from RCRA. Today's final rule adopts the same approach for all DOE radioactive and chemically hazardous waste.

[11] "Guidance on the Definition and Identification of Commercial Mixed Low Level Radioactive and Hazardous Waste," Jan. 5, 1987.

Accordingly, for purposes of RCRA, DOE interprets the term byproduct material to refer only to the radioactive component of a nuclear waste. The nonradioactive chemically hazardous component of the waste will be subject to regulation under RCRA.

Procedural Matters

A. Executive Order 12291

This rule has been reviewed in accordance with Executive Order 12291. The rule is not classified as a major rule because it does not meet the criteria for major rules established by that Order.

B. National Environmental Policy Act

This rule is an interpretative rule intended only to clarify the meaning of a statutory definition. Issuance of the rule will have no environmental impact.

C. Regulatory Flexibility Act Certification

The rule will not have a significant impact on a substantial number of small entities.

D. Paperwork Reduction Act of 1980

There are no information collection requirements in the rule.

List of Subjects in 10 CFR Part 962

Nuclear materials, Byproduct material.

Issued in Washington, DC, April 27, 1987.

J. Michael Farrell,

General Counsel.

In consideration of the foregoing, Part 962 is added to 10 CFR Chapter III, to read as follows:

PART 962—BYPRODUCT MATERIAL

Sec.

962.1 Scope.

962.2 Purpose.

962.3 Byproduct material.

Authority: The Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*); Energy Reorganization Act of 1974 (42 U.S.C. 5801 *et seq.*); Department of Energy Organization Act (42 U.S.C. 7101 *et seq.*); Nuclear Waste Policy Act (Pub. L. 97-425, 96 Stat. 2201).

§ 962.1 Scope.

This Part applies only to radioactive waste substances which are owned or produced by the Department of Ener at facilities owned or operated by or the Department of Energy under the Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq*). This Part does not apply to substances which are not owned or produced by the Department of Energy.

§ 962.2 Purpose.

The purpose of this Part is to clarify the meaning of the term "byproduct material" under section 11e(1) of the Atomic Energy Act of 1954 (42 U.S.C. 2014(e)(1)) for use only in determining the Department of Energy's obligations under the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*) with regard to radioactive waste substances owned or produced by the Department of Energy pursuant to the exercise of its responsibilities under the Atomic Energy Act of 1954. This Part does not affect materials defined as byproduct material under section 11e(2) of the Atomic Energy Act of 1954 (42 U.S.C. 2014(e)(2)).

§ 962.3 Byproduct material.

(a) For purposes of this Part, the term "byproduct material" means any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material.

(b) For purposes of determining the applicability of the Resource Conservation and Recovery Act (42 U.S.C. 6901 *et seq.*) to any radioactive waste substance owned or produced by the Department of Energy pursuant to the exercise of its atomic energy research, development, testing and production responsibilities under the Atomic Energy Act of 1954 (42 U.S.C. 2011 *et seq.*), the words "any radioactive material," as used in subsection (a), refer only to the actual radionuclides dispersed or suspended in the waste substance. The nonradioactive hazardous component of the waste substance will be subject to regulation under the Resource Conservation and Recovery Act.

[FR Doc. 87-9885 Filed 4-30-87; 8:45 am]

BILLING CODE 6450-01-M

FEDERAL RESERVE SYSTEM

12 CFR Parts 207, 220, 221 and 224

Regulations G, T, U and X; Securities Credit Transactions; List of Marginable OTC Stocks

AGENCY: Board of Governors of the Federal Reserve System.

ACTION: Final rule; determination of applicability of regulations.

SUMMARY: The List of Marginable OTC Stocks is comprised of stocks traded over-the-counter (OTC) that have been determined by the Board of Governors of the Federal Reserve System to be subject to the margin requirements under certain Federal Reserve regulations. The List is published four times a year by the Board as a guide for lenders subject to the regulations and the general public. This document sets forth additions to or deletions from the previously published List effective February 10, 1987 and will serve to give notice to the public about the changed status of certain stocks.

EFFECTIVE DATE: May 12, 1987.

FOR FURTHER INFORMATION CONTACT: Peggy Wolffrum, Research Assistant, Division of Banking Supervision and Regulation, (202)-452-2781. For the hearing impaired only, Earnestine Hill or Dorothea Thompson, Telecommunications Device for the Deaf (TDD) (202)-452-3544, Board of Governors of the Federal Reserve System, Washington, DC 20551.

SUPPLEMENTARY INFORMATION: Set forth below are stocks representing additions to or deletions from the Board's List of Marginable OTC Stocks. A copy of the complete List incorporating these additions and deletions is available from the Federal Reserve Banks. This List supersedes the last complete List which was effective February 10, 1987. (Additions and deletions for that List were published at 52 FR 3217, February 3, 1987). The current List includes those stocks that meet the criteria specified by the Board of Governors in Regulations G, T, U and X (12 CFR Parts 207, 220, 221 and 224, respectively). These stocks have the degree of national investor interest, the depth and breadth of market, and the availability of information respecting the stock and its issuer to warrant regulation in the same fashion as exchange-traded securities. The List also includes any stock designated under an SEC rule as qualified for trading in the national market system (NMS Security). Additional OTC stocks may be designated as NMS securities in the interim between the Board's quarterly publications. They will become automatically marginable at broker-dealers upon the effective date of their NMS designation. The names of these stocks are available at the Board and the Securities and Exchange Commission and will be incorporated into the Board's next quarterly List.

The requirements of 5 U.S.C. 553 with respect to notice and public participation were not followed in connection with the issuance of this amendment due to the objective character of the criteria for inclusion and continued inclusion on the List specified in 12 CFR 207.6 (a) and (b), 220.17 (a) and (b), and 221.7 (a) and (b). No additional useful information would be gained by public participation. The full requirements of 5 U.S.C. section 553 with respect to deferred effective date have not been followed in connection with the issuance of this amendment because the Board finds that it is in the public interest to facilitate investment and credit decisions based in whole or in part upon the composition of this List as soon as possible. The Board has responded to a request by the public and allowed a two-week delay before the List is effective.

List of Subjects

12 CFR Part 207

Banks, Banking, Credit, Federal Reserve System, Margin, Margin requirements, National Market System (NMS Security), Reporting and recordkeeping requirements, Securities.

12 CFR Part 220

Banks, Banking, Brokers, Credit, Federal Reserve System, Margin, Margin requirements, Investments, National Market System (NMS Security), Reporting and recordkeeping requirements, Securities.

12 CFR Part 221

Banks, Banking, Credit, Federal Reserve System, Margin, Margin requirements, Securities, National Market System (NMS Security), Reporting and recordkeeping requirements.

12 CFR Part 224

Banks, Banking, Borrowers, Credit, Federal Reserve System, Margin, Margin requirements, Reporting and recordkeeping requirements, Securities.

Accordingly, pursuant to the authority of sections 7 and 23 of the Securities Exchange Act of 1934, as amended (15 U.S.C. 78g and 78w), and in accordance with 12 CFR 207.2(k) and 207.6(c) (Regulation G), 12 CFR 220.2(s) and 220.17(c) (Regulation T), and 12 CFR 221.2(j) and 221.7(c) (Regulation U), there is set forth below a listing of deletions from and additions to the Board's List:

Deletions From List

Stocks Removed for Failing Continued Listing Requirements

American Aggregates Corporation
  No par common
Bio-Medicus, Inc.
  Warrants (expire 08-31-88)

Appendix D

<u>Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste</u>, September 23, 1988. (53 <u>FR</u> 37045)

Chittenden Cos., VT, Due: April 15, 1989, Contact: Ralph Abele, Jr. (617) 965–5100.

Published FR 11–13–87—Review period extended.

EIS No. 880152, Draft, USA, PRO, NAT, Nationwide Biological Defense Research Program, Continuation, Implementation, Due: October 4, 1988, Contact: Charles Dasey (301) 663–2732. Published FR 5–20–88–Review period extended.

EIS No. 880267, DSuppl, AFS, OR, ID, Wallowa Whitman National Forest, Land and Resources Management Plan, Additional Alternative, Implementation, Baker, Union, Wallowa, Grant, Malheur and Umatilla Counties, OR and Adams, Nez Perce and Idaho Counties, ID, Due: December 12, 1988, Contact: Bruce McMillan (503) 523–6319.

Published FR 9 9–88—Review period extended, incorrect date published in 9–9–88 FR.

Dated: September 20, 1988.

William D. Dickerson,

Deputy Director, Office of Federal Activities.

[FR Doc. 88–21862 Filed 9–22–88; 8:45 am]

BILLING CODE 6560-50-M

[FRL–3452–6]

Clarification of Interim Status Qualification Requirements for the Hazardous Components of Radioactive Mixed Waste

AGENCY: Environmental Protection Agency (EPA).

ACTION: Clarification notice.

SUMMARY: The Environmental Protection Agency (EPA) is today publishing a notice which clarifies requirements for facilities that treat, store or dispose of radioactive mixed waste to obtain interim status pursuant to Subtitle C of the Resource Conservation and Recovery Act (RCRA). Radioactive mixed wastes are wastes that contain both hazardous waste subject to RCRA and radioctive waste subject to the Atomic Energy Act (AEA). Additionally, this notice addresses "notification" requirements for handlers of radioactive mixed waste.

DATE: Owners and operators of facilities treating, storing, or disposing of radioactive mixed waste in States not authorized by September 23, 1988 to administer the Federal hazardous waste program in lieu of EPA must submit a RCRA Part A permit application to EPA by March 23, 1989 to qualify for interim status. Facilities treating, storing or disposing of radioactive mixed waste in States that received authorizatioin by September 23, 1988 are not subject to RCRA regulations until the State revises its existing authorized hazardous waste program to include authority to regulate radioactive mixed waste. Owners and operators must then comply with applicable State requirements regarding interim status.

To date, four States (i.e., Colorado, South Carolina, Tennessee, and Washington) have been authorized to regulate radioactive mixed wastes. In those States, owners and operators must comply with the applicable State law governing interim status for radioactive mixed waste facilities if it is more stringent than the otherwise applicable provisions of this notice.

FOR FURTHER INFORMATION CONTACT: Betty Shackleford, Office of Solid Waste (WH–563B), U.S. Environmental Protection Agency, 401 M Street SW., Washington, DC 20460, (202) 382–2221.

SUPPLEMENTARY INFORMATION:

A. Background

In 1976, the Resource Conservation and Recovery Act (RCRA) as amended, was passed to provide for development and implementation of a comprehensive program to protect human health and the environment from the improper management of hazardous waste. Specifically, Subtitle C of RCRA creates a managment system intended to ensure that hazardous waste is safely handled from the point of generation to final disposal. To acomplish this, Subtitle C requires the Agency first to define and characterize hazardous waste. Second, a hazardous waste manifest system was implemented to track the movement of hazardous waste from the point of generation to ultimate disposal. Hazardous waste generators and transporters must employ appropriate management practices and procedures to ensure the effective operation of the manifest system. Third, owners and operators of treatment, storage or disposal facilities (TSDF's) must comply with standards the Agency established under section 3004 of RCRA that "may be necesary to protect human health and the environment." These standards are implemented exclusively through permits issued to TSDF owners and operators by the Agency or authorized States. Until final permits are issued, treatment, storage, and disposal facilities must comply with the interim status regulations found in 40 CFR Part 265, which were promulgatd mostly on May 19, 1980.

Under RCRA interim status, the owner or operator of a TSDF may operate without a final permit if: (1) The facility existed on November 19, 1980 (or existed on the effective date of statutory or regulatory changes under RCRA that render the facility subject to the requirements to have a permit under section 3005); (2) the owner or operator complies with the notification requirements of section 3010 of RCRA: and (3) the owner or operator submits a RCRA Part A permit application (40 CFR 270.70). Interim status is retained until the Agency or authorized State makes a formal decision to issue or deny the final TSDF permit.

As provided by section 3006(b) of RCRA, States may apply to EPA for authorization to administer and enforce a hazardous waste program pursuant to Subtitle C of RCRA. Authorized State programs are carried out in lieu of EPA. To date, forty-four States have received final authorization to administer the basic hazardous waste program. Of these forty-four States, only four (i.e., Colorado, South Carolina, Tennessee, and Washington) have received the additional authorization needed to regulate radioactive mixed waste. In these States, which had base program authorization by July 3, 1986, the State's regulations on interim status for mixed waste facilities control.

The other forty States with base program authorization must still revise their existing programs to include authority to regulate the hazardous component of radioactive mixed waste. In the twelve States and trust territories (i.e., Alaska, American Samoa, California, Connecticut, Hawaii, Idaho, Iowa, Marianna Islands, Ohio, Puerto Rico, Virgin Islands, and Wyoming) *unauthorized* to carry out their own RCRA hazardous waste program, radioactive mixed waste is subject to Federal hazardous waste regulations administered by EPA.

Historically, substantial confusion and uncertainty have surrounded the applicability of RCRA to hazardous wastes containing certain radioactive materials (i.e., source, special nuclear or byproduct material as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923)). This uncertainty stemmed, to a large extent, from the exclusion of source, special nuclear and byproduct material from the definition of solid waste under section 1004(27) of RCRA.

To clarify State responsibilities with regard to the hazadous components of radioactive mixed waste, the EPA published a notice in the Federal Register of July 3, 1986 (51 FR 24504). That notice recognized that States had not previously been authorized under RCRA to regulate radioactive mixed waste because of continuing debate surrounding the extent of RCRA jurisdiction over this category of waste.

Through that notice, EPA clarified its position that the hazardous component(s) of mixed waste was subject to RCRA regulation. Accordingly, States were required to revise their existing hazardous waste programs and apply for RCRA authorization to regulate radioactive mixed waste in accordance with the deadlines set forth in the July 3, 1986 notice. Similarly, such authority must now be sought by States initially submitting an application for RCRA final authorization.

Since publication of the July 3, 1986 notice, the Agency promulgated new deadlines for State hazardous waste program modifications (the "Cluster Rule," September 22, 1986, 51 FR 33712). This subsequent rulemaking established annual deadlines for States to submit program changes in groups or clusters when seeking Agency authorization. For State program changes occurring after June 1984, the groups or clusters were to correspond to successive twelve-month periods beginning each July 1 and ending June 30 of the following year. In accordance with the schedule established by the Cluster Rule, States which applied for final authorization before July 3, 1986 were required to revise existing hazardous waste programs to include the authority to regulate the hazardous component of radioactive mixed waste by July 1, 1988 (or by July 1, 1989 if a statutory amendment is necessary). States initially seeking final authorization after July 3, 1987 were required to seek authorization for radioactive mixed waste as part of their application for final authorization. Any State applying for HSWA corrective action must concurrently seek authority for radioactive mixed waste. The July 3, 1986 notice addressing RCRA's applicability to TSDF's handling radioactive mixed waste did not, however, address the issue of interim status.

B. Clarification of the Definition of Byproduct Material

At the same time that EPA's rules governing State programs for radioactive mixed waste were being developed and implemented, controversy arose over which wastes are mixed and therefore subject to RCRA and which wastes are pure "byproduct material" and therefore exempt from RCRA regulations as provided by section 1004(27). To delineate RCRA applicability to their byproduct material waste streams, the Department of Energy (DOE) issued an interpretive rule on May 1, 1987 (52 FR 15937). In that rule DOE stated that the term byproduct material as it applies to DOE-owned wastes (i.e., any radioactive material except special nuclear material yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material) refers only to the actual radionuclides dispersed or suspended in the waste substance. That interpretation is consistent with the position issued on January 8, 1987 by the EPA and the Nuclear Regulatory Commission (NRC) in a document entitled "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste and Answers to Anticipated Questions." Therefore, as DOE clarified in its May 1, 1987 byproduct rule, any matrix containing a RCRA hazardous waste as defined in 40 CFR 261 and a radioactive waste subject to the AEA is a radioactive mixed waste. Such wastes are subject to RCRA hazardous waste regulations regardless of further subclassification of the radioactive waste constituent as high-level, low-level, transuranic, etc.

C. Interim Status

As discussed previously, RCRA section 3005(a) prohibits treatment, storage, or disposal of hazardous waste without a permit after November 19, 1980. However, section 3005(e) of RCRA provides that facilities in existence on November 19, 1980 *or* on the date of statutory or regulatory changes which subject the facility to RCRA requirements, may continue treatment, storage, or disposal under "interim status" pending a final decision on its permit application.[1] To qualify for interim status under section 3005(e), the owner or operator of a TSDF in existence must submit a Part A permit application and meet applicable notification requirements under section 3010 of RCRA.

EPA has become aware that many TSDF's handling radioactive mixed waste, both in authorized and unauthorized States (EPA-administered hazardous waste programs), have been substantially confused about the regulatory status of their particular mix of hazardous waste. Further, these owners and operators are uncertain about how to qualify for interim status if they are handling radioactive mixed waste.

The July 3, 1986 notice addressing RCRA's applicability to TSDF's handling radioactive mixed waste did not address the issue of interim status. Given that omission and subsequent definitional clarifications on which radioactive waste streams are subject to RCRA regulation, EPA has determined that substantial confusion about interim status requirements existed. The primary purpose of this notice, therefore, is to clarify RCRA interim status requirements with respect to TSDF's managing radioactive mixed waste. The requirements are discussed below.

1. Requirement That Facilities Be "In Existence"

Interim status provides temporary authorization to continue hazardous waste management activities at facilities engaging in such activities at the time that they first become subject to RCRA regulation. Without interim status, the activities would have to cease until a permit application was filed and reviewed and final permit issued.

One of the conditions for qualifying for interim status under section 3005(e) is that the facility be "in existence" either on November 19, 1980 or on the date of the regulatory or statutory change which first subjects the facility to RCRA permitting requirements. Under EPA regulations at 40 CFR 260.10 and 270.2, to be "in existence" (i.e., to be an existing hazardous waste management facility or existing facility) means that the facility is either operating or construction of such a facility has commenced on the relevant date.

As applied to facilities handling radioactive mixed waste in States unauthorized to implement a hazardous waste program (i.e., without base program authorization) as of the date of this notice, EPA believes that facilities in operation or under construction as radioactive mixed waste treatment, storage, or disposal facilities on July 3, 1986 may qualify for interim status under section 3005(e)(1)(A)(ii) of RCRA. The Agency interprets this provision as applying to such facilities in existence on July 3, 1986 because the July 3, 1986 notice was EPA's first official pronouncement to the general public that RCRA permitting requirements are applicable to radioactive mixed waste. In view of the level of confusion surrounding regulation of radioactive mixed waste prior to that time, EPA treat the July 3, 1986 notice as the relevant regulatory change for establishing that facilities in existence

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[1] *However, if a facility* has previously had its interim status terminated, the facility is barred by statute from qualifying for interim status for a newly listed waste (RCRA section 3005(e)(1)). *If only* certain *units* at the facility have previously had interim status terminated, then the facility may operate newly-regulated units under interim status (see 40 CFR 270.72).

on that date may qualify for interim status if other applicable requirements are met.

Facilities treating, storing, or disposing of radioactive mixed waste but not other hazardous waste in a State with base program authorization are not subject to RCRA regulation until the State program is revised and authorized to issue RCRA permits for radioactive mixed waste. The effective date of the State's receipt of radioactive mixed waste regulatory authorization from EPA will therefore be the regulatory change that subjects these TSDF's to RCRA permitting requirements. Any facility treating, storing, or disposing of radioactive mixed waste, or any such facility at which construction commenced by the effective date of authorization for the State's radioactive mixed waste program revision may qualify for interim status if the other requirements described below are met. However, owners and operators of TSDF's in authorized States are subject to all applicable State laws. A State can establish its own date for qualifying for interim status but, in order to be no less stringent than the Federal program, that date *may not* be after the effective date of EPA's authorization to the State to regulate radioactive mixed waste.

Some facilities in States with base program authorization as of July 3, 1986 may already have interim status under RCRA because they handle other RCRA hazardous wastes. These facilities should submit a revised Part A permit application reflecting their radioactive mixed waste activities within six months of the State's receipt of authorization for radioactive mixed waste.

2. Requirements to File a Permit Application

To qualify for interim status under RCRA section 3005(e) (1), the owner or operator of an "existing" facility must submit a Part A permit application. Under 40 CFR 270.10(e), existing facilities in *unauthorized* States must submit Part A of their permit application no later than six months after the date of "publication or regulations" which first require them to comply with technical standards, or thirty days after they first become subject to the technical standards, whichever is first. Although the July 3, 1986 notice clarified RCRA jurisdiction over radioactive mixed waste, it specifically addressed only the issue of State authorization. Application of the time periods specified in 40 CFR 270.10(e) to facilities located in unauthorized States was not addressed. Furthermore, the July 3, 1986 notice was technically not a regulation, which is the trigger for § 270.10(e) in normal circumstances. As a result, owners and operators in unauthorized States could legitimately have been confused as to whether (and when) they were required to submit a Part A permit application. Under § 270.10(e)(2), EPA finds that the confusion is substantial and is attributable primarily to (1) ambiguities surrounding the 40 CFR parts 260–265 regulatory status of mixed waste, (2) the narrow scope of the July 3, 1986 notice and (3) uncertainty regarding DOE's final definition of byproduct material which had direct bearing on RCRA applicability to Federally-owned radioactive mixed wastes and indirect bearing on commercial radioactive mixed wastes.

EPA, therefore, is exercising its authority today under § 270.10(e)(2) to extend the Part A permit application filing dates for owners and operators of facilities handling radioactive mixed waste in unauthorized States. Owners and operators of radioactive mixed waste facilities in operation or under construction as of July 3, 1986 (See 45 FR 33066, May 19, 1980) in unauthorized States must submit RCRA Part A permit applications or modifications within six months of the date of publication of today's notice to qualify for interim status. This is predicated on the Agency's determination that the time periods specified in § 270.10(e) are triggered as of the date of publication of this notice given the circumstances presented herein. It should be noted, however, that radioactive mixed waste land disposal facilities must also submit a final (Part B) permit application and certification of compliance with applicable ground-water monitoring and financial assurance requirements within twelve months from the date of this notice pursuant to section 3005(e)(3) of RCRA. Failure to do so may result in loss of interim status for the affected units and possibly for the facility. Facilities other than land disposal must submit Part B of the permit application in accordance with deadlines established by the EPA Regional Office.

Mixed waste TSDF's in States with base program authorization must comply with applicable State requirements and deadlines for obtaining interim status as prescribed in authorized State law. Radioactive mixed waste land disposal facilities obtaining interim status in authorized States are nevertheless subject to the section 3005(e)(3) one-year provision on loss of interim status for newly-listed wastes. Thus, the owners or operators of such facilities must submit the State analogue of the Part B permit application and the required certifications within twelve months of the effective date of the State's authorization to regulate radioactive mixed waste. Failure to submit the Part B permit application or the required certifications will result in loss of interim status for the affected units and possibly for the facility. Facilities other than land disposal must submit the Part B permit application in accordance with deadlines established by the authorized State program.

3. Requirement to Comply with Section 3010 Notification

The final condition for obtaining interim status under section 3005(e) of RCRA is notification of hazardous waste activity under section 3010(a) of RCRA. Section 3010(a) requires persons handling hazardous wastes at the time of publication of EPA's initial hazardous waste regulations (on May 19, 1980) to notify EPA of their hazardous waste activity within 90 days (i.e., by August 18, 1980). Section 3010(a) also allows the Administrator discretion on whether to require persons to provide such notification not later than 90 days after promulgation or regulations identifying a substance they handle as hazardous waste thereby providing EPA with a current picture of the hazardous waste universe.

Although many facilities currently treating, storing, or disposing of radioactive mixed waste were doing so in May 1980, EPA believes that the status of radioactive mixed waste was sufficiently unclear that no notification under section 3010(a) was required by August 18, 1980 for facilities handling such waste (See 45 FR 76631–32, November 19, 1980). Nor has notification subsequently been required as part of EPA promulgation of additional RCRA regulations. Therefore, EPA has determined that it is unreasonable to penalize owners and operators of facilities currently handling radioactive mixed waste for any failure to file notification under Section 3010.

Further, EPA finds that TSDF's have "complied with the requirements of section 3010(a)" for purposes of section 3005(e) interim status under 40 CFR 270.70(a)(1). This finding is predicated largely on the fact that radioactive mixed waste will not be subject to hazardous waste regulations in the vast majority of States until they revise their programs to include such authority. These program revisions could take until July 3, 1989 for States needing a statutory amendment. Because notification would be linked to radioactive mixed waste authorization for these States, receipt of this information would be fragmented. Moreover, the Agency has been aware of the magnitude of the potential radioactive mixed waste universe for some time since each NRC and NRC Agreement State lincensee is a potential handler of radioactive mixed waste. Thus, no further notification of EPA under § 270.70(a)(1) is required in order for facilities treating, storing or disposing of mixed waste to qualify for interim status. However, TSDF owners and operators, like generators and transporters of radioactive mixed waste, must obtain an EPA Identification Number in accordance with the procedures set forth in 40 CFR 265.11 if they do not already have one. The Identification Number may be obtained by completing EPA Notification Form 8700-12 and submitting it to the EPA Regional Office serving the area where the hazardous waste activity is located.

D. Joint Regulation of Radioactive Mixed Waste

As stated previously, a single radioactive mixed waste stream is subject to regulation by two separate Federal agencies (i.e., EPA and NRC, or EPA and DOE). This dual regulatory system requires handlers of waste formerly regulated exclusively by NRC or DOE to also comply with RCRA regulations for hazardous waste management. EPA is committed to minimizing the impact of RCRA regulations by developing a strategy for joint regulation of radioactive mixed wastes that will effect program implementation in the least burdensome manner practicable.

One area of the radioactive mixed waste regulatory process which may lend itself to streamlining occurs when regulatory requirements for hazardous and radioactive waste management are duplicative. When this occurs, compliance with regulations governing radioactive waste management may accomplish a level of environmental protection that may be commensurate with that required under RCRA for hazardous waste management or vice versa. In such instances, EPA will accept, to the extent possible, information already submitted to the NRC when processing the RCRA permit. Moreover, EPA and NRC are assessing the feasibility of developing a joint permitting/licensing guidance that will address these concerns. Suggestions from the regulated community regarding duplicative requirements and simplification of the licensing/permitting process are welcome. Comments should be specific and should document how equivalent protection of human health and the environment from hazardous waste is achieved. The Agency urges States authorized to regulate radioactive mixed waste to adopt a comparable practice when implementing its hazardous waste program.

E. Consistency with the Atomic Energy Act

Publication of the clarification notice addressing RCRA applicability to radioactive mixed waste precipitated a variety of concerns from the regulated community, most of which reflected confusion about the RCRA program. However, two issues were commonly raised, namely, (1) the appropriateness of RCRA hazardous waste regulations for managing waste containing radioactive components and, (2) compliance with RCRA would result in violation of a basic tenet of radioactive waste management, that of keeping radiation exposures as low as reasonably achievable (ALARA).

These concerns prompted the EPA and the NRC to jointly review their respective regulations in an effort to delineate the extent of inconsistencies between EPA's hazardous waste and NRC's radioactive waste management requirements. No inconsistencies were identified as a result of this comparison although RCRA was more prescriptive in some instances and differences in stringency were observed. Differing or more stringent regulations do not necessarily constitute inconsistent requirements. For example, the comparison of container management regulations (See 10 CFR Parts 61 and 71 and 40 CFR Part 264, Subpart I) revealed that they covered different aspects of container management. NRC regulations provide requirements for packaging and placement for land disposal (including the use of fill and liquid-absorbent materials) (See 10 CFR 61.51 and 10 CFR 40-44) while EPA regulations provide prescriptive provisions for the design, use, and inspection of containers at storage facilities and describe how spills from storage areas are to be mitigated. Both agencies have regulations on packaging and waste transport. Here, the regulatory requirements were found to be complementary rather than conflicting.

Although NRC and EPA waste management regulations differ in stringency and scope, the technical requirements were not found to be inconsistent. Section 1006(a) of RCRA precludes any solid or hazardous waste regulation by EPA or a State that is "inconsistent" with the requirements of the AEA. In such instances, the AEA would take precedence and the inconsistent RCRA requirement would be inapplicable.

EPA recognizes that implementation of the dual regulatory program for radioactive mixed waste management might result in instances where compliance with both sets of regulations is not only infeasible but undesirable. Therefore, EPA urges the regulated community to bring to our attention all cases of actual inconsistency which may form the basis for future rulemaking and/or technical or policy guidance.

Dated September 16, 1988.

Lee M. Thomas,

Administrator, Environmental Protection Agency.

[FR Doc. 88-21776 Filed 9-22-88; 8:45 am]

BILLING CODE 6560-50-M

[OPTS-51714; FRL-3452-9]

Toxic and Hazardous Substances; Certain Chemicals Premanufacture Notices

AGENCY: Environmental Protection Agency (EPA).

ACTION: Notice.

SUMMARY: Section 5(a)(1) of the Toxic Substances, Control Act (TSCA) requires any person who intends to manufacture or import a new chemcial substance to submit a premanufacture notice (PMN) to EPA at least 90 days before manufacture or import commences. Statutory requirements for section 5(a)(1) premanufacture notices are discussed in the final rule published in the Federal Register of May 13, 1983 (48 FR 21722). This notice announces receipt of forty-eight such PMNs and provides a summary of each.

DATES: Close of Review Periods:

P 88-1878, 88-1879, 88-1880, November 22, 1988.

P 88-1881, 88-1882, November 23, 1988.

P 88-1883, 88-1884, 88-1885, 88-1886, 88-1887, 88-1888, 88-1889, 88-1890, 88-1891, 88-1892, 88-1893, 88-1894, 88-1895, 88-1896, November 26, 1988.

P 88-1897, 88-1898, 88-1899, 88-1900, 88-1901, 88-1902, 88-1903, 88-1904, 88-1905, 88-1906, 88-1907, 88-1908, 88-1909, 88-1910, 88-1911, November 27, 1988.

P 88-1912, 88-1913, 88-1914, November 28, 1988.

P 88-1915, 88-1916, 88-1917, 88-1918, 88-1919, 88-1920, 88-1921, 88-1922, 88-1923, 88-1924, 88-1925, November 29, 1988.

Written comments by:

P 88-1878, 88-1879, 88-1880, October 23, 1988.

P 88-1881, 88-1882, October 24, 1988.

P 88-1883, 88-1884, 88-1885,

Appendix E

Fact Sheet and EPA Memorandum - Permitting Deadlines for Mixed Waste Storage and Treatment Units

Permitting Deadlines for Mixed Waste Storage and Treatment Units

- *Mixed waste storage and treatment units are not subject to the deadlines for submitting Part B applications and for permitting issuance that were established in RCRA §3005(c).* These deadlines apply only to facility units that obtained or should have obtained interim status by November 8, 1984; mixed waste units could not have obtained interim status until after EPA issued the clarification of its authority over mixed waste on July 3, 1986.

- Regions and States authorized for mixed waste will establish appropriate permitting schedules for those facilities or units that are not required to meet the deadlines established in §3005(c).

- RCRA §3005(c) requires facility owner/operators to submit treatment and storage Part B applications by November 8, 1988, to protect against loss of interim status in 1992, and establishes November 8, 1992, as the permitting deadline for treatment and storage facilities. However, these two deadlines apply only to the facility units that obtained or should have obtained interim status by November 8, 1984.

    -- Therefore, if a facility obtained interim status by November 8, 1984, but at any time after this date submitted a change during interim status to add units to its Part A permit application, the deadlines do not apply to the unit or units that were added.

    -- In addition, units that were temporarily excluded on November 8, 1984, are not considered as having interim status on that date, and thus, the interim status and permitting deadlines do not apply.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

MAR 21 1988

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

MEMORANDUM

SUBJECT: Hammer Dates for Mixed Waste Storage and Treatment Units

FROM: Bruce Weddle, Director
Permits and State Programs Division
Office of Solid Waste

TO: Kenneth D. Feigner, Chief
Waste Management Branch
Region X

In your memorandum of March 1, 1988, you raise several questions regarding the November 8, 1988 "hammer date" established in §3005(c) requiring facility owner/operators to submit treatment and storage Part B applications in order to retain interim status after November 8, 1992. Specifically, you ask if Part B applications for newly regulated treatment and storage units must be submitted by November 8, 1988 to protect against loss of interim status in 1992. Additionally, you ask whether the November 8, 1992 deadline for permit issuance applies to these newly regulated units even if the November 8, 1988 deadline does not. In a related question, you ask if the Part B submission and the permitting deadlines apply to units that qualify for interim status after November 8, 1988.

We have determined that the storage and treatment facility deadlines for Part B applications (November 8, 1988) and permit issuance (November 8, 1992) apply only to facilities that obtained or should have obtained interim status by November 8, 1984. Furthermore, these deadlines apply only to those units listed in the facility's Part A permit application as of November 8, 1984 or to those units that needed to be listed in the Part A as of that date. (Units that were identified on the Part A but that were temporarily excluded on November 8, 1984 are not considered as being in interim status on that date.) Thus, a unit that was added to an interim status facility after this date through a change in interim status (or by the lapsing of a temporary exclusion) would not be subject to either of these deadlines.

In the example you discuss regarding the Hanford facility, I assume that the facility obtained interim status in 1980 (or at some point prior to November 8, 1984) and therefore is subject to the hammer dates in §3005(c). However, the 22 mixed waste storage and treatment units are not subject to either of the two deadlines since the units obtained interim status only in November 1987. In this case, permitting may proceed to address the remainder of the facility, with the 22 mixed waste units to be permitted on an appropriate schedule as established by the Region and the State of Washington.

The same principles discussed above apply to facilities that had interim status by November 8, 1984 at which there are units that gain interim status after November 8, 1988. Therefore, the Part B permit application deadline and the permit issuance deadline do not apply to such units.

The Office of Solid Waste will soon be issuing additional guidance on the general applicability of the November 8, 1988 permit application deadlines to interim status facilities.

cc: Regional Hazardous Waste Branch Chiefs, Regions I-IX, with copy of incoming.

Rec'd 3/7/88

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10
SEATTLE, WASHINGTON 98101

MAR 01 1988

REPLY TO ATTN OF: HW-112

MEMORANDUM

SUBJECT: Hammer Dates for Mixed Waste Storage and Treatment Units

FROM: Kenneth D. Feigner, Chief
Waste Management Branch

TO: Bruce Weddle, Director
Permits and State Programs Division
Office of Solid Waste

The "hammer dates" in Section 3005(c) establish November 8, 1988, as the date for submittal of treatment and storage Part B applications in order to retain interim status after November 1992, for mixed waste and treatment units. Section 3005(c) is silent as to the applicability of this date for newly regulated units (i.e., those that qualify for interim status after November 8, 1984).

Mixed wastes became regulated in Washington State on November 23, 1987. Until that date, the applicability of RCRA to many waste management activities at the Department of Energy Hanford facility was unclear. The state, Region 10, and the Department of Energy and its contractors are developing an Action Plan that, among other things, establishes dates for reviewing all Hanford permit applications and closure plans. Of the 51 units* that will be permitted or closed, 22 are mixed waste treatment or storage units. Obviously, if Hanford is to prepare Part B applications for each of these 22 units, its resources would be diverted from such existing priorities as further development of land disposal applications (including corrective action), work on the Action Plan, and other physical and administrative activities.

In researching the issue of hammer dates for newly regulated units, we noted that other provisions of the Hazardous and Solid Waste Amendments of 1984 do speak to newly regulated units. Specifically §3005(j)(6)(A) provides four years for newly regulated surface impoundments to demonstrate compliance with minimum technology requirements (MTR). This allows newly regulated units the same amount of time to demonstrate compliance with MTR that existing hazardous waste impoundments were given. In somewhat the same vein, §3005(e)(3) provides newly regulated land disposal units the same 12 months that existing units had to meet the "loss of interim status" requirements.

*Some of the 51 are multi-unit groupings such as single or double shell tank farms and low-level waste disposal areas.

We would like clarification of the applicability of §3005(c) hammer dates to newly regulated treatment and storage units. Specifically, must all Part B applications be submitted by November 8, 1988, to protect against loss of interim status in 1992? Or is there justification for allowing newly regulated treatment and storage units the same four years that existing units had to submit permit applications? Or is the November 8, 1992, deadline for issuance of all treatment and storage permits the critical date (i.e. newly created treatment and storage units would not have to submit applications to protect against loss of interim status, but the 1992 deadline for issuance of the permit would be applicable)? What about units that qualify for interim status after November 8, 1988? Because of the very short timeframe and numerous units involved, we would appreciate an expedited response to these questions.

Appendix F

Fact Sheet and EPA Memorandum - Mixed Waste Regulation in Authorized States

Mixed Waste Regulation in Authorized States

- In authorized States, non-HSWA listed or identified hazardous wastes are not RCRA hazardous wastes until such wastes become part of the State's authorized program. In unauthorized States both non-HSWA and HSWA wastes are RCRA hazardous wastes regulated under EPA's Federal RCRA program. This is an important premise in determining RCRA applicability to mixed waste.

  Applicability of Section 3006(g) of RCRA

  -- *The provisions of Section 3006(g) of RCRA apply only to RCRA hazardous waste.* This section provides that any requirement pursuant to HSWA, which is applicable to hazardous waste, takes effect in both authorized and unauthorized States at the same time. This provision does not apply to mixed waste. Mixed waste is a non-HSWA waste and requirements pertaining to mixed waste were effective in unauthorized States one year after EPA clarified its authority to regulate mixed waste (Notice published July 3, 1986). In base-RCRA authorized States mixed waste will not come under RCRA regulation until the effective date of the State's authorization for mixed waste.

- Availability of Interim Status

  -- *In base-RCRA authorized States, interim status for facilities handling mixed waste is unavailable under the State equivalent of §3005(e) until the State incorporates mixed waste into its hazardous waste program.* Furthermore, facilities in these States cannot be granted interim status through the Federal RCRA program because in these States, the State authority over hazardous waste operates in lieu of Federal authority. Mixed waste facilities (or mixed waste units at regulated facilities) in these States, may continue to operate without interim status because mixed waste is not regulated as hazardous waste. Interim status for mixed waste facilities will become available in base-RCRA authorized States after the State receives mixed waste authorization.

- Interstate Transport of Waste

  -- *Hazardous waste in one State may be shipped to a second State that has not yet regulated the waste as hazardous.* If a RCRA permit cannot be issued to a facility because the waste is not hazardous under authorized State law, then that waste can be delivered to that facility without violation.

- Applicability of the Land Ban

  -- *The land ban provisions do not apply to mixed waste disposal in base-RCRA authorized States that do not also have mixed waste authorization.* This is because the land ban provisions only apply to RCRA hazardous waste. When a State obtains mixed waste authorization, mixed waste disposal in that State will be subject to the land ban provisions. These provisions will be implemented through either State or Federal authority depending on whether or not the State has obtained HSWA authorization for the land ban provisions.

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

AUG 25

MEMORANDUM

SUBJECT: Clarification of RCRA Issues Pertinent to the Waste Isolation Pilot Plant

FROM: Sylvia K. Lowrance, Director
Office of Solid Waste

TO: John Tseng, Director
Office of Environmental Guidance and Compliance

Attached is an issue paper we developed in response to the concerns you raised at our meeting regarding the Waste Isolation Pilot Plant (WIPP). The paper summarizes our position on the availability of interim status, interstate movement of waste and the applicability of the land ban to mixed waste activities at the WIPP. However, as you know, authorized State hazardous waste programs may be more stringent than the Federal program. Coordination with appropriate State programs is necessary to ensure compliance with applicable regulatory requirements.

Questions may be addressed to Joe Carra, Director, Permits and State Programs Division at 382-7919. Thank you for bringing these issues to my attention, and I look forward to continued progress in the area of mixed waste regulation.

Attachment

cc: Kitty Taimi
Betty Shackleford

MIXED WASTE POSITION PAPER

1. ISSUE: Availability of Interim Status

Can TSDF's in States with RCRA base program authorization obtain interim status before the State is authorized to regulate mixed waste?

Example: DOE's Waste Isolation Pilot Plant (WIPP) which is located in Carlsbad, New Mexico.

POSITION: NO

BASIS: States with authorized hazardous waste programs operate in lieu of Federal authority. In authorized States, interim status is a matter of State and not Federal law. Until a non-HSWA listed or identified hazardous waste becomes part of the State's authorized program, such wastes are not RCRA hazardous wastes in that State. TSDF's do not need interim status or a RCRA permit to continue handling these wastes prior to the effective date of State authorization. Interim status under the State analog to Section 3005(e) is unavailable until the State is authorized to regulate mixed waste. However, other State law could be applicable in the interim and may authorize facility operation.

2. **ISSUE: Interstate Transport of Waste**

May a waste which is defined as hazardous waste in the generator State be shipped to a TSDF in a consignment State in which the waste is not classified as hazardous waste.

POSITION: YES

BASIS: EPA's generator regulations require a generator of hazardous waste to "designate on the manifest one facility which is permitted to handle the waste described on the manifest." 40 CFR Section 262.20(b). This requirement, standing alone, might be ambiguous in that "permitted" could mean "allowed" or could mean "has a permit." However, the regulations make clear that the facility so designated is the "designated facility" as defined in the Section 260.10. That definition refers specifically to Section 262.20, the requirement that generators designate a permitted facility. Thus, a "facility which is permitted to handle the waste" must also be a facility that fits the definition of "designated facility." Under that definition, a designated facility must: [1] have an EPA permit (or interim status) in accordance with the requirements of Parts 270 and 124, [2] have a permit from a State authorized in accordance with Part 271, or [3] be a TSDF that is regulated under Section 261.6(c)(2) or Subpart F of Part 266, and that has been designated on the manifest by the generator pursuant to Section 262.20.

The phrase "in accordance with" as used in the definition of designated facility can be read to imply that if a RCRA permit could not be issued to a facility because the waste is not hazardous under authorized State law, then the waste could be delivered to that facility without violation of authorized State or Federal law. It should be noted that this interpretation of "designated facility" reflects the special situation where hazardous waste in one State is shipped to a second State that has not yet regulated the waste as hazardous.

3. **ISSUE: Applicability of land ban to mixed waste**

Do HSWA land ban provisions apply to mixed waste activities in States with base program but not mixed waste authorization?

Example: Does the land ban apply to mixed waste in authorized States that are not yet authorized for mixed waste?

POSITION: NO

BASIS: The land ban provisions in Section 3004(d)-(h) apply to listed and identified hazardous waste. Furthermore, Section 3006(g) provides that "any requirement or prohibition which is applicable to the generation, transportation, treatment, storage or disposal of hazardous waste pursuant to HSWA" takes effect in both authorized and unauthorized states at the same time. Mixed waste, a non-HSWA waste, is not a "hazardous waste" in States with base program authorization until such programs are revised to include mixed waste regulatory authority and authorization for that revision is given (per July 3, 1986 FR Notice). Accordingly, since mixed wastes are not hazardous wastes in authorized States, the provisions of Sections 3004(d)-(h) and 3006(g) are inapplicable until mixed waste authorization for mixed waste becomes effective in a given State.

Appendix G

Fact Sheet - ORP Standards

ORP STANDARDS FACT SHEET

Background

- The Office of Radiation Programs (ORP) is authorized under the Atomic Energy Act (AEA) to develop standards that NRC and DOE implement through incorporation into their regulations and orders. These standards are intended to provide a minimum level of protection from radiological hazards for human health and the environment.

- ORP has already published generally applicable standards that address both operations and disposal for high-level waste, transuranic waste, and spent nuclear fuel (40 CFR Part 191). Following a remand by a Federal Court, the high-level disposal standards are now being revised and are expected to be proposed in early 1990.

Standards to be Proposed

- ORP is planning to propose both generally applicable low-level waste radionuclide exposure standards and NARM waste disposal requirements in the near future. ORP standards, as implemented by NRC and DOE, will be used to regulate radioactive waste and the radioactive component of mixed waste and will apply to both NRC-licensed facilities and DOE-owned facilities.

- <u>Low-level Waste Standards (40 CFR Part 193)</u>

  - ***Low-level Waste Pre-Disposal Limit.*** Will limit the annual effective whole-body exposure from all environmental pathways to any member of the public from facilities that process, manage, or store low-level waste. Intended to address the increasing number of facilities storing low-level waste for long periods, the standard will target potential exposures from direct gamma radiation, water pathways, and from release caused by spillage and similar incidents. (Exposure from atmospheric releases are covered by Clean Air Act radionuclide emission regulations). ORP analyses indicate that control of these exposures should require no more effort than maintaining processing and storage vessels away from public access and adequate practices to eliminate or cleanup spillage.

  - ***Post-Disposal Exposure Limit.*** Will limit annual effective whole-body exposure from all environmental pathways to the public from disposal facilities, and would apply to any disposal method or facility constructed after the effective date of this rule. The standard would have the same purpose as the individual exposure performance-objective in NRC's regulations.

  - ***Ground-Water Protection Criteria.*** These critieria are being developed within the context of EPA's Groundwater Protection Strategy, which calls for the protection of ground water commensurate with its value and use.

  - ***Below Regulatory Concern (BRC) Criteria.*** Sets an annual whole-body exposure level as that level of radioactivity that is sufficiently low to allow safe disposal as non-hazardous waste. ORP estimates 35% of all commercial and low-level waste could be classified as BRC. Waste identified as BRC and containing a hazardous component will be regulated as RCRA hazardous waste, not mixed waste.

-- *Implementation Guidelines.* These qualitative requirements would clarify the context and assumptions within which the standards should be implemented, address areas not appropriate for quantitative requirements, and compensate for the uncertainties that necessarily accompany plans to isolate radioactive wastes from the environment for a long time.

- NARM Standard (40 CFR Part 764)

  -- NARM waste above a threshold concentration would have to be disposed of in an AEA low-level waste disposal facility and would be subject to AEA post-disposal requirements. The standard would apply to discrete, non-diffuse, low-volume, high-concentration NARM, with the exemption of certain common consumer products.

  -- In developing the standard, ORP focused on assuring the same disposal for high-activity NARM wastes as for similar AEA wastes. High-volume diffuse wastes are not addressed because ORP is currently focusing on standards for regulated disposal sites operated by State compacts or the Federal governement.

Appendix H

NRC Regional Offices - Addresses and Telephone Numbers

NRC Regional Offices
Addresses and Telephone Numbers

Region I
475 Allendale Road
King of Prussia, PA 19406
(215) 337-5000

Region II
101 Marietta Street
Suite 2900
Atlanta, GA 30303
(404) 331-4503

Region III
799 Roosevelt Road
Glenn Ellen, IL 60137
(312) 790-5500

Region IV
611 Ryan Plaza Drive
Suite 1000
Arlington, TX 76011
(817) 860-8128

Region V
1450 Maria Lane
Suite 210
Walnut Creek, CA 94596
(415) 943-3700

Appendix I

DOE Operations Offices - Addresses and Telephone Numbers

DOE Operations Offices
Addresses and Telephone Numbers

Albuquerque Operations Office
PO Box 5400
Albequerque, NM 87115
(505) 846-3118

Chicago Operations Office
9800 South Cass Avenue
Argonne, IL 60439
(312) 972-2001

Idaho Operations Office
785 DOE Place
Idaho Falls, Idaho 83402
(208) 526-0111

Nevada Operations Office
PO Box 98518
Las Vegas, NV 89193-8518
(702) 295-1212

Oak Ridge Operations Office
PO Box E
Oak Ridge, TN 37831
(615) 576-5454

Richland Operations Office
825 Jadwin Avenue
Richland, WA 99352
(509) 376-7411

San Francisco Operations Office
1333 Broadway
Oakland, CA 94612
(415) 273-4237

Appendix J

List of Mixed Waste Contacts

List of Mixed Waste Contacts

NRC Headquarters

Mr. Dan E. Martin
Division of Low-Level Waste Management
and Decommissioning
U.S. Nuclear Regulatory Commission
Washington, DC 20555
301-492-0557 Commercial
492-0557 FTS

EPA Headquarters

Ms. Betty Shackleford
Office of Solid Waste (WH-563B)
U.S. Environmental Protection
Agency
401 M Street, SW
Washington, DC 20460
202-382-2221 Commercial
382-2221 FTS

NRC Regional Offices

(Contact)
U.S. Nuclear Regulatory Commission
Region I
475 Allendale Road
King of Prussia, PA 19406
215-337-5000 Commercial
346-5000 FTS

(Contact)
U.S. Nuclear Regulatory Commission
Region II
101 Marietta Street, Suite 2900
Atlanta, GA 30323
404-331-5000 Commercial
242-4503 FTS

(Contact)
U.S. Nuclear Regulatory Commission
Region III
799 Roosevelt Road
Glen Ellyn, IL 60137
312-790-5500 Commercial
388-5500 FTS

(Contact)
U.S. Nuclear Regulatory Commission
Region IV
Parkway Central Plaza Building
611 Ryan Plaza Drive, Suite 1000
Arlington, TX 76011
817-860-8100 Commercial
728-8100 FTS

(Contact)
U.S. Nuclear Regulatory Commission
Region V
1450 Maria Lane, Suite 210
Walnut Creek, CA 94596
415-943-3700 Commercial
463-3700 FTS

EPA Regional Offices

(Contact)
U.S. Environmental Protection Agency
Region 1
John F. Kennedy Federal Building
Room 2203
Boston, MA 02203
617-223-7210 Commercial
223-7210 FTS

(Contact)
U.S. Environmental Protection Agency
Region 2
26 Federal Plaza, Room 900
New York, NY 10278
212-264-2525 Commercial
264-2525 FTS

(Contact)
U.S. Environmental Protection Agency
Region 3
841 Chestnut Street
Philadelphia, PA 19107
215-597-9800 Commercial
597-9800 FTS

(Contact)
U.S. Environmental Protection Agency
Region 4
345 Courtland Street, NE
Atlanta, GA 30365
404-881-4727 Commercial
257-4727 FTS

(Contact)
U.S. Environmental Protection Agency
Region 5
230 South Dearborn Street
Chicago, IL 60604
312-353-2000 Commercial
353-2000 FTS

(Contact)
U.S. Environmental Protection Agency
Region 6
1201 Elm Street
Dallas, TX 75270
214-767-2600 Commercial
729-2600 FTS

(Contact)
U.S. Environmental Protection Agency
Region 7
726 Minnesota Avenue
Kansas City, KS 66101
913-236-2800 Commercial
757-2800 FTS

(Contact)
U.S. Environmental Protection Agency
Region 8
One Denver Place, Suite 1300
999 18th Street
Denver, CO 80202-2413
303-293-1603 Commercial
564-1603 FTS

(Contact)
U.S. Environmental Protection Agency
Region 9
215 Freemont Street
San Francisco, CA 94105
415-974-8153 Commercial
454-8153 FTS

(Contact)
U.S. Environmental Protection Agency
Region 10
1200 Sixth Street
Seattle, WA 98101
206-442-5810 Commercial
399-5810 FTS

NRC Agreement States

Alabama

Mr. Aubrey V. Godwin, Chief
Bureau of Radiological Health
Environmental Health Administration
Room 314, State Office Building
Montgomery, AL 36130
205-261-5313

Arizona

Mr. Charles F. Tedford, Director
Arizona Radiation Regulatory Agency
4814 South 40th Street
Phoenix, AZ 85040
602-255-4845

Arkansas

Ms. Greta Dicus, Director
Div. of Radiation Control and
Emergency Management
Arkansas Department of Health
4815 West Markham
Little Rock, AR 72205-3867
501-661-2301

California

Mr. Paul Szalinski, Chief
Radiologic Health Branch
Department of Health
714 P Street, Room 498
Sacramento, CA 95814
916-445-0931

Colorado

Mr. Robert Quillan, Director
Radiation Control Division
Office of Health Protection
Department of Public Health
4210 East 11th Avenue
Denver, CO 80220
303-331-8482

Florida

Lyle E. Jarrett, Director
Office of Radiation Control
Department of Health & Rehabilitative
Services
1317 Winewood Boulevard
Tallahassee, FL 32399-0700
904-487-1004

Georgia

Thomas E. Hill, Acting Director
Radiological Health Section
Department of Human Resources
Room 600
878 Peachtree Street
Atlanta, GA 30309
404-894-5795

Idaho

Mr. Ernest Ranieri, Supervisor
Compliance Section
Idaho Department of Health
and Welfare
Statehouse
Boise, ID 83720
208-334-5879

Illinois

Dr. Terry Lash, Director
Department of Nuclear Safety
1035 Outer Park Drive
Springfield, IL 62704
217-785-9868

Iowa

Donald A. Flater, Chief
Bureau of Radiological Health
Iowa Department of Health
Lucas State Office Building
Des Moines, IA 50319
515-281-4928

Kansas

Mr. Gerald W. Allen, Chief
Bureau of Air Quality and Radiation Control
Department of Health & Environment
Forbes Field, Building 321
Topeka, Kansas 66620
913-296-1542

Kentucky

Mr. Donald Hughes, Manager
Radiation Control Branch
Department of Health Services
Cabinet For Human Services
275 East Main Street
Frankfort, KY 40621
502-564-3700

Louisiana

Mr. William H. Spell, Administrator
Nuclear Energy Division
Office of Air Quality & Nuclear Energy
P.O. Box 14690
Baton Rouge, LA 70898
504-925-4518

Maryland

Mr. Roland G. Fletcher, Administrator
Center for Radiological Health
Department of the Environment
2500 Broening Highway
Baltimore, MD 21224
301-631-3300

Mississippi

Mr. Eddie S. Fuente, Director
Division of Radiological Health
State Board of Health
3150 Lawson Street
P.O. Box 1700
Jackson, MS 39215-1700

Nebraska

Mr. Harold Borchert, Director
Division of Radiological Health
State Department of Health
301 Centennial Mall South
P.O. Box 95007
Lincoln, NE 68509

Nevada

Mr. Stanley R. Marshall, Supervisor
Radiological Health Section
Health Division
Department of Human Resources
505 East King Street, Room 202
Carson City, NV 89710
702-885-5394

New Hampshire

Ms. Diane Tefft, Program Manager
Radiological Health Program
Bureau of Environmental Health
Division of Health Services
Health & Welfare Building, Hazen Drive
Concord, NH 03301
603-271-4588

New Mexico

Benito J. Garcia, Chief
Community Services Bureau
Environmental Improvement Division
Department of Health & Environment
P.O. Box 968
Santa Fe, NM 87504-0968
505-827-2959

New York

Mr. Jay Dunkleberger, Director
Bureau of Nuclear Operation
New York State Energy Office
Agency Building 2
2 Rockefeller Plaza
Albany, NY 12223
518-474-2190

North Carolina

Mr. Dayne H. Brown, Chief
Radiation Protection Section
Division of Facility Service
701 Barbour Drive
Raleigh, NC 27603
919-741-4283

North Dakota

Mr. Dana Mount, Director
Division of Environmental Engineering
Radiological Health Program
State Department of Health
1200 Missouri Avenue
Bismarck, ND 58502-5520
701-224-2348

Oregon

Mr. Ray Paris, Manager
Radiation Control Section
Department of Human Resources
1400 South West Fifth Avenue
Portland, OR 97201
503-229-5797

Rhode Island

Mr. James E. Hickey, Chief
Division of Occupational Health
and Radiation Control
Rhode Island Department of Health
Cannon Building, Davis Street
Providence, RI 02908
401-227-2438

South Carolina

Mr. Heyward G. Shealy, Chief
Bureau of Radiological Health
S.C. Department of Health and
Environmental Control
J. Marion Sims Building
2600 Bull Street
Columbia, SC 29201
803-734-4700

Tennessee

Mr. Michael H. Mobley, Director
Division of Radiological Health
TERRA Building, 150 9th Avenue, N.
Nashville, TN 37219-5404
615-741-7812

Texas

Mr. David K. Lacker, Chief
Bureau of Radiation Control
Texas Department of Health
1100 W. 49th Street (Mail Only)
Austin, TX 78756
512-835-7000

Utah

Mr. Larry Anderson, Director
Bureau of Radiation Control
State Department of Health
288 North 1460 West
P.O. Box 16690
Salt Lake City, UT 84116-0690
801-538-6734

Washington

Mr. Terry R. Strong, Chief
Office of Radiation Protection
Department of Social and Health
Services
Mail Stop LE-13
Olympia, WA 98504
206-586-8949

EPA Authorized States

(EPA to add Authorized State contacts.)

Appendix K

DOE Orders

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5400.3

2-22-89

SUBJECT: HAZARDOUS AND RADIOACTIVE MIXED WASTE PROGRAM

1. PURPOSE. To establish Department of Energy (DOE) hazardous and radioactive mixed waste policies and requirements and to implement the requirements of the Resource Conservation and Recovery Act (RCRA) within the framework of the environmental programs established under DOE 5400.1.

2. EXCEPTIONS. The provisions of this Order apply to hazardous waste regulated under RCRA and to all radioactive mixed waste as defined in this Order. Byproduct material as defined in the Atomic Energy Act (AEA) is excluded under this Order provided that it is not mixed with hazardous waste.

3. REFERENCES.

   a. DOE 5400.1, GENERAL ENVIRONMENTAL PROTECTION PROGRAM, of 11-9-88, which establishes the environmental protection program for DOE operations.

   b. DOE 5400.2A, ENVIRONMENTAL COMPLIANCE ISSUE COORDINATION, of 1-31-89, which sets forth policy, direction, and procedures for coordinating environmental issues that are of significance to DOE.

   c. DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

   d. DOE 5440.1C, NATIONAL ENVIRONMENTAL POLICY ACT, of 4-9-85, which establishes procedures for implementing a DOE National Environmental Policy Act (NEPA) program.

   e. DOE 5480.1B, ENVIRONMENT, SAFETY, AND HEALTH PROGRAM FOR DOE OPERATIONS, of 9-23-86, which outlines environmental protection, safety, and health protection policies and responsibilities.

   f. DOE 5482.1B, ENVIRONMENT, SAFETY, AND HEALTH APPRAISAL PROGRAM, of 9-23-86, which establishes the DOE environmental protection, safety, and health appraisal program.

   g. DOE 5632.1A, PROTECTION PROGRAM OPERATIONS, of 2-9-88, which prescribes DOE requirements for physical protection of classified matter.

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Office of Environment, Safety and Health

h. DOE 5700.6B, QUALITY ASSURANCE, of 9-23-86, which establishes DOE's quality assurance program.

i. DOE 5820.2A, RADIOACTIVE WASTE MANAGEMENT, of 9-26-88, which establishes policies and guidelines by which the Department manages its radioactive waste, waste byproducts, and radioactively contaminated surplus facilities.

j. Title 42 U.S.C. 2011 et seq., The Atomic Energy Act of 1954, as amended, which authorizes the conduct of atomic energy activities.

k. Title 42 U.S.C. 6901 et seq., The Resource Conservation and Recovery Act of 1976, as amended, which authorizes the Environmental Protection Agency (EPA) and the States to regulate hazardous and solid wastes.

l. Title 42 U.S.C. 9615 et seq., The Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as amended, which requires the identification and cleanup of inactive hazardous waste sites by responsible parties; and, imposes certain response and reporting requirements for releases of hazardous substances.

m. Title 42 U.S.C. 4321 et seq., The National Environmental Policy Act of 1969, as amended, which establishes broad national environmental policy.

n. Title 10 CFR Part 962, Byproduct Material, Final Rule, which interprets the Atomic Energy Act definition of the term "byproduct material," set forth in section 11e(1) of that Act as it applies to DOE owned or produced radioactive waste substances which are also "hazardous waste" within the meaning of RCRA.

o. Title 40 CFR Parts 260-268, 270-272, and 280, implementing regulations of the Resource Conservation and Recovery Act of 1976, as amended.

4. DEFINITIONS.

a. Hazardous Waste is that waste defined as hazardous in 40 CFR Part 261. The radionuclides of source material, special nuclear material, and byproduct material as defined by the AEA of 1954, as amended, are specifically excluded from the term hazardous waste. The hazardous components of waste mixed with the radionuclides of source, special nuclear, or byproduct material are not excluded from the term hazardous waste.

b. Inconsistency between RCRA and the AEA occurs if the requirements of both laws are incompatible. RCRA applies to hazardous or radioactive mixed waste to the extent it is not inconsistent with the requirements of the AEA.

c. Radioactive Waste is solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954, as amended, and of negligible economic value considering costs of recovery.

d. Radioactive Mixed Waste is waste containing both radioactive and hazardous components regulated by the AEA and RCRA, respectively. The term "radioactive component" refers only to the actual radionuclides dispersed or suspended in the waste substance.

e. State Hazardous Waste is waste defined as hazardous by a State. Pursuant to RCRA Section 6001, DOE is subject to and must comply with State requirements respective to solid and hazardous waste management.

f. Additional Definitions are defined in the implementing regulations of RCRA and are applicable to DOE.

5. BACKGROUND. The Department issued a final interpretative rule (Title 10 CFR Part 962) regarding radioactive waste and byproduct material for the purpose of clarifying DOE's obligations under the Resource Conservation and Recovery Act, as amended, and the Atomic Energy Act on 5-1-87. Title 10 CFR Part 962.3, "Byproduct Material", issued pursuant to the Atomic Energy Act of 1954, as amended, contains the following definitions:

a. Byproduct Material means (1) any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to the radiation incident to the process of producing or utilizing special nuclear material, and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any material processed primarily for its source material content.

b. Any Radioactive Material, as used in subsection (a) of the Atomic Energy Act of 1954 (42 U.S.C. 2011 et seq.), refers only to the actual radionuclides dispersed or suspended in the waste substance. The nonradioactive hazardous component of the waste substance will be subject to regulation under the Resource Conservation and Recovery Act.

DOE interprets these definitions to mean that whenever any hazardous waste identified or listed in Title 40 CFR Part 261 is inadvertently mixed with any source material, special nuclear material, or byproduct material, the hazardous waste component is subject to regulation under Subtitle C of RCRA. The May 1, 1987 Federal Register notice did not affect materials that are defined as byproduct material under Section 11e(2) of the Atomic Energy Act.

6. POLICY. It is the policy of DOE to:

   a. Manage all Departmental hazardous and radioactive mixed wastes according to the requirements of Subtitle C of the Resource Conservation and Recovery Act, and the Atomic Energy Act, respectively. RCRA applies to the extent it is not inconsistent with the AEA. The radioactive component of radioactive mixed waste is subject to the requirements of DOE 5820.2A.

   b. Protect the environment and the safety and health of the public, DOE, and DOE contractor employees by managing operations to the greatest extent practicable in a manner that provides for the safe handling, transportation, treatment, storage, or disposal of hazardous and radioactive mixed wastes generated by those operations.

   c. Implement a hazardous and radioactive mixed waste program complying with applicable laws and regulations.

   d. Implement waste minimization measures as specified in RCRA for hazardous and radioactive mixed wastes.

7. RESPONSIBILITIES AND AUTHORITIES.

   a. The Assistant Secretary for Environment, Safety and Health (EH-1) shall:

      (1) Develop and issue policies, guides, requirements, and procedu for implementing the requirements of the Resource Conservatio and Recovery Act at DOE facilities and integrating them with the requirements of CERCLA and NEPA.

      (2) Assist program and field offices in determining the need for research and development efforts to solve generic DOE hazardous waste and radioactive mixed waste problems.

      (3) Advise all Program Senior Officials (PSOs) and Heads of Field Organizations (HFOs), as defined in DOE 5400.1, of any amendments to RCRA applicable to DOE.

      (4) In consultation with PSOs, HFOs and General Counsel (GC-1), coordinate and resolve any determination of inconsistencies between AEA and RCRA requirements and environmental compliance issues as required in DOE 5400.2A.

      (5) Advise GC-1, in a timely manner, of significant legal issues regarding hazardous or radioactive mixed waste which require resolution.

b. The General Counsel shall:

(1) Provide legal advice to EH-1, PSOs and HFOs, as appropriate, in support of DOE's hazardous waste and radioactive mixed waste management program.

(2) Advise EH-1, in a timely manner, of significant RCRA hazardous and radioactive mixed waste management legal issues which require resolution and/or consideration.

(3) Advise EH-1 on the resolution of inconsistency issues.

c. Program Senior Officials shall:

(1) Manage RCRA hazardous and radioactive mixed waste programs and actions for which they have assigned responsibilities, requesting such funds in their budgets as they deem necessary to implement these programs and actions.

(2) Oversee Field Organization activities under their authority for compliance with the requirements of RCRA, applicable EPA and State requirements, applicable DOE policies, and the requirements of this Order.

(3) Advise EH-1, in a timely manner, of significant programmatic issues regarding hazardous waste and radioactive mixed waste management which require resolution.

(4) Advise GC-1 in a timely manner of significant legal issues regarding hazardous waste and radioactive mixed waste which require resolution.

(5) Identify when an inconsistency may exist between the requirements of the Atomic Energy Act and the Resource Conservation and Recovery Act, as amended. When a potential inconsistency is identified, follow issue coordination requirements of DOE 5400.2A.

d. Heads of Field Organizations shall:

(1) Develop and implement a program to assure that hazardous and radioactive mixed wastes at facilities for which they are responsible are managed in accordance with AEA and RCRA requirements and the requirements of this Order,

(2) Complete all RCRA reporting requirements.

(3) Oversee RCRA programs and actions for which they have assigned responsibilities, requesting such funds in their budgets as they deem necessary to implement these programs and actions.

(4) Identify when an inconsistency may exist between the requirements of the Atomic Energy Act and the Resource Conservation and Recovery Act. When a potential inconsistency is identified, follow issue coordination requirements of DOE 5400.2A.

(5) Implement a waste minimization program for hazardous and radioactive mixed wastes.

e. Director, Naval Nuclear Propulsion Program. Executive Order 12344, statutorily prescribed by PL 98-525 (42 USC 7158 note), establishes the responsibilities and authority of the Director, Naval Nuclear Propulsion Program (who is also the Deputy Assistant Secretary for Naval Reactors within the Department) over all facilities and activities which comprise the Program, a joint Navy-DOE organization. The policy principle promoted by these executive and legislative actions is cited in the Executive Order as "...preserving the basic structure, policies, and practices developed for this Program in the past..." Accordingly, based on the Executive Order and this policy principle, the Naval Nuclear Propulsion Program is exempt from the provisions of this Order. The Director shall maintain an environmental protection program to assure compliance with applicable environmental statutes and regulations. The Director and EH-1 shall cooperatively develop information exchange and other mutually beneficial programs as appropriate, consistent with PL 98-525.

BY ORDER OF THE SECRETARY OF ENERGY:

LAWRENCE F. DAVENPORT
Assistant Secretary
Management and Administration

[illegible] DEPARTMENT ELEMENTS [illegible]
[illegible]

ENVIRON GUIDANCE & COMP
EH-23
[illegible] FORRESTAL

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5480.1B

9-23-86

SUBJECT: ENVIRONMENT, SAFETY, AND HEALTH PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS

1. PURPOSE. To establish the Environment, Safety, and Health (ES&H) Program for Department of Energy (DOE) operations.

2. CANCELLATION. DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS, of 8-13-81.

3. SCOPE. The provisions of this Order apply to all Departmental Elements and contractors performing work for the Department as provided by law and/or contract and as implemented by the appropriate contracting officer.

4. REFERENCES.

   a. DOE 0000.1A, STANDARD SUBJECT CLASSIFICATION SYSTEM, of 8-14-79, which contains the categories for filing records and documents.

   b. DOE 1324.2, RECORDS DISPOSITION, of 5-28-80, which describes the procedures for retention of records and documents.

   c. DOE 3790.1A, FEDERAL EMPLOYEE OCCUPATIONAL SAFETY AND HEALTH PROGRAM, of 10-22-84, which establishes the policy for the implementation and administration of the occupational safety and health program for Federal employees.

   d. DOE 5000.3, UNUSUAL OCCURRENCE REPORTING SYSTEM, of 11-7-84, which establishes a system for reporting unusual occurrences having programmatic significance.

   e. DOE 5440.1C, IMPLEMENTATION OF THE NATIONAL ENVIRONMENTAL POLICY ACT, of 4-9-85, which establishes procedures for implementing the National Environmental Policy Act of 1969.

   f. DOE 5480.5, SAFETY OF NUCLEAR FACILITIES, of 9-23-86, which establishes DOE's nonreactor nuclear facility safety program.

   g. DOE 5480.6, SAFETY OF DEPARTMENT OF ENERGY-OWNED NUCLEAR REACTORS, of 9-23-86, which establishes DOE's reactor safety program.

   h. DOE 5480.14, COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT PROGRAM, of 4-26-85, which establishes a program to identify and remediate inactive hazardous waste disposal sites, and to control hazardous substance mitigation.

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Assistant Secretary for Environment, Safety, and Health

i. DOE 5481.1B, SAFETY ANALYSIS AND REVIEW SYSTEM, of 9-23-86, which establishes uniform requirements for the preparation and review of safety analyses.

j. DOE 5482.1B, ENVIRONMENT, SAFETY, AND HEALTH APPRAISAL PROGRAM, of 9-23-86, which presents the Department's policy and requirements for appraisal of environment, safety, and health programs.

k. DOE 5483.1A, OCCUPATIONAL SAFETY AND HEALTH PROGRAM FOR GOVERNMENT-OWNED CONTRACTOR-OPERATED FACILITIES, of 6-22-83, which provides guidance and establishes procedures for the government-owned contractor-operated safety and health program.

l. DOE 5484.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS, of 2-24-81, which establishes the requirements and procedures for reporting and investigating matters of environmental protection, safety, and health protection significance to DOE operations.

m. DOE 5610.3, PROGRAM TO PREVENT ACCIDENTAL OR UNAUTHORIZED NUCLEAR EXPLOSIVE DETONATIONS, of 12-18-80, which establishes safety policies and procedures applicable to activities involving nuclear explosives.

n. DOE 5700.1C, MAJOR SYSTEMS ACQUISITIONS, of 9-6-83, which establishes requirements and objectives and assigns responsibilities and authorities necessary for the acquisition of major systems.

o. DOE 5700.4A, PROJECT MANAGEMENT SYSTEM, of 11-7-83, which provides the principles and requirements which govern the development, approval, and execution of DOE's major system acquisitions and major projects.

p. DOE 5700.6B, QUALITY ASSURANCE, of 9-23-86, which establishes DOE's quality assurance program.

q. Title 29 CFR 1960, Safety and Health Provisions for Federal Employees, which provides the regulations and guidelines for the implementation of Executive Order 12196.

r. Department of Energy Acquisition Regulation, 48 CFR 970.23, and 48 CFR 923.70, which together provide the clauses to be used in contracts where DOE is either required to, or elects to, enforce ES&H requirements.

s. Executive Order 12088, "Federal Compliance with Pollution Control Standards", which establishes requirements and procedures for Federal agencies to comply with environmental legislation and regulations.

Executive Order 12196, "Occupational Safety and Health Programs for Federal Employees," which establishes the requirement for Federal agencies to provide occupational safety and health programs for their employees.

DEFINITIONS.

a. DOE Contractor includes any prime contractor or subcontractor subject to the contractual provisions of 48 CFR 923.70, 48 CFR 970.23, or other contractual provisions where DOE has elected to enforce ES&H requirements by specific negotiated contract provisions.

b. DOE Operations are those DOE-funded activities for which DOE has assumed responsibility for the environment, safety, and health programs.

c. Environment, Safety, and Health Overview is an organized set of activities performed as independent functions. It's purpose is to assure that all aspects of environment, safety and health-related activities at the program, project, and contractor level are adequately addressed. Such activities include:

(1) Establishing Department-wide environment, safety, and health policies, requirements and standards;

(2) Periodic and timely reviews of program and project documents, activities, actions, and plans;

(3) Appraising the implementation of environment, safety and health programs at the Headquarters, field, and contractor level as appropriate; and

(4) Providing support, assistance, and guidance to Headquarters program offices and field organizations.

d. Environment, Safety, and Health (ES&H) Program encompasses those DOE requirements, activities, and functions in the conduct of all DOE and DOE-controlled operations that are concerned with: controlling air, water, and soil pollution; limiting the risks to the well being of both operating personnel and the general public to acceptably low levels; and protecting property adequately against accidental loss and damage. Typical activities and functions related to this program include, but are not limited to, the following: environmental protection, occupational safety, fire protection, industrial hygiene, health physics, occupational medicine, process and facilities safety, nuclear safety, emergency preparedness, quality assurance, and radioactive and hazardous waste management.

e. Environmental Survey is a documented, multidiscipline assessment (with sampling and analysis) of a facility to determine environmental conditions and to identify environmental problem areas of environmental risk requiring corrective action.

f. Environmental Audit is a documented assessment of a facility to monitor the progress of necessary corrective actions, to assure compliance with environmental laws and regulations, and to evaluate field organization practices and procedures.

g. Exception is an interim release from a standard of the type specified under the Occupational Safety and Health Act. An exception is processed in accordance with DOE 5483.1A.

h. Federal Employee Occupational Safety and Health Program is that program mandated by Executive Order 12196 and implemented by 29 CFR 1960, DOE 3790.1A, and HQ 3790.2.

i. Generic Exemption is a temporary or permanent release from the requirements of this Order or other Orders in the DOE 5480 series, which extends beyond specific facilities and projects or applies to a category of facilities or activities (see also paragraph 8d(6)).

j. Implementation Plan is a concise description of the approach, resources, and time period planned for implementing Orders that require such plans on a site-wide basis. The plan includes a description of the execution of environmental protection, safety, and health responsibilities and authorities by the field organization, and any proposed generic exemptions to parts of such DOE Orders.

k. Line Organization is that unbroken chain of command which extends from the Secretary through the Under Secretary, to the Program Senior Officials (PSO) who set program policy and plans and develop assigned programs, to the field organization managers who are responsible to the PSO for execution of these programs, to the contractors who conduct the programs. Environment, safety, and health are integral parts of each program. Accordingly, line management responsibility for ES&H functions flows from the Secretary through the Under Secretary, to the PSO, to the field organization managers, to the contractors.

l. Program Senior Official (PSO) is a senior outlay program manager and includes the Assistant Secretaries for Conservation and Renewable Energy, Defense Programs, Fossil Energy, and Nuclear Energy, the Director of Energy Research, and the Director of Civilian Radioactive Waste Management. For purposes of this Order, this definition also includes the Administrators of the Bonneville and Western Area Power Administrations.

Standard means a specified set of rules or conditions concerned with the classification of components; delineation of procedures; definition of terms; specifications of materials, performance, design, or operations; or measurements of quality in describing materials, products, systems, services or practices. Standards may be specified by DOE as mandatory (i.e., required) or recommended.

n. Technical Safety Appraisal is a documented, multidiscipline appraisal of selected Department reactors and nuclear facilities conducted by a team selected by the Deputy Assistant Secretary for Safety, Health, and Quality Assurance (EH-30). They assure proper Department-wide application of particular safety elements of the ES&H program, nuclear industry lessons learned, and appropriate licensed facility requirements as described in DOE 5482.1B, paragraph 9b.

o. Unreviewed Safety Question. A proposed change, test, or experiment shall be deemed to involve an unreviewed safety question if:

(1) The probability of occurrence or the consequences of an accident or malfunction of equipment important to safety evaluated previously by safety analyses will be significantly increased, or

(2) A possibility for an accident or malfunction of a different type than any evaluated previously by safety analyses will be created which could result in significant safety consequences.

p. Variance is a release from a standard of the type specified under the Occupational Safety and Health Act which is processed in accordance with DOE 5483.1A.

6. APPLICATION.

a. This Order applies to the ES&H programs at all Government-owned contractor-operated (GOCO) facilities including the occupational safety and health programs for DOE contractor employees at GOCO facilities where the contracts include the occupational safety and health contract clause specified in DOE Acquisition Regulations 48 CFR 923.70 and 48 CFR 970.23. This Order also applies to environmental protection programs and programs for the protection against accidental loss or damage to property as provided by law and/or contract and as implemented by the appropriate contracting officer. This Order does not apply to the occupational safety and health programs for non-GOCO contractor employees doing work for the Department or Federal employees as described in DOE 3790.1A (see paragraph 8e of this Order).

b. A partial or complete variance from this Order may be granted when compliance with the Order may be inconsistent with external regulatory, legislative, or judicial requirements imposed on a DOE program. Such variances shall be recorded by means of a memorandum of understanding (MOU) to be signed by the Assistant Secretary for Environment, Safety, and Health (EH-1) and by the requesting Program Senior Official (PSO). The MOU will contain the basis for the granting of the variance, the identification of the specific portion(s) of the Order to which the variance applies, and, when applicable, the alternative measures that will be implemented to accomplish the intent and purpose of the Order's requirements.

7. POLICY. It is Department policy to:

a. Assure the protection of the environment and the health and safety of the public.

b. Assure safe and healthful workplaces and conditions of employment for all employees of DOE and DOE contractors as described in paragraph 6, above.

c. Protect Government property against accidental loss and damage.

d. Assure compliance with applicable statutory requirements affecting Federal facilities and operations and where possible, consistent with the Department's mission and supported by appropriate cost/benefit analysis, reduce identified environment, safety, and health risks, even though not mandated by specific requirements.

e. Assure that quality assurance is pursued (i.e. that research, development, demonstration, and production activities are performed in a controlled manner; that components, systems, and processes are designed, developed, constructed, tested, operated, and maintained according to industry accepted engineering standards, quality practices, and Technical Specifications/Operational Safety Requirements; and that resulting technology data are valid and retrievable).

f. Require line management to be responsible for effective Environment, Safety, and Health (ES&H) performance in their programs. Through overview, the Assistant Secretary for Environment, Safety, and Health (EH-1) is responsible to assure acceptable ES&H performance for the Secretary and for Program Senior Officials.

8. RESPONSIBILITIES AND AUTHORITIES.

a. Under Secretary (S-3) has overall responsibility and authority for DOE programs and may take necessary management actions to ensure safety, including directing the curtailment and suspension of operations, when in his or her opinion, such operation would result in an undue risk.

b. Program Senior Officials (PSO) are assigned primary responsibility for implementation of the DOE ES&H program. This responsibility includes confirming that DOE and Federal ES&H policies and directives are adhered to vigorously in all DOE operations. Including responsibilities described in other DOE 5480 series Orders, PSOs shall:

(1) Provide clear and explicit delegations of authority and responsibilities.

(2) Ensure that appropriate ES&H requirements, as identified in the DOE Orders, are included in program plans and proposals for design, construction, operation, modification, and decommissioning of DOE operations.

(3) Take necessary management actions, including the requirement that budget proposals for their assigned functions provide adequate ES&H resources.

(4) Confirm that applicable ES&H requirements are identified and provided to the contracting officers for inclusion in contracts.

(5) Perform program reviews to confirm effective implementation of DOE ES&H requirements by program and field organizations. In the execution of this responsibility, maximum use should be made of the appraisals and other reviews performed by EH, including assuring that recommendations made by EH are addressed in a responsive and timely manner.

(6) Provide program and project direction to the field organizations consistent with the ES&H Orders and ES&H policy guidance requirements relating to ES&H. Program or project direction that is related to ES&H and affects more than one field organization must be concurred in by EH-1.

(7) Provide EH-1 with copies of field organization implementation plans for DOE 5480 series Orders.

(8) Review and, subsequent to EH-1 concurrence, approve implementation plans for DOE 5480 series Orders submitted by field organizations.

(9) Assume the responsibilities assigned to Heads of Field Organizations in paragraph 8d below for DOE program activities not assigned to a field organization for implementation.

(10) Take such action as may be appropriate to ensure safety, including directing the field organization head to curtail and suspend operations when, in their opinion, such operation would result in an undue ES&H risk.

(11) Ensure that documents generated under this Order and other DOE 5480 series Orders are reviewed for classification where appropriate.

(12) Request EH-1 concurrence in generic exemptions (post implementation plan) from ES&H requirements and responsibilities as contained in the DOE 5480 series Orders.

(13) Participate in selected field organization appraisals, as appropriate, in accordance with DOE 5482.1B.

(14) Ensure that EH-1 recommendations on ES&H upgrades are considered in their formulation of budget requests to the Office of Management and Budget and Congress.

(15) Approve the construction and initial operation of reactors and high and selected moderate hazard facilities or modifications thereto involving an unreviewed safety question in accordance with DOE 5481.1B.

(16) Assure that EH-1 is provided all information and documentation requested to enable efficient discharge of their overall ES&H responsibilities.

c. Assistant Secretary for Environment, Safety and Health (EH-1) shall:

(1) Develop and establish ES&H policies, standards, guidance, requirements, and procedures for DOE projects and program operations, including but not limited to those on notification, investigation, and reporting of occurrences having ES&H significance.

(2) Review and concur in ES&H program and project direction issued by a PSO to the field that is directly related to ES&H matters which affect more than one field organization.

(3) Provide advice and assistance concerning ES&H programs to line organizations.

(4) Seek the advice of appropriate field organizations and program offices in determining ES&H research and technical assistance activities to be undertaken.

(5) Provide a central point for coordination within DOE and liaison with other agencies and groups in the development of ES&H related regulations, standards, and requirements; and resolution of environmental, safety, or health issues applicable to DOE operations, including review of proposed statutes (where appropriate), regulations, standards, and requirements for their application to and potential impact on DOE activities; and participation in the development and review of general design criteria.

(6) Develop guidelines on the content of field organization Implementation Plans which will be used by all field organizations to ensure a consistent approach to the implementation of the DOE 5480 series Orders where required.

(7) Review and concur in all field organization Implementation Plans for DOE 5480 series Orders.

(8) Conduct appraisals of the line organization's ES&H programs in accordance with DOE 5482.1B and other DOE 5480 series Orders.

(9) Identify needs for research and development to support ES&H programs and recommend appropriate actions.

(10) Provide a central point for the collection, retention, evaluation and dissemination of information having ES&H significance.

(11) Render interpretations of this Order and other DOE 5480 series Orders.

(12) Provide independent assurance that safety analyses are prepared and reviewed in accordance with DOE 5481.1B.

(13) Concur in generic exemptions from ES&H requirements and responsibilities contained in DOE 5480 series Orders.

(14) Process requests for variances from occupational safety and health standards in accordance with the procedures of DOE 5483.1.

(15) Conduct reviews of facilities and operations including, technical safety appraisals of Department reactors and nuclear facilities, environmental surveys, and environmental audits. The planning and conduct of these reviews will be coordinated with the appropriate field organizations and Headquarters program offices to minimize overlap or duplication of effort. Appropriate field organizations and Headquarters program offices will be requested to participate.

(16) Participate in selected field organization ES&H appraisals of contractor facilities/operations in accordance with DOE 5482.1B. All participation shall be as a full active member and scheduled for the year at the time of the annual submittal by the field of its proposed appraisal schedule.

(17) Provide an independent prioritization of ES&H corrective actions and upgrade projects to the PSO and the Assistant Secretary for Management and Administration (MA-1), for use in initiating and, ultimately, by the Under Secretary, in establishing the Departmental budget requested. This input would be based on a number of information sources including ES&H appraisals, environmental surveys, environmental audits, and Field Office Manager's and PSO's recommended budget requests.

(18) For reactors and high and selected moderate hazard facilities, concurs in accordance with DOE 5481.1B, with the safety related aspects of the construction and initial operating authorizations or modifications involving an unreviewed safety question.

(19) Prepare and coordinate Departmental comments on emerging regulations, and policies of other agencies related to ES&H that could impact DOE projects and program operations.

(20) Curtail or suspend operations at DOE facilities, under the conditions described below, when a clear and present danger exists to workers or members of the public. (Clear and present danger is a condition or hazard which could reasonably be expected to cause death or serious harm to plant workers or the public immediately or before such condition or hazard can be eliminated through normal procedures.)

(a) Whenever EH-1, in carrying out his or her responsibilities, determines that the environmental, safety, or health conditions at any DOE facility present a clear and present danger, EH-1 shall notify the Under Secretary that such a determination has been made. In addition, notification shall be provided to the Program Senior Official and the Head of the appropriate Field Element. Upon receiving such notification, the Head of the Field Element shall take immediate action to curtail or suspend the operation and to mitigate the danger.

(b) If appropriate action is not taken to curtail or suspend the operation and mitigate the identified danger, EH-1 shall advise the Secretary. In the event that the Secretary is unavailavble, EH-1 is authorized to direct the PSO or field element to suspend or curtail an operation which EH-1 has determined is posing a clear and present danger until the danger has been mitigated.

(c) The authority reflected in subparagraph (20) may not be redelegated or assumed by acting officials and will terminate on 1-31-88, unless specifically renewed.

d. Heads of Field Organizations are responsible for assuring that all operations under their jurisdiction are carried out consistent with sound ES&H practices and in accordance with the ES&H Orders. In carrying out this responsibility the Heads of Field Organizations shall:

(1) Execute programs and assure that contractors and their subcontractors execute programs and policies which utilize appropriate ES&H program elements, as identified in this and other Orders for siting, design, construction, operation, maintenance, modification, deactivation, decontamination, and decommissioning of DOE facilities and activities.

(2) Take such action as may be appropriate to assure acceptable environment, safety, and health, including curtailment and suspension of operations when, in their opinion, such operation would result in an undue ES&H risk.

(3) In the selection of contractors, ensure the ability of offerors to meet ES&H requirements. Assure that applicable environment, safety, health, and quality assurance requirements are included in contracts.

(4) Execute programs and assure that contractors and their subcontractors execute programs and policies in a manner that complies with mandatory requirements relating to ES&H.

(5) Appraise the programs, projects, and facilities of subordinate field activities in accordance with DOE 5482.1B, and other DOE 5480 series Orders.

(6) Prepare implementation plans for this Order and other DOE 5480 series Orders.

(a) These plans shall include:

1 The designation of ES&H responsibilities and authorities by the field organization and their contractors; and

2 A concise description of the approach, resources, and time period planned for implementing Orders that require such plans on a site wide basis, including a description of the execution of ES&H responsibilities and authorities by the field organization, and any proposed generic exemptions to parts of such Orders.

(b) The field organization implementation plans will be reviewed and approved by the cognizant PSO before implementation. This requirement in no way prohibits Heads of Field Organizations from initiating actions of necessity in exercising responsibility for environment, safety, and health activities. Specific exemptions to the requirements of this Order or other ES&H Orders which are dependent on specific facility designs would not be a part of the implementation plans but shall be identified in the facility design documentation and safety analysis which will be reviewed and approved in the normal process of facility design and operation and assessed as part of the ES&H appraisal programs.

Note: These procedures for specific exemptions do not apply to Federal regulations (such as the National Environmental Policy Act), Environmental Impact Statements, or Environmental Assessment documents.

(7) Establish and maintain liaison with regional, State, or local officials as appropriate, and advise the responsible PSO of any ES&H requirements issued by these officials that will significantly affect their operations. Concurrently advise EH-1 of all requirements issued that will significantly affect any DOE operation.

(8) Grant exceptions to, and process requests for variances from occupational safety and health standards in accordance with DOE 5483.1.

(9) Request Program Senior Official approval of generic exemptions from ES&H requirements and responsibilities as contained in the DOE 5480 series Orders.

(10) Authorize the construction and initial operation of reactors and high and moderate hazard facilities or modifications thereto involving an unreviewed safety question in accordance with DOE 5481.1B.

(11) Assure that documents generated under this Order are reviewed for classification where appropriate.

(12) Provide EH-1 with copies of their prioritized recommendations for major ES&H upgrades and corrective actions included in their budget requests to the PSO.

(13) Provide EH-1 all information and documentation requested to enable efficient discharge of EH-1 overall responsibilities.

(14) Assure the establishment, implementation, and maintenance of a Quality Assurance Program, by DOE contractors to whom this Order is made applicable, in accordance with this Order and DOE 5700.6B.

(15) Provide for an overview of environment, safety, and health in their organization independent of line management responsibility.

NOTE: The Manager, Pittsburgh Naval Reactors Office, and the Manager, Schenectady Naval Reactors Office, together with their branch field offices located at DOE Naval Reactor prototype sites, report to the Deputy Assistant Secretary for Naval Reactors because of their unique responsibility solely involved with the Naval Reactors Program. In this regard, the Deputy Assistant Secretary for Naval Reactors will continue to carry out responsibilities for approving implementation of DOE requirements in such areas as reactor safety, criticality control, radiation protection, and radiological environmental monitoring and protection defined herein and in other DOE Orders for field organization managers.

e. The Director of Administration (MA-2) is responsible for the administration and overview of the Federal Employee Occupational Safety and Health Program. In carrying out this function, MA-2 responsibilities and authorities are detailed in DOE 3790.1A. Questions regarding impact on Federal employees shall be addressed to this organization.

f. Deputy Assistant Secretary for Naval Reactors shall:

(1) Be responsible for conducting management appraisals, implementing DOE ES&H requirements, and establishing overviews in such areas as reactor safety, criticality control, radiation protection, and radiological environmental monitoring and protection in the Naval Reactors Program. These appraisals, implementation actions, and overviews are excluded from EH-1 responsibility, notification, requirements, and authority.

(2) Carry out responsibilities assigned herein and in other DOE ES&H Orders to field organization managers for approving and implementing DOE requirements in such areas as reactor safety, criticality control, radiation protection, and radiological environmental monitoring and protection.

(3) Carry out the responsibilities and authorities of a Program Secretarial Officer for activities under his cognizance.

JOHN S. HERRINGTON
Secretary

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5820.2A

9-26-88

SUBJECT: RADIOACTIVE WASTE MANAGEMENT

1. PURPOSE. To establish policies, guidelines, and minimum requirements by which the Department of Energy (DOE) manages its radioactive and mixed waste and contaminated facilities.

2. CANCELLATION. DOE 5820.2, RADIOACTIVE WASTE MANAGEMENT OF 2-6-84.

3. SCOPE. The provisions of this Order apply to all DOE elements and, as required by law and/or contract and as implemented by the appropriate contracting officer, all DOE contractors and subcontractors performing work that involves management of waste containing radioactivity and/or radioactively contaminated facilities for DOE under the Atomic Energy Act of 1954, as amended (Public Law 83-703).

4. EXCLUSION. This Order does not apply to the management by the Department of commercially generated spent nuclear fuel or high-level radioactive waste, nor to the geologic disposal of high-level waste produced by the Department's activities and operations. Such materials are managed by the Office of Civilian Radioactive Waste Management under the requirements of the Nuclear Waste Policy Act of 1982, as amended (Public Law 97-425).

5. POLICY. Radioactive and mixed wastes shall be managed in a manner that assures protection of the health and safety of the public, DOE, and contractor employees, and the environment. The generation, treatment, storage, transportation, and/or disposal of radioactive wastes, and the other pollutants or hazardous substances they contain, shall be accomplished in a manner that minimizes the generation of such wastes across program office functions and complies with all applicable Federal, State, and local environmental, safety, and health laws and regulations and DOE requirements.

6. REFERENCES. (See Attachment 1.)

7. DEFINITIONS. (See Attachment 2.)

8. RESPONSIBILITIES.

   a. Assistant Secretary for Defense Programs (DP-1) has authority for establishing policy for the management of DOE waste and assuring that DOE waste generated by operations and activities under DP-1 cognizance, or any other waste within the purview of DP-1, is managed according to the requirements of this Order. DP-1 also has general responsibility for assuring that

DISTRIBUTION:

All Departmental Elements

INITIATED BY

Office of Defense Waste and Transportation Management

DP-1 programmatic decisions include waste management considerations when appropriate. Specific responsibilities include:

(1) Assuring the safe storage and disposal of all DOE waste other than that managed by NE-1 and RW-1;

(2) Implementing new and alternative technologies and processes to improve management of DP waste;

(3) Developing and operating the Waste Isolation Pilot Plant, a facility near Carlsbad, New Mexico, for conducting research and development to demonstrate the safe disposal of radioactive waste from defense activities and programs of the United States exempted from regulation by the Nuclear Regulatory Commission;

(4) Conducting research and development for DOE waste transportation systems and providing for safe, efficient, and economic transport of materials, pursuant to DOE 1540.1;

(5) Managing DP contaminated facilities, including those that are surplus to program needs;

(6) Assuring that the environmental, safety, health, transportation, quality assurance, unusual occurrence, construction project management, real estate management, and facility design requirements set forth in DOE Orders are implemented for DP-1 waste management programs; and

(7) Supporting the information needs of the Integrated Data Base program on defense program activities and jointly managing and funding the program in cooperation with NE-1 and RW-1 (see Attachment 1, page 3, paragraph 23).

b. Director of Defense Waste and Transportation Management (DP-12) is charged with carrying out DP-1 waste management responsibilities for oversight of the waste management complex, for interpreting waste management policy, and for implementing the requirements of this Order for waste management facilities and operations funded by DP-12. Specific responsibilities include:

(1) Management of storage, treatment, and disposal operations for defense waste;

(2) Managing defense contaminated facilities that are excess to programmatic needs;

(3) Reviewing and approving new or alternative waste management practices;

(4) Conducting research and development for DOE waste transportation systems and providing for safe, efficient, and economic transport of materials, pursuant to DOE 1540.1;

(5) Conducting independent health, safety, and quality assurance audits of field waste management organizations, in cooperation with EH-1, to assess compliance with the requirements of this Order;

(6) Issuing, in consultation with EH-1, approval of exemptions from the requirements of this Order (paragraph 9) that are proposed by other Headquarters or field organizations;

(7) Issuing in consultation with EH-1 and Headquarters program organizations updated waste management guidance; and

(8) Approving documents, reports, and plans, as required by this Order, for DP programs and activities.

c. Director of Civilian Radioactive Waste Management (RW-1) is responsible for selected research and development, siting, construction, operation, and management activities assigned to the Secretary of Energy by the Nuclear Waste Policy Act of 1982 (Public Law 97-425) for the interim storage and disposal of high-level waste and spent nuclear fuel. Specific responsibilities include the following:

(1) The long-term care, in cooperation with NE-1, of closed commercial low-level waste sites transferred to DOE;

(2) Lead responsibility, in cooperation with NE-1 and DP-1, for the Integrated Data Base program (see Attachment 1, page 3, paragraph 23);

(3) Assurance that the requirements of DOE Orders are met for all waste management activities under RW-1 purview; and

(4) Independent health, safety, and quality assurance audits of field waste management organizations in cooperation with EH-1, to assess compliance with the requirements of this Order.

d. Assistant Secretary for Nuclear Energy (NE-1) is responsible for assuring that waste generated by operations funded by NE-1 is managed according to the requirements of this Order and that NE-1 program decisions include waste management considerations, as appropriate. Specific responsibilities include:

(1) Managing DOE wastes from NE-1 operations and activities, including the breeder reactor, space nuclear, naval reactor, and remedial action programs, as well as the Three Mile Island and West Valley projects;

(2) Managing waste generated by DOE enrichment operations and disposed at sites located at the Oak Ridge, Portsmouth, and Paducah gaseous diffusion plants;

(3) Managing any greater than Class C low-level waste, as defined in Section 3(b)(1)(D) of Public Law 99-240, which may be accepted by the Department for disposal in cooperation with DP-1;

(4) Developing and implementing alternative technologies and processes to support storage and disposal of waste or spent fuel generated by NE-1 operations;

(5) Managing NE-1 contaminated facilities, including those that are surplus to program needs, and waste storage/disposal sites;

(6) Developing and implementing commercial applications for waste byproducts;

(7) Assuring that environmental, safety, health, transportation, quality assurance, unusual occurrence, construction project management, real estate management, and facility design requirements set forth in DOE Orders, are implemented for NE-1 waste management programs;

(8) Conducting independent health, safety, and quality assurance audits of field waste management operations in cooperation with EH-1 to assess compliance with the requirements of this Order; and

(9) Supporting the information needs of the Integrated Data Base program on civilian nuclear program activities in cooperation with DP-1 and RW-1 (see Attachment 1, page 3, paragraph 23).

e. Assistant Secretary for Environment, Safety and Health (EH-1) is responsible for providing an independent overview of DOE radioactive waste management and decommissioning programs to determine compliance with DOE environment, safety, and health requirements and applicable Environmental Protection Agency (EPA) and state regulations. Specific responsibilities include:

(1) Advising the Secretary of the status of Departmental compliance with the requirements of this Order and applicable provisions of DOE 5480.1B, and EH Orders.

(2) Conducting independent appraisals and audits of DOE waste management and decommissioning programs consistent with the requirements of DOE 5482.1B.

(3) Reviewing site Waste Management Plans and Decommissioning Project Plans with regard to compliance with DOE environment, safety, and health requirements.

f. Director, Naval Nuclear Propulsion Program: Executive Order 12344, statutorily prescribed by PL 98-525 (42 USC 7158 note), establishes the responsibilities and authority of the Director, Naval Nuclear Propulsion Program (who is also the Deputy Assistant Secretary for Naval Reactors within the Department) over all facilities and activities which comprise the Program, a joint Navy-DOE organization. The policy principle promoted by these executive and legislative actions is cited in the Executive Order as "...preserving the basic structure, policies and practices developed for this Program in the past...". Accordingly, The Naval Propulsion Program is exempt from the provisions of this Order. The rector shall maintain an environmental protection program to assure compliance with applicable environmental statutes and regulations. The Director and EH-1 shall exchange information and cooperate as appropriate to facilitate exercise of their respective responsibility.

g. Directors of other Headquarters Program Organizations are responsible for implementing the requirements of this Order for all DOE waste generated by their programs until it is transferred to a DOE or licensed storage/disposal site. For all contaminated facilities under their jurisdiction, they are responsible for assuring that their programmatic decisions include waste management considerations, as appropriate, and for implementing the requirements of other applicable DOE Orders for their waste management programs.

h. Office of General Counsel (GC-1) provides legal advice to program organizations regarding DOE waste management and decommissioning activities involving DOE-owned and privately owned sites; renders legal opinion on DOE authority to undertake remedial action and other waste management activities; and renders legal opinions on, and concurs in, program actions to comply with the National Environmental Policy Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund Amendments and Reauthorization Act, and other legal authorities in conjunction with proposed waste management and decommissioning activities.

i. Assistant Secretary, Management and Administration (MA-1) is responsible for providing contractual and business advice to program organizations regarding DOE waste management activities, including use of DOE managemen and operating contractors in such activities.

j. Heads of Field Organizations are responsible for all activities that affect the treatment, storage, or disposal of waste in facilities under their jurisdiction regardless of where the waste is generated. Heads of field organizations with treatment, storage or disposal facilities respon sibility have the authority for establishing waste management requirement at that facility (e.g., setting waste acceptance criteria, waste certification, verification of contents of waste shipped or to be shipped, concurring in waste reduction plans). In addition, they are responsible for assuring that the day-to-day waste management and surplus facility operations at their sites are conducted in compliance with the requirements of this Order and comply with all applicable Federal, State, and local statutes. Specific responsibilities include the following:

(1) Preparing annual updates of the Waste Management Plans for all operations under their purview according to the format in the Waste Management Plan Outline, Chapter VI. These Plans shall be submitted in December of each year and be distributed to DP-12, EH-1, and other appropriate Headquarters organizations for review and comment.

(2) Preparing supplements to this Order that identify specific detailed requirements for waste management practices and procedures conducted at their sites.

(3) Overseeing fiscal responsibility for transporting waste and establishing of fees to recover the incremental costs for storage and disposal of DOE waste at their sites.

(4) Establishing waste acceptance criteria and reviewing waste minimization plans of other field organization's facilities that generate radioactive, hazardous, or mixed waste that will be treated, stored or disposed of at facilities under their purview.

(5) Auditing any waste generating organization that ships waste to their sites for treatment, storage, or disposal to assure compliance with established waste acceptance criteria.

(6) Maintaining environmental, safety, and health programs for all DOE waste management operations under their purview.

(7) Managing contaminated facilities under their purview according to the requirements of this Order and guidance provided by Headquarters program offices, providing program secretarial officers with the necessary characterizational and engineering data for contaminated facilities, and developing site-specific priorities, schedules, and costs for remedial actions.

(8) Assuring that the requirements of the Order, applicable to contractors and subcontractors whose contracts fall within the scope of the Order, are properly reflected in the contract document.

(9) Defining and assuring that required quality assurance activities are established and implemented for all waste management activities under their purview, pursuant to the requirements of DOE 5700.6B and reporting unusual occurrences pursuant to the requirements of DOE 5000.3.

(10) Providing information, as requested, to the Integrated Data Base Program, Oak Ridge National Laboratory, for all types of waste under

their purview, including: high-level waste; transuranic waste; low-level waste; naturally occurring and accelerator produced radioactive material; mixed waste; and wastes from decommissioning activities (see Attachment 1, page 3, paragraph 23).

k. Manager of Albuquerque Operations Office is responsible, in addition to the responsibilities identified in paragraph 8j, for use of certified packaging, standard containers, transportation, waste acceptance criteria, and all other aspects related to transuranic waste emplacement at the Waste Isolation Pilot Plant. Within the Albuquerque Operations Office, a standing committee, the Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee, is responsible for review, audit, and approval of generator transuranic waste certification programs and activities. The Manager of the Albuquerque Operations Office, as Head of the Waste Isolation Pilot Plant project office, also has responsibility for the design, construction, technology development, and operational activities leading to permanent isolation of transuranic waste from the biosphere.

9. EXEMPTIONS. Exemptions from the requirements of this Order may be granted only with the approval of DP-12 in consultation with EH-1. New or alternate waste management practices that are based on appropriate documented safety, health protection, and economic analyses may be proposed by field organizations and adopted with the approval of DP-12 and EH-1.

10. IMPLEMENTING PROCEDURES AND REQUIREMENTS. Within 6 months of the date of issuance of this Order, Heads of Field Elements shall prepare and submit to appropriate Headquarters program organizations an implementation plan describing schedules, costs, and quality assurance activities for compliance with the requirements of this Order with copies to EH-1 for review and comment. Specific guidance for the plan will be issued by DP-12 under separate cover. Thereafter, the status of compliance with the requirements of this Order shall be reported to the appropriate Headquarters program organization in the annual update of the Waste Management Plans.

11. CLEARANCE UNDER THE PAPERWORK REDUCTION ACT OF 1980. This directive has been determined to contain information collections under the provisions of 5 CFR 1320, "Controlling Paperwork Burdens on the Public." The Office of Management and Budget (OMB) has issued a clearance to the Department (OMB No. 1910-0900) for these information collections.

BY ORDER OF THE SECRETARY OF ENERGY:

LAWRENCE F. DAVENPORT
Assistant Secretary
Management and Administration

REFERENCES

1. DOE 1332.1A, UNIFORM REPORTING SYSTEM, of 10-15-85, establishes the content and format of plans and reports to be obtained from the Department's contractors and stipulated as a contract requirement.

2. DOE 1430.1A, MANAGEMENT OF THE DEPARTMENT'S SCIENTIFIC AND TECHNICAL INFORMATION, of 9-10-86, which establishes the policy that scientific and technical information developed during work supported by DOE shall be promptly and fully reported to the Technical Information Center (MA-28), located in Oak Ridge, Tennessee, for inclusion in the Department's information data base.

3. DOE 1540.1, MATERIALS TRANSPORTATION AND TRAFFIC MANAGEMENT of 5-3-82, establishes the Department's policies for management of materials transportation activities.

4. DOE 1540.2, HAZARDOUS MATERIAL PACKAGING FOR TRANSPORTATION ADMINISTRATIVE PROCEDURES of 9-30-86, establishes administrative procedures for the certification and use of radioactive and other hazardous materials packaging by the Department of Energy.

5. DOE 2110.1, PRICING OF DEPARTMENTAL MATERIALS AND SERVICES of 2-16-84, which establishes the Department's policy for establishing prices and charges for materials and services provided to outside persons and organizations.

6. DOE 4300.1B, REAL PROPERTY AND SITE DEVELOPMENT PLANNING of 7-1-87, establishes Department policies and procedures for planning the development and utilization of sites and their facilities and for the acquisition, use, inventory, and disposal of real property or interests therein.

7. DOE 4700.1, PROJECT MANAGEMENT SYSTEM, of 3-6-87, establishes the DOE Project Management System (PMS), provides implementing instructions, formats and procedures and sets forth requirements which govern the development, approval and execution of DOE's outlay program acquisition as embodied in the PMS.

8. DOE 5000.3, UNUSUAL OCCURRENCE REPORTING SYSTEM of 11-7-84, establishes the Department's policy and provides instructions for reporting, analyzing, and disseminating information on programmatically significant events.

9. DOE 5400.2, ENVIRONMENTAL COMPLIANCE ISSUE COORDINATION, of 8-13-87, establishes DOE requirements for coordination of significant environmental compliance issues.

10. DOE 5440.1C, NATIONAL ENVIRONMENTAL POLICY ACT of 4-9-85, establishes the Department's policy for implementation of the National Environmental Policy Act of 1969 (Public Law 91-190).

11. DOE 5480.1B, ENVIRONMENTAL SAFETY, AND HEALTH PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS of 9-23-86, establishes an overall framework of program requirements for safety, environmental, and health protection, including criteria for radiation exposure and radioactive effluent releases for operating facilities and sites.

12. DOE 5480.3, SAFETY REQUIREMENTS FOR THE PACKAGING AND TRANSPORTATION OF HAZARDOUS MATERIALS, HAZARDOUS SUBSTANCES AND HAZARDOUS WASTES, of 7-9-85, establishes requirements for the packaging and transportation of hazardous materials, hazardous substances, and hazardous wastes.

13. DOE 5481.1B, SAFETY ANALYSIS AND REVIEW SYSTEM of 9-23-86, establishes uniform requirements for the preparation and review of safety analyses of DOE operations.

14. DOE 5482.1B, ENVIRONMENT, SAFETY AND HEALTH APPRAISAL PROGRAM of 9-23-86, establishes an environment safety and health appraisal program for DOE.

15. DOE 5484.1, ENVIRONMENTAL, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS of 2-24-81, establishes requirements and practices for reporting environmental, health, and safety information for DOE operations.

16. DOE 5700.6B, QUALITY ASSURANCE of 9-23-86, sets forth principles and assigns responsibilities for establishing, implementing, and maintaining programs of plans and actions to assure quality achievement in the Department's programs.

17. DOE 6430.1, GENERAL DESIGN CRITERIA of 12-12-83, establishes general design criteria for use in acquisition of the Department's facilities and to establish responsibilities and authorities for the development and maintenance of those criteria.

18. WIPP-DOE-069, rev. 2, of 9-85, "Transuranic Waste Acceptance Criteria for the Waste Isolation Pilot Plant" of 9-81, as updated, specifies basic requirements for disposal of contact-handled and remote-handled transuranic waste at the Waste Isolation Pilot Plant. Copies of this and other DOE Waste Isolation Pilot Plant reports may be obtained from the Albuquerque Operations Office.

19. WIPP-DOE-120, rev. 1, of 1-83, "Quality Assurance" establishes the Quality Assurance requirements to ensure that each site's transuranic waste certification program will perform satisfactorily.

20. WIPP-DOE-157 rev. 1, of 9-85, "Data Package Format for Certified Transuaranic Waste for the Waste Isolation Pilot Plant" specifies the arrangement of data which are required to be reported to the Waste Isolation Pilot Plant for transuranic waste to be received.

21. DOE/LLW-63T of 9-87, "Guidance for Conduct of Waste Management Systems Performance Assessment" provides information on meeting the systems performance requirement of Chapter III 3b(2) of DOE 5820.2A.

22. DOE-JIO-025 of 9-87, "Comprehensive Implementation Plan for the DOE Defense Buried Transuranic-Contaminated Waste Program," describes long term management alternatives for all DOE sites with buried transuranic waste.

23. DOE/RW-0006, rev. 3, "Integrated Data Base for 1987: Spent Fuel and Radioactive Waste Inventories, Projections, and Characteristics" of 9-87, with annual updates, summarizes data in the Integrated Data Base program on all domestic spent fuel and radioactive waste. Copies may be obtained from the Office of Nuclear Energy, Germantown, or the Technical Information Center, Oak Ridge.

24. DOE/DP/0020/1 "An Evaluation of Commercial Respository Capacity for the Disposal of Defense High Level Waste," of 6-85, evaluates the use of civilian repository capacity for the disposal of high level waste resulting from Defense activities, and provided to the President as one analytical input for his evaluation as required under the Nuclear Waste Policy Act.

25. Nuclear Waste Policy Act of 1982, as amended, (Public Law 97-425) provides for the development of repositories for the disposal of high-level waste and spent nuclear fuel.

26. Uranium Mill Tailings Radiation Control Act of 1978 (Pubic Law 95-604) establishes national policy for control of uranium mill tailings.

27. Energy Reorganization Act of 1974 (Public Law 93-438), in Section 202, assigns licensing and related regulatory authority to the Nuclear Regulatory Commission for facilities authorized for the express purpose of long-term storage of defense high-level waste.

28. Department of Energy National Security and Military Applications of Nuclear Energy Authorization Act of 1980 (Public Law 96-164), Section 213(a) authorizes the Waste Isolation Pilot Plant.

29. Low-Level Radioactive Waste Policy Amendments Act of 1985 (Public Law 99-240) makes the Federal Government responsible for disposal of commercially generated greater than class C waste as defined in Section 3(b)(1)(D) of the Act.

30. Resource Conservation and Recovery Act of 1976, as amended, (Public Law 94-580) establishes safe and environmentally acceptable management practices for solid wastes.

31. Comprehensive Environment Response, Compensation, and Liability Act of 1980, as amended, (Public Law 96-510) to provide for liability, compensation, cleanup, and emergency response for hazardous substances released into the environment, and the cleanup of inactive hazardous waste disposal sites.

32. The Superfund Amendments and Reauthorization Act of 1986 (Public Law 99-270) provides for a fund (Superfund) which may be utilized by the Environmental Protection Agency, State, and local governments to clean up hazardous waste sites listed on the National Priorities List.

33. National Environmental Policy Act of 1969 (Public Law 91-190) requires the preparation of a statement which considers environmental impacts, alternatives, and resource commitments for any major Federal action that significantly affects the quality of the human environment.

34. Title 5 CFR 1320, Controlling Paperwork Burdens on the Public serves as the implementing regulation for Public Law 96-511, Paperwork Reduction Act of 1980 and directs the identification and clearance of information collections levied on the public, including contractors, State and local government units, and persons who perform services for the Department on an individual basis.

35. Title 10 CFR Part 60, of 2-25-81, Disposal of High-Level Wastes in Geologic Repositories, prescribes rules governing the licensing of the Department of Energy to receive and possess source, special nuclear, and byproduct material at a geologic repository operations area.

36. Title 10 CFR Part 61, of 12-27-82, Licensing Requirements for Land Disposal of Radioactive Waste, establishes technical requirements for the land disposal of commercial low-level waste including site selection, site design, and facility operation and closure.

37. Title 10 CFR Part 71, of 8-5-83, Packaging and Transportation of Radioactive Material, establishes (1) requirements for packaging, preparation for shipment, and transportation of licensed material and (2) procedures and standards for NRC approval of packaging and shipping procedures for fissile material and for a quantity of other licensed material in excess of a Type A quantity.

38. Title 10 CFR Part 962, of 5-1-87, Radioactive Waste; Byproduct Material establishes the policy that all DOE radioactive waste which is hazardous under the Resource Conservation and Recovery Act will be subject to regulation under both the Resource Conservation and Recovery Act and Atomic Energy Act.

39. Title 40 CFR Part 61, of 7-1-87 National Emission Standards for Hazardous Air Pollutants, establishes standards for atmospheric emissions of hazardous air pollutants and radionuclides.

40. Title 40 CFR Part 191, of 9-19-85, Environmental Radioactive Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level and transuranic Radioactive Waste, establishes radiation protection standards governing the management and storage of spent nuclear fuel or high-level or transuranic wastes at any disposal facility operated by DOE.

41. Title 40 CFR Part 192, of 1-5-83, Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings, concerns the control of residual radioactive material at designated processing or disposal sites.

42. Title 40 CFR Part 261, of 5-19-80, Identification and Listing of Hazardous Waste identifies those solid wastes that are subject to regulation as hazardous waste.

43. Title 40 CFR 262, of 5-19-80, Standards Applicable to Generators of Hazardous Waste, establishes manufacturing, packaging, labeling, record keeping, and reporting requirements for generators of hazardous waste.

44. Title 40 CFR Part 263, of 5-19-80, Standards Applicable to Transporters of Hazardous Waste, establishes manufacturing, record keeping, spill reporting and cleanup requirements for transporters of hazardous waste.

45. Title 40 CFR Part 264, of 5-19-80, Standards for Owners and Operators of Hazardous Waste Treatment, Storage and Disposal Facilities, establishes minimum national standards defining the acceptable management of hazardous waste.

46. Title 40 CFR Part 265, of 5-19-80, Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, establishes minimum national standards that define the acceptable management of hazardous waste during the period of interim status and until certification of final closure.

47. Title 49 CFR Parts 100-178, of 10-1-86, Other Regulations Relating to Transportation: Chapter I-Research and Special Programs Administration, Department of Transportation, prescribes the requirements of the DOT governing the transportation of hazardous material and the manufacture and testing of packaging and containers.

48. ANSI/ASME NQA-1 "American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1," sets forth requirements for the establishment and execution of quality assurance programs for the design, construction, operation, and decommissioning of nuclear facilities.

49. Atomic Energy Act of 1954, as amended 42 U.S.C. § § 2011-2292 (1982) which authorizes and directs the Atomic Energy Commission to produce special nuclear material in its own facilities to produce atomic weapons or atomic weapons parts and to research and develop military applications of atomic energy.

50. Nuclear Waste Policy Amendments Act of 1987 (part of the Budget Reconciliation Act for FY 1988 Public Law 100-203), of December 22, 1987, streamlines and focuses the high level waste management program established by the Nuclear Waste Policy Act.

DEFINITIONS

1. Below Regulatory Concern. A definable amount of low-level waste that can be deregulated with minimal risk to the public.

2. Buffer Zone. The smallest region beyond the disposal unit that is required as controlled space for monitoring and for taking mitigative measures, as may be required.

3. Byproduct Material. (Attachment 1, pages 4 and 5, paragraphs 38 and 49.)

   a. Any radioactive material (except special nuclear material) yielded in, or made radioactive by, exposure to the radiation incident or to the process of producing or utilizing special nuclear material. For purposes of determining the applicability of the Resource Conservation and Recovery Act to any radioactive waste, the term "any radioactive material" refers only to the actual radionuclides dispersed or suspended in the waste substance. The nonradioactive hazardous waste component of the waste substance will be subject to regulation under the Resource Conservation and Recovery Act.

   b. The tailings or waste produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content. Ore bodies depleted by uranium solution extraction operations and which remain underground do not constitute "byproduct material."

4. Certified Waste. Waste that has been confirmed to comply with disposal site waste acceptance criteria (e.g., the Waste Isolation Pilot Plant-Waste Acceptance Criteria for transuranic waste) under an approved certification program.

5. Closure.

   a. Operational Closure. Those actions that are taken upon completion of operations to prepare the disposal site or disposal unit for custodial care, (e.g., addition of cover, grading, drainage, erosion control).

   b. Final Site Closure: Those actions that are taken as part of a formal decommissioning or remedial action plan, the purpose of which is to achieve long-term stability of the disposal site and to eliminate to the extent practical the need for active maintenance so that only surveillance, monitoring, and minor custodial care are required.

6. Contact-Handled Transuranic Waste. Packaged transuranic waste whose external surface dose rate does not exceed 200 mrem per hour.

7. Decommissioning. Actions taken to reduce the potential health and safety impacts of DOE contaminated facilities, including activities to stabilize, reduce, or remove radioactive materials or to demolish the facilities.

8. Decontamination. The removal of radioactive contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques.

9. Department of Energy Waste. Radioactive waste generated by activities of the Department (or its predecessors), waste for which the Department is responsible under law or contract, or other waste for which the Department is responsible. Such waste may be referred to as DOE waste.

10. Disposal. Emplacement of waste in a manner that assures isolation from the biosphere for the foreseeable future with no intent of retrieval and that requires deliberate action to regain access to the waste.

11. Disposal Facility. The land, structures, and equipment used for the disposal of waste.

12. Disposal Site. That portion of a disposal facility which is used to dispose of waste. For low-level waste, it consists of disposal units and a buffer zone.

13. Disposal Unit. A discrete portion (e.g., a pit, trench, tumulus, vault, or bunker) of the disposal site into which waste is placed for disposal.

14. DOE Reservation. A location consisting of a DOE-controlled land area including DOE-owned facilities (e.g., the Oak Ridge Reservation) in some cases referred to as a Site, such as the Nevada Test Site, the Hanford Site; or as a Laboratory, such as the Idaho National Engineering Laboratory; or as a Plant, such as Rocky Flats Plant; or as a Center, such as the Feed Materials Production Center.

15. Free Liquids. Liquids which readily separate from the solid portion of a waste under ambient temperature and pressure.

16. Engineered Barrier. A man-made structure or device that is intended to improve the performance of a disposal facility.

17. Hazardous Wastes. Those wastes that are designated hazardous by EPA regulations (40 CFR 261).

18. High-Level Waste. The highly radioactive waste material that results from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid waste derived from the liquid, that contains a combination of transuranic waste and fission products in concentrations requiring permanent isolation.

19. Institutional Control. A period of time, assumed to be about 100 years, during which human institutions continue to control waste management facilities.

20. Low-Level Waste. Waste that contains radioactivity and is not classified as high-level waste, transuranic waste, or spent nuclear fuel or 11e(2) byproduct material as defined by this Order. Test specimens of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as low-level waste, provided the concentration of transuranic is less than 100 nCi/g.

21. Monitoring. The making of observations and measurements to provide data to evaluate the performance of a waste management operation.

22. Mixed Waste. Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act and the Resource Conservation and Recovery Act, respectively.

23. Natural Barrier. The physical, chemical, and hydrological characteristics of the geological environment at the disposal site that, individually and collectively, act to retard or preclude waste migration.

24. Naturally Occurring and Accelerator Produced Radioactive Material. Any radioactive material that can be considered naturally occurring and is not source, special nuclear, or byproduct material or that is produced in a charged particle accelerator.

25. Near Surface Disposal. Disposal in the upper 30 meters of the earth's surface, (e.g. shallow land burial).

26. Performance Assessment. A systematic analysis of the potential risks posed by waste management systems to the public and environment, and a comparison of those risks to established performance objectives.

27. Pyrophoric Material. A material which under normal conditions is liable to cause fires through friction, retained heat from manufacturing or processing, or which can be ignited readily and when ignited burns so vigorously and persistently as to create a serious transportation, handling or disposal hazard.

28. Quality Assurance. All those planned and systematic actions necessary to provide adequate confidence that a facility, structure, system, or component will perform satisfactorily and safely in service. Quality assurance includes quality control, which comprises all those actions necessary to control and verify the features and characteristics of a material, process, product, or service to specified requirements.

29. Radioactive Waste. Solid, liquid, or gaseous material that contains radionuclides regulated under the Atomic Energy Act of 1954, as amended and of negligible economic value considering costs of recovery.

30. Remedial Action. Activities conducted at DOE facilities to reduce potential risks to people and/or harm to the environment from radioactive and/or hazardous substance contamination.

31. Remote-Handled Transuranic Waste. Packaged transuranic waste whose external surface dose rate exceeds 200 mrem per hour. Test specimens of fissionable material irradiated for research and development purposes only and not for the production of power or plutonium may be classified as remote-handled transuranic waste.

32. Repository. A facility for the permanent deep geologic disposal of High Level or Transuranic Waste.

33. Spent Nuclear Fuel. Fuel that has been withdrawn from a nuclear reactor following irradiation, but that has not been reprocessed to remove its constituent elements.

34. Storage. Retrievable retention of waste pending disposal.

35. Storage Facility. Land area, structures, and equipment used for the storage of waste.

36. Storage Unit. A discrete part of the storage facility in which waste is stored.

37. Surplus Facility. Any facility or site (including equipment) that has no identified or planned programmatic use and is contaminated with radioactivity to levels that require controlled access.

38. Transuranium Radionuclide. Any radionuclide having an atomic number greater than 92.

39. Transuranic Waste. Without regard to source or form, waste that is contaminated with alpha-emitting transuranium radionuclides with half-lives greater than 20 years and concentrations greater than 100 nCi/g at the time of assay. Heads of Field Elements can determine that other alpha contaminated wastes, peculiar to a specific site, must be managed as transuranic waste.

40. Treatment. Any method, technique, or process designed to change the physical or chemical character of waste to render it less hazardous, safer to transport, store or dispose of, or reduced in volume.

41. Treatment Facility. The specific area of land, structures, and equipment dedicated to waste treatment and related activities.

42. Waste Container. A receptacle for waste, including any liner or shielding material that is intended to accompany the waste in disposal.

43. Waste Management. The planning, coordination, and direction of those functions related to generation, handling, treatment, storage, transportation, and disposal of waste, as well as associated surveillance and maintenance activities.

44. Waste Package. The waste, waste container, and any absorbent that are intended for disposal as a unit. In the case of surface contaminated, damaged, leaking, or breached waste packages, any overpack shall be considered the waste container, and the original container shall be considered part of the waste.

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CHAPTER I

HIGH-LEVEL WASTE

1. PURPOSE. To establish policies and guidelines for managing the Department of Energy's (DOE) high-level waste and any other materials which, because of their highly radioactive nature (level of health risk, longevity of health risk and thermal activity), require similar handling. (Unless demonstrated to the contrary, all high-level waste shall be considered to be radioactive mixed waste and subject to the requirements of the Atomic Energy Act, as amended, and the Resource Conservation and Recovery Act.)

2. POLICY. All high-level waste generated by DOE operations shall be safely stored, treated, and disposed of according to requirements set forth in this Order. Storage operations shall comply with applicable EPA standards and EPA/State regulations. Geologic disposal shall comply with both Nuclear Regulatory Commission regulations and EPA standards.

3. REQUIREMENTS.

   a. Design.

      (1) Requirements for New Facilities.

         (a) Design objectives for new facilities will assure protection of the public and operating personnel from hazards associated with normal high-level waste operations, accident conditions, and the effects of natural phenomena. Other objectives are compliance with DOE policies regarding nuclear safety, quality assurance, fire protection, pollution control, and safeguards and security protection for high-level waste and protection of essential operations from the effects of potential accidents.

         (b) Designs for new storage and treatment facilities shall meet the requirements of DOE 6430.1, applicable EH Orders and 40 CFR 264.

         (c) Designs for new storage facilities shall incorporate features to facilitate retrieval capability.

      (2) Design Review for Existing Facilities. Uniform requirements for the preparation of safety analysis reports for high-level waste operations, detailed in DOE 5481.1B, include the review of existing operational facilities based on current technical criteria. When hazards are identified that should be eliminated, controlled, or mitigated, appropriate upgrading, actions in accordance with paragraph 3a(1) above, shall be identified and implemented according to the requirements of DOE 5481.1B.

b. Storage Operations - Doubly Contained Systems.

(1) Waste Characterization.

(a) Liquid and solidified high-level waste shall be characterized consistent with radiation protection requirements to determine its hazardous components, per 40 CFR 261 and 40 CFR 264. Characterization shall satisfy requirements of paragraph 3b(1)(b) and may reflect knowledge of waste generating processes, laboratory testing results, and/or the results of periodic sampling and analysis. Examples of required information are chemical composition, physical properties, radionuclide concentrations, and pH.

(b) Waste characteristics and compatibility information shall be documented in a safety analysis report (see DOE 5481.1B) and be used as a basis for designing new facilities.

(2) Storage and Transfer Operations.

(a) All new high-level waste handling, transfer, and storage facilities (e.g., tanks, bins, pipelines, and capsules) shall be doubly contained.

(b) Singly contained pipelines may be used routinely for liquid waste that has a total radioactivity concentration of less than 0.05Ci/gal (4.9×10^{11}Bq/m^3). They may be used on a temporary basis for higher activity waste, if appropriate design and administrative controls are in place to mitigate adverse effects from a pipeline failure.

(c) Leaking waste storage systems shall not be used to receive waste unless secondary containment is maintained (e.g., liquid level maintained below leak point) and it can be shown with the support of formal documentation (e.g., Safety Analysis Reports, Operational Safety Requirements, Operating Standards) that temporary operation can be performed without releasing radioactive liquid to the environment.

(d) Secondary containment systems shall be capable of containing liquids that leak into them from the primary system and shall be equipped with transfer capability to retrieve the leaked liquid. Secondary containment systems for solidified high-level waste shall provide for physical isolation of the waste from the environment.

(e) To the extent practical, waste shall be segregated by type (sludge, salt, high activity, and low activity) to make accessibility for future processing easier.

(f) Where required, ventilation and filtration systems shall be provided to maintain radionuclide releases within the guidelines specified in DOE 5481.1B and applicable EH Orders. Ventilation systems shall be provided where the possibility exists for generating flammable and explosive mixtures of gases (e.g., hydrogen/air or organics/air).

(g) Facilities using cathodic corrosion protection systems shall include engineered features that protect against abnormal conditions such as stray currents or system failure. The cathodic protection systems shall be calibrated annually, and all sources of impressed current shall be inspected and/or tested at least every other month.

(h) Engineering controls shall be incorporated to provide liquid volume inventory data and to prevent spills, leaks, and overflows from tanks or containment systems. Examples are level-sensing devices, liquid level alarms, and maintenance of sufficient freeboard. The high-level waste shall be stored at pressures lower than those of ancillary systems (e.g., cooling water).

(i) Nuclear criticality safety considerations and controls shall be evaluated for normal operations and, before any significant operational changes are made, to protect against an uncontrolled nuclear criticality incident (e.g., dissolution of sludges for removal from tank).

(j) Each facility shall utilize remote maintenance features and other appropriate techniques to minimize personnel radiation exposure in accordance with DOE 5481.1B.

(k) Upon loss and subsequent recovery of normal electrical power, high-level waste transfer equipment shall not have the capability to restart without active operator action.

(3) Monitoring, Surveillance, and Leak Detection.

(a) Monitoring and leak detection capability shall be incorporated in the engineering systems (e.g., liquid level sensing devices and alarms for high-level waste liquid systems) to provide rapid identification of failed containment, and measurement of abnormal temperatures. The following, at a minimum, shall be monitored: temperature; pressure; radioactivity in ventilation exhaust; and liquid effluent streams associated with high-level waste facilities. Where the possibility exists for the generation of flammable and explosive mixtures of gases, monitoring shall be conducted. For facilities storing liquid high-level waste, the following should also be monitored: liquid levels; sludge volume; tank chemistry; condensate and cooling water.

(b) Leak detection systems (e.g., conductivity probes) shall be designed and operated so that they will detect the failure of the primary containment boundary, the occurrence of waste release, or accumulated liquid in the secondary containment system.

(c) A method for periodically assessing waste storage system integrity (e.g., coupons for corrosion testing, photographic and periscopic inspections, leak detectors, liquid level devices) shall be established, documented, and reported as required in the Waste Management Plan.

(d) Electrical monitoring and leak detection devices essential to safe operations shall be provided with backup power, as appropriate, to ensure operability under emergency conditions.

(e) Surface water systems associated with the high-level waste storage area shall be monitored according to applicable National Pollution Discharge Elimination System permits and EH Order requirements.

(f) A system of ground water or vadose zone monitoring wells meeting the Resource Conservation and Recovery Act requirements per 40 CFR 264 shall be installed, as a minimum, around clusters of liquid waste storage tanks.

(4) Contingency Actions.

(a) A tank or secondary containment system from which there has been a leak or a spill to the surrounding soil, or which is otherwise unfit for use, shall be removed from service until conditions can be evaluated fully.

(b) Upon detection of released radioactive materials, steps shall be taken to prevent further migration of the release to soil or surface water. Major contamination in the soil shall be removed or stabilized unless compliance with this requirement would cause greater harm to human health or the environment.

(c) If a release results from a spill and the integrity of the system is not damaged, the system may be returned to service as soon as action to correct the condition is completed.

(d) For emergency situations involving liquid high-level waste, spare capacity with adequate heat dissipation capability shall be maintained to receive the largest volume of liquid contained in any one tank. Adequate transfer pipelines also shall be maintained in operational condition. Interconnected tank farms with adequate transfer capabilities and spare capacity may be considered as a single tank farm for purposes of this requirement.

(e) A schedule and procedure shall be developed for monitoring, surveillance, and calibration checks. The frequency of these activities shall be based on the potential rate of equipment deterioration and the possibility of an environmental or human health incident, assuming that a malfunction from equipment failure or human error is not detected between checks. Schedules, procedures, and performance requirements shall be documented in the operating and maintenance documentation.

(f) Each high-level waste facility shall have response procedures for credible emergencies, as identified in the Safety Analysis Reports.

(5) Training.

(a) Operator training and qualification standards shall be developed and an up-to-date record of training status shall be maintained.

(b) Worker safety training must comply with the requirements of DOE 5480.1B and applicable EH Orders.

(6) Quality Assurance. Consistent with DOE Order 5700.6B, high-level waste operations shall be conducted in accordance with applicable requirements of the American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1 and other appropriate national consensus standards. (See Attachment 1, page 5, paragraph 48).

(7) Waste Treatment and Minimization.

(a) For the purpose of economy and enhancing the safety of high-level waste storage, processing programs shall be developed and implemented at the generating site to reduce the quantity of waste being sent to storage, and techniques (e.g., evaporation) shall be implemented to reduce further the waste volume in storage.

(b) Programs should be developed and implemented to treat high-level waste in storage to prepare it for eventual conversion to suitable disposal forms, as such forms are developed. This may include separation of high-level waste into other waste categories, such as transuranic waste or low-level waste.

(c) The chemistry of liquid high-level waste shall be adjusted to control corrosion within design limits for the storage system.

(d) Treatment reagents shall not be placed in a tank system without proven effective mitigative action if they could cause the tank, its ancillary equipment, or the containment system to rupture, leak, or otherwise fail.

(e) Waste generation and waste management systems that significantly change the chemical and physical forms of the waste shall be technically assessed to assure compatibility and retrievability.

c. Storage Operations - Singly Contained Tank Systems.

(1) Waste Characterization. The contents of singly contained tank systems shall be characterized consistent with radiation protection requirements and the needs associated with safe storage to determine its hazardous components consistent with 40 CFR 261, 40 CFR 264, and State requirements. Characterization may reflect knowledge of waste generating processes, laboratory testing results, and/or the results of periodic sampling and analysis.

(2) Storage and Transfer Operations.

(a) Singly contained tank systems shall not be used to store fresh high-level waste from fuel reprocessing operations except under emergency conditions as determined by the Operations Office Manager.

(b) Storage and transfer operations shall be conducted within the limits defined in the Safety Analysis Reports according to DOE 5481.1B.

(c) Engineered systems shall be incorporated to provide waste volume inventory data, consistent with the nature of the specific waste stored in singly contained tanks. Examples are surface level sensing devices and interstitial liquid level sensing devices.

(d) Singly contained pipelines: (see paragraph 3b(2)(b)).

(e) Where active ventilation is required, systems shall be provided to maintain radionuclide releases at the point of discharge within the guidelines specified in applicable EH Orders for offsite concentrations and DOE 5480.1B for onsite dose commitment considerations.

(f) Nuclear criticality safety (see paragraph 3b(2)(i)).

(g) Each facility shall use remote maintenance features and other appropriate techniques to maintain personnel radiation exposure as low as reasonably achievable.

(h) Electrical power loss (see paragraph 3b(2)(k)).

(3) Monitoring, Surveillance, and Leak Detection.

(a) Monitoring and surveillance capability shall exist to provide liquid volume, waste inventory data, and identification of failed containment.

(b) A method for periodically assessing waste storage tank integrity (e.g., coupons, photographic inspections, leak detectors, liquid level devices) shall be established and documented.

(c) Emergency power (see paragraph 3b(3)(d)).

(d) Monitoring wells (see paragraph 3b(3)(f)).

(4) Contingency Action.

(a) A contingency action plan shall be maintained to respond to spills or leaks and other credible emergencies as identified in the Safety Analysis Reports.

(b) Leak mitigation (see paragraph 3b(4)(b)).

(c) For emergency situations involving pumpable liquid in singly contained tanks, appropriate equipment (e.g., pumps) shall be maintained to provide removal of liquid.

(5) Training. (see paragraphs 3b(5)(a) and (b)).

(6) Quality Assurance. (see paragraphs 3b(6)(a)).

d. Disposal. New and readily retrievable waste shall be processed and the high-level waste fraction disposed of in a geologic repository according to the requirements of the Nuclear Waste Policy Act of 1982 (Public Law 97-425) as amended. Options for permanent disposal of other waste, such as single shell tank waste, shall be evaluated and include such methods as in-place stabilization as well as retrieval and processing, as required for new and readily retrievable waste. Analytic predictions of disposal system performance shall be prepared and incorporated in the National Environmental Policy Act process.

(1) New and Readily Retrievable. New and readily retrievable existing high-level waste shall be processed to a final immobilized form in facilities such as the Defense Waste Processing Facility and the Hanford Waste Vitrification Plant preparatory to permanent disposal in a deep geologic repository.

(a) Waste acceptance specifications and criteria based upon the requirements outlined in 10 CFR 60.113, 10 CFR 60.131(b)(7), 10 CFR 60.135, 10 CFR 71.87, and 40 CFR 191 shall be developed for high-level waste forms prior to startup of facilities that generate the disposal waste form. Specifications and criteria shall be approved by RW-20 and DP-12 for Defense Programs high-level waste forms and by RW-20 and NE-20 for West Valley Demonstration Project product. As examples, specifications and criteria for the Defense Waste Processing Facility vitrified high-level waste form are documented in DOE/RW-0125; those for the West Valley Demonstration Project high-level waste form are documented in DOE/RW-0136.

(b) Interim storage for solidified high-level waste awaiting transport to the designated geologic repository shall comply with applicable requirements in paragraph 3b.

(2) Other Waste. High-level waste that is not readily retrievable shall be monitored periodically in situ. Field offices shall reevaluate the safety of such waste to determine the need for corrective measures as necessary. Options for permanent disposal of singly contained tank waste shall be evaluated and include such methods as in-place stabilization as well as retrieval and processing, as required for new and readily retrievable waste in paragraph 3d(1).

CHAPTER II

MANAGEMENT OF TRANSURANIC WASTE

1. PURPOSE. To establish policies and guidelines for managing DOE transuranic waste starting with its generation, continuing through closure of the Waste Isolation Pilot Plant, and finally the management of buried transuranic waste as defined in Attachment 1, page 3, paragraph 22. Transuranic wastes that are also mixed wastes are subject to the requirements of the Atomic Energy Act and the Resource Conservation and Recovery Act. Additionally, buried transuranic wastes are subject to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act.

2. POLICY. Transuranic waste shall be managed to protect the public and worker health and safety, as well as the environment, and performed in compliance with applicable radiation protection standards and environmental regulations. Practical and cost effective methods shall be used to reduce the volume and toxicity of transuranic waste.

   a. Transuranic waste shall be certified in compliance with the Waste Isolation Pilot Plant-Waste Acceptance Criteria, placed in interim storage (if required), and sent to the Waste Isolation Pilot Plant.

   b. Transuranic waste that the Department of Energy has determined, with the concurrence of the EPA Administrator, does not need the degree of isolation provided by a geologic repository or, transuranic waste that cannot be certified or otherwise approved for acceptance at the Waste Isolation Pilot Plant, shall be disposed of by alternative methods. Alternative disposal methods shall be approved by DOE Headquarters (DP-12 and EH-1) and shall comply with the National Environmental Policy Act requirements and EPA/State regulations.

3. REQUIREMENTS.

   a. Waste Classification.

      (1) Any material that is known to be, or suspected of being contaminated with transuranium radionuclides shall be evaluated as soon as possible in the generating process, and determined to be either recoverable material, transuranic waste, low-level waste, mixed waste, or non-radioactive trash in order to avoid commingling the various material streams.

      (2) The lower concentration limit for transuranic waste (>100 nCi/g of waste) shall apply to the contents of any single waste package at the time of assay. The mass of the waste container including shielding shall not be used in calculating the specific activity of the waste.

(3) Radioactive wastes with quantities of transuranic radionuclides in concentrations of 100 nCi/g of waste or less shall be considered to be low-level waste, and shall be managed according to the requirements of Chapter III of this Order.

(4) Mixed transuranic waste:

(a) Mixed transuranic waste meeting the requirements of the Waste Isolation Pilot Plant-Waste Acceptance Criteria shall be sent to the Waste Isolation Pilot Plant.

(b) The Data Package prepared by the generators for the Waste Isolation Pilot Plant shall include information on the kinds and quantities of hazardous components contained in a waste package in accordance with applicable Resource Conservation and Recovery Act regulations.

(c) The determination whether the transuranic waste exhibits any hazardous characteristics or contains listed hazardous components may be based on knowledge of the waste generating process when the performance of a chemical analysis would significantly increase the radiation hazard to personnel.

b. Transuranic Waste Generation and Treatment.

(1) Technical and administrative controls shall be directed to reducing the gross volume of waste generated and/or the amount of radioactivity requiring disposal. Transuranic waste reduction efforts shall be based on the implementation of techniques such as process modification, process optimization, materials substitution, decontamination, assay of suspect waste, and new technology development. Volume reduction techniques, such as incineration, compaction, extraction, and shredding, shall be implemented wherever cost effective and practical. Treatment facilities shall be permitted by the appropriate regulatory authority.

(2) Transuranic waste shall be assayed or otherwise evaluated to determine the kinds and quantities of transuranic radionuclides present prior to storage. Additionally, hazardous waste components shall be estimated or analyzed, whichever is appropriate.

(3) Mixed transuranic waste shall be treated, where feasible and practical, to destroy the hazardous waste component.

(4) Transuranic waste that is classified for security reasons shall be treated to remove or destroy the classified characteristic(s) prior to certification. Declassification should be performed by the generator.

c. Transuranic Waste Certification.

(1) Transuranic waste shall be certified, pursuant to the Waste Isolation Pilot Plant-Waste Acceptance Criteria, placed in interim storage, and sent to the Waste Isolation Pilot Plant when it becomes operational.

(2) Uncertified transuranic waste shall not be sent to the Waste Isolation Pilot Plant except by special permission granted in response to a formal, documented request to the Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee and the Waste Isolation Pilot Plant Waste Operations.

(3) All transuranic waste certification sites shall prepare a certification plan which describes how the waste meets each waste acceptance criterion described in the WIPP-DOE-069 (see Attachment 1, page 3, paragraph 18).

(4) Each certification plan shall define controls and other measures to ensure that each element of the certification plan is performed adequately as described. Requirements for these quality assurance activities are described in the WIPP-DOE-120 (see Attachment 1, page 2, paragraph 19).

(5) Certification plans, including associated quality assurance plans, shall be submitted for review, comment, and approval by the Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee.

(6) The Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee shall submit certification and associated quality assurance plans to the state of New Mexico's Environmental Evaluation Group for review and comment prior to granting formal approval of such plans.

(7) The Environmental Evaluation Groups's comments on certification and associated quality assurance plans shall be resolved between the affected site and the Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee prior to granting formal approval of the plans.

(8) Approved certification and associated quality assurance plans shall be implemented by the generating sites using specific, written operational procedures.

(9) Certification activities conducted under approved plans and procedures shall be audited periodically, in accordance with a written audit program plan on a continuing basis by the Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee. An Environmental Evaluation Group representative may accompany the Waste Isolation

Pilot Plant-Waste Acceptance Criteria Certification Committee audit team as an observer during site audits. The Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee may grant certifying authority to the site following successful completion of an audit.

(10) The Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee shall issue a formal audit report to the responsible field organization following the completion of an audit. The audit report shall describe the activities of the Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee audit team and include a record of any findings, observations, and recommendations. Corrective actions taken as a result of a finding shall be verified on subsequent audits. The Waste Isolation Pilot Plant-Waste Acceptance Criteria Certification Committee shall institute a tracking system to ensure timely resolution of findings, observations, recommendations, and the resultant corrective actions.

(11) Failure to resolve and close out previous audit findings and recommendations or sending noncomplying waste to the Waste Isolation Pilot Plant when judged by the Waste Acceptance Criteria Certification Committee to be a serious violation, shall result in suspension of certifying authority, pending satisfactory resolution.

d. Transuranic Waste Packaging.

(1) Newly generated transuranic waste shall be placed in noncombustible packaging that meets DOT requirements.

(2) All Type A transuranic waste containers shall be equipped with a method to prevent pressure buildup. Acceptable pressure-relief devices include permeable gaskets, vent clips, and filtered vents.

(3) The waste packages shall be marked, labeled, and sealed in accordance with the Waste Isolation Pilot Plant-Waste Acceptance Criteria, EPA, and DOT requirements, as defined in the WIPP-DOE-069, 40 CFR 262, Subpart C, and 49 CFR 172, Subparts D, E, and 49 CFR 173, Subpart I, where applicable, prior to shipping.

e. Temporary Storage at Generating Sites. The following activities shall be performed to assure the safe storage of transuranic wastes consistent with the requirements of applicable Resource Conservation and Recovery Act regulations:

(1) Transuranic waste shall be segregated or otherwise clearly identified to avoid the commingling of transuranic waste streams with high-level waste or low-level waste.

(2) Certified transuranic waste shall not be commingled with noncertified transuranic waste and shall be stored in a manner unlikely to alter its certification status.

(3) Transuranic waste in storage areas shall be protected from unauthorized access.

(4) Transuranic wastes in storage shall be monitored periodically to ensure that the wastes are not releasing their radioactive and/or hazardous constituents.

(5) Transuranic waste storage facilities shall be designed, constructed, maintained, and operated to minimize the possibility of fire, explosion, or accidental release of radioactive and/or hazardous components of the waste to the environment.

(6) Facilities which store transuranic waste shall have a contingency plan designed to minimize the adverse impacts of fire, explosion, or accidental release of hazardous components of the waste to the environment.

(7) Transuranic waste shall be stored in such a way so as to maintain radiation exposures as low as reasonably achievable.

f. <u>Transportation/Shipping to the Waste Isolation Pilot Plant</u>.

(1) Transuranic waste shipments shall comply with the provisions of DOE and DOT regulations, pursuant to DOE 1540.1.

(2) Transuranic waste shipments by truck shall be by a DOE-controlled carrier system. All transuranic waste shall be transported in certified Type B packaging.

(3) Shipping papers shall provide the information required by DOT (49 CFR 172, Subpart C), the Waste Isolation Pilot Plant Data Package (WIPP-DOE-157), and, as necessary, the manifest required by EPA (40 CFR 261, and 262).

(4) Distribution of the shipping papers shall be as follows:

(a) Shipper - one copy (or more);

(b) Carrier - one copy; and

(c) Waste Isolation Pilot Plant - two copies.

A copy of the papers will be returned by the Waste Isolation Pilot Plant to the shipper after emplacement of the waste at the Waste Isolation Pilot Plant.

(5) Appropriate EPA and State authorizations/permits shall be obtained for the transport system, as applicable.

(6) Placarding of shipments shall be carried out, as required by the regulations of DOT (contained in 49 CFR 172, Subpart F).

(7) All shipments of transuranic waste shall be in or on "exclusive use" vehicles, as defined in 49 CFR 173. Shipments shall be made as expeditiously as possible and shall be tracked from origin to destination using a real-time tracking communications system. Deviations from "preferred routes," delays and other irregularities detected by the system shall be investigated by the responsible traffic manager and a report sent to the Waste Isolation Pilot Plant within 90 days.

(8) The Albuquerque Operations Office shall develop a transuranic waste transportation management and operations plan which addresses, but is not limited to, the following considerations:

(a) Communication between transport vehicle and traffic management;

(b) Shipment tracking in transit;

(c) Security;

(d) Emergency notification/response;

(e) Shipment routing;

(f) Shipment notification as appropriate;

(g) Driver training and qualifications;

(h) Vehicle maintenance and inspection;

(i) State surveillance and inspection; and

(j) Inspection and recertification of transport packagings.

g. Interim Storage.

(1) Interim storage sites have been designated for storage of:

(a) Waste certified by off site generators;

(b) Waste certified by on site generators;

(c) Waste certified by interim storage personnel; and

(d) Uncertified waste received from on site and/or off site generators that is awaiting processing and certification.

(2) New interim storage facilities shall be sited, designed, constructed, and operated consistent with the requirements of applicable Resource Conservation and Recovery Act regulations and in a manner which satisfactorily addresses the following considerations at a minimum:

(a) Proximity to ground water and areas of seismic activity or flood plains shall be identified, and potential impacts shall be evaluated.

(b) The facility shall be designed and operated to minimize the run on and run off of precipitation. The run off control system shall provide for collecting and sampling run off, which may come in contact with the waste packages, prior to releasing the water for discharge.

(c) An environmental monitoring system shall be provided to detect any release and migration of major radioactive and hazardous components. Background levels of primary radioactive and hazardous waste components shall be determined.

(d) The storage facility design shall minimize the possibility for the unauthorized entry of persons.

(e) Incompatible wastes types shall be placed in separate packages and stored in segregated areas to prevent accidental ignition or chemical reaction.

(f) Waste storage facilities shall be designed and operated to minimize the exposure of personnel to radiation and chemicals.

(g) The storage facility operator shall inspect or verify routinely the condition of waste packages at the storage site for deterioration that may threaten human health or cause release of hazardous or radioactive components to the environment.

(h) The storage facility operator shall prepare plans that identify and describe how the site will be closed at the end of its active life. These plans shall address sampling, testing, and monitoring for major radioactive and hazardous waste components in soil and groundwater.

(i) Sites that use underground storage tanks for the storage of transuranic waste shall comply with the requirements of the Resource Conservation and Recovery Act, as applicable.

(j) Permits shall be acquired, as necessary, from appropriate regulatory entities for all the interim storage facility activities listed above.

(3) Existing interim storage sites shall be reviewed for consistency with the items in paragraph 3g(2). Any necessary corrective actions shall be performed based on a compliance schedule approved by appropriate regulatory authorities.

(4) Certified waste shall be stored in a manner unlikely to alter the certification of the waste package.

(5) Operators of interim storage facilities shall receive data package information (see Attachment 1, page 2, paragraphs 18 and 20) for each waste package from the generator. The operator shall store the waste generator's data and shall use the data to prepare a new Data Package at the time of shipment to the Waste Isolation Pilot Plant.

(6) Certified waste from off site generators does not require additional waste analysis or interim inspection, either upon receipt at the storage site or at the time of shipment to the Waste Isolation Pilot Plant. The generator of the certified waste is responsible for describing the waste form and waste package content.

(7) Waste that has been certified by a generator and shipped to an interim storage site shall be reshipped to the Waste Isolation Pilot Plant by the interim storage site in the following manner:

(a) The generator/certifier shall be identified as the generator/certifier and shipping originator.

(b) The interim storage site shall be identified as the reshipper.

(c) The shipping originator is responsible for certifiability of the waste form, waste package content, waste container procurement documentation, related Data Package information, and proper marking, labeling and placarding of the shipment. The shipping originator is responsible for any problems or discrepancies relating to the above-mentioned items that may occur during shipment to or emplacement at the Waste Isolation Pilot Plant.

(d) The reshipper is responsible for complete data package assembly, transmittal, proper marking, labeling, placarding, verifying the adequacy of the exterior condition of the container (e.g., no significant deterioration, bulging) and for proper shipment loading. The reshipper shall perform radiation dose rate and contamination surveys on each package. The reshipper is responsible for any problems or discrepancies involving the items mentioned above.

(8) The interim storage site is the shipping originator for stored waste certified at that site. Agreements may need to be developed between offsite waste generators and interim storage site operators/certifiers to define clearly their respective responsibilities.

h. Waste Isolation Pilot Plant.

(1) The Waste Isolation Pilot Plant is a defense activity of the DOE for the express purpose of providing a research and development facility to demonstrate the safe disposal of radioactive wastes resulting from defense activities.

(2) After the successful demonstration of the safe disposal of defense transuranic wastes, the Waste Isolation Pilot Plant will be the planned destination for all certified contact-handled and remote-handled transuranic waste, including mixed transuranic waste.

(3) Prior to shipment of waste, the Waste Isolation Pilot Plant shall validate the data package for that waste shipment.

(4) Upon receipt of waste, Waste Isolation Pilot Plant activities shall include, but not be limited to, the following:

(a) Verification of the package or assembly identification numbers against the Data Package;

(b) Measurement of the external radiation dose rate of the package and shipping container;

(c) Verification that contamination levels on the package and shipping container surfaces are within acceptable limits; and

(d) Review and proper processing of all shipping papers and manifests.

(5) During a period of up to 5 years from the first emplacement of waste in the Waste Isolation Pilot Plant, the waste shall be stored retrievably. This phase is called the Operations Demonstration Period.

(6) The decision for or against permanent disposal will be made at the end of the Operations Demonstration Period. If the decision is against using the Waste Isolation Pilot Plant as the repository, the stored waste shall be retrieved, repackaged, if necessary, and handled as directed by DOE. At that time, the Waste Isolation Pilot Plant shall be decontaminated, decommissioned, and closed, per agreement with the State of New Mexico.

(7) If the Waste Isolation Pilot Plant is designated a repository, the underground portion of the Waste Isolation Pilot Plant shall be sealed upon completion of all planned transuranic waste disposal activities. Surface facilities shall be decontaminated and decommissioned, and the Waste Isolation Pilot Plant will be closed, per agreement with the state of New Mexico.

(8) Following closure, the salt tailings will be disposed of in an environmentally acceptable manner and the site shall be returned to its natural state. Waste burial record shall be stored securely, and permanent markers shall be installed to minimize the possibility of future human intrusion.

i. Buried Transuranic-Contaminated Waste.

(1) Alternatives for the long term management of buried transuranic-contaminated waste at inactive DOE waste sites are addressed in Attachment 1, page 3, paragraph 22. The inactive waste sites are located at Idaho National Engineering Laboratory, Los Alamos National Laboratory, Oak Ridge National Laboratory, Savannah River Plant, and the Hanford Site. The program will lead to the closure of each waste site, in compliance with the National Environmental Policy Act requirements, the Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund Amendments and Reauthorization Act, and other applicable DOE, EPA, and State requirements.

(2) Each waste site shall be characterized to include information on types and quantities of radioactive and hazardous chemicals. This information shall be verified by appropriate sampling/analysis/monitoring techniques. The characterization and verification activities will also include determination of waste migration from the burial sites and potential environmental and health impacts.

(3) Each DOE site will develop a closure strategy for the waste site(s), utilizing the waste characterization data. Basic site-closure strategies which could be a combination of (a), (b), and (c) depending on site-specific and regulatory requirements, are as follows:

(a) Leave waste in place with enhanced monitoring.

(b) Leave waste in place, use enhanced confinement or in-situ immobilization techniques, and provide enhanced monitoring.

(c) Retrieve, process, and dispose of the transuranic waste at the Waste Isolation Pilot Plant.

(4) Each DOE site will develop a site closure plan, which will include, as a minimum, the following:

(a) National Environmental Policy Act requirements;

(b) Applicable Federal, State and local regulations (e.g., DOE, EPA, State);

(c) Permits required;

(d) Selected closure strategy and justification;

(e) A waste retrieval strategy:

<u>1</u> Methodology for segregating transuranic and low-level waste,

<u>2</u> Identification of mixed waste components,

<u>3</u> Certification of transuranic waste for disposal at the Waste Isolation Pilot Plant,

<u>4</u> Management of low-level waste and mixed waste, and

<u>5</u> Plans for maintaining exposures as low as reasonably achievable;

(f) Budget requirements by fiscal year;

(g) Schedule for closure strategy completion; and

(h) Post-closure monitoring and controls.

j. <u>Quality Assurance</u>. Consistent with DOE Order 5700.6B, transuranic waste operations shall be conducted in accordance with applicable requirements of the American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1 (see Attachment 1, page 5, paragraph 48) and other appropriate national consensus standards.

CHAPTER III

MANAGEMENT OF LOW-LEVEL WASTE

1. PURPOSE. To establish policies, requirements and guidelines, for managing the Department's solid low-level waste.

2. POLICY.

   a. DOE-low-level waste operations shall be managed to protect the health and safety of the public, preserve the environment of the waste management facilities, and ensure that no legacy requiring remedial action remains after operations have been terminated.

   b. DOE-low-level waste shall be managed on a systematic basis using the most appropriate combination of waste generation reduction, segregation, treatment, and disposal practices so that the radioactive components are contained and the overall system cost effectiveness is maximized.

   c. DOE-low-level waste shall be disposed of on the site at which it is generated, if practical, or if on-site disposal capability is not available, at another DOE disposal facility.

   d. DOE-low-level waste that contains non-radioactive hazardous waste components (mixed waste) shall conform to the requirements of this order, applicable EH Orders, and shall also be regulated by the appropriate regional authorities under the Resource Conservation and Recovery Act.

3. REQUIREMENTS.

   a. Performance Objectives. DOE-low-level waste that has not been disposed of prior to issuance of this Order shall be managed on the schedule developed in the Implementation Plan (See page 7, paragraph 10) to accomplish the following:

      (1) Protect public health and safety in accordance with standards specified in applicable EH Orders and other DOE Orders.

      (2) Assure that external exposure to the waste and concentrations of radioactive material which may be released into surface water, ground water, soil, plants and animals results in an effective dose equivalent that does not exceed 25 mrem/yr to any member of the public. Releases to the atmosphere shall meet the requirements of 40 CFR 61. Reasonable effort should be made to maintain releases of radioactivity in effluents to the general environment as low as is reasonably achievable.

(3) Assure that the committed effective dose equivalents received by individuals who inadvertently may intrude into the facility after the loss of active institutional control (100 years) will not exceed 100 mrem/yr for continuous exposure or 500 mrem for a single acute exposure.

(4) Protect ground water resources, consistent with Federal, State and local requirements.

b. Performance Assessment.

(1) Field organizations with disposal sites shall prepare and maintain a site specific radiological performance assessment for the disposal of waste for the purpose of demonstrating compliance with the performance objectives stated in paragraph 3a.

(2) Each field organization shall, for each DOE reservation within its cognizance, prepare and maintain an overall waste management systems performance assessment supporting the combination of waste management practices used in generation reduction, segregation, treatment, packaging, storage, and disposal. Background and guidance on waste management systems performance assessment is provided in Attachment 1, page 3, paragraph 21.

(3) Where practical, monitoring measurements to evaluate actual and prospective performance should be made at locations as required, within and outside each facility and disposal site. Monitoring should also be used to validate or modify the models used in performance assessments.

c. Waste Generation.

(1) Technical and administrative controls shall be directed to reducing the gross volume of waste generated and/or the amount of radioactivity requiring disposal. Waste reduction efforts shall include consideration of process modification, process optimization, materials substitution and decontamination.

(2) Waste Generation Reduction. All DOE-low-level waste generators shall establish auditable programs (goals, incentives, procedures, and reports) to assure that the amount of low-level waste generated and/or shipped for disposal is minimized.

(3) Waste Segregation. Each DOE-low-level waste generator shall separate uncontaminated waste from low-level waste to facilitate cost effective treatment and disposal.

(4) Waste Minimization. Each DOE-low-level waste generator preparing a design for a new process or process change shall incorporate principles into the design that will minimize the generation of low-level waste.

d. Waste Characterization.

(1) Low-level waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, storage, and disposal. This characterization shall ensure that, upon generation and after processing, the actual physical and chemical characteristics and major radionuclide content are recorded and known during all stages of the waste management process.

(2) Waste characterization data shall be recorded on a waste manifest, as required by paragraph 3m, and shall include:

(a) The physical and chemical characteristics of the waste.

(b) Volume of the waste (total of waste and any solidification or absorbent media).

(c) Weight of the waste (total of waste and any solidification or absorbent media).

(d) Major radionuclides and their concentrations.

(e) Packaging date, package weight, and external volume.

(3) The concentration of a radionuclide may be determined by direct methods or by indirect methods such as use of scaling factors which relate the inferred concentration of one radionuclide to another that is measured, or radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements.

e. Waste Acceptance Criteria.

(1) Waste shipped from one field organization to another for treatment, storage or disposal shall be done in accordance with the requirements established by the operations office having responsibility for operations of the receiving facility.

(2) Waste acceptance criteria shall be established for each low-level waste treatment, storage, and disposal facility, and submitted to the cognizant field organization.

(3) Generators of waste shall implement a low-level waste certification program to provide assurance that the waste acceptance criteria for

any low-level waste treatment, storage, or disposal facility used by the generator are met. Generators and facilities receiving the waste are jointly responsible for assuring compliance with waste acceptance criteria. Generators are financially responsible for actions required due to nonconformance.

(4) Generator low-level waste certification programs shall be subject to a periodic audit by operators of facilities to which the waste is sent by the generator.

(5) The waste acceptance criteria for storage, treatment, or disposal facilities shall address the following issues:

(a) Allowable quantities/concentrations of specific radioisotopes to be handled, processed, stored or disposed of;

(b) Criticality safety requirements (waste forms and geometries);

(c) Restrictions regarding low-level waste classified for security reasons;

(d) External radiation and internal heat generation;

(e) Restrictions on the generation of harmful gases, vapors, or liquids in waste;

(f) Chemical and structural stability of waste packages, radiation effects, microbial activity, chemical reactions, and moisture;

(g) Restrictions for chelating and complexing agents having the potential for mobilizing radionuclides; and

(h) Quantity of free liquids.

f. Waste Treatment.

(1) Waste shall be treated by appropriate methods so that the disposal site can meet the performance objectives stated in paragraph 3a.

(2) Waste treatment techniques such as incineration, shredding, and compaction to reduce volume and provide more stable waste forms shall be implemented as necessary to meet performance requirements. Use of waste treatment techniques to increase the life of the disposal facility and improve long-term facility performance, by improved site stability and reduction of infiltrating water, is required to the extent it is cost effective.

(3) The development of large scale waste treatment facilities shall be supported by appropriate the National Environmental Policy Act documentation in addition to the following:

(a) A document shall be prepared that analyzes waste streams needing treatment, treatment options considered and a rationale for selection of proposed treatment processes;

(b) A construction design report including projected waste throughputs and treatment methods, construction and operating cost estimates; and

(c) A Safety Analysis Report.

(4) Operation of waste treatment facilities shall be supported by adequate documentation including the following:

(a) Operation and maintenance procedures;

(b) Personnel training and qualification procedures;

(c) Monitoring and emergency response plans; and

(d) Records shall be maintained for each package of low-level waste that enters and leaves the treatment facility.

g. Shipment.

(1) The volume of waste and number of shipments of low-level waste shall be minimized and the shipments will be conducted based on plans developed by field organizations. Off site shipment of low-level waste shall be in compliance with DOE 1540.1.

(2) Generators shall provide an annual forecast in the third quarter of the fiscal year to the field organizations managing the off-site disposal facility to which the waste is to be shipped.

(3) Generators must receive advance approval from the receiving facility and shall certify prior to shipment that waste meets the receiving facility waste acceptance criteria. The certification program shall be auditable and able to withstand independent review.

(4) Each package of waste must comply with the labeling requirements of DOE 1540.1.

Short-term storage

h. Long-Term Storage.

(1) Low-level waste shall be stored by appropriate methods, to achieve the performance objectives stated in paragraph 3a.

(2) Records shall be maintained for all low-level waste that enters and leaves the storage facility, (see paragraph 3m).

(3) The development and operation of a waste storage facility shall be supported by the following documentation (two or more of these may be combined for convenience):

(a) An analysis which identifies the need for the storage facility;

(b) A Construction Design Report, including projected waste planned for storage; construction and operating cost estimates;

(c) A Safety Analysis Report and appropriate National Environmental Policy Act documentation; and

(d) Operational procedures and plans.

(4) Storage of waste to allow for nuclides to decay or storage of wastes until they can be disposed of by approved methods are acceptable.

i. Disposal.

(1) Low-level waste shall be disposed of by methods appropriate to achieve the performance objectives stated in paragraph 3a, consistent with the disposal site radiological performance assessment in paragraph 3b.

(2) Engineered modifications (stabilization, packaging, burial depth, barriers) for specific waste types and for specific waste compositions (fission products, induced radioactivity, uranium, thorium, radium) for each disposal site shall be developed through the performance assessment model (see paragraph 3b(1)). In the course of this process, site specific waste classification limits may be developed if operationally useful in determining how specific wastes should be stabilized and packaged for disposal.

(3) An Oversight and Peer Review Panel of DOE, contractor, and other specialists in performance assessments will be selected by DP-12, with participation by EH-1 and operations office representatives. Through consultation and review, this panel shall ensure consistency and technical quality around the DOE complex in the development and application of performance assessment models that include site specific geohydrology and waste composition.

(4) Disposition of waste designated as greater-than-class C, as defined in 10 CFR 61.55, must be handled as special cases. Disposal systems for such waste must be justified by a specific performance assessment through the National Environmental Policy Act process and with the concurrence of DP-12 for all DP-1 disposal facilities and of NE-20 for those disposal facilities under the cognizance of NE-1.

(5) The following are additional disposal requirements intended either to improve stability of the disposal site or to facilitate handling and provide protection of the health and safety of personnel at the disposal site:

(a) Waste must not be packaged for disposal in cardboard or fiberboard boxes, unless such boxes meet DOT requirements and contain stabilized waste with a minimum of void space. For all types of containers, void spaces within the waste and between the waste and its packaging shall be reduced as much as practical.

(b) Liquid wastes, or wastes containing free liquid, must be converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable, but, in no case, shall the liquid exceed 1 percent of the volume of the waste when the waste is in a disposal container, or 0.5 percent of the volume of the waste processed to a stable form.

(c) Waste must not be readily capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water.

(d) Waste must not contain, or be capable of generating, quantities of toxic gases, vapors, or fumes harmful to persons transporting, handling, or disposing of the waste. This does not apply to radioactive gaseous waste packaged as identified in paragraph 3i(5)(e).

(e) Waste in a gaseous form must be packaged at a pressure that does not exceed 1.5 atmospheres at 20°C.

(f) Waste must not be pyrophoric. Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be nonflammable.

(6) Waste containing amounts of radionuclides below regulatory concern, as defined by Federal regulations, may be disposed without regard to radioactivity content.

(7) <u>Disposal Site Selection</u>.

(a) Disposal site selection criteria (based on planned waste confinement technology) shall be developed for establishing new low-level waste disposal sites.

(b) Disposal site selection shall be based on an evaluation of the prospective site in conjunction with planned waste confinement technology, and in accordance with the the National Environmental Policy Act process.

(c) The disposal site shall have hydrogeologic characteristics which, in conjunction with the planned waste confinement technology, will protect the groundwater resource.

(d) The potential for natural hazards such as floods, erosion, tornadoes, earthquakes, and volcanoes shall be considered in site selection.

(e) Site selection criteria shall address the impact on current and projected populations, land use resource development plans and nearby public facilities, accessibility to transportation routes and utilities, and the location of waste generation.

(8) Disposal Facility and Disposal Site Design.

(a) Design criteria shall be established prior to selection of new disposal facilities, new disposal sites, or both. These design criteria shall be based on analyses of physiographic, environmental, and hydrogeological data to assure that the policy and requirements of this Order can be met. The criteria shall be also based on assessments of projected waste volumes, waste characteristics, and facility and disposal site performance.

(b) Disposal units shall be designed consistent with disposal site hydrology, geology, and waste characteristics and in accordance with the National Environmental Policy Act process.

(9) Disposal Facility Operations.

(a) Field organizations shall develop and implement operating procedures for low-level waste disposal facilities that protect the environment, health and safety of the public, and facility personnel; ensure the security of the facility; minimize the need for long-term control; and meet the requirements of the closure/post-closure plan.

(b) Permanent identification markers for disposal excavations and monitoring wells shall be emplaced.

(c) Operating procedures shall include training for disposal facility operating personnel, emergency response plans, and a system of reporting unusual occurrences according to DOE 5000.3.

(d) Waste placement into disposal units should minimize voids between containers.

(e) Operations are to be conducted so that active waste disposal operations will not have an adverse effect on filled disposal units.

j. Disposal Site Closure/Post Closure.

(1) Field organizations shall develop site-specific comprehensive closure plans for new and existing operating low level waste disposal sites. The plan shall address closure of disposal sites within a 5-year period after each is filled and shall conform to the requirements of the National Environmental Policy Act process. Performance objectives for existing disposal sites shall be developed on a case-by-case basis as part of the National Environmental Policy Act process.

(2) During closure and post closure, residual radioactivity levels for surface soils shall comply with existing DOE decommissioning guidelines.

(3) Corrective measures shall be applied to new disposal sites or individual disposal units if conditions occur or are forecasted that could jeopardize attainment of the performance objectives of this Order.

(4) Inactive disposal facilities, disposal sites, and disposal units shall be managed in conformance with the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act, or, if mixed waste is involved, may be included in permit applications for operation of contiguous disposal facilities.

(5) Closure plans for new and existing operating low-level waste disposal facilities shall be reviewed and approved by the appropriate field organization.

(6) Termination of monitoring and maintenance activity at closed facilities or sites shall be based on an analysis of site performance at the end of the institutional control period.

k. Environmental Monitoring.

(1) Each operational or non-operational low-level waste treatment, storage, and disposal facility shall be monitored by an environmental monitoring program that conforms with DOE 5484.1 and, at a minimum, meet the requirements of paragraph 3K(2) through 3K(4).

(2) The environmental monitoring program shall be designed to measure: (a) operational effluent releases; (b) migration of radionuclides; (c) disposal unit subsidence; and (d) changes in disposal facility and disposal site parameters which may affect long-term site performance.

(3) Based on the characteristics of the facility being monitored, the environmental monitoring program may include, but not necessarily be limited to, monitoring surface soil, air, surface water, and, in the subsurface, soil and water, both in the saturated and the unsaturated zones.

(4) The monitoring program shall be capable of detecting changing trends in performance sufficiently in advance to allow application of any necessary corrective action prior to exceeding performance objectives. The monitoring program shall be able to ascertain whether or not effluents from each treatment, storage, or disposal facility or disposal site meet the requirements of applicable EH Orders.

l. Quality Assurance. Consistent with DOE 5700.6B, the low-level waste operational and disposal practices shall be conducted in accordance with applicable requirements of American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1 (See Attachment 1, page 5, paragraph 48) and other appropriate national consensus standards.

m. Records and Reports.

(1) Each field organization shall develop and maintain a record keeping system that records the following: a historical record of waste generated, treated, stored, shipped, disposed of, or both, at the facilities under its cognizance. The data maintained shall include all data necessary to show that the waste was properly classified, treated, stored, shipped, and/or disposed of. The data maintained in the system shall be based on the data recorded on waste manifests.

(2) Waste Manifest. Records shall be kept and accompany each waste package from generator through final disposal. The manifest shall contain data necessary to document the proper classification, and assist in determining proper treatment, storage, and disposal of the waste. Waste manifests will be kept as permanent records. At a minimum, the following data will be included:

(a) Waste physical and chemical characteristics,

(b) Quantity of each major radionuclide present,

(c) Weight of the waste (total of waste and any solidification or absorbent media),

(d) Volume of the waste (total of waste and any solidification or absorbent media), and

(e) Other data necessary to demonstrate compliance with waste acceptance criteria.

CHAPTER IV

MANAGEMENT OF WASTE CONTAINING AEA 11e(2) BYPRODUCT MATERIAL AND NATURALLY OCCURRING AND ACCELERATOR PRODUCED RADIOACTIVE MATERIAL

1. PURPOSE. To establish policies and guidelines for managing DOE waste containing byproduct material, as defined by section 11e(2) of the Atomic Energy Act of 1954, as amended, and Naturally Occurring and Accelerator Produced Radioactive Material.

2. POLICY. DOE waste containing naturally occurring and accelerator produced radioactive material or byproduct material as defined by section 11e(2) of the Atomic Energy Act, as amended, or similarly contaminated residues derived from DOE remedial actions, shall be stored, stabilized in-place, and/or disposed of consistent with the requirements of the residual radioactive material guidelines contained in 40 CFR 192. Small volumes of DOE waste containing 11e(2) byproduct material or naturally occurring and accelerator produced radioactive material may be managed as low-level waste in accordance with the requirements of Chapter III of this Order. If the waste is classified as mixed waste, management also must be in compliance with the requirements of the Resource Conservation and Recovery Act.

3. REQUIREMENTS.

   a. Waste Management.

      (1) Waste covered under this chapter in quantities too large for acceptance at DOE low-level waste disposal sites shall be managed according to the requirements of 40 CFR 192, and disposed of at specially designated DOE sites or tailing disposal sites established under the Uranium Mill Tailings Radiation Control Act of 1978 (Public Law 95-604). These disposal sites should be identified and developed as needed in support of DOE remedial actions, and will normally be located in the State in which the wastes are generated.

      (2) With the approval of the appropriate field organization, small volumes of 11(e) byproduct material and naturally occurring and accelerator produced radioactive material waste may be disposed of at DOE low-level waste sites in accordance with the requirements of Chapter III of this Order.

      (3) All DOE waste containing:

         (a) Naturally occurring and accelerator produced radioactive material mixed with the Resource Conservation and Recovery Act hazardous chemicals shall be managed as hazardous waste under the Resource Conservation and Recovery Act.

(b) Byproduct 11e(2) (or a combination of 11e(2) byproduct and naturally occurring and accelerator produced radioactive material) mixed with the Resource Conservation and Recovery Act hazardous chemicals, shall be managed consistent with both the Resource Conservation and Recovery Act and 40 CFR Part 192.

b. Quality Assurance. Consistent with DOE 5700.6B, waste management practices shall be conducted in accordance with applicable requirements of American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1 (reference 48) and other appropriate national consensus standards.

CHAPTER V

DECOMMISSIONING OF RADIOACTIVELY CONTAMINATED FACILITIES

1. PURPOSE. To establish policies and guidelines for the management, decontamination, and decommissioning of radioactively contaminated facilities under DOE ownership or control.

2. POLICY. Radioactively contaminated facilities for which DOE is responsible shall be managed in a safe, cost-effective manner to assure that release of, and exposure to, radioactivity and other hazardous materials comply with Federal and State standards. Facilities, equipment, and valuable materials shall be recovered and reused when practical.

3. REQUIREMENTS. DOE organizations shall develop and document their programs to provide for the surveillance, maintenance, and decommissioning of contaminated facilities. The decommissioning programs shall be implemented as follows:

   a. General.

      (1) Each field organization shall prepare and maintain a complete list of contaminated facilities both operational and excess under its jurisdiction. A continuous record of jurisdictional program responsibility for all contaminated facilities shall be maintained by the cognizant field organization for use in assigning decommissioning responsibility.

      (2) Operational records (e.g., facility design drawings and modifications, characterization data on contamination levels, prior decontamination activities, and incident reports required by DOE Orders) for all contaminated facilities shall be maintained by the cognizant field organization for use in preparing decommissioning plans.

      (3) Planning for facility decommissioning shall be initiated during the design phase for new facilities and prior to termination of operations for existing operational facilities. Such plans shall consider the 2-year budget cycle to assure adequate funding availability.

      (4) Program offices shall be responsible for placing the facility in a safe storage condition, providing surveillance and maintenance, and decommissioning the facilities under their jurisdiction when they become excess to programmatic needs, or for finding another programmatic sponsor for them. For multiple user facilities, the program office shall determine decommissioning liability for user program offices based on each program's overall contribution to the contamination or some other mutually acceptable basis. This cost sharing formula may be applied when the facility is placed in safe storage or during surveillance and maintenance, when appropriate.

(5) Responsibility for contaminated facilities may be transferred from one program organization to another by mutual agreement of the programs involved. The program organization to which a facility is transferred shall accept full responsibility for surveillance, maintenance, and decommissioning of the facility according to the requirements of this Order. Agreements to transfer facilities for functional purposes shall be in writing and shall identify explicitly the concurrent transfer of responsibility for surveillance, maintenance, and decommissioning.

(6) The DP and NE decommissioning programs exist for the primary purpose of managing and decommissioning the contaminated facilities currently assigned to them. Other contaminated facilities that have no programmatic sponsor, or that are excess to program needs and have a current sponsor, shall be assigned to the DP and NE programs for management and decommissioning with the approval of the program secretarial officers involved or their designees.

(7) Decommissioning expertise gained by DOE and its contractors is available at most major DOE facilities, and should be utilized by DOE programs. A computerized Decommissioning Technology data base is maintained at the Richland Operations Office. Published reports on nuclear facility decommissioning may be obtained from the Remedial Action Program Information Center at Oak Ridge National Laboratory.

b. Facility Design. Facilities in which radioactive or other hazardous materials are utilized shall be designed to simplify decontamination and decommissioning and/or increase the potential for reuse. Features and procedures that simplify and facilitate decommissioning shall be identified during the planning and design phase based upon a proposed decommissioning method or conversion to other use. Examples of features to be incorporated are identified in DOE 6430.1.

c. Post-Operational Activities.

(1) DOE Program organizations shall identify contaminated facilities under their jurisdiction, document the potential for reuse and recovery of materials and equipment, and develop schedules for decommissioning them. Projects consisting of one or more facilities shall be identified as appropriate, and priorities shall be developed based on:

(a) Maintaining employee and public health and safety,

(b) Protection of the environment,

(c) Compliance with the National Environmental Policy Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund Amendments and Reauthorization Act, and other contractual or legal requirements,

(d) Cost effective program management (e.g., maintaining manpower pools, selecting economical decommissioning alternatives), and

(e) Future site plans.

(2) Program organizations shall assure that, prior to initiation of decommissioning activities, adequate surveillance and maintenance is performed for their surplus facilities to meet applicable radiation protection (DOE 5480.1B), hazardous chemical and safety standards, to maintain physical safety and security, and to reduce potential public and environmental hazards. All high-level waste and stored hazardous materials should be removed by the operator as part of the last operational activities prior to entering into the decommissioning phase.

d. Decommissioning Project Activities.

(1) Characterization. Baseline data for each project shall be collected to support a thorough physical, chemical, and radiological characterization to fulfill the requirements of the National Environmental Policy Act reviews, the Resource Conservation and Recovery Act, and the Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund Amendments and Reauthorization Act preliminary assessment/site investigations, and detailed engineering. The baseline data shall include:

(a) Drawings, photographs, and other records reflecting the as-built and as-modified condition of the facility and grounds;

(b) The condition of all structures, existing protective barriers, and systems installed to ensure public, occupational, and environmental safety;

(c) The type, form, quantity, and location of hazardous chemical and radioactive material from past operations at the site; and

(d) Information on factors that could influence the selection of decommissioning alternatives (safe storage, entombment, dismantlement) such as potential future use, long-range site plans required by DOE 4300.1B, facility condition, and potential health, safety, and environmental hazards.

(2) Environmental Review Process. The Comprehensive Environmental Response, Compensation, and Liability Act, the Superfund Amendments and Reauthorization Act and/or the Resource Conservation and Recovery

Act status of each project shall be identified and a remedial investigation/feasibility study performed if required. Based on the results of the remedial investigation/feasibility study and any additional data deemed necessary by the responsible field organization, an appropriate environmental review shall be performed according to the requirements of the National Environmental Policy Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act. Candidate-decommissioning alternatives shall be identified, assessed, and evaluated, and a preferred decommissioning alternative selected based on the results of the environmental review.

(3) Engineering. Technical engineering planning for each project shall be conducted during the environmental review process to assure that alternative actions and associated environmental issues are identified and assessed, and to support preparation of environmental documentation. Detailed engineering will be initiated after a preferred alternative is selected. A Decommissioning Project Plan shall be prepared for approval by the appropriate program office in compliance with DOE 4700.1. The Plan shall include the following:

(a) Physical, chemical, and radiological characterizational data or references to such data;

(b) A summary evaluation of decommissioning alternatives for the facility including the preferred alternative;

(c) Plans for meeting requirements from the environmental review process (National Environmental Policy Act, the Resource Conservation and Recovery Act, the Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act) and all necessary permits;

(d) Radiological criteria to be used (modifications, if any, to guidance presented in applicable EH Orders must be approved by the Headquarters program organization and EH-1);

(e) Projections of occupational exposure;

(f) Estimated quantities of radioactive waste to be generated; and

(g) Detailed administrative, cost, schedule, and management information.

(4) Decommissioning Operations.

(a) The decommissioning project shall be conducted in accordance with guidance from Headquarters program offices and the Decommissioning Project Plan. Significant deviations shall be approved by the responsible field organization in consultation with the appropriate program office.

(b) Approval of MA-22 (Office of Project and Facilities Management) shall be obtained before initiating activities to demolish a DOE-owned facility, per the requirements of DOE 4300.1B.

(c) Status reports on project activities shall be prepared in accordance with the requirements of DOE 1332.1A or 4700.1, as appropriate.

(d) Information on waste generation shall be provided to the Integrated Data Base Program, as required.

(e) Decommissioning operations shall be considered a waste generator and shall meet generator requirements contained in the previous chapters of this Order.

(5) Post Decommissioning Activities.

(a) After decommissioning operations have been completed, a final radiological and chemical survey report (or an independent verification survey report, at remote sites) and a project final report shall be prepared. The final report shall include a description of the project, the final status of the property, and the lessons learned from the project.

(b) The responsible field organization shall compile a Project Data Package consisting of, as a minimum: the Record of Completion; the final radiological and chemical survey report; the Project Final Report; and for remote sites, an independent verification survey report, Certification Docket, and appropriate public notices. The Project Data Package shall be retained permanently in the field organization archives.

(c) The responsible program organization shall assure that any necessary long-term maintenance and surveillance or other safety controls are provided for the decommissioned property.

(d) The decommissioned property may be released from DOE ownership according to the requirements of DOE 4300.1B, if the responsible program organization, in consultation with the Office of the Assistant Secretary EH-1, certifies that the property meets applicable release criteria for residual radioactivity and hazardous chemicals, and the property is identified properly by notation in the legal land records of the local government entity.

(e) The decommissioned property may be reused for other program activities that may or may not involve radioactivity or hazardous chemicals. If appropriate release criteria are not met, the property may be reused for other program activities that may or may not involve radioactivity or hazardous chemicals provided that adequate safety controls are maintained.

e. Quality Assurance. Consistent with DOE 5700.6B, waste management practices shall be conducted in accordance with applicable requirements of American National Standards Institute/American Society of Mechanical Engineers Nuclear Quality Assurance-1 (Attachment 1, page 5, paragraph 48) and other appropriate national consensus standards.

CHAPTER VI

WASTE MANAGEMENT PLAN OUTLINE

1. PURPOSE. To provide guidance on the development and maintenance of a waste management plan for each site that generates, treats, stores, or disposes of DOE waste.

2. DISCUSSION. The Order for radioactive waste management emphasizes accountable operational requirements set forth in a prescriptive style. Each site that generates, treats, stores, or disposes of DOE radioactive waste, or decommissions contaminated facilities, is responsible for complying with these requirements in terms of how operations are conducted and how these activities are documented. The documentation serves as the written word that the actual operations are being conducted within the framework of the Order.

   The primary purpose of the Waste Management Plan is to compile and consolidate an annual report on how waste management operations are conducted, what facilities are being used to manage wastes, what forces are acting to change current waste management systems, and what plans are in store for the coming fiscal year. The scope of the plan includes the management of both radioactive and hazardous constituents in the Department's waste, whether these are separated or mixed. The body of the Waste Management Plan should not include descriptions of Environmental Restoration activities, as this information is provided under a separate program. However, several documents prepared with Environmental Restoration funding may be cited in Attachment VI-1 to the Waste Management Plan; this preserves consistency in accounting for documentation. Also, the Waste Management Plan includes the management of the DOE's liquid low-level waste which is not governed specifically by this Order.

   The waste management plan provides a vehicle to report current waste management practices and plans for the coming year. It serves as the core document in the site's waste management operations and should reference supporting documentation as appropriate. The attachment to the Waste Management plan allows sites to account for major documentation as required by the Order.

3. FORMAT FOR WASTE MANAGEMENT PLANS.

   a. Executive Summary. An Executive Summary is mandatory for each Waste Management Plan.

      (1) As a rule of thumb, limit the length of the executive summary to 10 percent or less of the length of the Waste Management Plan. Summarize the past year in waste management including the principal regulatory/environmental issues and the degree to which planned activities were accomplished.

(2) Provide a forecast of the coming year and discuss project startups, facility modifications, regulatory issues, and the waste management budget.

b. General Site Information.

(1) Organization and Administration. Indicate the DOE field organization(s) and contractor(s) responsible for managing waste treatment, storage and disposal operations; discuss approval authorities, and clarify DOE/contractor interfaces. Include relationships between contractor's operations if multiple contractors are involved.

(a) Use charts to enhance text descriptions of organizational structure. Describe lead responsibilities of functional groups including the organization responsible for preparing this plan.

(b) Show the relationships, in a separate section, between documents that guide and support the waste management program at the site. Identify the organization responsible for maintaining up-to-date copies of all reference documents at the field organization level.

(2) Site Description. Include a brief description of site location, demography size, geographic features, climate, geologic and hydrogeologic conditions, and primary mission where waste management operations are conducted.

c. Radioactive and Mixed Waste Management. This section of the plan describes radioactive and mixed waste management operations at the site and includes descriptions of the waste management systems and facilities, the characteristics of wastes managed, and discussion of the problems, recommendations, and the future direction of the site operations. The top-level divisions of this section should be by waste type; i.e., high-level, transuranic, and low-level. These categories should be subdivided further by waste phase, liquid, solid, or gaseous (where appropriate).

(1) System and Facility Descriptions.

(a) Overview. For each of the categories of waste provide an overview of the systems that treat, store, and dispose of these wastes. Use flowcharts to indicate waste sources, intermediate processing steps, and ultimate disposition of waste streams. Identify which waste streams are classified as mixed waste.

(b) Facility Descriptions. Identify the facilities that comprise the waste management systems according to waste type and waste phase and describe the facilities in the following order: Treatment Facilities; Storage Facilities; and Disposal Facilities. Detailed descriptions of facility operations are not required, but enough explanation should be given to support the discussion of planned activities. Examples of appropriate information include location maps, radiological and chemical characteristics of waste treated/stored/disposed, facility operating parameters, unique or special equipment used, and status of permitting activities. Include facility layout drawings and flow sheets where appropriate.

(2) Current and Future Plans. This section is used to document the planning efforts at the site and indicate the direction of radioactive and mixed waste management activities. It should be organized to reflect site-specific situations. In general, it should: define problems with, and/or new requirements for, waste management systems; cite specific recommendations and strategy for making improvements; identify actions to achieve compliance with regulations; and discuss plans to modify current waste management systems such as construction of new facilities, plant upgrades, facility decommissioning/closure. Remedial actions should indicate how the findings of system performance assessments were factored into recommendations and plans. They should clearly indicate the driving forces behind their stated plans, such as: to achieve disposal of waste currently in storage; to enhance systems performance; to meet regulatory requirements; and to increase worker protection/safety.

(3) Implementation Requirements. This section is used to document the implementation status by updating the "Implementation Summary Table" from the Implementation Plan. It should present these data in similar tabular format. It should also report progress realized during the past year, remaining actions to complete, remaining costs, and estimated completion dates. In addition it should indicate any variances from original cost and schedule projections in the Implementation Plan, and discuss reasons for variances.

d. Hazardous Waste Management (DP Facilities).

(1) System and Facility Descriptions.

(a) Overview. Provide an overview of the system used to treat, store, and dispose of hazardous wastes at the site. Use flow sheets and location maps where appropriate.

(b) Facility Description. Organize according to treatment facilities, storage facilities, and disposal. Describe the combination of facilities used to manage hazardous wastes at the site and include a discussion of current methods of disposal. Indicate the kinds of hazardous wastes generated and their sources. (Facility drawings and location maps should be included as appropriate.) Indicate status of permitting activities and other actions to achieve compliance with the Resource Conservation and Recovery Act and the Comprehensive Environmental Response, Compensation, and Liability Act, and the Superfund Amendments and Reauthorization Act.

(2) Current and Future Plans. Indicate recent and planned changes in waste management practice as well as actions to minimize hazardous waste generation; e.g., materials substitution and treatment to render waste nonhazardous. Identify plans for new facility construction, modifications, upgrades, or closures.

e. Schedule and Cost Summary. Show current FY costs and operational schedule for the waste management program. In a separate set of tables, show a 5-year (FY + 4) cost and schedule projection and indicate major milestones to be accomplished during that period.

f. Environmental Monitoring Programs. Describe the status of environmental monitoring that supports waste management operations, with discussion of monitoring installations, media sampled, and constituents analyzed. (This section of the plan should focus on the environmental monitoring systems installed to meet regulatory compliance at the individual waste management facilities. It is not necessary to describe the site-wide monitoring program that reports directly to EH.) Provide descriptions of planned system upgrades and modifications and key these to applicable discussions in paragraphs 3c and d. Include facility maps where appropriate.

g. Related Subjects. Use this section to report on related topics of significant interest to waste management planning efforts at the site. Examples include preparation/review of major National Environmental Policy Act documentation; personnel training; quality assurance; technology demonstrations; and decommissioning projects.

WASTE MANAGEMENT DOCUMENTATION REQUIREMENTS

DISCUSSION. To identify principal documentation requirements as identified, sites are required to list and describe (where appropriate) the waste management documentation indicated below. Each of the following paragraphs refer to specific sections of this Order that require the preparation of waste management documentation. Reporting is limited to documents issued in the previous FY, unless the most recent revision of an existing document was issued earlier. Where possible, this Attachment should retain a standard bibliographical format.

(1) Chapter I - High-Level Waste.

(a) Paragraph 3a. List titles and dates of issue of Safety Analysis Reports. Forecast schedule for preparation and issue date of planned Safety Analysis Reports.

(b) Paragraph 3b(3)(c). List titles and dates of documents supporting the periodic assessment of waste storage tank integrity.

(c) Paragraph 3b(4). Cite documentation of contingency actions of the past year. List schedule for completion of corrective actions.

(2) Chapter II - Transuranic Waste.

(a) Paragraph 3c(3). Cite the Transuranic Waste Certification Plan and date of issue. If not issued, give schedule for preparation.

(b) Paragraph 3g(2)(h). Cite the closure plan for interim storage facilities. If not issued, give schedule for preparation.

(c) Paragraph 3(i). Index major documentation developed under the Buried Transuranic - Contaminated Waste Program. Show schedule for preparation of documents in the current fiscal year.

(3) Chapter III - Low-Level Waste.

(a) Paragraph 3b(1). Cite documentation on radiological performance assessment of disposal facilities. If not issued, provide schedule for preparation in paragraph 3 of the Waste Management Plan.

(b) Paragraph 3e(1). Cite Waste Acceptance Criteria for each low-level waste treatment storage and disposal facility. List anticipated additions to this list for the current fiscal year.

(c) Paragraph 3e(3). Report the status of audits of certification activities by operators of disposal facilities. Report status of follow-up reports.

(d) Paragraph 3g(2). List document(s) forecasting waste to be shipped by generators to off-site disposal facilities.

(e) Paragraph 3i(4)(d). List reports justifying on-site disposal of waste exceeding Class C limits. Such disposal cases anticipated for the next year should be forecast.

(f) Paragraph 3i(8). Cite major National Environmental Policy Act documentation (e.g., Environmental Impact Statement, Environmental Assessment) supporting selection of any new disposal sites. Give schedule of preparation for appropriate documentation for the next year.

(g) Paragraph 3j(1). Cite closure plans for low-level waste disposal sites and dates of issue. Give schedule of preparation for anticipated reports.

(4) Decommissioning of Radioactively Contaminated Facilities.

(a) Paragraphs 3a(1). Cite field organization documentation where the complete listing and the jurisdictional program responsibility for all contaminated facilities is recorded.

(b) Paragraph 3c(1). Cite the post-operational documentation that records the potential for reuse and recovery of materials and equipment and the schedule for decommissioning contaminated facilities.

(c) Paragraph 3d(3). List Decommissioning Project Plans and dates of issue. Show a schedule for preparation of Plans in the current fiscal year.

(d) Paragraph 3d(5). List final radiological and chemical survey reports and project final reports, and show dates of issue. Show anticipated additions to this list for the coming year.

U.S. Department of Energy
Washington, D.C.

ORDER

DOE 5400.1

11-9-88

SUBJECT: GENERAL ENVIRONMENTAL PROTECTION PROGRAM

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1. PURPOSE. To establish environmental protection program requirements, authorities, and responsibilities for Department of Energy (DOE) operations for assuring compliance with applicable Federal, State and local environmental protection laws and regulations, Executive orders, and internal Department policies. The Order more specifically defines environmental protection requirements that are generally established in DOE 5480.1B.

2. SUPERSESSION. DOE 5480.1A, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION PROGRAM FOR DOE OPERATIONS, of 8-13-81, Chapter XII, Prevention, Control, and Abatement of Environmental Pollution.

3. SCOPE. The provisions of this Order apply to all Departmental elements and contractors performing work for the Department as provided by law and/or contract as implemented by the appropriate contracting officer.

4. REFERENCES.

   a. DOE Orders.

      (1) DOE 4300.1B, REAL PROPERTY AND SITE DEVELOPMENT PLANNING, of 7-1-87, which establishes requirements for preparing site development plans for DOE facilities.

      (2) DOE 4700.1, PROJECT MANAGEMENT SYSTEM, of 3-6-87, which establishes requirements and objectives, and assigns responsibilities and authorities necessary for acquisition of major systems.

      (3) DOE 5000.3, UNUSUAL OCCURRENCE REPORTING SYSTEM, of 11-7-84, which establishes DOE policy and provides instructions for reporting, analyzing, and disseminating information on programmatically significant events.

      (4) DOE 5400.2, ENVIRONMENTAL COMPLIANCE ISSUE COORDINATION, of 8-13-87, which sets forth policy, direction, and procedures for coordinating environmental issues that are of significance to DOE.

      (5) DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

DISTRIBUTION:
All Departmental Elements

INITIATED BY
Office of Environment,
Safety and Health

(6) DOE 5440.1C, NATIONAL ENVIRONMENTAL POLICY ACT, of 4-9-85, which establishes DOE policy for implementation of the National Environmental Policy Act of 1969.

(7) DOE 5480.1B, ENVIRONMENT, SAFETY, AND HEALTH PROGRAM FOR DEPARTMENT OF ENERGY OPERATIONS, of 9-23-86, which outlines environmental protection, safety, and health protection policies and responsibilities.

(8) DOE 5482.1B, ENVIRONMENT, SAFETY AND HEALTH APPRAISAL PROGRAM, of 9-23-86, which establishes the DOE environmental protection, safety, and health protection appraisal program.

(9) DOE 5484.1, ENVIRONMENTAL PROTECTION, SAFETY, AND HEALTH PROTECTION INFORMATION REPORTING REQUIREMENTS, of 2-24-81, which establishes the requirements and procedures for reporting and investigating matters of environmental protection, safety, and health protection significance to DOE operations.

(10) DOE 5500.1A, EMERGENCY MANAGEMENT SYSTEM, of 2-26-87, which establishes overall policies and requirements for DOE emergency preparedness and response programs.

(11) DOE 5700.6B, QUALITY ASSURANCE, of 9-23-86, which establishes DOE's quality assurance program.

(12) DOE 5820.2, RADIOACTIVE WASTE MANAGEMENT, of 2-6-84, which establishes policies and guidelines for the management of radioactive waste and contaminated facilities.

(13) DOE 6430.1, GENERAL DESIGN CRITERIA, of 12-12-83, which provides general design criteria for use in acquisition of DOE facilities.

b. Legislation.

(1) Title 42 U.S.C. 2011, et seq., The Atomic Energy Act of 1954, as amended, which authorizes the conduct of atomic energy activities.

(2) Title 42 U.S.C. 7101, et seq., The Department of Energy Organization Act, which establishes the statutory responsibility to ensure incorporation of national environmental protection goals in the formulation of energy programs, and advance the goal of restoring, protection, and enhancing environmental quality, and assuring public health and safety.

(3) Title 42, U.S.C. 4321, et seq., The National Environmental Policy Act of 1969, as amended, which establishes broad national environmental policy.

(4) Title 42 U.S.C. 7401, et seq., The Clean Air Act, as amended, which provides requirements to protect and enhance the quality of the Nation's air resources to promote the public health and welfare.

(5) Title 33 U.S.C. 1251, et seq., The Federal Water Pollution Control Act, as amended, which provides requirements to restore and maintain the chemical, physical, and biological integrity of the Nation's waters.

(6) Title 42 U.S.C. 6901, et seq., Solid Waste Disposal Act of 1965, as amended, which authorizes the U.S. Environmental Protection Agency (EPA) to regulate hazardous and solid wastes.

(7) Title 40 U.S.C. 9601, et seq., The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended, which requires the identification, characterization, and cleanup of inactive hazardous waste sites by responsible parties; and, imposes certain response and reporting requirements for operations from which hazardous substances have been released.

(8) Title 42 U.S.C. 300, et seq., The Safe Drinking Water Act, as amended, which authorizes EPA to promulgate regulations under two specific programs: the first protects the Nation's public drinking water supplies; the second protects subsurface waters.

(9) Title 16 U.S.C. 1451, et seq., The Coastal Zone Management Act of 1972, as amended, which establishes and supports national coastal zone management policies.

(10) Title 16 U.S.C. 1531, et seq., The Endangered Species Act of 1973, as amended, which establishes a program for the conservation of endangered species and their ecosystems.

(11) Title 16 U.S.C. 661, et seq., The Fish and Wildlife Coordination Act, as amended, which authorizes the Secretary of the Interior to provide assistance to and cooperate with public and private organizations in the development and protection of the Nation's fish and wildlife.

(12) Title 16 U.S.C. 470, et seq., The National Historic Preservation Act of 1966, as amended, which establishes the policy of the U.S. Government to protect and preserve historical structures, sites and artifacts.

(13) Title 15 U.S.C. 2601, et seq., Toxic Substances Control Act, as amended, which provides requirements to safely regulate the manufacture, processing, distribution in commerce, use or disposal of chemical substances and mixtures which may present an unreasonable risk to either the public health or the environment.

(14) Title 42 U.S.C. 1996, et seq., The American Indian Religious Freedom Act, as amended, which establishes a policy of the U.S. Government to protect and preserve for American Indians their inherent right of freedom of religion, including access to sites.

(15) Title 7 U.S.C. 136, et seq., The Federal Insecticide, Fungicide, and Rodenticide Act, as amended, which authorizes EPA to promulgate regulations governing the use and disposal of pesticides.

(16) Title 42 U.S.C. 4901, et seq., The Noise Control Act of 1972, as amended, which establishes a means for coordination of Federal noise control research, setting noise emission standards, and providing information to the general public.

(17) Title 33 U.S.C. 1412, et seq., The Marine Protection, Research, and Sanctuaries Act, as amended, which regulates the dumping of materials into ocean waters.

(18) Title 16 U.S.C. 1273, et seq., The Wild and Scenic Rivers Act, as amended, which establishes a national wild and scenic rivers system to preserve and protect selected rivers of the Nation.

(19) Title 42 U.S.C. 10101, et. seq., The Nuclear Waste Policy Act of 1982, as amended, which provides for the development of repositories for the disposal of high-level radioactive waste and spent fuel, and to establish a program of research, development, and demonstration regarding the disposal of high-level radioactive waste and spent nuclear fuel.

(20) Title 42 U.S.C. 2021, et. seq., The Low-Level Radioactive Waste Policy Act, as amended, which establishes procedures for the implementation of compacts providing for the establishment and operation of regional disposal facilities for low-level radioactive waste.

(21) Title 42 U.S.C. 7901, et. seq., The Uranium Mill Tailings Radiation Control Act of 1978, as amended, which provides for a remedial action program at selected inactive uranium mill tailings sites.

(22) Title 42 U.S.C. 7158 Note, The Department of Defense Authorization Act of 1985, which statutorily prescribes Executive order 12344.

c. Executive Orders.

(1) Executive order 12088, "Federal Compliance with Pollution Control Standards," of 10-13-78, which requires that all Federal facilities and activities comply with applicable pollution control standards.

(2) Executive order 12344, "Naval Nuclear Propulsion Program," of 2-1-82, which establishes an integrated Naval Nuclear Propulsion Program to be carried out by two organizational units, one in the U.S. Department of the Navy and one in the U.S. Department of Energy.

(3) Executive order 12580, "Superfund Implementation," of 1-23-87, which delegates to various federal officials the responsibilities vested in the President for implementing the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA or Superfund) and the Superfund Amendments and Reauthorization Act of 1986 (SARA). [The Order delegates most of these responsibilities to the Administrator of the Environmental Protection Agency (EPA), but several are delegated to the heads of Federal agencies, including DOE.]

(4) Office of Management and Budget (OMB) Circular No. A-106, "Reporting Requirements in Connection with the Prevention, Control, and Abatement of Environmental Pollution of Existing Federal Facilities," of 12-31-74.

d. Applicable State and Local Legislation and Regulations in Which DOE Operations are Located.

e. Other.

(1) DOE's "Final Guidelines for Compliance with the National Environmental Policy Act," 52 FR 47662, of 12-15-87, and subsequent amendments, which establish final guidelines for implementing the procedural provisions of the National Environmental Policy Act as required by the Council on Environmental Quality regulations.

5. POLICY.

a. It is DOE policy to conduct its operations in an environmentally safe and sound manner. Protection of the environment and the public are responsibilities of paramount importance and concern to DOE. All DOE activities should recognize and reflect this concern and public trust. To that end, DOE is firmly committed to ensuring incorporation of national environmental protection goals in the formulation and implementation of DOE programs. It has an equal commitment to advance the goals of restoring and enhancing environmental quality, and ensuring public health. Accordingly, it is DOE policy to conduct the Department's operations in compliance with the letter and spirit of applicable environmental statutes, regulations, and standards. In addition, DOE is committed to good environmental management of all its programs and at all its facilities to correct existing environmental problems, to minimize risks to the environment or public health, and to anticipate and address potential environmental problems before they pose a threat to the quality of the environment or the public welfare. Finally, it is DOE's policy that efforts to meet environmental obligations be carried out consistently across all operations and among all field organizations and programs.

b. While responsibility for good environmental management is a Departmental one, environmental protection practices will, of necessity, be carried out at the levels and locations where many DOE activities are performed by its management and operating contractors. Thus, although the Department will continue to indemnify its management and operating contractors for fines, penalties, and other liabilities that are incurred pursuant to their contracts and not the result of willful misconduct or lack of good faith, it is DOE policy that contractors will share the Department's commitment to good environmental management. DOE expects its management and operating contractors to conduct their operations in an environmentally sound manner that limits the risks to the environment and protects the public health. DOE will actively oversee contractors' activities to assure compliance with this policy.

6. APPLICABILITY.

a. In recognition of the environmental significance of Departmental activities authorized by the Atomic Energy Act (AEA), this Order addresses and, of necessity, emphasizes requirements for radiation protection. It also is written to reflect the DOE organizational structure for operations that implement AEA activities. It is understood and expected that other DOE elements, e.g., power marketing administrations, will design and manage their environmental protection programs in such a manner so as to be equivalent to requirements contained in this Order and in compliance with applicable statutes and regulations.

b. Environmental management activities of DOE are extensively, but not entirely, regulated by EPA, State, and local environmental agencies. Where these agencies clearly exercise environmental protection authority through permitting and compliance administrative procedures applicable to DOE, they establish and regulate required performance for environmental protection. This Order and other DOE environmental protection directives provide requirements for satisfying these externally imposed regulations. Additionally, these directives establish requirements for those environmental protection programs that are not externally regulated, but require internal management consistent with DOE Orders that provide specific, detailed requirements in selected areas of environmental protection.

c. Inasmuch as this directive for the most part serves to implement legislatively mandated requirements, it is expected that activities, documentation, and special planning conducted to meet these legal requirements will be used to the maximum extent to satisfy requirements of this Order.

7. LEGISLATIVE AUTHORITY. The Department of Energy Organization Act of 1977 and the Atomic Energy Act of 1954, as amended, provide for, among other things, the protection of the health and safety of the public and the environment in the conduct of the Department's programs.

8. DEFINITIONS.

a. DOE Operations, for the purposes of this Order, are those DOE managed, directed, or funded activities for which the Department has responsibility for Environment, Safety and Health (ES&H).

b. Effluent is any treated or untreated air emission or liquid discharge at a DOE site or from a DOE facility.

c. Environmental Monitoring is the collection and analysis of samples or direct measurements of environmental media. Environmental monitoring consists of two major activities: effluent monitoring and environmental surveillance.

d. Environmental Protection Standard is a specified set of rules or conditions concerned with: delineation of procedures; definition of terms; specification of performance, design, or operations; or measurements that define the quantity of emissions, discharges, or releases to the environment and the quality of the environment.

e. Effluent Monitoring is the collection and analysis of samples, or measurements of liquid and gaseous effluents for the purpose of characterizing and quantifying contaminants, assessing radiation exposures of members of the public, providing a means to control effluents at or near the point of discharge, and demonstrating compliance with applicable standards and permit requirements.

f. Environmental Surveillance is the collection and analysis of samples, or direct measurements, of air, water, soil, foodstuff, biota, and other media from DOE sites and their environs for the purpose of determining compliance with applicable standards and permit requirements, assessing radiation exposures of members of the public and assessing the effects, if any, on the local environment.

g. Environmental Occurrence is any sudden or sustained deviation from a regulated or planned performance at a DOE operation that has environmental protection and compliance significance.

h. DOE Contractor includes any prime contractor or subcontractor subject to the contractual provisions of 48 CFR Part 923.70, 48 CFR Part 970.23, or other contractual provisions where DOE has elected to enforce ES&H requirements by specific negotiated contract provisions.

i. Field Organization is the first line DOE field element that carries the organizational responsibility for (1) managing and executing assigned programs, (2) directing contractors who conduct the programs, and (3) assuring that environment, safety, and health are integral parts of each program.

j. Program Senior Official (PSO) is a senior outlay program manager and includes the Assistant Secretaries for Conservation and Renewable Energy, Defense Programs, Fossil Energy, and Nuclear Energy, the Director of Energy Research, and the Director of Civilian Radioactive Waste Management. For purposes of this Order, this definition also includes the Administrators of the Bonneville and Western Area Power Administrations.

9. RESPONSIBILITIES AND AUTHORITIES. The following responsibilities and authorities, as well as those contained in DOE 5480.1B, are assigned.

a. The Deputy Secretary (S-2) has overall responsibility and authority for DOE programs and may take necessary management actions to ensure safety, including directing the curtailment and suspension of operations, when in his or her opinion, such operation would result in undue risk.

b. The Assistant Secretary for Environment, Safety and Health (EH-1) shall.

(1) Establish environmental protection policies, guidance, requirements, and procedures for DOE operations.

(2) Provide the central point for coordination among PSOs and field organizations, and interact with other agencies and groups in:

(a) The development of internal DOE environmental protection policy, guidance, and directives;

(b) The development of environmental protection regulations, standards, and requirements by Federal and State regulatory agencies; and

(c) The review and comment on proposed environmental legislation and regulation that may affect DOE operations.

(3) Conduct the environmental survey program and follow-on audits of line organizations in accordance with DOE 5482.1B and other environmental requirements.

(4) Direct the DOE National Environmental Policy Act program, approve and concur in Departmental Environmental Impact Statements and other NEPA documents, and assure Departmental compliance with NEPA in accordance with DOE 5440.1C.

(5) Develop environmental compliance policies, requirements, and procedures for DOE operations including notification and reporting of significant environmental occurrences.

(6) Coordinate the timely review, resolution, and dissemination of significant environmental compliance issues (which are to be included in permit applications, settlement agreements, consent decrees and Orders, and lawsuits) and related activities for the Department with the Office of the General Counsel, affected PSOs and field organizations, in accordance with DOE 5400.2.

(7) Develop and maintain systems for collection, retention, evaluation and dissemination of information that characterizes DOE environmental management and demonstrates compliance with environmental protection laws and regulations.

(8) Coordinate, prepare, and submit pollution abatement plans and progress reports to the Environmental Protection Agency in accordance with Executive order 12088 and OMB Circular A-106.

(9) Review and concur in program and project direction guidance issued by a PSO related to environmental protection matters that affect more than one field organization or that have environmental policy implications.

(10) Curtail or suspend operations at DOE facilities, under the conditions described below, when a clear and present danger exists to workers or members of the public, as provided in DOE Order 5480.1B. (Clear and present danger is a condition or hazard which could reasonably be expected to cause death or serious harm to plant workers or the public immediately or before such condition or hazard can be eliminated through normal procedures.)

(a) Whenever EH-1, in carrying out his or her responsibilities, determines that the environmental, safety, or health conditions at any DOE facility present a clear and present danger, EH-1 shall notify the Deputy Secretary that such a determination has been made. In addition, notification shall be provided to the PSO and the Head of the appropriate field organization. Upon receiving such notification, the Head of the Field Organization shall take immediate action to curtail or suspend the operation and mitigate the danger.

(b) If appropriate action is not taken to curtail or suspend the operation and mitigate the identified danger, EH-1 shall advise the Secretary. In the event that the Secretary is unavailable, EH-1 is authorized to direct the PSO or field organization to suspend or curtail an operation which EH-1 has determined is posing a clear and present danger until the danger has been mitigated.

(c) The authority reflected in subparagraph (11) may not be redelegated or assumed by acting officials and will terminate on 1-31-89, unless specifically renewed.

(11) Issue guidance in cooperation with PSOs to field organizations for the preparation of long range environmental protection plans; review those plans upon submission by field organizations; coordinate the development of a DOE-wide long range environmental protection plan.

c. Program Senior Officials (PSOs) shall:

(1) Provide clear and explicit delegations of authority and responsibilities for implementing DOE environmental protection programs.

(2) Ensure that appropriate environmental requirements are included in program plans.

(3) Advise EH-1, in a timely manner, of significant programmatic environmental issues requiring resolution.

(4) Concur in significant environmental compliance issues, such as compliance agreements and consent orders which may affect programs or projects under his or her jurisdiction.

(5) In consultation with EH-1, provide environmental protection direction to field organizations consistent with Departmental Orders and policies.

(6) Provide oversight and, as appropriate, verify field organization compliance with any environmental guidance provided by the PSO.

(7) Assure that program budget proposals include provisions to comply with environmental protection requirements that are consistent with programs and projects identified in the OMB Circular A-106 pollution plans and, as required by DOE 5480.1B, take appropriate management actions to include adequate ES&H resources for assigned functions in budget proposals that incorporate results of the ES&H upgrade project ranking process.

(8) Participate with, and support EH-1 in preparing and coordinating Departmental comments on emerging environmental regulations and policies of other agencies that may affect DOE operations.

(9) Participate in selected environmental appraisals, surveys, and audits as described in DOE 5482.1B.

(10) Direct Heads of Field Organizations to curtail or suspend operations when any activity presents a clear and present danger to workers, members of the public, or the environment, as provided in DOE 5480.1B, page 10, paragraph 8(c)(20).

(11) Provide EH-1 with environmental information and documentation upon request.

(12) Support EH-1 in issuing guidance for the preparation of long range environmental protection plans; review those plans upon submission by field organizations; coordinate with EH-1 in the development by EH-1 of a DOE-wide long range environmental protection plan.

d. The General Counsel shall:

(1) Provide advice and assistance to EH-1 and other DOE elements in support of DOE environmental protection programs and compliance activities.

(2) Provide prompt advice and assistance to EH-1 in resolving environmental compliance issues and related activities within his or her area of responsibility (e.g., consent decrees and consent administrative orders).

(3) Provide advice and assistance to EH-1 and other DOE program elements in preparing departmental comments on emerging environmental regulations and policies that may affect DOE operations.

(4) Advise EH-1 and other DOE program elements on Departmental environmental impact statements and other NEPA documents.

(5) Coordinate DOE environmental litigation activities and represent DOE at the Department of Justice on these activities.

e. Assistant Secretary, Management and Administration (MA-1) shall review long range environmental protection plans prepared by Heads of Field Organizations; and support the development of a DOE-wide long range environmental protection plan.

f. Heads of Field Organizations shall:

(1) Issue and update, as required, a general environmental statement that reflects the statement of policy in this Order and contains broad environmental protection goals for all facilities and activities for which he or she is responsible.

(2) Ensure that all operations under their authority comply with applicable environmental protection laws and regulations, and directives.

(3) Identify significant environmental compliance issues that require resolution and coordination, and advise EH-1 and Headquarters program elements in a timely manner.

(4) Ensure that all required environmental permits are secured from the appropriate regulatory agency in a timely fashion. Consistent with the requirements of DOE 5400.2, in negotiating the terms and conditions of permits, settlements, consent orders, consent decrees, or other legal or administrative documents, every effort shall be made to assure that permit requirements and conditions reflect the requirements of environmental regulations, consistent with national security interests, and are cost-effective.

(5) Conduct environmental appraisals of programs, projects, and facilities in accordance with DOE 5482.1B, and other ES&H requirements, and provide copies of appraisal reports to EH-1 and the appropriate program office.

(6) Establish and maintain liaison and cooperative programs with appropriate Federal, Regional, State, and local environmental officials so as to facilitate effective environmental management.

(7) Develop and implement programs that direct contractors to execute environmental protection compliance programs and policies, and provide for oversight, confirmation, and independent verification of those contractor programs.

(8) Prepare long range environmental protection plans in accordance with guidance issued by EH-1.

(9) Ensure that budget requests provide for required environmental protection upgrades and corrective action, that they are timely, and are consistent with pollution abatement plans prepared as required by OMB Circular A-106.

(10) Prepare biannual pollution abatement plans required by OMB Circular A-106 and submit to EH-1 on a schedule provided by that office.

(11) Provide EH-1 all environmental information and documentation that is requested.

(12) Curtail or suspend any operation that poses a clear and present danger to members of the public or the environment.

(13) Provide for community public information and education programs concerning DOE environmental protection programs, consistent with the requirements of environmental regulations and national security interests.

g. Director, Naval Nuclear Propulsion Program: Executive Order 12344, statutorily prescribed by P.L. 98-525 (42 USC 7158 note), establishes the responsibilities and authority of the Director, Naval Nuclear Propulsion Program (who is also the Deputy Assistant Secretary for Naval Reactors within the Department) over all facilities and activities which comprise the Program, a joint Navy-DOE organization. The policy principle promoted by these executive and legislative actions is cited in the Executive Order as ". . . preserving the basic structure, policies, and practices developed for this Program in the past . . ." Accordingly, based on the Executive Order and this policy principle, the Naval Nuclear Propulsion Program is exempt from the provisions of this Order. The Director shall maintain an environmental protection program to assure compliance with applicable environmental statutes and regulations. The Director and EH-1 shall cooperatively develop information exchange and other mutually beneficial programs as appropriate, consistent with P.L. 98-525.

BY ORDER OF THE SECRETARY OF ENERGY:

JOSEPH F. SALGADO
Deputy Secretary

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CHAPTER I

ENVIRONMENTAL PROTECTION STANDARDS

1. PURPOSE. To provide the mandatory environmental standards that are in effect at DOE operations and procedural guidance for securing an exemption from a standard.

2. ENVIRONMENTAL PROTECTION STANDARD. See definition at page 8, subparagraph 8d.

3. STANDARDS. Environmental protection standards fall into three categories.

    a. Those imposed by Federal statutes, regulations, and requirements. (The major federal environmental protection standards that apply to DOE operations are contained in the listing in Attachment I-1.)

    b. Those imposed by State and local statutes, regulations, and requirements which are applicable to DOE.

    c. Those imposed by DOE directives.

4. EXEMPTION PROCEDURES. Requests for exemptions from applicable environmental protection standards are not encouraged. However, in limited cases, programmatic circumstances or operational conditions may warrant such requests in accord with the following procedures.

    a. From Federal, State and Local Regulations.

        (1) Specific procedures for processing exemptions to standards are contained in Federal, State, and local laws and regulations. To the extent that Federal, State, and local laws and regulations allow for an exemption from any standard, field organizations and PSOs, as appropriate, are to use applicable administrative and legal procedures to secure approval for any exemption. EH-1 will provide technical and administrative support to any organization upon request. In the case of generic issues that affect department-wide compliance with environmental standards, EH-1 will coordinate efforts to obtain agreements from the regulatory authority for a DOE-wide exemption. Heads of Field Organizations and PSOs, as appropriate, shall submit to EH-1, the General Counsel, and the appropriate Program Senior Official(s) information copies of all requests to Federal or State agencies for exemptions.

(2) The field organization and PSOs, as appropriate, shall take the lead role in coordinating the exemption request with the appropriate Federal, State, or local agency responsible for the enforcement of the standard for which the exemption is being requested.

(3) After a determination has been made by the appropriate Federal, State, or local agency, the field organization and PSOs, as appropriate, shall notify EH-1, the General Counsel, and the appropriate PSOs of the disposition of the request.

b. From Internal DOE Environmental Standards. Procedures for exemptions from standards which are internally imposed as a matter of DOE policy are as follows:

(1) Temporary Exemptions.

(a) Heads of Field Organizations and PSOs, as appropriate, shall submit to EH-1, with copies to the appropriate Program Senior Official(s), a request for a temporary exemption from DOE mandatory standards. A request for a temporary exemption shall contain the following:

1 A specification of the standard from which the field organization or PSO seeks an exemption;

2 Detailed statements of why the field organization or PSO is unable to comply with the standard;

3 A statement of the steps taken or to be taken to minimize the risk to the public and environment, including the conditions the field organization or PSO shall maintain and the means, methods, operations, and processes which shall be adopted and used;

4 An analysis of the benefits to be gained from the exemption and the negative impact on the program or activity if not granted, compared with the risk posed by conducting the activity under the exemption; and

5 A statement of when the field organization or PSO will be able to comply with the standard and what steps have been and will be taken by the field organization to come into compliance with the standard.

(b) EH-1 shall review the field organization's or PSO's request within 60 days of receipt of the request. After review and evaluation of the request and recommendations from the appropriate PSO, EH-1 shall approve a temporary exemption if the request establishes that the field organization or PSO:

1 Is unable to comply with the standard because of unavailability of funding, professional or technical personnel, materials or equipment, or because necessary construction or alteration of facilities must be completed to comply;

2 Is taking all available steps to provide environment and health protection; and,

3 Has an effective program for coming into compliance with the standard as quickly as possible.

(c) A temporary exemption may be in effect for the period needed by the field organization or PSO to achieve compliance with the standard, but no longer than 2 years, except that in unusual circumstances (e.g., lack of programmatic funding), a temporary exemption may be renewed for a 1-year period. An application for renewal must be filed and processed in the same manner specified in subparagraphs 4b(1)(a) and 4b(1)(b); this shall be done at least 90 days prior to expiration of the temporary exemption.

(2) Permanent Exemptions. In limited cases, EH-1 may approve a permanent exemption if the field organization or PSO has demonstrated that the conditions, practices, means, methods, operations, or processes to be used will provide environment, safety, and health protection which is comparable to that which would prevail if the field organization or PSO had complied with the standard. Heads of Field Organizations or PSOs shall submit to EH-1 any request for a permanent exemption from DOE standards. The request for exemption shall contain all applicable information specified in subparagraph 4b(1)(a). Within 60 days of the receipt of the request, EH-1 shall review and evaluate the request and recommendations from the appropriate PSO.

(3) Field-Level Exemptions. The Head of the Field Organization or PSO may grant field-level exemptions from mandatory standards during the period of time in which the request for a temporary or permanent exemption is being processed by Headquarters. A field-level exemption shall be granted where the Head of the Field Organization or PSO has sufficient assurance that the

environmental and health risks are acceptably low. The field-level exemption is to be effective until a decision on the issuance of an exemption is made by EH-1.

c. Presidential Exemption. Any request for a Presidential exemption from applicable pollution control standards shall comply with the procedures prescribed in Section 1-7 of Executive order 12088. The request should be forwarded to EH-1 with copies to the appropriate PSO. Recommendations for Presidential exemptions will be developed by EH-1, concurred in by GC and the PSO, and transmitted to the Office of Management and Budget under the Secretary's signature. Presidential exemptions may be requested under the following Acts, *inter alia*.

(1) Clean Air Act, as amended, Section 118(b).

(2) Clean Water Act, as amended, Section 313(a).

(3) Safe Drinking Water Act, as amended, Section 1447(b).

(4) Resource Conservation and Recovery Act, as amended, Section 6001.

(5) Comprehensive Environmental Response, Compensation, and Liability Act, as amended, Section 120(j)(1).

(6) Noise Control Act, as amended, Section 4(b)(2).

MANDATORY ENVIRONMENTAL PROTECTION STANDARDS

To the extent legally applicable to a particular activity, standards contained in the following legislation, regulations, and Executive orders are mandatory for DOE Operations. This Appendix includes certain major federal requirements, but is not necessarily all-inclusive. Specific standards -including state and local requirements - applicable to individual activities should be determined on a site-specific basis.

1. EXECUTIVE ORDERS (E.O.)

   a. E.O. 11987, "Exotic Organisms."

   b. E.O. 11988, "Floodplain Management."

   c. E.O. 11989, "Off-Road Vehicles on Public Lands."

   d. E.O. 11990, "Protection of Wetlands."

   e. E.O. 11514 and E.O. 11991, "Protection and Enhancement of Environmental Quality."

   f. E.O. 11593, "Protection and Enhancement of Cultural Environment."

   g. E.O. 12088, "Federal Compliance with Pollution Control Standards."

   h. E.O. 12146, "Management of Federal Legal Resources."

   i. E.O. 12316, "Response to Environmental Damage."

   j. E.O. 12342, "Environmental Safeguards on Activities for Animal Damage Control on Federal Lands."

   k. E.O. 12344, "Naval Nuclear Propulsion Program."

   l. E.O. 12580, "Superfund Implementation."

2. THE NATIONAL HISTORIC PRESERVATION ACT OF 1966, AS AMENDED.

   a. Title 36 CFR Part 800, "Protection of Historic and Cultural Properties."

   b. Title 43 CFR Part 7, "Protection of Archaeological Resources."

3. TITLE 42 U.S.C. 7401, ET SEQ., THE CLEAN AIR ACT, AS AMENDED.

   a. Title 40 CFR Part 50, "National Primary and Secondary Ambient Air Quality Standards."

   b. Title 40 CFR Part 52, "Approval and Promulgation of Implementation Plans."

   c. Title 40 CFR Part 53, "Ambient Air Monitoring Reference and Equivalent Methods."

   d. Title 40 CFR Part 58, "Ambient Air Quality Surveillance."

   e. Title 40 CFR Part 60, "Standards of Performance for New Stationary Sources."

   f. Title 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants."

   g. Title 40 CFR Part 65, "Delayed Compliance Orders."

   h. Title 40 CFR Part 66, "Assessment and Collection of Noncompliance Penalties by EPA."

   i. Title 40 CFR Part 69, "Special Exemptions from Requirements of the Clean Air Act."

   j. Title 40 CFR Part 81, "Designation of Areas for Air Quality Planning Purpose."

4. TITLE 33 U.S.C. 1251 ET SEQ., THE CLEAN WATER ACT, AS AMENDED.

   a. Title 33 CFR Parts 153-157, "Control of Pollution by Oil and Hazardous Substances."

   b. Title 33 CFR Part 159, "Marine Sanitation Devices."

   c. Title 33 Parts 320, 322-329, "Permit Programs Regulations."

   d. Title 40 CFR Part 109, "Criteria for State, Local and Regional Oil Removal Contingency Plans."

   e. Title 40 CFR Part 110, "Discharge of Oil."

   f. Title 40 CFR Part 112, "Oil Pollution Prevention."

   g. Title 40 CFR Part 113, "Liability Limits for Small Onshore Storage Facilities."

h. Title 40 CFR Part 114, "Civil Penalties for Violation of Oil Pollution Prevention Regulations."

i. Title 40 CFR Part 116, "Designation of Hazardous Substances."

j. Title 40 CFR Part 117, "Determination of Reportable Quantities for Hazardous Substances."

k. Title 40 CFR Part 121, "State Certification of Activities Requiring a Federal License or Permit."

l. Title 40 CFR Part 122, "EPA Administered Permit Programs: The National Pollutant Discharge Elimination System."

m. Title 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System."

n. Title 40 CFR Part 129, "Toxic Pollutant Effluent Standards."

o. Title 40 CFR Part 131, "Water Quality Standards."

p. Title 40 CFR Part 133, "Secondary Treatment Regulation."

q. Title 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."

r. Title 40 CFR Part 140, "Marine Sanitation Device Standard."

s. Title 40 CFR Parts 220-225, 227-229, "Ocean Dumping Regulations and Criteria."

t. Title 40 CFR Part 230, "Section 404(b)(1) Guidelines for Specification of Disposal Sites for Dredged or Fill Material."

u. Title 40 CFR Part 231, "Section 404(c) Procedures."

v. Title 40 CFR Part 401, "General Provisions for Effluent Guidelines and Standards" (Note: Title 40 CFR Part Section 401.14, "Cooling Water Intake Structures).

w. Title 40 CFR Part 403, "General Pretreatment Regulations for Existing and New Sources of Pollution."

x. Title 40 CFR Part 413, "Electroplating Point Source Category."

y. Title 40 CFR Part 423, "Steam Electric Power Generating Point Source Category."

z. Title 40 CFR Part 457, "Explosives Manufacturing Point Source Category."

aa. Title 40 CFR Part 459, "Photographic Point Source Category."

5. TITLE 42 U.S.C. 300 F, ET SEQ., THE SAFE DRINKING WATER ACT, AS AMENDED.

a. Title 40 CFR Part 141, "National [Interim] Primary Drinking Water Regulations."

b. Title 40 CFR Part 142, "National Primary Drinking Water Regulations Implementation."

c. Title 40 CFR Part 143, "National Secondary Drinking Water Regulations."

d. Title 40 CFR Part 144, "Underground Injection Control Program."

e. Title 40 CFR Part 146, "Underground Injection Control Program: Criteria and Standards."

f. Title 40 CFR Part 147, "State Underground Injection Control Programs."

g. Title 40 CFR Part 149, "Sole Source Aquifers."

6. TITLE 16 U.S.C. 1451, ET SEQ., THE COASTAL ZONE MANAGEMENT ACT OF 1972, AS AMENDED.

a. Title 15 CFR Part 921, "NOAA Guidelines on Estuarine Sanctuaries."

b. Title 15 CFR Part 923, "NOAA Coastal Zone Management Program Approval Regulations."

c. Title 15 CFR Part 930, "NOAA Regulations on Federal Consistency with Approved Coastal Management Program."

d. Title 15 CFR Part 931, "NOAA Regulations on Coastal Energy Impact Program."

7. RADIATION PROTECTION.

a. Title 10 CFR Part 712, "Grand Junction Remedial Action Criteria."

b. Title 40 CFR Part 190, "Environmental Radiation Protection Standards for Nuclear Power Operations."

c. Title 40 CFR Part 191, "Environmental Radiation Protection Standards for Management and Disposal of Spent Nuclear Fuel, High-Level, and Transuranic Radioactive Wastes."

d. Title 40 CFR Part 192, "Health and Environmental Protection Standards for Uranium and Thorium Mill Tailings."

8. TITLE 42 U.S.C. 9601 [9615] ET SEQ., THE COMPREHENSIVE ENVIRONMENTAL RESPONSE, COMPENSATION, AND LIABILITY ACT OF 1980, AS AMENDED.

a. Title 40 CFR Part 300, "National Oil and Hazardous Substances Pollution Contingency Plan."

b. Title 40 CFR Part 302, "Designation, Reportable Quantities, and Notification."

c. Title 40 CFR Part 305, "Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Arbitration Procedures."

d. Title 40 CFR Part 306, "Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Natural Resources Claims Procedures."

e. Title 43 CFR Part 11, "Natural Resource Damage Assessments."

9. TITLE 7 U.S.C. 136, ET SEQ., THE FEDERAL INSECTICIDE, FUNGICIDE, AND RODENTICIDE ACT, AS AMENDED.

a. Title 40 CFR Part 162, "Regulations for the Enforcement of the Federal Insecticide, Fungicide, and Rodenticide Act."

b. Title 40 CFR Part 165, "Regulations for the Acceptance of Certain Pesticides and Recommended Procedures for the Disposal and Storage of Pesticides and Pesticides Containers."

c. Title 40 CFR Part 166, "Exemption of Federal and State Agencies for Use of Pesticides Under Emergency Conditions."

d. Title 40 CFR Part 170, "Worker Protection Standards for Agricultural Pesticides."

e. Title 40 CFR Part 171, "Certification of Pesticide Applicators."

10. TITLE 42 U.S.C. 6901, ET SEQ., THE RESOURCE CONSERVATION AND RECOVERY ACT OF 1976, AS AMENDED.

a. Title 40 CFR Part 240, "Guidelines for the Thermal Processing of Solid Wastes."

b. Title 40 CFR Part 241, "Guidelines for the Land Disposal of Solid Wastes."

c. Title 40 CFR Part 243, "Guidelines for the Storage and Collection of Residential, Commercial, and Institutional Solid Waste."

d. Title 40 CFR Part 244, "Solid Waste Management Guidelines for Beverage Containers."

e. Title 40 CFR Part 245, "Promulgation Resource Recovery Facilities Guidelines."

f. Title 40 CFR Part 246, "Source Separation for Materials Recovery Guidelines."

g. Title 40 CFR Part 247, "Guidelines for Procurement of Products that Contain Recycled Material."

h. Title 40 CFR Part 256, "Guidelines for Development and Implementation of State Solid Waste Management Plans."

i. Title 40 CFR Part 257, "Criteria for Classification of Solid Waste Disposal Facilities and Practices."

j. Title 40 CFR Part 260, "Hazardous Waste Management System: General."

k. Title 40 CFR Part 261, "Identification and Listing of Hazardous Waste."

l. Title 40 CFR Part 262, "Standards Applicable to Generators of Hazardous Waste."

m. Title 40 CFR Part 263, "Standards Applicable to Transporters of Hazardous Waste."

n. Title 40 CFR Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

o. Title 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

p. Title 40 CFR Part 266, "Standards for the Management of Specific Hazardous Wastes and Specific Types of Hazardous Waste Management Facilities."

q. Title 40 CFR Part 267, "Interim Standards for Owners and Operators of New Hazardous Waste Land Disposal Facilities."

r. Title 40 CFR Part 268, "Land Disposal Restrictions."

s. Title 40 CFR Part 270, "EPA Administered Permit Programs: The Hazardous Waste Permit Program."

t. Title 40 CFR Part 272, "Approved State Hazardous Waste Management Programs."

u. Title 40 CFR Part 280, "Underground Storage Tanks."

11. TITLE 16 U.S.C. 1531, ET SEQ., THE ENDANGERED SPECIES ACT OF 1973, AS AMENDED, TITLE 50 CFR PART 17, "FISH AND WILDLIFE SERVICE LIST OF ENDANGERED AND THREATENED WILDLIFE AND PLANTS".

12. TITLE 15 U.S.C., ET SEQ., THE TOXIC SUBSTANCES CONTROL ACT, AS AMENDED, TITLE 40 CFR PART 761, "POLYCHLORINATED BIPHENYLS (PCBs) MANUFACTURING, PROCESSING, DISTRIBUTION IN COMMERCE, AND USE PROHIBITIONS".

13. TITLE 42 U.S.C. 4901, ET SEQ., THE NOISE CONTROL ACT OF 1972, AS AMENDED.

14. TITLE 16 U.S.C. 1131, ET SEQ., THE WILDERNESS ACT, AS AMENDED, TITLE 43 CFR PART 19, "WILDERNESS PRESERVATION".

CHAPTER II

NOTIFICATION AND REPORTS

1. PURPOSE. To establish requirements for: (a) notification and follow-up of environmental occurrences; and, (b) periodic routine reporting of significant environmental protection information. Each DOE facility is unique; thus, notification and reporting requirements shall be determined by the Head of Field Organization on a case-by-case basis, consistent with regulatory requirements and DOE directives.

2. NOTIFICATION OF ENVIRONMENTAL OCCURRENCES TO EH-1.

   a. Consistent with the notification requirements contained in DOE 5484.1 and DOE 5000.3, and the DOE orders in the 5500 series dealing with emergency management, field organizations shall notify the Headquarters Emergency Operations Center (EOC) of the significant nonroutine release of any pollutant or hazardous substance, e.g., releases of hazardous substances that are reported to the Environmental Protection Agency National Response Center as required by the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). Notification to the EOC shall be concurrent with notification to any regulatory agencies. Where applicable, existing reporting formats should be used. A written report of follow-up and resolution of any reported environmental occurrence which has environmental significance shall be prepared in accordance with the requirements of DOE 5484.1 and DOE 5000.3.

   b. Field organizations shall maintain documentation of responses to environmental occurrences and have them available for regulatory agency inspectors, DOE auditors, and the general public. Field organizations shall prepare annual summary reports on environmental occurrence activities. This information shall be included in Annual Site Environmental Reports.

3. OFFICE OF MANAGEMENT AND BUDGET CIRCULAR A-106. Departmental pollution abatement projects shall be reported in a 5-year plan as required by Office of Management and Budget (OMB) Circular A-106, and EPA and DOE guidance issued thereto. Field Organizations shall submit their reports semiannually to EH-1 on dates determined by EH-1, but in any event no later than May 1 and December 15 of each year. Confirmatory reports are to be submitted by line organizations in those instances where there are no pollution abatement projects planned or underway.

4. ANNUAL SITE ENVIRONMENTAL REPORT.

a. Purpose. The purpose of this report is to present summary environmental data so as to characterize site environmental management performance, confirm compliance with environmental standards and requirements, and highlight significant programs and efforts.

b. Extent. Reports shall be prepared for all sites that conduct significant environmental protection programs. The breadth and detail should reflect the size and extent of any program at a particular site.

c. Reporting Criteria. All DOE facilities that conduct significant environmental protection programs shall prepare an Annual Site Environmental Report. Environmental reports covering the previous calendar year shall be prepared annually and distributed by June 1 to EH-1 (10 copies), appropriate PSOs, the Office of Scientific and Technical Information, the Environmental Protection Agency, and to other agencies and organizations, as appropriate.

d. Content and Format. Suggested content and format for the Annual Site Environmental Report is contained in Attachment II-1.

5. REPORTS ON RADIOACTIVE EFFLUENT/ON-SITE DISCHARGE/UNPLANNED RELEASES.

a. Radioactive Effluent and On-site Discharge Data Reports covering the previous calendar year shall be submitted to the Waste Information Systems Branch, EG&G Idaho, Inc., Idaho Falls, Idaho 83415, by April 1 a copy of the cover letter shall be sent to EH-1. The reports, including the data forms, cover sheet, maps, and, if necessary, explanatory information shall be submitted in accordance with instructions provided in Section II of the Effluent Information System and On-site Discharge Information System User's Manuals. Maps should be included only when they reflect modifications (terminations or startups, etc.) from previous years. The report shall consist of:

(1) A cover sheet listing the site, facility, report period, contractor(s), and address;

(2) A summary providing pertinent descriptive and interpretative information which would serve to explain any facets of the data which are not adequately described on the sheets. (Classified effluent data should be submitted on separate forms.);

(3) Maps, 8-1/2 x 11 inches, showing the locations of effluent streams and on-site discharge points;

(4) Completed DOE F 5821.1, "Radioactive Effluents/On-site Discharges/ Unplanned Releases," unless submitted via the Secure Automatic Communications Network (SACNET) or directly to the computer operations.

b. Unplanned releases of radioactive materials in effluents, such as spills, leaks, etc., whether on-site or offsite, also shall be reported to the Information System Branch, EG&G Idaho, Inc., on Form DOE F-5821.1. Releases of no environmental concern, including those that are subsequently cleaned up, need not be reported.

c. Field Organizations should assure that any data errors on DOE F 5821.1 are reported promptly to the Information Systems Branch, EG&G Idaho, Inc., using amended forms.

SUGGESTED CONTENT AND FORMAT FOR ANNUAL SITE ENVIRONMENTAL REPORTS

Content and format for the Annual Site Environmental Report is provided below; guidelines and examples are included to illustrate the quality and kind of information required. The report should be of the high quality typical of DOE and contractor technical and public reports. The cover should be of appropriate quality and appearance, and the text printed and professionally edited. Where possible, pages illustrating figures, maps, etc. should be 8 1/2" x 11".

1. COVER PAGE. The cover page should include the site name, facility, reporting period, reporting organization, address, and document number. The report should be titled "(Name) Site Environmental Report for Calendar Year 19--."

2. TITLE PAGE. Same as for 1 above.

3. TABLE OF CONTENTS. The Table of Contents should list sections, locations of figures, texts, appendices, references, etc., in the document.

4. INTRODUCTION. The introduction should include a brief description of the site, its mission, the nature of its primary operations, and activities. A general discussion of environmental features and land and water use, including pertinent demographic information, should be included in this section.

5. SUMMARY. The summary should provide evaluation and interpretation of the information included in each of the sections (items 6-9 which follow) contained in the report; the meaning of these data should be explained in the context of applicable environmental standards and requirements. The summary should be written in a manner understandable to the general public. Explanations, as appropriate, should be included for unusual events or releases. A discussion of abnormal occurrences which resulted from or could have impact upon either the program activity or the site, should be included. Population dose estimates and the dose to the maximum exposed individual (where appropriate) should be included. The total quantity of radioactivity by radionuclide released as airborne and liquid effluents should be included, along with descriptive information on nonradioactive effluents.

6. COMPLIANCE SUMMARY. This section should review the facility's compliance record. Specific instances of noncompliance should be discussed and a description of corrective actions should be included.

7. ENVIRONMENTAL PROGRAM INFORMATION. This section should provide a summary of all of a site's environmental activities performed to comply with laws and regulations, to enhance environmental quality, and to improve understanding of the effects of environmental pollutants from site operations. Items to be included are:

   a. A summary of environmental monitoring performed. This should be a brief description of the types of monitoring performed; which regulations require it; number of stations, frequency, and parameters measured; to whom data are reported; and a summary of results compared to applicable standards. This summary should address programs for both radioactive and nonradioactive monitoring.

   b. A listing of environmental permits issued to the site by Federal, state and local regulatory agencies. Include the type of permit, by whom issued, and the expiration date.

   c. A listing of draft and final EISs and EAs completed during the year that pertain to site activities.

   d. A summary of significant environmental activities at the site. This could include activities to meet permit or EIS requirements, new procedures implemented to comply with regulations, pollution abatement projects, and special studies of the fate and effect of pollutants from the site.

8. ENVIRONMENTAL RADIOLOGICAL PROGRAM INFORMATION. This section should provide an accurate description of the environmental radiological monitoring program conducted at each facility. For facilities that do not need to monitor for radioactivity in the environment, a "Not Applicable" response is sufficient.

   a. Radioactive Effluent Data. Effluent data for radionuclides should be summarized. The nuclides of concern and the total number of curies in airborne and liquid effluents released to the offsite environment should be included in the portion of the report dealing with air and water monitoring, respectively. In instances where liquid effluents released to different receiving streams result in separate routes of potential exposure, the radioactivity discharged to each receiving stream should be identified. For purposes of reporting radiological effluent data, gross radioactivity measurements are unacceptable, unless specified by applicable federal, state, or local regulations.

   b. Environmental Sampling for Radioactivity. Include a brief description of each of the media sampled as part of the monitoring program or as part of a special study. The type and frequency of sampling and the methods of analysis should be presented. Individual data points are not required, but tables, graphs, or text which clearly and accurately present the overall monitoring results should be provided. A map showing the location of monitoring stations and sampling points also should be included. As a general rule, data should be presented for radioactivity in media for which there are applicable standards or other meaningful bases for interpreting the results. Interpretation should be made, where appropriate, of how the environmental levels (resulting from site operations) compare to relevant parameters such as background radioactivity, and applicable effluent or environmental standards.

c. Reporting Potential Dose to the Public. The Environmental Report should contain an assessment of the potential radiation exposure to the public which could have resulted from site operations during the calendar year. The assessment should be as accurate and realistic as possible. The modeling and calculation methodology used in the dose assessment should be included or referenced. A comparison of results with applicable standards and relevant parameters (e.g., natural and manmade sources of exposure) also should be included.

d. Reporting Units. The following units should be used in reporting radiological data:

(1) Air. uCi/ml (for tritium, report in pCi/ml; for uranium and thorium, also include pg/ml).

(2) Sediment. uCi/g or pCi/g dry weight. Specify sample depth and method of obtaining dry weight. For uranium and thorium, also include ug/g dry or wet weight, where possible. For tritium, the concentration may be expressed in uCi/ml of moisture content in unit volume of wet samples.

(3) Food and Vegetation. uCi/g or pCi/g dry weight. Specify percent moisture and method of obtaining dry weight. For tritium, the concentration may be expressed in uCi/ml of moisture content in unit volume of wet samples.

(4) Milk. uCi/ml.

(5) Penetrating Radiation. mrem/yr.

(6) Soil. Three possible reporting units:

(a) uCi/m^2 (or pCi/m^2). Specify sample depth or profile depth. For tritium, the concentration may be expressed in uCi/ml of soil moisture;

(b) uCi/g (or pCi/g) dry weight. Specify sample depth and method of obtaining dry weight;
(c) For uranium and thorium, also include ug/g dry or wet weight.

(7) Water. uCi/ml.

9. ENVIRONMENTAL NON-RADIOLOGICAL PROGRAM INFORMATION. This section should provide an accurate description of the environmental non-radiological monitoring program conducted at each facility. For facilities that do not need to monitor non-radiological pollution, a "Not Applicable" response is sufficient.

a. Effluent Data. Effluent monitoring data should be summarized. Pollutants of concern and discharge volumes in airborne and liquid effluents released to the environment should be included in the portion of the report dealing with air and water monitoring, respectively.

b. Environmental Sampling for Non-Radiological Pollution. Include a brief description of each of the media sampled as part of the monitoring program or as part of a special study. The type and frequency of sampling and the methods of analysis should be presented. Individual data points are not required, but tables, graphs, or text which clearly and accurately present the overall monitoring results should be provided. A map showing the location of monitoring stations and sampling points also should be included.

As a general rule, data should be presented for which there are applicable standards or other meaningful bases for interpreting the results. Interpretation should be made, where appropriate, of how the environmental levels (resulting from site operations) compare to relevant parameters such as background levels, and applicable effluent or environmental standards.

c. Reporting Units. In reporting non-radiological data, units should agree with those specified by the analytical methods. Where applicable, reporting units should agree with the units specified on permits issued under regulatory programs.

10. GROUNDWATER PROTECTION. The groundwater protection program should be summarized, including a review of the monitoring program that describes the number of wells, sampling method, sampling frequency, analyses performed and a summary of results. There also should be a summary of the hydrogeology of the site, major aquifers, movement of groundwater, potential sources of groundwater pollution, and uses of groundwater in the vicinity of the site.

11. QUALITY ASSURANCE. A quality assurance section should summarize the measures taken to ensure the quality of monitoring data. The overall program, including sampling, analysis, and data management, should be described for both radioactive and nonradioactive effluent and environmental monitoring. A summary of results from participation in interlaboratory cross-check programs should be included, listing site results and expected results.

12. REFERENCES. A section should list applicable references and other documents cited in the body of the report.

13. DISTRIBUTION LIST. A standard distribution list of those persons or organizations receiving copies of the report should be included.

CHAPTER III

ENVIRONMENTAL PROTECTION PROGRAM PLANS

1. PURPOSE. This Chapter establishes requirements for DOE operations to develop and implement specific program plans for each facility or group of facilities for which they are responsible. The Office of Fossil Energy shall be responsible for developing these plans for operations under its direct cognizance.

2. IMPLEMENTATION PLAN. Each field organization shall prepare a plan for implementing the requirements of this Order. An implementation plan shall be prepared for each facility or group of facilities, the purpose of which is to provide management direction, including assignment of responsibilities and authorities, to ensure that all DOE facilities are operated and managed in a manner that will protect, maintain, and, where necessary, restore environmental quality, minimize potential threats to the environment and the public health, and comply with environmental regulations and DOE policies. Specifically, the implementation plan shall:

   a. Provide environmental protection goals and objectives for the organization, and identify strategies and timetables for attaining them. Organization and staffing, including assignment of responsibilities for environmental activities, policies, facility operating procedures, and budgeting, will be described.

   b. Provide an overall framework for the design and implementation of an environmental protection program for each DOE facility; and

   c. Assign responsibilities for complying with requirements under all Federal, state and local environmental laws and/or regulations for all DOE facilities.

   d. The implementation plan shall be prepared no later than 12 months after the effective date of this Order and shall be updated annually. The plan shall be approved by the appropriate PSO, with concurrence by EH-1.

3. LONG RANGE ENVIRONMENTAL PROTECTION PLAN. As an element of its long range ES&H planning, each field organization shall develop a long range environmental protection plan that comprehensively defines specific environmental objectives and the means and schedules for attaining objectives and completing programs and projects at each facility or group of facilities. Information contained in this plan will be integrated into the appropriate PSO planning, support environmental program budget requests, and provide the basis for comprehensive PSO environmental long range planning. The plan will serve as a mechanism for Headquarters and field organizations to coordinate strategies for addressing environmental needs.

a. The plan shall:

(1) Identify requirements;

(2) Compare operations against requirements to identify needs;

(3) Establish strategies for meeting identified needs;

(4) Identify activities required to implement the strategies; and

(5) Identify needed resources and develop a schedule to accomplish those activities.

b. Specific guidance for preparing the plan will be issued by EH-1. Each plan will be submitted to the appropriate PSO, EH-1, and MA-1.

4. SPECIAL PROGRAM PLANNING REQUIREMENTS. In addition to other program requirements and documentation required in this Order, each Head of Field Organization shall prepare a separate plan of sufficient scope and detail to reflect program significance, as appropriate, for each of the following activities.

a. A Groundwater Protection Management Program that includes, for each site, the following: (1) documentation of the groundwater regime with respect to quantity and quality; (2) design and implementation of a groundwater monitoring program to support resource management and comply with applicable environmental laws and regulations; (3) a management program for groundwater protection and remediation, including specific Safe Drinking Water Act (SDWA), Resource Conservation and Recovery Act (RCRA) and CERCLA actions; (4) a summary and identification of areas that may be contaminated with hazardous substances; (5) strategies for controlling sources of these contaminants; (6) a remedial action program that is part of the site CERCLA program required by DOE 5400.4; (7) decontamination and decommissioning, and other remedial programs contained in DOE directives. Plans, permits, and other technical documents such as those associated with compliance with the SDWA, RCRA, and CERCLA may be used in whole or in part to satisfy this requirement. This plan shall be completed no later than 18 months after the effective date of this Order. The plan shall be reviewed annually and updated every 3 years.

b. A Waste Minimization Program that will contain goals for minimizing the volume and toxicity of all wastes that are generated, with annual reductions if programmatic requirements allow. Changes in waste quantity, volume and toxicity that are achieved shall be compared with quantities generated in the previous year. The proposed methods of treatment, storage, and disposal that accomplish waste minimization that are technically and economically practicable shall be reported as appropriate. Waste minimization plans required by specific legislation, such as RCRA, shall be included as a part of this program plan. This plan shall be completed no later than 18 months after the effective date of this Order. The plan shall be reviewed annually and updated every 3 years.

c. A Pollution Prevention Awareness Program that shall be specifically identified in his or her environmental protection statement. All mission statements and project plans shall recognize a requirement for pollution prevention, where appropriate. The documented program, including elements for employee awareness through specific training, special awareness campaigns, and incentives and award programs shall be implemented. This plan shall be completed no later than 12 months after the effective date of this Order. The plan shall be reviewed annually and updated every 3 years.

CHAPTER IV

ENVIRONMENTAL MONITORING REQUIREMENTS

1. PURPOSE.

   a. This Chapter contains requirements and guidance for environmental monitoring programs concerned with: (1) measuring and monitoring effluents from DOE operations; and (2) surveillance through measurement, monitoring, and calculation of the effects of those operations on the environment and public health. The objectives of the monitoring programs are to: demonstrate compliance with legal and regulatory requirements imposed by applicable Federal, State and local agencies; confirm adherence to DOE environmental protection policies; and support environmental management decisions. A critical element of monitoring is quality assurance and verification. Each DOE Facility is unique; therefore, the need and levels of effort for monitoring programs shall be determined by the appropriate field organization on a case-by-case basis, consistent with regulatory requirements, DOE directives, and the degree of environmental assurance that activities at the particular site require.

   b. All requirements contained in Chapter IV shall be implemented no later than 36 months after the effective date of this Order, unless otherwise required by other DOE Orders, or by applicable Federal, State, or local legislation or regulation.

   c. Monitoring requirements for radioactivity are contained in DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

2. APPLICABILITY.

   a. The following environmental monitoring requirements apply: (1) those contained in DOE Orders in the 5400 series dealing with radiation protection of the public and the environment, and DOE 5820.2; and (2) those specified by applicable Federal, State, or local regulations.

   b. To the extent that a regulation or permit allows for exemptions from required monitoring practices and procedures, Heads of Field Organizations shall obtain approval for any exemption from the appropriate regulatory agency. In those instances where an exemption from a DOE-imposed monitoring requirement is justifiable, approval shall be granted by the appropriate Head of Field Organization. The procedures contained in page I-1, paragraph 4 of this Order are not applicable to any exemptions that are made for environmental monitoring requirements.

3. PREOPERATIONAL MONITORING OF FACILITIES, SITES, AND OPERATIONS. An environmental study shall be conducted prior to start up of a new site, facility, or process which has the potential for significant adverse environmental impact. The preoperational study should begin not less than 1 year, and preferably 2 years before start up to evaluate seasonal changes. The study shall serve to: characterize existing physical, chemical, and biological conditions that could be affected; establish background levels of radioactive and chemical components; characterize pertinent environmental and ecologic parameters; and identify potential pathways for human exposure or environmental impact as a basis for determining the nature and extent of the subsequent routine operational and emergency effluent monitoring and environmental surveillance programs. Where time and circumstances do not allow for completion of preoperational monitoring prior to start-up, it shall be conducted concurrent with work on the new site, facility, or process. The preoperational study shall be consistent with NEPA compliance activities. Where appropriate, activities and documentation conducted for NEPA compliance may substitute for compliance with this requirement.

4. ENVIRONMENTAL MONITORING PLANS. A written environmental monitoring plan shall be prepared for each site, facility, or process that uses, generates, releases, or manages significant pollutants or hazardous materials. The plan shall contain the rationale and design criteria for the monitoring program, extent and frequency of monitoring and measurements, procedures for laboratory analyses, quality assurance requirements, program implementation procedures, and direction for the preparation and disposition of reports. The plan shall be approved by the appropriate Head of Field Organization, or his or her designee. The plan shall be reviewed annually and updated as needed. The plan shall identify and discuss two major activities: (a) effluent monitoring, and (b) environmental surveillance. The plan shall reflect the importance of monitoring as a critical element of an effective environmental protection program. The plan shall be reviewed annually and updated every 3 years.

5. ENVIRONMENTAL MONITORING - GENERAL REQUIREMENTS. Environmental monitoring shall consist of two major activities: effluent monitoring and environmental surveillance. Selected references for environmental monitoring are listed in Attachment IV-1.

a. Effluent Monitoring.

(1) Effluent monitoring shall be conducted at all DOE sites to satisfy the following program objectives:

(a) Verify compliance with applicable Federal, State, and local effluent regulations and DOE Orders.

(b) Determine compliance with commitments made in Environmental Impact Statements, Environmental Assessments, or other official documents.

(c) Evaluate the effectiveness of effluent treatment and control.

(d) Identify potential environmental problems and evaluate the need for remedial actions or mitigation measures.

(e) Support permit revision and/or reissuance.

(f) Detect, characterize, and report unplanned releases.

(2) Effluent monitoring shall comply with applicable regulations and shall be conducted to provide representative measurements of the quantities and concentrations of pollutants in liquid and airborne discharges, and solid wastes.

(a) Monitoring Stations. Effluents from on-site waste treatment or disposal systems shall be monitored in accordance with applicable regulations. Influents to on-site waste treatment or disposal systems should be monitored as needed.

(b) Sampling. Sample collection programs shall reflect specific facility needs. Type and frequency of sampling shall be adequate to characterize effluent streams.

(c) Sample Analysis. Standard analyses shall be used to analyze samples whenever such methods are required by regulatory programs. Exemptions due to analytical problems or for non-routine analyses may be employed after receiving approval from the appropriate regulatory agency. Analyses not required by regulations may be conducted as determined by site-specific conditions.

(d) Monitoring Data Recordkeeping. Auditable records shall be established in accordance with the requirements of DOE 5700.6B.

b. Environmental Surveillance.

(1) Environmental surveillance shall be conducted to monitor the effects, if any, of DOE activities on on-site and offsite environmental and natural resources. An environmental surveillance screening program shall be undertaken at DOE sites to determine the need for a permanent surveillance program. Environmental surveillance shall be designed to satisfy one or more of the following program objectives:

(a) Verify compliance with applicable environmental laws and regulations;

(b) Verify compliance with environmental commitments made in Environmental Impact Statements, Environmental Assessments, Safety Analysis Reports, or other official DOE documents;

(c) Characterize and define trends in the physical, chemical and biological condition of environmental media;

(d) Establish baselines of environmental quality;

(e) Provide a continuing assessment of pollution abatement programs;

(f) Identify and quantify new or existing environmental quality problems.

(2) Environmental surveillance programs and components should be determined on a site-specific basis by the field organization. Programs should reflect facility characteristics, applicable regulations, hazard potential, quantities and concentrations of materials released, the extent and use of affected air, land, and water, and specific local public interest or concern. Surveillance programs are likely to include one or more of the following:

(a) Monitoring stations;

(b) Sampling and analysis; and

(c) Monitoring data recordkeeping.

6. <u>METEOROLOGICAL MONITORING PROGRAM</u>. Representative meteorological data are required at DOE facilities to support environmental monitoring activities. This information is essential to characterize atmospheric transport and diffusion conditions in the vicinity of the DOE facility and to represent other meteorological conditions (e.g., precipitation, temperature, and atmospheric moisture) which are important to environmental surveillance activities such as air quality and radiation monitoring.

a. <u>Meteorological Information/Monitoring Programs</u>. A meteorological information/monitoring program shall be developed as a specific element of all environmental monitoring plans. The program shall identify types of meteorological information required to support all environmental protection activities (both routine and non-routine) and the regulations applicable to assessing impacts of airborne releases. The elements of the program (e.g., acquisition, analysis, and data management) shall be specified and the rationale or purpose for selecting those elements documented.

b. General Requirements. Representative meteorological information shall be available at or in the vicinity of DOE facilities to:

(1) Provide data to characterize atmospheric transport, diffusion conditions, and other climatic conditions of importance in the vicinity of the DOE facility for assessments of the impacts of airborne releases (both routine and non-routine) on public health and safety;

(2) Provide data to characterize conditions important to environmental surveillance activities such as air quality and radiation monitoring;

(3) Provide data to confirm compliance with and implementation of applicable regulations and DOE Orders; and

(4) Provide a consistent data base upon which decisions can be made concerning airborne releases and appropriate control activities.

7. RADIOLOGICAL MONITORING.

a. Requirements for the environmental monitoring of radioactive materials are to be found in DOE Orders in the 5400 series dealing with radiation protection of the public and the environment. Airborne radiation and radioactive materials discharged from DOE facilities shall comply with the requirements of 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants." Further, for those radioactive materials not regulated under the Clean Air Act, DOE has established standards to meet its responsibilities under the Atomic Energy Act.

b. An assessment of the potential radiation dose to members of the public which could have resulted from site operations shall be made for facilities required to conduct effluent and environmental radiological monitoring. Assessments shall be made in accordance with the requirements of DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

8. NON-RADIOLOGICAL MONITORING.

a. Air Monitoring - Emissions.

(1) Air emission monitoring shall be in accordance with the requirements of applicable Federal, State, and local regulations authorized by the Clean Air Act (42 U.S.C. 7401, *et. seq.*). Section 118 of the Act specifically addresses the control of airborne pollution from federal facilities. Design of air quality monitoring programs should be undertaken with a thorough understanding of the complex framework of air quality management.

(2) Where applicable, DOE facilities shall comply with monitoring requirements discussed in 40 CFR Part 60, which includes monitoring of fossil fuel combustion sources and associated test methods. Appendix A of 40 CFR Part 60 provides methods referred to in 40 CFR Part 60.8 (Performance Tests) and 40 CFR Part 60.11 (Compliance with Standards and Maintenance Requirements).

(3) Large permanent facilities or modification to such facilities may require a Prevention of Significant Deterioration (PSD) permit prior to construction. In addition to pre- and post-operational emission testing, the permit process may require up to a year of meteorological and ambient air quality monitoring. Monitoring shall conform to the EPA PSD monitoring regulations (40 CFR Part 58) which contain siting, quality assurance, and accuracy requirements. Siting of monitoring stations requires the use of atmospheric dispersion modeling to locate areas of expected maximum offsite impact. The rules also identify specific reference methods and equivalent method analyses which shall be used for the program.

b. Air Monitoring - Environmental Surveillance.

(1) Ambient air quality monitoring programs should be designed to accomplish the following:

(a) Establish background concentration levels of pertinent chemical species;

(b) Determine the highest concentrations of the pertinent pollutant species expected to occur in the vicinity of DOE operations;

(c) Determine representative pollutant concentrations at areas where public health and other concerns should be considered; and

(d) Evaluate the effects of emissions on ambient levels of pertinent contaminants.

(2) Where possible, background data should be gathered from existing State and Local Air Monitoring Stations (SLAMS) which are required by 40 CFR Part 58.20 to be provided for in a State's implementation plan. Design considerations for siting any supplementary air quality monitoring stations should include emissions, meteorology and climatology, topography, and geography. Specific requirements associated with ambient air quality monitoring are found in regulations promulgated by EPA. Particular attention shall be given to the following:

(a) 40 CFR Part 50, "National Primary and Secondary Ambient Air Quality Standards"

(b) 40 CFR Part 52, "State Implementation Plans"

(c) 40 CFR Part 53, "Ambient Air Monitoring Reference and Equivalent Methods"

(d) 40 CFR Part 58, "Ambient Air Quality Surveillance"

c. Water Monitoring - Effluents.

(1) Under the authority of the Clean Water Act (33 U.S.C. 1251, et. seq.), EPA has promulgated regulations for monitoring liquid effluent discharges. In the National Pollutant Discharge Elimination System (NPDES) established by section 402, the EPA Administrator, or States with approved programs, after opportunity for public hearing, issues permits that control and limit the discharge of any pollutant to the waters of the United States.

(2) Where required, DOE facilities shall monitor liquid effluent discharges. Federal regulations defining NPDES requirements for monitoring nonradioactive effluents appear in the following:

(a) 40 CFR Part 123, "State Program Requirements"

(b) 40 CFR Part 124, "Procedures for Decisionmaking"

(c) 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System"

(d) 40 CFR Part 129, "Toxic Pollutant Effluent Standards"

(3) NPDES permits contain specific and legally enforceable effluent limitations and self-monitoring requirements for flow measurement and sampling.

(4) In addition to rules promulgated under the Clean Water Act, DOE facilities shall satisfy monitoring requirements called for under the Resource Conservation and Recovery Act (RCRA), as amended, since under RCRA, a solid waste can be a liquid. Under RCRA, it shall first be determined if a waste is hazardous. If a waste is determined to be hazardous, the applicable regulations in 40 CFR Parts 260 through 280 shall be implemented.

d. Water Monitoring - Environmental Surveillance.

(1) Ambient water quality monitoring should be conducted through a network of fixed stations from which data will establish well-defined histories of the physical, biological, and chemical conditions of local bodies of water and sediments. The data obtained from this network should be coordinated with other monitoring activities. Water quality data may be obtained from existing State and local monitoring stations.

(2) Analysis of data collected from a fixed station monitoring network should support:

(a) Characterizing and defining trends in the physical, chemical, and biological condition of surface waters;

(b) Establishing baselines of water quality;

(c) A continuing assessment of water pollution control programs;

(d) Identifying new water quality problems; and

(e) Detecting, characterizing, and reporting unplanned releases and their effects on water quality.

(3) Monitoring networks should be operated and maintained in a uniform manner, i.e., through established procedures that allow comparative evaluations of data from monitoring sites. Receiving water characteristics will determine the location of stations. A reconnaissance survey might be sufficient in siting stations. Under complex circumstances, mathematical models could be needed to select stations sites.

(4) Monitoring programs are best served by fixed station networks. However, a network of effluent monitoring and selected mobile monitoring stations could satisfy the needs at some facilities.

(5) Surface water sampling performed at fixed monitoring stations will characterize physical and chemical properties of the water column and sediments, and biological species in the water column and benthos. Types of sampling performed should depend upon local conditions and the variability of stream characteristics and water quality.

(6) The monitoring frequency at a fixed network station is a function of the variability of the chemical, physical, and biological conditions of the water body. Data collected shall be representative of the variations in water quality and changes in pollutant loads. Varying sampling frequencies could be required

to accurately reflect seasonal changes, variable pollution sources, time of water travel between stations, and tidal and diurnal variations.

(7) Ambient water quality monitoring serves to confirm compliance with the Clean Water Act. An understanding of the Water Quality Management (WQM) process implemented by EPA, the States, interstate agencies, and area-wide, local and Regional planning organizations is essential to the design of a water quality monitoring program. The elements of the WQM processes are described in 40 CFR Part 130. Test procedures for pollutant analyses are listed in the 40 CFR Part 136.

9. GROUNDWATER MONITORING PROGRAM. Groundwater that is or could be affected by DOE activities shall be monitored to determine and document the effects of operations on groundwater quality and quantity and to demonstrate compliance with DOE requirements and applicable Federal, State, and local laws and regulations.

a. Groundwater Monitoring Plans. A groundwater monitoring plan shall be developed as a specific element of all environmental monitoring plans and the Groundwater Protection Management Program required in page III-2, subparagraph 4a. The plan shall identify all DOE requirements and regulations applicable to groundwater protection and include monitoring strategy. The elements of the groundwater monitoring program shall be specified (sampling plan, sampling, analysis, and data management), as shall the rationale or purpose for selecting these elements.

b. General Requirements. Groundwater monitoring programs shall be conducted on-site and in the vicinity of DOE facilities to:

(1) Obtain data for the purpose of determining baseline conditions of groundwater quality and quantity;

(2) Demonstrate compliance with and implementation of all applicable regulations and DOE Orders;

(3) Provide data to permit the early detection of groundwater pollution or contamination;

(4) Provide a reporting mechanism for detected groundwater pollution or contamination.

(5) Identify existing and potential groundwater contamination sources and to maintain surveillance of these sources;

(6) Provide data upon which decisions can be made concerning land disposal practices and the management and protection of groundwater resources.

c. Site-specific characteristics shall determine monitoring needs. Where appropriate, groundwater monitoring programs shall be designed and implemented in accordance with 40 CFR Part 264, Subpart F, or 40 CFR Part 265, Subpart F. For sites with multiple groundwater pollutant sources, extensive groundwater pollution or other unique site problems, groundwater monitoring programs could require more extensive information than those specified in 40 CFR Parts 264 and 265. Monitoring for radionuclides shall be in accordance with DOE Orders in the 5400 series dealing with radiation protection of the public and the environment.

10. QUALITY ASSURANCE AND DATA VERIFICATION.

a. Quality Assurance. A quality assurance program consistent with DOE 5700.6B shall be established covering each element of environmental monitoring and surveillance programs commensurate with its nature and complexity. The quality assurance program shall include, but not be limited to, the following:

(1) Organizational responsibility;

(2) Program design;

(3) Procedures;

(4) Field quality control;

(5) Laboratory quality control;

(6) Human factors;

(7) Recordkeeping;

(8) Chain-of-custody procedures;

(9) Audits;

(10) Performance reporting; and

(11) Independent data verification.

b. Laboratory Certification. DOE and DOE contractor laboratories shall confirm the need and apply for any certification requirements with appropriate Federal, State or local agencies. Where DOE operations secure the support of outside contractor laboratories, this work shall be conducted by appropriately certified laboratories.

c. DOE Laboratory Quality Assessment Program for Radioactive Material. All DOE and contractor laboratories that conduct analytical work in support of DOE environmental radiological monitoring programs for radioactive materials shall participate in the DOE interlaboratory quality assurance program coordinated by the DOE Environmental Measurements Laboratory, New York, New York. Guidelines and procedures for this program shall be issued annually by EH-1.

d. Independent Data Verification. EH-1, in consultation with the appropriate PSO and field organization shall develop an independent data verification program as a part of environmental monitoring programs at DOE facilities. The program shall be in place no later than twelve months after the effective date of this Order.

SELECTED REFERENCES FOR ENVIRONMENTAL MONITORING

1. 40 CFR Part 60, "Standards of Performance for New Stationary Sources."

2. 40 CFR Part 61, "National Emission Standards for Hazardous Air Pollutants."

3. 40 CFR Part 125, "Criteria and Standards for the National Pollutant Discharge Elimination System."

4. 40 CFR Part 129, "Toxic Pollutant Effluent Standards."

5. 40 CFR Part 130, "Water Quality Planning and Management."

6. 40 CFR Part 136, "Guidelines Establishing Test Procedures for the Analysis of Pollutants."

7. 40 CFR Part 146, "Underground Injection Control Program: Criteria and Standards."

8. 40 CFR Part 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

9. 40 CFR Part 265, "Interim Status Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities."

10. MCD-51, NPDES Compliance Sampling Inspection Manual, U.S. Environmental Protection Agency, 1979.

11. EPA 600/4-82-029, Handbook for Sampling and Sample Preservation of Water, U.S. Environmental Protection Agency, 1982.

12. EPA-600/4-79-020, Methods for Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, 1979.

13. EPA-600/7-77-088, Handbook for Analytical Quality Control in Radioanalytical Laboratories, U.S. Environmental Protection Agency, 1977.

14. EPA-550/7-77-14, Quality Control for Environmental Measurements Using Gamma-Ray Spectrometry, Environmental Monitoring and Support Laboratory, Las Vegas, Nevada, 1977.

15. EPA 600/4-84-017, Technical Addition to Methods for the Chemical Analysis of Water and Wastes, U.S. Environmental Protection Agency, 1984.

16. EPA 600/4-84-077, Characterization of Hazardous Waste Sites - A Methods Manual, U.S. Environmental Protection Agency, 1984.

17. SW-846, Test Methods for Evaluating Solid Waste, U.S. Environmental Protection Agency, 1986.

18. Guidance for Air Quality Monitoring Network Design and Instrument Siting (40 CFR Part 58, Appendices D and E), U.S. Environmental Protection Agency, January 1974.

19. SW-611, Procedures Manual for Groundwater Monitoring at Solid Waste Facilities, U.S. Environmental Protection Agency, 1977.

20. OSWER-9950.1, RCRA Groundwater Monitoring Technical Enforcement Guidance Document, U.S. Environmental Protection Agency, 1986.

21. EMSL-LV-0539-17, Radiochemical Analytical Procedures for Analysis of Environmental Samples, U.S. Environmental Protection Agency, 1979.

22. NEIC Manual for Groundwater/Surface Investigations Center, U.S. Environmental Protection Agency, 1981.

23. Methods of Air Sampling and Analysis, APHA Intersociety Committee, Morris Katz, editor, 1983.

24. ANSI N.13.1-1969, Guide to Sampling Airborne Radioactive Materials in Nuclear Facilities, American National Standards Institute.

25. Standard Methods for the Examination of Water and Waste Waters, 16th Edition, 1985, et. seq., APHA-AWWA-WPCF.

26. HASL-300, HASL Procedures Manual, Environmental Measurements Laboratory.

27. Manual of Groundwater Sampling Procedures, National Water Well Association, Worthington, Ohio, 1981.

28. Groundwater Monitoring, L.G. Everett, General Electric Company, Schenectady, NY, 1980.

29. Regulatory Guide 4.15, Quality Assurance for Radiological Monitoring Programs (Normal Operations)--Effluent Streams and the Environment, Revision 1, U.S. Nuclear Regulatory Commission, Office of Standards Development, Washington, DC, 1979.

30. IDO-12096, Radiological and Environmental Sciences Laboratory Analytical Chemistry Branch Procedures Manual, U.S. Department of Energy, Idaho Falls, ID, 1982.

31. ANSI N.42.18-1980, Specification and Performance of On-site Instrumentation for Continuously Monitoring Radioactivity in Effluents, American National Standards Institute.

32. Air Pollutant Sampling and Analysis Deskbook, Cheremisinoff 1979.

33. AIRDOS-EPA: A Computerized Methodology for Estimating Environmental Concentrations and Doses to Man from Airborne Releases of Radionuclides, Oak Ridge National Laboratory, ORNL-5532.

34. Test Report: Particulate Sampling Strategy in Circular Ducts, J. Brown and K. Yu, Emission Measurement Branch, Emissions Standards and Engineering Division, U.S. Environmental Protection Agency, 1980.

35. GPO 055-000-00240-1, Permit Applicants Guidance Manual for Hazardous Land Treatment, Storage and Disposal Facilities, U.S. Environmental Protection Agency, 1984.

36. EPA 600-4-79-019, Handbook for Analytical Quality Control in Water and Wastewater Laboratories, U.S. Environmental Protection Agency, 1979.

37. EPA 450/2-78-027 R, Guideline on Air Quality Models (Revised), U.S. Environmental Protection Agency, 1986.

38. EPA 600/8-78-017, Microbiological Methods for Monitoring the Environment, Water and Waste, U.S. Environmental Protection Agency, 1978.

39. Identification of Technical Guidance Related to Groundwater Monitoring, Oak Ridge National Laboratory, Environmental Sciences Division, June 1986.

40. EPA-520/5-84-006, Radiochemistry Procedures Manual, U.S. Environmental Protection Agency, 1984.

Appendix L

RCRA Section 1006; Application of Act and integration with other Acts

States and approved by the Administrator. In any such case, action required to be taken by the Governor of a State, respecting regional designation shall be required to be taken by the Governor of each of the respective States with respect to so much of the interstate region as is within the jurisdiction of that State.

"(b) CONSENT OF CONGRESS TO COMPACTS.—The consent of the Congress is hereby given to two or more States to negotiate and enter into agreements or compacts, not in conflict with any law or treaty of the United States, for—

"(1) cooperative effort and mutual assistance for the management of solid waste or hazardous waste (or both) and the enforcement of their respective laws relating thereto, and

"(2) the establishment of such agencies, joint or otherwise, as they may deem desirable for making effective such agreements or compacts.

No such agreement or compact shall be binding or obligatory upon any State a party thereto unless it is agreed upon by all parties to the agreement and until it has been approved by the Administrator and the Congress.

"APPLICATION OF ACT AND INTEGRATION WITH OTHER ACTS

42 USC 6905. "SEC. 1006. (a) APPLICATION OF ACT.—Nothing in this Act shall be construed to apply to (or to authorize any State, interstate, or local authority to regulate) any activity or substance which is subject to the
33 USC 1251 note. Federal Water Pollution Control Act (33 U.S.C. 1151 and following), the Safe Drinking Water Act (42 U.S.C. 300f and following), the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1401 and following), or the Atomic Energy Act of 1954 (42 U.S.C. 2011 and following) except to the extent that such application (or regulation) is not inconsistent with the requirements of such Acts.

"(b) INTEGRATION WITH OTHER ACTS.—The Administrator shall integrate all provisions of this Act for purposes of administration and enforcement and shall avoid duplication, to the maximum extent practicable, with the appropriate provisions of the Clean Air Act (42 U.S.C. 1857 and following), the Federal Water Pollution Control Act
33 USC 1251 note. (33 U.S.C. 1151 and following), the Federal Insecticide, Fungicide, and Rodenticide Act (7 U.S.C. 135 and following), the Safe Drinking Water Act (42 U.S.C. 300f and following), the Marine Protection, Research and Sanctuaries Act of 1972 (33 U.S.C. 1401 and following) and such other Acts of Congress as grant regulatory authority to the Administrator. Such integration shall be effected only to the extent that it can be done in a manner consistent with the goals and policies expressed in this Act and in the other acts referred to in this subsection.

"FINANCIAL DISCLOSURE

42 USC 6906. "SEC. 1007. (a) STATEMENT.—Each officer or employee of the Administrator who—

"(1) performs any function or duty under this Act; and

"(2) has any known financial interest in any person who applies for or receives financial assistance under this Act

shall, beginning on February 1, 1977, annually file with the Administrator a written statement concerning all such interests held by such officer or employee during the preceding calendar year. Such statement shall be available to the public.

Appendix M

"Nuclear Exchange Brewing at NRC; Becquerel, Gray and Sievert May Obliterate Curie, Rad and Rem," Washington Post; Tomas W. Lippman

Nuclear Exchange Brewing at NRC

Becquerel, Gray and Sievert May Obliterate Curie, Rad and Rem

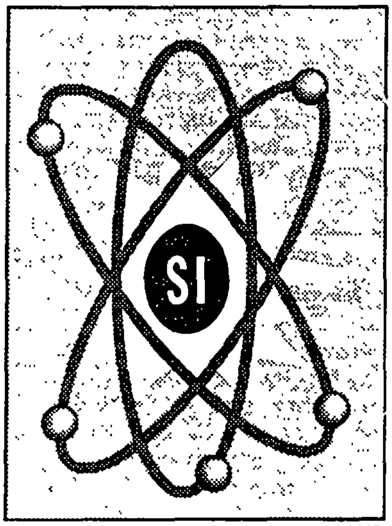
By Thomas W. Lippman
Washington Post Staff Writer

All right, class, now that you have mastered the metric system, now that you can easily measure in meters, shop in grams and buy gasoline in liters, it's time for the next step: learning to measure radiation exposure by the new International System of Units. Forget the curie, pick up the becquerel.

The Nuclear Regulatory Commission is trying to decide whether the United States should adopt the international vocabulary of radiation measurement, known as SI from its French initials. An NRC metrication committee—headed by Zoltan Rosztoczy, deputy director of the division of regulatory applications—is expected to make its recommendations to the commission late this year.

This issue is unlikely to galvanize public attention, but it is of intense interest to nuclear scientists, reactor operators and regulators. Adoption of SI would require the rewriting of untold thousands of pages of regulations, operating instructions, labels and training manuals and probably the recalibration of testing instruments at every nuclear site. But it would simplify nuclear information exchanges between the United States and other nations.

"We saw this in the reporting on the accident at Chernobyl," Rosztoczy said. "Reports from the Soviet Union, Sweden, Poland and Switzerland were in one set of units; reports in the United States were in another set."



BY PETER HOEY—THE WASHINGTON POST

U.S. regulations on radiation exposure are expressed in the traditional curie, rad and rem. A curie is the amount of any radioactive material that will decay at the rate of 37 billion disintegrations per second. A radiation absorbed dose (rad) is the deposition of 100 ergs of energy in one gram of material from ionization from any type of radiation. A roentgen equivalent man (rem) measures biological damage to human tissue from radiation. One rem equals the damage that would be caused by one rad of exposure to gamma radiation in the body.

Holders of NRC reactor licenses must adhere to exposure limits expressed in these terms. For example, workers in nuclear power plants may not be exposed to more than 1.25 rem of whole body radiation every three months. Exposure of the public to radiation released from a reactor cannot exceed 2 millirem in any hour or 100 millirem in a seven-day period.

Under SI, adopted by the International Atomic Energy Agency, these units of measurement are replaced by the becquerel (one 37-billionth of a curie), the gray (100 rad) and the sievert (100 rem).

U.S. scientists are learning to think in these units. But some scientists are uncomfortable because they regard the SI units as unworkable, according to T.E. Allen, a health physicist at the NRC's training center in Chattanooga, Tenn.

"The basic problem we have is that radiation exposures and doses have been going down through the years, getting smaller and smaller because of improvements in controls," Allen said. "Mostly now we talk in millirems. But the sievert is a very large number. It doesn't fit everyday experience. It's as if we were to start pricing gasoline by the barrel instead of the gallon, so I'd have to buy maybe one-hundredth of a barrel for my lawnmower."

Appendix N

NRC Technical Training Center Syllabus of Courses, 1989-1990

The Nuclear Regulatory Commission

Technical Training Center Syllabus of Courses

Technical Training Center
Office for Analysis and
Evaluation of Operational
Data

ADDENDUM TO
Office of Personnel
Guide to Training
Opportunities

1989–1990

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Appendix O

Joint NRC/EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities (Directive Number 9487.00-8)

United States
Environmental Protection
Agency

Office of
Solid Waste and
Emergency Response

EPA

DIRECTIVE NUMBER: 9480.00-14

TITLE: Combined NRC-EPA Siting Guidelines for Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Waste

APPROVAL DATE: 06/29/87

EFFECTIVE DATE: 06/29/87

ORIGINATING OFFICE: Office of Solid Waste

☒ **FINAL**

☐ **DRAFT**

STATUS:

[ ] A- Pending OMB approval
[ ] B- Pending AA-OSWER approval
[ ] C- For review &/or comment
[ ] D- In development or circulating headquarters

REFERENCE (other documents):

OSWER OSWER OSWEI
'E DIRECTIVE DIRECTIVE

MAR 13 1987

TO THE STATES AND COMPACT REGIONS:

SUBJECT: COMBINED NRC-EPA SITING GUIDELINES FOR DISPOSAL OF MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE

As you are aware, the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA) established milestones (and penalties for not meeting these milestones) to ensure adequate development of future disposal capacity for commercial low-level radioactive waste (LLW). The penalties are quite severe and the deadlines do not leave much room for slippage.

We would like to call to your attention the January 1, 1988 milestone (Section 5(e)(1)(B)) which requires that each non-sited compact or non-member state develop a siting plan for a LLW disposal facility. These siting plans must include detailed procedures and a schedule for establishing a disposal facility location and preparing a license application. Among other things, Section 5(e)(1)(B)(iii) provides that the siting plan shall:

> "... identify, to the extent practicable, the process for (1) screening for broad siting areas; (2) identifying and evaluating specific candidate sites; and (3) characterizing the preferred site(s), ..."

This letter serves four purposes:

(1) to inform states and compacts that, under current Federal law, the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA) have dual jurisdiction over mixed low-level radioactive and hazardous waste (Mixed LLW); (2) to state that both NRC and EPA do not consider the absence of EPA's final comprehensive location standards to be justification for states and compacts to not meet their obligations under the LLRWPAA; (3) to convey that both NRC and EPA are committed to providing guidance to states and compacts who request help in their efforts to meet the January 1988 LLRWPAA milestone for siting plans; and (4) to jointly transmit the NRC-EPA combined siting guidelines for Mixed LLW (enclosed).

Dual statutory authority exists for Mixed LLW, which is regulated by the NRC under the Atomic Energy Act (AEA), as amended, and by EPA under the Resource Conservation and Recovery Act (RCRA), as amended. Mixed LLW is defined as waste that satisfies the definition of LLW in the LLRWPAA and contains hazardous waste that either is listed in 40 CFR Part 261 Subpart D or causes the LLW to exhibit any of the hazardous waste characteristics identified in 40 CFR Part 261 Subpart C. Both the NRC and EPA staffs consider that Mixed LLW can be disposed of in accordance with the above statutes and NRC and EPA regulations.

In 1982, the NRC promulgated regulations containing minimum site suitability requirements for LLW land disposal facilities under 10 CFR Part 61. In 1981, EPA promulgated minimum location standards for hazardous waste treatment, storage, and disposal facilities in 40 CFR Part 264. Section 3004(o)(7) of RCRA, which was added by the Hazardous and Solid Waste Amendments of 1984 (HSWA), requires EPA to publish guidance identifying areas of vulnerable hydrogeology; this guidance was completed and issued in July 1986. Section 3004(o)(7) of RCRA also requires EPA to specify criteria for the acceptable location of new and existing hazardous waste treatment, storage, and disposal facilities as necessary to protect human health and the environment. EPA anticipates proposing these location standards in September 1987 and promulgating them by September 1988. This schedule provides affected states and compacts with a preview of the final standards and an opportunity to comment on the standards before promulgation.

Because of uncertainty about the precise content of EPA's future location standards, states and compacts may have questions regarding the site selection process. Both NRC and EPA are committed to providing guidance to states and compacts who request help in developing their siting plans by the January 1, 1988 deadline. Technical questions pertaining to siting a disposal facility for Mixed LLW should be submitted in writing to either the NRC or EPA contacts listed below, as appropriate.

For questions about the LLRWPAA siting deadline or NRC's site suitability requirements, contact:

Dr. Sher Bahadur
Division of Waste Management
Mail Stop 623-SS
U.S. Nuclear Regulatory Commission
Washington, D.C. 20555

For questions relating to EPA's location standards contact:

Mr. Burnell Vincent
Waste Management Division
Mail Code WH-565
U.S. Environmental Protection Agency
Washington, D.C. 20460

In summary, if states and compacts observe the enclosed NRC-EPA combined siting guidelines and keep abreast of the developing EPA location standards, the absence of final RCRA location standards should not prevent states and compacts from meeting their obligations under the LLRWPAA.

Sincerely,

Hugh L. Thompson, Jr., Director
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission

J. Winston Porter
Assistant Administrator
Office of Solid Waste
and Emergency Response
U.S. Environmental Protection Agency

Enclosure:
As stated

COMBINED NRC-EPA SITING GUIDELINES FOR DISPOSAL OF COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTES

Introduction

The Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA) requires states and compacts to develop siting plans for low-level radioactive waste (LLW) disposal facilities by January 1, 1988. These disposal facilities may receive commercial mixed low-level radioactive and hazardous waste (Mixed LLW), which is regulated by the U. S. Nuclear Regulatory Commission (NRC) under the Atomic Energy Act (AEA), as amended, and by the U. S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA), as amended. Mixed LLW is defined as waste that satisfies the definition of LLW in the LLRWPAA and contains hazardous waste that either is listed in Subpart D of 40 CFR Part 261 or causes the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261. To assist in applying that definition, NRC and EPA recently developed joint guidance entitled "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste and Answers to Anticipated Questions" (Jan. 8, 1987). NRC has promulgated LLW regulations and EPA has promulgated hazardous waste regulations that pertain to the siting requirements for disposal facilities for Mixed LLW. Because of uncertainty about the precise content of EPA's future location standards, states and compacts may have questions regarding the site selection process. This document provides combined NRC-EPA siting guidelines, to be used before EPA's new location standards are promulgated, to facilitate development of siting plans for disposal facilities that may receive Mixed LLW.

Section 5(e)(1)(B) of the LLRWPAA requires states and compacts to develop siting plans for LLW disposal facilities by January 1, 1988. In addition to other information, these siting plans must identify, to the extent practicable, the process for (1) screening for broad siting areas, (2) identifying and evaluating specific candidate sites, and (3) characterizing the preferred site(s). It is anticipated that this process will be based primarily on the site suitability requirements that apply to LLW disposal. If facilities also receive Mixed LLW, their siting requirements will reflect additional requirements that apply to disposal of hazardous waste as defined by RCRA.

In 1982, NRC promulgated regulations which contain minimum site suitability requirements for LLW land disposal facilities in 10 CFR 61.50. EPA has also promulgated minimum location standards for hazardous waste treatment, storage, and disposal facilities in 40 CFR 264.18. Considerations affecting siting are also found in 40 CFR 270.3, 270.14(b) and (c). Although both NRC and EPA have incorporated siting requirements in existing regulations for LLW and hazardous waste disposal, respectively, the 1984 Hazardous and Solid Waste Amendments (HSWA) to RCRA require EPA to publish guidance identifying areas of vulnerable hydrogeology.- In July 1986, EPA published this guidance in "Criteria for Identifying Areas of Vulnerable Hydrogeology under the Resource Conservation and Recovery Act--Statutory Interpretative Guidance, July 1986, Interim Final (PB-86-224953)." The 1984 HSWA also requires (in Section 3004(o)(7)) that EPA specify criteria for the acceptable location of new and existing hazardous waste treatment, storage, and disposal facilities. EPA anticipates proposing these location standards in September 1987 and promulgating them in final form by September 1988.

EPA's scheduled date for promulgating its final location standards is nine months after the LLRWPAA January 1, 1988, milestone for non-sited states and compacts to develop siting plans. Therefore, states and compacts may require some assistance in their efforts to develop siting plans for LLW disposal facilities that may receive Mixed LLW. The two agencies are issuing these combined guidelines to promote the development of siting plans by states and compacts. Both NRC and EPA consider that the absence of EPA's final comprehensive location standards for hazardous waste disposal facilities is not an adequate basis for states and compacts to delay development of siting plans for LLW disposal.

States and compacts should proceed at this time to develop siting plans in accordance with the existing NRC and EPA requirements. The following combined NRC-EPA guidelines are provided for use by the states and compacts, and are based on existing NRC regulations in 10 CFR Part 61 and EPA regulations in 40 CFR Parts 264 and 270. As EPA continues its development of location standards, both agencies will strive to keep states and compacts informed about the status of the developing siting requirements.

Combined NRC-EPA Siting Guidelines

Site suitability requirements for land disposal of LLW are provided in 10 CFR Section 61.50. These requirements constitute minimum technical requirements for geologic, hydrologic, and demographic characteristics of LLW disposal sites. Several of these requirements identify favorable site characteristics for near-surface disposal facilities for LLW. The majority of the site suitability requirements, however, identify potentially adverse site characteristics that must not be present at LLW disposal sites. The site suitability requirements in 10 CFR Part 61 are intended to function collectively with the requirements for facility design and operation, site closure, waste classification and segregation, waste form and packaging, and institutional controls to assure isolation of LLW for the duration of the radiological hazard. The NRC Technical Position entitled "Site Suitability, Selection, and Characterization" (NUREG-0902) provides detailed guidance on implementing the site suitability requirements in 10 CFR Part 61.

EPA has also promulgated certain minimum location standards for hazardous waste treatment, storage, and disposal facilities. These standards are provided in

40 CFR Section 264.18. As previously noted, the hazardous waste regulations also include other location considerations as well as applicable provisions of other Federal statutes. For example, Subpart F of 40 CFR Part 264 requires establishment of ground-water monitoring programs capable of detecting contamination from land disposal units. While not a siting criterion *per se*, this requirement can preclude siting in locations that cannot be adequately monitored or characterized. A further description of location-related standards and applicable provisions of other Federal statutes can be found in the "Permit Writers' Guidance Manual for Hazardous Waste Land Storage and Disposal Facilities: Phase I Criteria for Location Acceptability and Existing Applicable Regulations" (Final Draft - February 1985). This guidance manual describes five criteria for determining location acceptability: ability to characterize, exclusion of high hazard and unstable terrain, ability to monitor, exclusion of protected lands, and identification of areas of vulnerable hydrogeology. The first four of these criteria have a basis in the regulations and are fully described in the manual. The fifth criterion, vulnerable hydrogeology, is defined in the RCRA interpretive guidance manual mentioned above (Criteria for Identifying Areas of Vulnerable Hydrogeology under the Resource Conservation and Recovery Act--Statutory Interpretive Guidance, July 1986, Interim Final (PB-86-224953)).

However, since HSWA also added other requirements in addition to location standards to prevent or mitigate ground-water contamination, EPA recognizes that vulnerable hydrogeology must be considered in conjunction with design and operating practices. Vulnerability should not be the sole determining factor in RCRA siting decisions. Rather, this criterion provides a trigger for more detailed evaluation of sites that are identified as having potentially vulnerable hydrogeology. The extent of necessary site review and evaluation is related directly to the extent to which a location "fails" or "passes" the vulnerability criterion. Sites that are determined to be extremely vulnerable will require much closer examination than sites that are deemed non-vulnerable. The results of this more detailed review may then provide a basis for eventual permit conditions or modifications in design or operating practices.

By combining the above technical requirements, standards, and guidance of both agencies, NRC and EPA have formulated the eleven guidelines listed below. The use of terms in the guidelines is consistent with their regulatory definitions in 10 CFR Part 61 and 40 CFR Parts 260 and 264. The combined set of location guidelines is intended by the agencies to apply only as guidance to states and compacts developing siting plans for LLW disposal facilities that may receive Mixed LLW. These combined guidelines are not intended to displace existing standards and guidance. In addition, the independent guidance of both agencies should be considered in any application of the combined siting guidelines.

The combined siting guidelines for a commercial Mixed LLW disposal facility are as follows:

1. Primary emphasis in disposal site suitability should be given to isolation of wastes and to disposal site features that ensure that the long-term performance objectives of 10 CFR Part 61, Subpart C are met.

2. The disposal site shall be capable of being characterized, modeled, analyzed, and monitored. At a minimum, site characterization must be able to (a) delineate ground-water flow paths, (b) estimate ground-water flow velocities, and (c) determine geotechnical properties sufficiently to support facility design. At a minimum for site ground-water monitoring, disposal site operators must be able to (a) assess the rate and direction of ground-water flow in the uppermost aquifer, (b) determine background ground-water quality, and (c) promptly detect ground-water contamination.

3. The disposal site must be generally well-drained (with respect to surface water) and free of areas of flooding or frequent ponding.

4. The disposal site shall not be in the 100-year floodplain.

5. The site must be located so that upstream drainage areas are minimized to decrease the amount of runoff that could erode or inundate waste disposal units.

6. Disposal sites may not be located on lands specified in 10 CFR Section 61.50(a)(5), including wetlands (Clean Water Act) and coastal high hazard areas (Coastal Zone Management Act). Location of facilities on the following lands must be consistent with requirements of applicable Federal statutes: archeological and historic places (National Historic Places Act); endangered or threatened habitats (Endangered Species Act); national parks, monuments, and scenic rivers (Wild and Scenic Rivers Act); wilderness areas (Wilderness Protection Act); and wildlife refuges (National Wildlife Refuge System Administration Act).

7. The disposal site should provide a stable foundation for engineered containment structures.

8. Disposal sites must not be located in areas where:

(a) tectonic processes such as faulting, folding, seismic activity, or vulcanism may occur with such frequency and extent to affect significantly the ability of the disposal facility to satisfy the performance objectives specified in Subpart C of 10 CFR Part 61, or may preclude defensible modeling and prediction of long-term impacts; in particular, sites must be located more than 200 feet from a fault that has been active during the Holocene Epoch;

(b) surface geologic processes such as mass wasting, erosion, slumping, landsliding, or weathering occur with such frequency and extent to affect significantly the ability of the disposal facility to meet the performance objectives in Subpart C of 10 CFR Part 61, or may preclude defensible modeling and prediction of long-term impacts;

(c) natural resources exist that, if exploited, would result in failure to meet the performance objectives in Subpart C of 10 CFR Part 61;

(d) projected population growth and future developments within the region or state where the facility is to be located are likely to affect the ability of the disposal facility to meet the performance objectives in Subpart C of 10 CFR Part 61; and

(e) nearby facilities or activities could adversely impact the disposal facility's ability to satisfy the performance objectives in Subpart C of 10 CFR Part 61 or could significantly mask an environmental monitoring program.

9. The hydrogeologic unit beneath the site shall not discharge ground water to the land surface within the disposal site boundaries.

10. The water table must be sufficiently below the disposal facility to prevent ground-water intrusion into the waste, with the exception outlined under 10 CFR Section 61.50(a)(7).

11. In general, areas with highly vulnerable hydrogeology deserve special attention in the siting process. Hydrogeology is considered vulnerable when ground-water travel time along any 100-foot flow path from the edge of the engineered containment structure is less than approximately 100 years (Criteria for Identifying Areas of Vulnerable Hydrogeology Under RCRA--Statutory Interpretive Guidance, July 1986, Interim Final (PB-86-224953)). Disposal sites located in areas of vulnerable hydrogeology may require extensive, site-specific investigations which could lead to and provide bases for restrictions or modifications to design or operating practices. However, a finding that a site is located in an area of vulnerable hydrogeology alone, based on the EPA criteria, is not considered sufficient to prohibit siting under RCRA.

Appendix P

Combined NRC/EPA Siting Guidelines for Disposal of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Directive Number 9480.00-14)

United States Environmental Protection Agency

Office of Solid Waste and Emergency Response

EPA

DIRECTIVE NUMBER: 9487.00-8

TITLE: Joint NRC-EPA Guidance on a Conceptual Design Approach for Commercial Mixed Low-Level Radioactive and Hazardous Waste Disposal Facilities

APPROVAL DATE: August 3, 1987

EFFECTIVE DATE: August 3, 1987

ORIGINATING OFFICE: OSW

☒ **FINAL**

☐ **DRAFT**

STATUS:

[ ] A- Pending OMB approval
[ ] B- Pending AA-OSWER approval
[ ] C- For review &/or comment
[ ] D- In development or circulating headquarters

REFERENCE (other documents):

OSWER OSWER OSWER

DIRECTIVE DIRECTIVE DIRECTIVE

AUG 3 1987

TO THE STATES, COMPACT REGIONS, AND ALL NRC LICENSEES

SUBJECT: JOINT NRC-EPA GUIDANCE ON A CONCEPTUAL DESIGN APPROACH FOR COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE DISPOSAL FACILITIES

Under the Resource Conservation and Recovery Act (RCRA), the U.S. Environmental Protection Agency (EPA) has jurisdiction over the management of solid wastes with the exception of source, byproduct, and special nuclear material, which are regulated by the U.S. Nuclear Regulatory Commission (NRC) under the Atomic Energy Act (AEA). Low-Level Radioactive Wastes (LLW) contain source, byproduct, or special nuclear materials, but they may also contain chemical constituents which are hazardous under EPA regulations promulgated under Subtitle C of RCRA. Such wastes are commonly referred to as Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW).

Applicable NRC regulations control the byproduct, source, and special nuclear material components of the Mixed LLW (10 CFR Parts 30, 40, 61, and 70); EPA regulations control the hazardous component of the Mixed LLW (40 CFR Parts 260-266, 268 and 270). Thus, all of the individual constituents of Mixed LLW are subject to either NRC or EPA regulations. However, when the components are combined to become Mixed LLW, neither agency has exclusive jurisdiction under current Federal law. This has resulted in dual regulation of Mixed LLW where NRC regulates the radioactive component and EPA regulates the hazardous component of the same waste.

The attached guidance document provides a conceptual design approach for Mixed LLW disposal facilities. It has been developed jointly by the NRC and EPA to assist commercial LLW disposal site operators and State and Regional Compact regulatory agencies in designing disposal facilities that satisfy both EPA and NRC regulations for Mixed LLW facilities. Although EPA is currently in the process of promulgating regulations that further define the technical parameters for the leak detection, leachate collection, and double liner systems, affected parties may proceed to develop designs for disposal units that will accept Mixed LLW in accordance with existing regulatory requirements. Owners and operators should, however, keep abreast of developing EPA regulations in this area. The attached guidance is based on NRC and EPA regulations in effect on August 1, 1987.

The attached guidance presents a conceptual design approach that meets EPA's regulations covering minimum technology requirements for liners and leachate collection systems, and NRC's requirements for minimization of contact of waste with water, while also assuring long-term stability and avoidance of long-term maintenance which are required by both agencies. The concepts proposed in this document are presented as general guidance; specific design details are expected to be complementary to particular site conditions, so that a license application will have to address site characteristics and their relationship to a proposed design as well as the details of any engineered portion of the facility. The application of this guidance will not affect the requirements for waste disposal facilities to comply with all applicable NRC and EPA regulations.

The attached guidance should permit licensees to develop safe and effective designs for disposal of Mixed LLW that fully meet the regulatory requirements of both agencies. Depending on the particular type of conceptual design selected by a licensee, EPA may permit variances to the requirements for double liners and leachate collection systems.

Sincerely,

Hugh L. Thompson, Jr., Director
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory Commission

J. Winston Porter
Assistant Administrator
Office of Solid Waste
and Emergency Response
U.S. Environmental
Protection Agency

Enclosure:
As stated

JOINT NRC-EPA GUIDANCE ON A CONCEPTUAL DESIGN APPROACH FOR COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE DISPOSAL FACILITIES

Introduction

The Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA) requires that the three operating low-level radioactive waste (LLW) disposal facilities remain available through 1992. By that time, all states and compact regions are required to assume complete responsibility for LLW disposal. Both existing and new disposal facilities may receive commercial mixed low-level radioactive and hazardous waste (Mixed LLW), which is regulated by the U.S. Nuclear Regulatory Commission (NRC) under the Atomic Energy Act (AEA), and by the U.S. Environmental Protection Agency (EPA) under the Resource Conservation and Recovery Act (RCRA). Mixed LLW is defined as waste that satisfies the definition of LLW in the LLRWPAA and contains hazardous waste that either (1) is listed as a hazardous waste in Subpart D of 40 CFR Part 261 or (2) causes the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261. To assist in applying this definition, NRC and EPA issued joint guidance entitled "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive Waste and Answers to Anticipated Questions" on January 8, 1987.

This jointly developed NRC-EPA guidance document presents a conceptual design approach that meets the regulatory requirements of both agencies for the safe disposal of Mixed LLW. Other designs, or variation of the proposed design concept may also be acceptable under the requirements of both agencies and will be reviewed on a case-by-case basis as received.

EPA regulations in 40 CFR Part 264, Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities, identify the design and operating requirements for owners and operators that dispose of hazardous waste in landfills [264.300 to 264.317]. These regulations involve requirements for the installation of two or more liners and a leachate collection and removal system (LCRS) above and between the liners to protect human health and the environment. Exceptions to the double liner and leachate collection system requirements are allowed, if alternative design and operating practices, together with location characteristics, are demonstrated to EPA's Regional Administrator to be equally effective in preventing the migration of any hazardous constituent into the ground water or surface water.

NRC regulations in 10 CFR Part 61, Licensing Requirements for Land Disposal of Radioactive Waste, indicate that long-term stability of the waste and the disposal site require minimization of access of water to the waste [61.7(b)(2)] and that the disposal site must be designed to minimize, to the extent practicable, the contact of water with waste during storage, the contact of standing water with waste during disposal, and the contact of percolating or standing water with wastes after disposal [61.51(a)(6)]. The primary objective of the above NRC regulations is to preclude the possibility of the development of a "bath-tub" effect in which the waste could become immersed in liquid (e.g., from infiltration of surface water runoff) within a disposal unit below grade with a low-permeability bottom surface.

The guidance on a conceptual design approach that is offered in the subsequent paragraphs is intended to present basic design concepts that are acceptable in addressing the regulations of both the NRC and EPA with respect to requirements for liners, leachate collection systems and efforts to minimize the contact of liquid with the waste. It should be recognized that the guidance is being provided at the conceptual level and that the design and details that are complementary to specific site conditions need to be engineered by potential waste facility owners and operators. The application of the guidance in this document will not affect the requirements for licensees of waste disposal facilities to comply with all applicable NRC and EPA regulations.

Conceptual Design

Sketches and a brief discussion of the design considerations for an above grade disposal unit are provided. This design concept has been developed primarily to demonstrate the integration of EPA's regulatory requirements for two or more liners and a leachate collection system above and between liners and the regulations of the NRC that require the contact of water with the waste be minimized. In addition, the design concept fulfills the need under both agencies' regulations to assure long-term stability and minimize active maintenance after site closure.

In this approach, the Mixed LLW would be placed above the original ground surface in a tumulus that would be blended into the disposal site topography. Schematic details of some of the principal design features of an above grade Mixed LLW disposal unit are provided in the sketches accompanying this guidance document. Figure 1 depicts the three dimensional overall view of a conceptual Mixed LLW disposal unit; Figure 2 provides details of the perimeter berm, liners, and leachate collection system; Figure 3 presents a cross-sectional view of the covered portion of the disposal unit; and Figure 4 describes the final cover system.

In the overall view of the Mixed LLW disposal facility, the double liners and leachate collection and removal system are installed before the emplacement of the Mixed LLW; and the cover system is added at closure. The leak detection tank and leachate collection tank are encircled by a berm that controls surface water runoff from precipitation that would fall directly on the waste facility site. The drainage pipes in the upper primary collection system would collect any leachate that could possibly develop above the top flexible membrane liner and below the emplaced waste. Any leachate collected would drain through the pipes to the primary leachate collection tank where the leachate would be tested and treated, if required. Any leachate collected by the lower leachate collection and removal system would drain to the leak detection tank. The development of significant amounts of leachate from the solidified waste after closure is not anticipated. This is because the closure requirements provide that the cover must be designed and constructed 1) to provide long-term minimization of water infiltration into the closed disposal facility, 2) to function with minimum maintenance, 3) to promote drainage and minimize erosion, and 4) to have a permeability less than or equal to the permeability of any bottom liner system. It is anticipated that the area shown on Figure 3 between the slope of the final cover and the run-on control berm, where the tanks are located, would be regraded and the tanks removed at the end of the post-closure care period (normally 30 years) when leachate development and collection is no longer a problem.

Figure 2 provides the general details required by EPA regulations for the double liner and leachate collection and removal system. The perimeter berm for leachate runoff control would assure that all leachate is collected below the waste and safely contained and transported through the drainage layers and pipes to the tanks located outside the final cover slope. NRC's regulations requiring minimizing contact of the waste with water are fulfilled by requiring the waste to be placed above the level of the highest water table fluctuation and above the drainage layers where leachate would collect. The bottom elevation of the solidified Mixed LLW would be required in all instances to be at elevations above the top of the perimeter berm.

In Figures 3 and 4, the design concepts for the final cover over the solidified waste zone and the perimeter berm are presented. The actual zone for placement of solidified Mixed LLW may consist of different options, depending on the licensee's selection. Options that would be acceptable include use of stable high integrity waste containers (HICs) that have the spaces between containers filled with a cohesionless, low compressible fill material or placement of the waste in an engineered structure, such as a reinforced concrete vault. A cover system over the waste that would be acceptable to the EPA and NRC is shown in Figure 4. The cover system would consist of (1) an outer rock or vegetative layer to minimize erosion and provide for long-term stability, (2) a filter and drainage layer that transmits infiltrating water off of the underlying low permeability layers, (3) an impervious flexible membrane liner overlying a compacted low permeability clay layer, and (4) a filter and drainage layer beneath the compacted clay layer. If the solidified waste zone does not consist of an engineered vault structure with a top roof, an additional compacted clay layer should be placed immediately above the emplaced waste to direct any water infiltration away from the waste zone. Mixed LLW that contains Class C waste as designated by NRC's regulations would need to provide sufficient thickness of cover materials or an engineered intruder barrier to ensure the required protection against inadvertent intrusion.

Variations on the above described design approach may include placement of the Mixed LLW in an engineered reinforced concrete vault, a steel fiber polymer-impregnated concrete vault, or double-lined high integrity containers that are hermetically sealed. If proposed by license applicants, these variations would be reviewed by both the EPA and NRC on a case-by-case basis to evaluate their acceptability and conformance with established Federal regulations.

For questions related to NRC regulations and design requirements, contact:

Dr. Sher Bahadur, Project Manager
Division of Low-Level Waste Management
and Decommissioning
Mail Stop 623-SS
U.S. Nuclear Regulatory Commission
Washington, DC 20555

Facility specific questions, permitting requirements, variances and other related concerns should be addressed to either the EPA Regional office or State agency authorized to administer the mixed waste program as appropriate. For general questions related to EPA regulations and design requirements, contact:

Mr. Kenneth Skahn, Senior Engineer
Waste Management Division
Mail Stop WH-565E
U.S. Environmental Protection Agency
401 M Street, SW
Washington, DC 20460

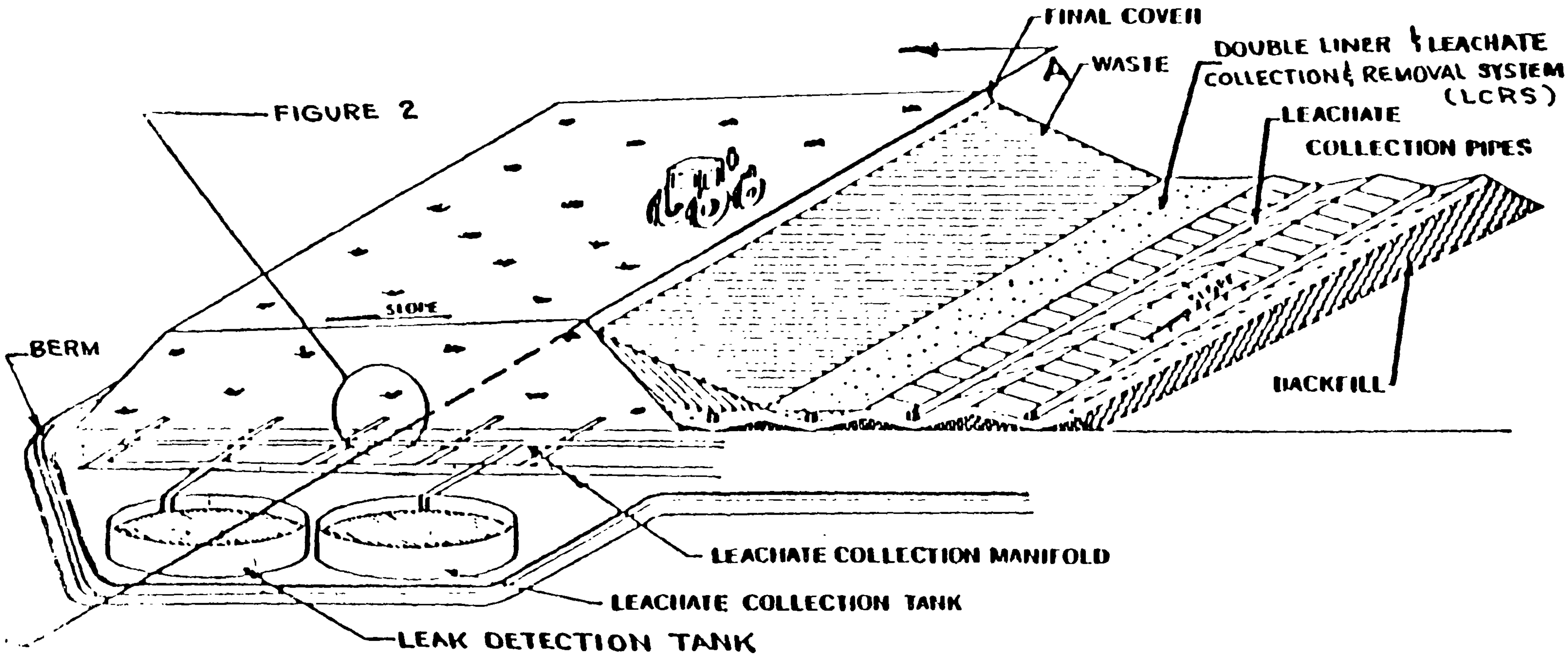
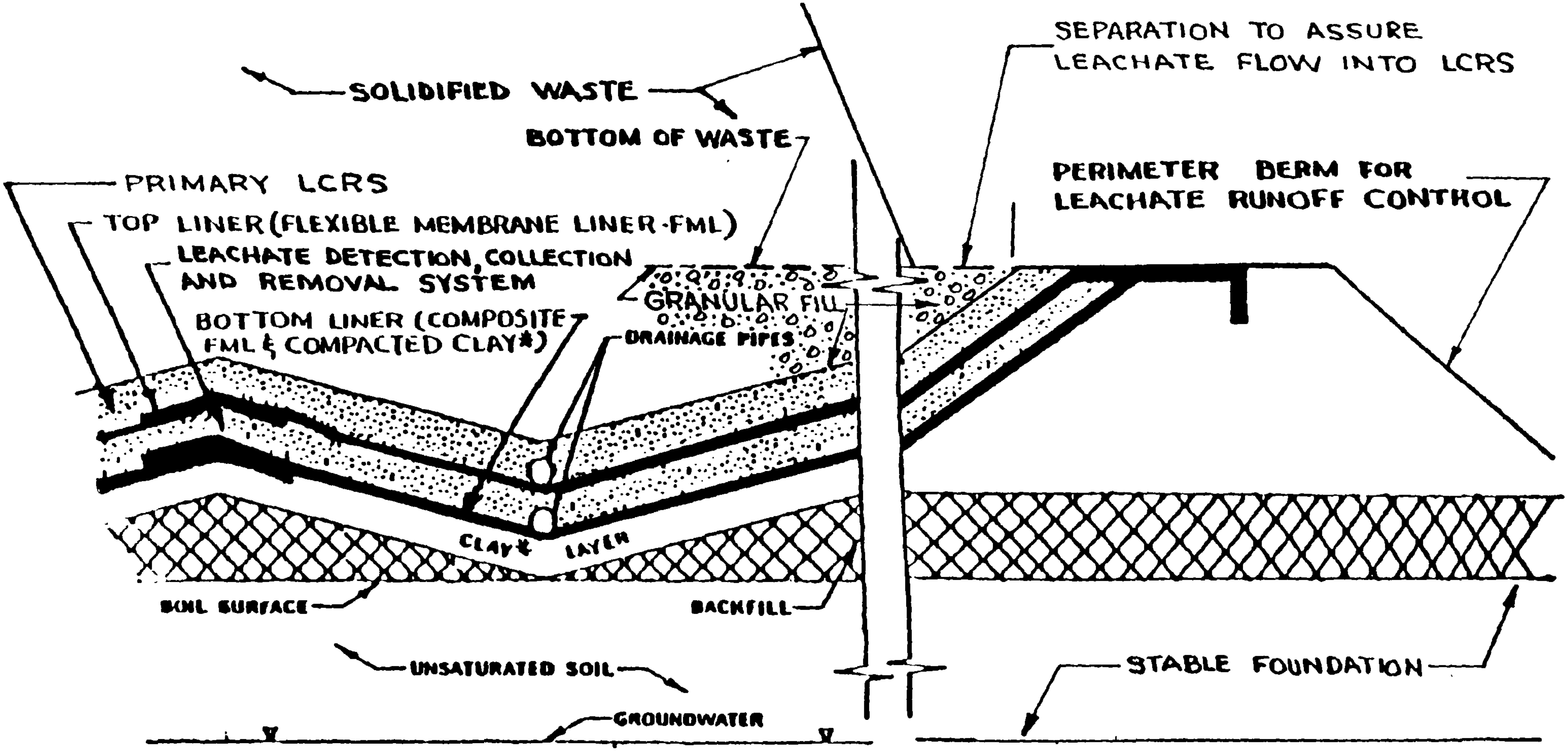


FIGURE 1- MIXED WASTE DISPOSAL FACILITY



*The compacted clay layer is to be a minimum 3 feet in thickness and have a hydraulic conductivity less than 1×10^{-7} cm/sec

FIGURE 2 - DOUBLE LINER AND LEACHATE COLLECTION SYSTEM

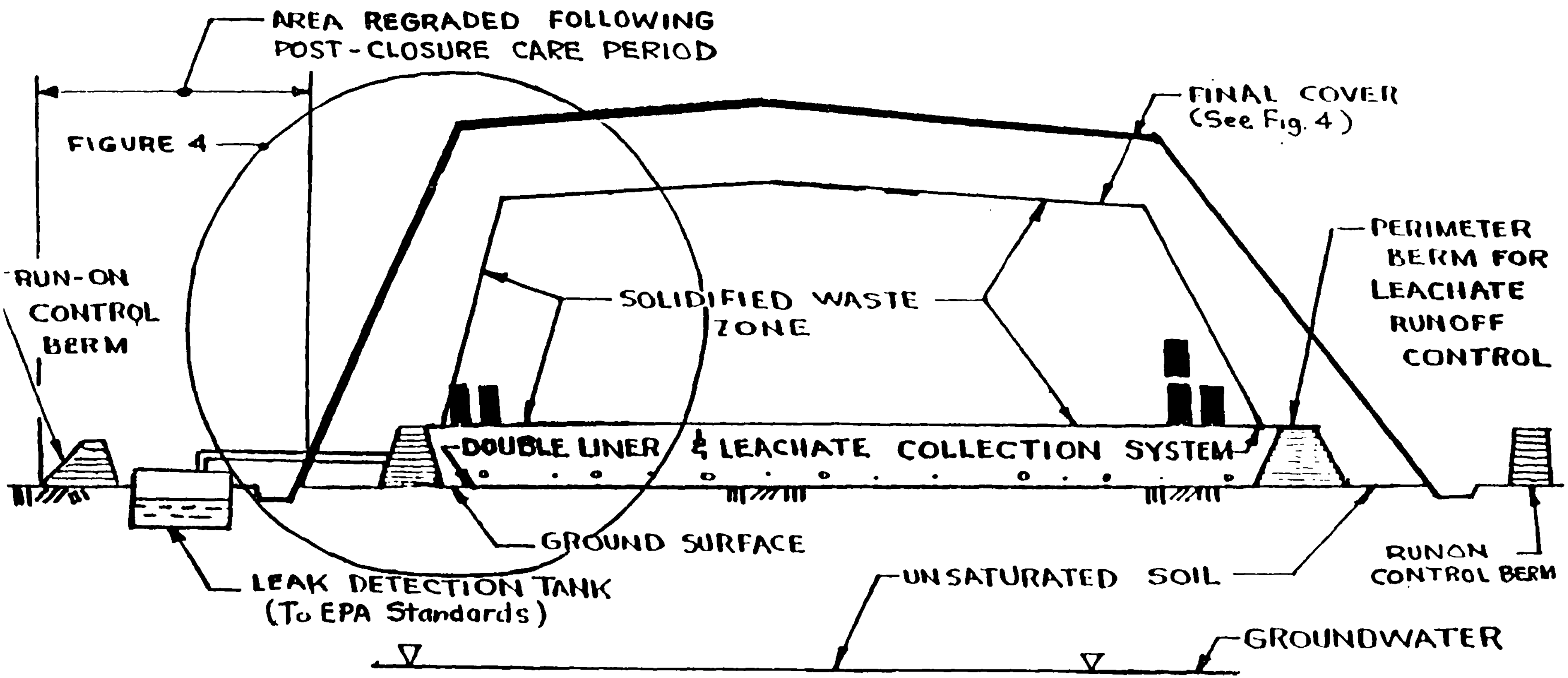


FIGURE 3 - CROSS-SECTIONAL VIEW A-A

(VERTICAL SCALE EXAGGERATED)

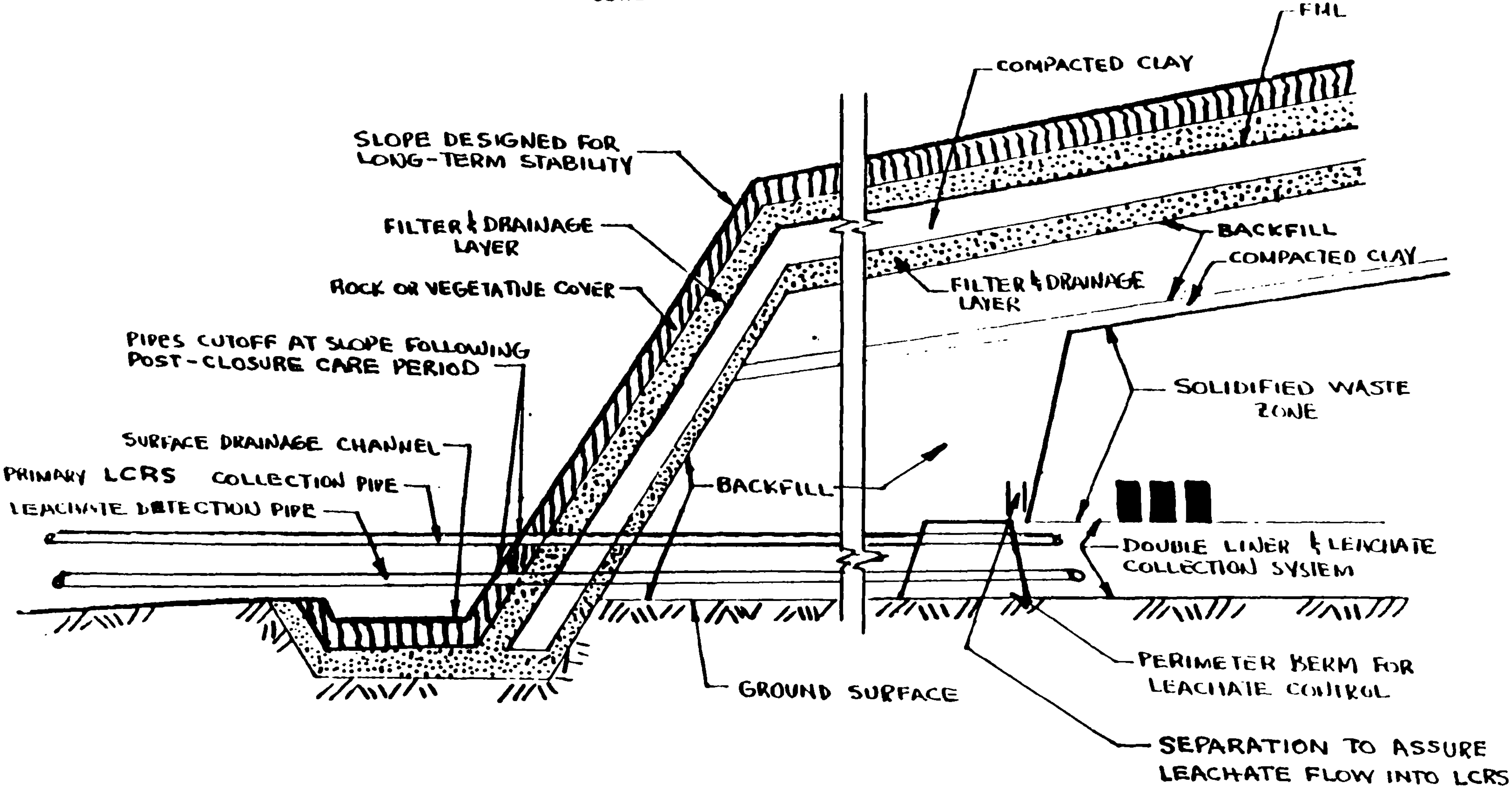


FIGURE 4 - WASTE COVER SYSTEM

(VERTICAL SCALE EXAGGERATED)

Appendix Q

Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste and Answers to Anticipated Questions

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
WASHINGTON, D.C. 20460

OCT 4 1989

OFFICE OF
SOLID WASTE AND EMERGENCY RESPONSE

TO ALL NRC LICENSEES:

SUBJECT: GUIDANCE ON THE DEFINITION AND IDENTIFICATION OF COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE AND ANSWERS TO ANTICIPATED QUESTIONS

The U.S. Environmental Protection Agency (EPA) has jurisdiction under the Resource Conservation and Recovery Act (RCRA) over the management of wastes with the exception of radioactive wastes subject to the Atomic Energy Act (AEA). Accordingly, commercial use and disposal of source, byproduct and special nuclear material wastes are regulated by the U.S. Nuclear Regulatory Commission (NRC) to meet EPA environmental standards. Under the AEA Low-Level Radioactive Wastes (LLW) contain source, byproduct, or special nuclear material, but they may also contain chemical constituents which are hazardous under EPA regulations in 40 CFR Part 261. Such wastes are commonly referred to as Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW).

NRC regulations exist to control the byproduct, source, and special nuclear material components of commercial Mixed LLW; EPA has the authority and continues to develop regulations to control the non-radioactive component of the Mixed LLW. Thus, the individual constituents of commercial Mixed LLW are subject to either NRC or EPA regulations. However, when the components are combined to become Mixed LLW, neither statute has exclusive jurisdiction. This has resulted in a situation of dual regulation where both NRC and EPA may regulate the same waste.

Enclosed is the revised guidance document entitled, "Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste." This document was developed jointly by the NRC and EPA to aid commercial LLW generators in assessing whether they are currently generating Mixed LLW. It is based on NRC and EPA regulations in effect on December 31, 1988.

Notice of availability of the guidance document and request for comments were published in the Federal Register on April 7, 1987, and comments were subsequently received. We have addressed public comment in the question and answer section of the guidance document to provide clarification of those major issues which were raised.

Sincerely,

Jonathan Z. Cannon

Jonathan Z. Cannon, Acting
Assistant Administrator
Office of Solid Waste and
Emergency Response
U.S. Environmental Protection
Agency

Robert Bernero

Robert Bernero, Director
Office of Nuclear Material
Safety and Safeguards
U.S. Nuclear Regulatory
Commission

GUIDANCE ON THE DEFINITION AND IDENTIFICATION OF COMMERCIAL MIXED LOW-LEVEL RADIOACTIVE AND HAZARDOUS WASTE

Definition

Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW) is defined as waste that satisfies the definition of low-level radioactive waste (LLW) in the Low-Level Radioactive Waste Policy Amendments Act of 1985 (LLRWPAA) and contains hazardous waste that either (1) is listed as a hazardous waste in Subpart D of 40 CFR Part 261 or (2) cause the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261.

Identification

The policy provided in this guidance was developed jointly by the U.S. Nuclear Regulatory Commission (NRC) and the U.S. Environmental Protection Agency (EPA). LLW that contains hazardous wastes defined under the Resource Conservation and Recovery Act (RCRA) is Mixed LLW. Under current Federal law, such waste is subject to regulation by NRC under the Atomic Energy Act (AEA), as amended, and by EPA under RCRA, as amended. In the absence of legislation to the contrary, management and disposal of this waste must be conducted in compliance with NRC and EPA or equivalent state regulations.

This guidance presents a methodology (Figure 1) that may be used by generators of commercial LLW to identify Mixed LLW. Implementation of the methodology should identify Mixed LLW and aid generators in assessing whether they are currently generating Mixed LLW. Generators are cautioned, however, that application of the methodology does not affect the need to comply with applicable NRC and EPA regulations. Because EPA's regulations for hazardous waste are currently changing, generators should use applicable regulations that are in effect at the time of implementation of the methodology. This guidance has been prepared based on NRC and EPA regulations in effect on December 31, 1988.

Application of this methodology to identify Mixed LLW will reveal the complexities of the definition of Mixed LLW. If generators have specific questions about whether LLW is Mixed LLW, they should promptly contact the agencies by writing to the persons listed below.

For questions about whether the waste is low-level radioactive waste, contact:

Mr. Dan E. Martin
Division of Low-Level Waste Management and Decommissioning
U.S. Nuclear Regulatory Commission
Mail Stop WF5E4
Washington, D.C. 20555

For questions about wheth the waste is hazardous waste, contact:

Ms. Betty Shackleford
Mixed Waste Coordinator
Permits and State Programs Division
Mail Code OS-342
U.S. Environmental Protection Agency
401 M St., S.W.
Washington, D.C. 20460

Methodology

Step 1. Identify LLW

Step 1 in the methodology requires that the generator determine whether the waste is LLW as defined in the LLRWPAA. This Act defines LLW as radioactive material that (A) is not high-level radioactive waste, spent nuclear fuel, or byproduct material as defined in section 11e(2) of the AEA (i.e., uranium or thorium mill tailings) and (B) the NRC classifies as LLW consistent with existing law and in accordance with (A). If the generator determines that the waste is LLW, the generator should proceed to step 2. If the determination i negative, then the waste cannot be Mixed LLW because it is not LLW. However, the waste may be another radioactive or hazardous waste regulated under AEA, RCRA, or both statutes.

Step 2. Identify Listed Hazardous Waste

In step 2, the generator determines whether the LLW contains any hazardous wastes listed in Subpart D of 40 CFR Part 261. Subpart D of Part 261 is reproduced in Appendix I of this guidance. LLW is Mixed LLW if it contains any hazardous wastes specifically listed in Subpart D of 40 CFR Part 261. Listed hazardous wastes include hazardous waste streams from specific and non-specific sources listed in 40 CFR Parts 261.31 and 261.32 and discarded commercial chemical products listed in 40 CFR Part 261.33. The generator is responsible for determining whether LLW contains listed hazardous wastes. The determination should be based on knowledge of the process that generates the waste. For example, if a process produces LLW that contains spent solvents that are specifically listed in the tables of Subpart D of Part 261, the generator should suspect that the waste is Mixed LLW.

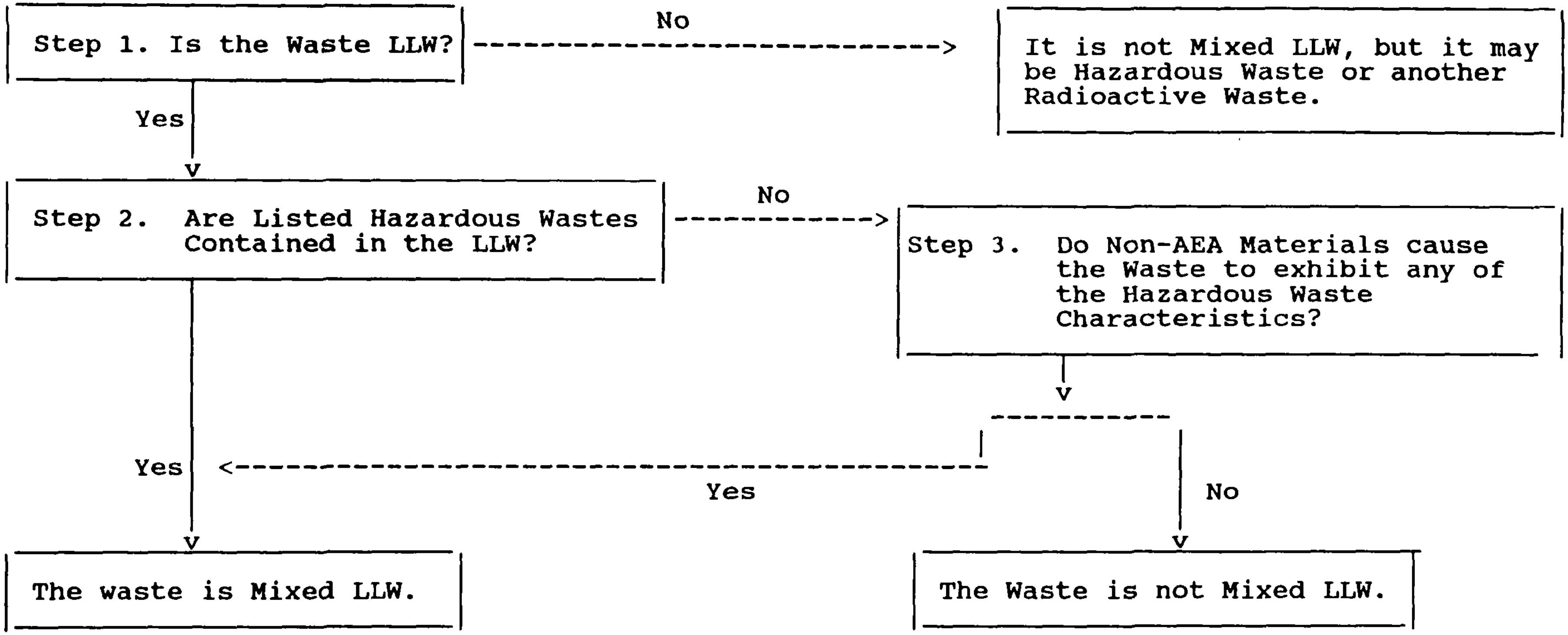


Figure 1. Identification of Mixed LLW.

Step 3. Identify Hazardous Characteristics

If the LLW does not contain a listed hazardous waste, Step 3 of the methodology requires the generator to determine whether the LLW contains hazardous wastes that cause the LLW to exhibit any of the hazardous waste characteristics identified in Subpart C of 40 CFR Part 261. This determination can be based on either (1) an assessment of whether the LLW exhibits one or more of the hazardous waste characteristics because it contains non-AEA materials (i.e., materials other than source, special nuclear, and byproduct materials) based on the generator's knowledge of the materials or processes used in generating the LLW or (2) testing of the LLW in accordance with the methods identified in Subpart C of Part 261. Except for certain ores containing source material, which are defined as source material in 10 CFR 40.4(h), and uranium and thorium mill tailings or wastes, NRC and EPA interpret the definitions of source, special nuclear, and byproduct materials to include only the radioactive elements themselves. Generators should identify non-AEA materials contained in the LLW by examining the process that generates the waste. For example, if the process mixes byproduct material (an AEA material) with a volatile organic solvent (a non-AEA material), the generator would determine either through his knowledge or testing of representative samples of the LLW that contain the solvent waste whether the waste exhibits any of the hazardous waste characteristics because it contains the solvent.

If the wastes are tested, the generator should collect and test representative samples of the LLW to determine if the waste exhibits any of the characteristics identified in Subpart C because it contains the non-AEA materials. These characteristics include ignitability (Section 261.21), corrosivity (Section 261.22), reactivity (Section 261.23), and Extraction Procedure (EP) toxicity (Section 261.24). Waste testing should be conducted in a manner that is consistent with the worker protection requirements in 10 CFR Part 20. The purpose of the characteristics tests is to identify hazardous wastes that are not specifically listed in Subpart D of 40 CFR Part 261. Test methods to collect representative samples of wastes are described in Appendix I of 40 CFR Part 261. The samples should then be tested using the referenced testing protocols (e.g., ASTM Standard D-93-79 or D-93-80 for the Pensky-Martens Closed Cup Ignitability Test). EPA's testing requirements are reproduced in Appendix II of this guidance. It should be noted that on June 13, 1986, EPA proposed a modification to the EP Toxicity testing requirements to include organic constituents.

If LLW contains a listed hazardous waste or non-AEA materials that cause the LLW to exhibit any of the hazardous waste characteristics, the waste is Mixed LLW and must, therefore, be managed and disposed of in compliance with EPA's Subtitle C hazardous waste regulations in 40 CFR Parts 124, and 260 through 270, and NRC's regulations in 10 CFR Parts 20, 30, 40, 61, and 70.

Management and disposal of Mixed LLW must be conducted in compliance with state requirements in states with EPA-authorized regulatory programs for the hazardous components of such waste and NRC agreement state radiation control programs for LLW.

Questions and Answers

As a supplement to the Guidance on the Definition and Identification of Commercial Mixed Low-Level Radioactive and Hazardous Waste (Mixed LLW), answers to anticipated questions are included to clarify obscure points and to respond to public comments.

1. Are my low-level radioactive wastes exempt from RCRA because they are source, special nuclear, or byproduct materials as defined under the AEA?

Except for certain ores containing source material, which are defined as source material in 10 CFR 40.4(h), and uranium and thorium mill tailings or wastes, NRC and EPA consider that only the radionuclides themselves are exempt from RCRA. Section 1004(27) of RCRA excludes source, special nuclear, and byproduct material from the definition of "solid waste." RCRA defines solid waste as:

> "any garbage, refuse, sludge from a waste treatment plant, water supply treatment plant, or air pollution control facility and other discarded material, including solid, liquid, semisolid, or contained gaseous material resulting from industrial, commercial, mining, and agricultural operations, or from community activities, <u>but does not include</u> solid or dissolved materials in irrigation return flows or industrial discharges which are point sources subject to permits under section 402 of the Federal Waster Pollution Control Act, as amended (86 Stat. 880), or <u>source</u>, <u>special nuclear</u>, or <u>byproduct material</u> as defined by the Atomic Energy Act of 1954, as amended (68 Stat. 923)." [emphasis added]

Since "hazardous waste" is a subset of "solid waste," RCRA also excludes source, special nuclear, and byproduct materials from the definition of hazardous waste and, therefore, from regulation under EPA's RCRA Subtitle C program. Section 11 of the Atomic Energy Act, as amended, defines these radioactive materials as follows:

> Source material means (1) uranium, thorium, or any other material which is determined by the Atomic Energy Commission (AEC) pursuant to the provisions of section 61 of the AEA to be source material, or (2) ores containing one or more of the foregoing materials, in such concentration as the AEC may by regulation determine from time to time.
>
> Special nuclear material means (1) plutonium, uranium enriched in the isotope 233 or in the isotope 235, and any other material which the AEC, pursuant to the provisions of Section 51 of the AEA, determines to be special nuclear material; or (2) any material artificially enriched by any of the foregoing, but does not include source material.

> Byproduct material means (1) any radioactive material (except special nuclear material) yielded in or made radioactive by exposure to radiation incident to the process of producing or utilizing special nuclear material, and (2) the tailings or wastes produced by the extraction or concentration of uranium or thorium from any ore processed primarily for its source material content.

Source, special nuclear, and byproduct materials, however, may be mixed with other radioactive or non-radioactive materials that are not source, special nuclear, or byproduct materials. For example, tritium may be contained in toluene, a nonhalogenated aromatic solvent. Consistent with the definition of byproduct material, the tritium may be considered a byproduct material, while the toluene that contains the tritium would not be byproduct material. Mixtures of toluene and tritium could satisfy the definition of Mixed LLW because they contain listed hazardous waste (spent toluene) and tritium that may qualify as LLW if it has been produced by activities regulated by NRC under the AEA.

2. What are some examples of Mixed LLW?

A preliminary survey performed for the NRC identified two potential types of Mixed LLW:

- LLW containing organic liquids, such as scintillation liquids and vials; organic lab liquids; sludges; and cleaning, degreasing, and miscellaneous solvents.

- LLW containing heavy metals, such as discarded lead shielding, discarded lined containers, and lead oxide dross containing uranium oxide; light water reactor (LWR) process wastes containing chromate and LWR decontamination resins containing chromium; and mercury amalgam in trash.

The preliminary survey concluded that potential Mixed LLW comprises a small percentage of all LLW. For example, LLW containing organic liquids accounted for approximately 2.3% by volume of LLW reported in the preliminary survey (Bowerman, et al., 1985).

An earlier survey identified a more diverse universe of potential Mixed LLW including wastes that contained aldehydes, aliphatic halogenated hydrocarbons, alkanes, alkenes, amino acids, aromatic hydrocarbons, chelating agents, esters, ethers, ketones, nitrosamines, nucleotides, pesticides, phenolic compounds, purines, resins, steroids, and vitamins (General Research Corporation, 1980). NRC also anticipates that additional LLW may be identified as Mixed LLW in the future, as generators implement the definition of Mixed LLW and as EPA revises the definition of hazardous waste.

3. Could some "below regulatory concern" wastes be considered Mixed LLW?

A determination that radioactive wastes are below regulatory concern (BRC) for radioactivity may affect how the wastes are managed or discarded, but it does not affect the legal status of the wastes. Specifically, their status with respect to the definition of Mixed LLW does not change. BRC waste is still LLW because it satisfies the definition of LLW in the LLRWPAA and is within the NRC's jurisdictional authority under the AEA.

When radioactive waste contains sufficiently low concentrations or quantities of radionuclides, NRC may find that they do not need to be managed or disposed of as radioactive wastes. For NRC to make such a finding, management and disposal of the waste must not pose an undue radiological risk to the public and the environment. However, NRC's determination that the radioactive content of the wastes is below NRC regulatory concern does not relieve licensees from compliance with applicable rules of other agencies governing non-radiological hazards (e.g., regulations of EPA or the Department of Transportation).

Therefore, some BRC wastes may still be considered Mixed LLW if they contain hazardous wastes that have been listed in Subpart D of 40 CFR Part 261 or that cause the LLW to exhibit any of the hazardous characteristics described in Subpart C of 40 CFR Part 261. BRC Mixed LLW may be managed without regard to its radioactivity (but it must still be managed as a hazardous waste in compliance with EPA's regulations for hazardous waste generation, storage, transportation, treatment, and disposal (cf. 40 CFR Parts 262 through 266)).

4. If I use chemicals in my process that are identified by EPA as hazardous constituents, should I assume that my LLW is Mixed LLW?

No. Low-level radioactive waste that contains hazardous constituents may not necessarily be Mixed LLW. As defined above, Mixed LLW is LLW that contains a known hazardous waste (i.e., a listed hazardous waste) or that exhibits one or more of the hazardous characteristics because it contains non-AEA materials. For wastes that are not listed in Subpart D of 40 CFR Part 261, testing is not necessarily required to "determine" whether the LLW exhibits any of the hazardous characteristics. A generator may be able to determine whether the LLW is Mixed LLW based on knowledge of the waste characteristics or the process that generates the LLW.

Furthermore, if the generator normally segregates LLW from hazardous and other types of wastes, there is no need to assume that hazardous wastes may have been inadvertently mixed with LLW or to inspect each container or receptacle to ensure that inadvertent mixing has not occurred. Although the generator is subject to RCRA inspections and must follow the manifest, pre-transport, and other requirements of

40 CFR Part 262, the generator is not required to demonstrate that every LLW container does not contain hazardous waste.

5. How can I obtain representative samples of heterogeneous trash included in LLW to perform the hazardous characteristics tests?

Before discussing the collection of representative samples of waste, generators are reminded that they are not required to test LLW to determine if the waste contains hazardous wastes. Generators and handlers of mixed waste and hazardous waste can declare their wastes hazardous or nonhazardous based on knowledge of the process/production of the waste, in lieu of testing for a characteristic.

Representative samples of waste should be collected for testing in accordance with EPA's regulations in 40 CFR 261.20(c), which state that waste samples collected using applicable methods specified in Appendix I of Part 261 will be considered as representative samples for hazardous characteristics testing. This appendix has been included in its entirety in Appendix II of this guidance. The sampling techniques described in Appendix I of Part 261 apply to extremely viscous liquids, fly ash-like material, containerized liquid wastes, and liquid wastes in pits, ponds, lagoons, and similar reservoirs. In the absence of guidance about sampling heterogeneous wastes, generators should use appropriate portions of the sampling methods described in Appendix I of Part 261 and EPA's manual entitled "Test Methods for Evaluating Solid Waste, Third Edition (i.e., SW-846) in combination with other methods to collect, to the maximum extent practicable, representative samples of the waste to be tested.

6. Are lead containers whose primary use is for shielding in disposal operations, hazardous waste under RCRA?

No. While lead containers and lead container liners may exhibit the hazardous characteristic for lead, those containers whose primary use is for shielding in low-level waste disposal operations are not considered wastes and thus, are not subject to the hazardous waste rules. These same containers and liners if disposed of or discarded would be considered wastes and if they exhibit the hazardous characteristic, would be subject to the hazardous waste rules.

It should be noted that EPA recognizes that all lead containers and liners may be equally hazardous to human health and the environment when placed in the ground independent of its legal classification as a waste or container. Therefore, EPA recommends that all lead containers and lead liners be managed in an environmentally safe manner (e.g., managed in a permitted hazardous waste facility or treated such that it no longer exhibits its characteristic).

Encapsulation may be a viable mechanism to mitigate lead migration from these containers and liners. The EPA has not evaluated specific containers or encapsulation methodologies using the EP Toxicity test.

7. If a waste contains any of the constituents listed on Appendix VIII of Part 261, is it a hazardous under RCRA?

No. Under RCRA, a waste is hazardous if it is a "listed" waste or it exhibits a hazardous characteristic. Wastes are listed by EPA if they contain significant amounts of toxic constituents identified in Appendix VIII, and the Agency has determined that these toxic constituents are persistent and mobile to some degree such that they pose a potential and substantial threat to human health and the environment. (Factors outlined in 40 CFR 261.11(a)(3)(i)-(xi), which include nature of the toxicity present and potential degradation products, may be considered when determining whether or not a waste should be listed). However, until the Agency lists the wastes in Subpart D of Part 261, they would not be considered hazardous by EPA (even if the waste contains one or more of the hazardous constituents listed on Appendix VIII) unless the waste would exhibit one or more of the hazardous waste characteristics.

References

Bowerman, B. S., Kempf, C. R., MacKenzie, D. R., Siskind, B. and P. L. Piciulo, 1985, "An Analysis of Low-Level Wastes: Review of Hazardous Waste Regulations and Identification of Radioactive Mixed Wastes," NUREG/CR-4406, U.S. Nuclear Regulatory Commission.

General Research Corporation, 1980, "Study of Chemical Toxicity of Low-Level Wastes," NUREG/CR-1793, U.S. Nuclear Regulatory Commission.

Appendix I

Subpart D—Lists of Hazardous Wastes

§ 261.30 General.

(a) A solid waste is a hazardous waste if it is listed in this subpart, unless it has been excluded from this list under §§ 260.20 and 260.22.

(b) The Administrator will indicate his basis for listing the classes or types of wastes listed in this Subpart by employing one or more of the following Hazard Codes:

Ignitable Waste	(I)
Corrosive Waste	(C)
Reactive Waste	(R)
EP Toxic Waste	(E)
Acute Hazardous Waste	(H)
Toxic Waste	(T)

Appendix VII identifies the constituent which caused the Administrator to list the waste as an EP Toxic Waste (E) or Toxic Waste (T) in §§ 261.31 and 261.32.

(c) Each hazardous waste listed in this subpart is assigned an EPA Hazardous Waste Number which precedes the name of the waste. This number must be used in complying with the notification requirements of Section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265 and Part 270 of this chapter.

(d) The following hazardous wastes listed in § 261.31 or § 261.32 are subject to the exclusion limits for acutely hazardous wastes established in § 261.5: EPA Hazardous Wastes Nos. FO20, FO21, FO22, FO23, FO26, and FO27.

[45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983; 50 FR 2000, Jan. 14, 1985]

§ 261.31 Hazardous wastes from non-specific sources.

The following solid wastes are listed hazardous wastes from non-specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No.	Hazardous waste	Hazard code
Generic		
F001	The following spent halogenated solvents used in degreasing: Tetrachloroethylene, trichloroethylene, methylene chloride, 1,1,1-trichloroethane, carbon tetrachloride, and chlorinated fluorocarbons; all spent solvent mixtures/blends used in degreasing containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those solvents listed in F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F002	The following spent halogenated solvents: Tetrachloroethylene, methylene chloride, trichloroethylene, 1,1,1-trichloroethane, chlorobenzene, 1,1,2-trichloro-1,2,2-trifluoroethane, ortho-dichlorobenzene, trichlorofluoromethane, and 1,1,2 trichloroethane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above halogenated solvents or those listed in F001, F004, or F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F003	The following spent non-halogenated solvents: Xylene, acetone, ethyl acetate, ethyl benzene, ethyl ether, methyl isobutyl ketone, n-butyl alcohol, cyclohexanone, and methanol; all spent solvent mixtures/blends containing, before use, only the above spent non-halogenated solvents; and all spent solvent mixtures/blends containing, before use, one or more of the above non-halogenated solvents, and, a total of ten percent or more (by volume) of one or more of those solvents listed in F001, F002, F004, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I)*
F004	The following spent non-halogenated solvents: Cresols and cresylic acid, and nitrobenzene; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, and F005; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(T)
F005	The following spent non-halogenated solvents: Toluene, methyl ethyl ketone, carbon disulfide, isobutanol, pyridine, benzene, 2-ethoxyethanol, and 2-nitropropane; all spent solvent mixtures/blends containing, before use, a total of ten percent or more (by volume) of one or more of the above non-halogenated solvents or those solvents listed in F001, F002, or F004; and still bottoms from the recovery of these spent solvents and spent solvent mixtures.	(I,T)
F006	Wastewater treatment sludges from electroplating operations except from the following processes: (1) Sulfuric acid anodizing of aluminum; (2) tin plating on carbon steel; (3) zinc plating (segregated basis) on carbon steel; (4) aluminum or zinc-aluminum plating on carbon steel; (5) cleaning/stripping associated with tin, zinc and aluminum plating on carbon steel; and (6) chemical etching and milling of aluminum.	(T)
F019	Wastewater treatment sludges from the chemical conversion coating of aluminum	(T)
F007	Spent cyanide plating bath solutions from electroplating operations	(R, T)
F008	Plating bath residues from the bottom of plating baths from electroplating operations where cyanides are used in the process	(R, T)
F009	Spent stripping and cleaning bath solutions from electroplating operations where cyanides are used in the process	(R, T)
F010	Quenching bath residues from oil baths from metal heat treating operations where cyanides are used in the process	(R, T)
F011	Spent cyanide solutions from salt bath pot cleaning from metal heat treating operations	(R, T)
F024	Wastes, including but not limited to, distillation residues, heavy ends, tars, and reactor clean-out wastes from the production of chlorinated aliphatic hydrocarbons, having carbon content from one to five, utilizing free radical catalyzed processes. (This listing does not include light ends, spent filters and filter aids, spent dessicants, wastewater, wastewater treatment sludges, spent catalysts, and wastes listed in § 261.32.)	(T)
F020	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- or tetrachlorophenol, or of intermediates used to produce their pesticide derivatives. (This listing does not include wastes from the production of Hexachlorophene from highly purified 2,4,5-trichlorophenol.)	(H)
F021	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of pentachlorophenol, or of intermediates used to produce its derivatives.	(H)
F022	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzenes under alkaline conditions.	(H)
F023	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the production or manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tri- and tetrachlorophenols. (This listing does not include wastes from equipment used only for the production or use of Hexachlorophene from highly purified 2,4,5-trichlorophenol.)	(H)
F026	Wastes (except wastewater and spent carbon from hydrogen chloride purification) from the production of materials on equipment previously used for the manufacturing use (as a reactant, chemical intermediate, or component in a formulating process) of tetra-, penta-, or hexachlorobenzene under alkaline conditions.	(H)
F027	Discarded unused formulations containing tri-, tetra-, or pentachlorophenol or discarded unused formulations containing compounds derived from these chlorophenols. (This listing does not include formulations containing Hexachlorophene synthesized from prepurified 2,4,5-trichlorophenol as the sole component.)	(H)
F028	Residues resulting from the incineration or thermal treatment of soil contaminated with EPA Hazardous Waste Nos. F020, F021, F022, F023, F026, and F027.	(T)

*(I,T) should be used to specify mixtures containing ignitable and toxic constituents.

[46 FR 4617, Jan. 16, 1981, as amended at 46 FR 27477, May 20, 1981; 49 FR 5312, Feb. 10, 1984; 49 FR 37070, Sept. 21, 1984; 50 FR 665, Jan. 4, 1985; 50 FR 2000, Jan. 14, 1985; 50 FR 53319, Dec. 31, 1985; 51 FR 2702, Jan. 21, 1986; 51 FR 6541, Feb. 25, 1986]

§ 261.32 Hazardous wastes from specific sources.

The following solid wastes are listed hazardous wastes from specific sources unless they are excluded under §§ 260.20 and 260.22 and listed in Appendix IX.

Industry and EPA hazardous waste No	Hazardous waste	Hazard code
Wood preservation: K001	Bottom sediment sludge from the treatment of wastewaters from wood preserving processes that use creosote and/or pentachlorophenol	(T)
Inorganic pigments		
K002	Wastewater treatment sludge from the production of chrome yellow and orange pigments	(T)
K003	Wastewater treatment sludge from the production of molybdate orange pigments	(T)
K004	Wastewater treatment sludge from the production of zinc yellow pigments	(T)
K005	Wastewater treatment sludge from the production of chrome green pigments	(T)
K006	Wastewater treatment sludge from the production of chrome oxide green pigments (anhydrous and hydrated)	(T)
K007	Wastewater treatment sludge from the production of iron blue pigments	(T)
K008	Oven residue from the production of chrome oxide green pigments	(T)
Organic chemicals		
K009	Distillation bottoms from the production of acetaldehyde from ethylene	(T)
K010	Distillation side cuts from the production of acetaldehyde from ethylene	(T)
K011	Bottom stream from the wastewater stripper in the production of acrylonitrile	(R, T)
K013	Bottom stream from the acetonitrile column in the production of acrylonitrile	(R, T)
K014	Bottoms from the acetonitrile purification column in the production of acrylonitrile	(T)
K015	Still bottoms from the distillation of benzyl chloride	(T)
K016	Heavy ends or distillation residues from the production of carbon tetrachloride	(T)
K017	Heavy ends (still bottoms) from the purification column in the production of epichlorohydrin	(T)
K018	Heavy ends from the fractionation column in ethyl chloride production	(T)
K019	Heavy ends from the distillation of ethylene dichloride in ethylene dichloride production.	(T)
K020	Heavy ends from the distillation of vinyl chloride in vinyl chloride monomer production	(T)
K021	Aqueous spent antimony catalyst waste from fluoromethanes production	(T)
K022	Distillation bottom tars from the production of phenol/acetone from cumene	(T)
K023	Distillation light ends from the production of phthalic anhydride from naphthalene	(T)
K024	Distillation bottoms from the production of phthalic anhydride from naphthalene	(T)
K093	Distillation light ends from the production of phthalic anhydride from ortho-xylene	(T)
K094	Distillation bottoms from the production of phthalic anhydride from ortho-xylene	(T)
K025	Distillation bottoms from the production of nitrobenzene by the nitration of benzene	(T)
K026	Stripping still tails from the production of methy ethyl pyridines	(T)
K027	Centrifuge and distillation residues from toluene diisocyanate production	(R, T)
K028	Spent catalyst from the hydrochlorinator reactor in the production of 1,1,1-trichloroethane	(T)
K029	Waste from the product steam stripper in the production of 1,1,1-trichloroethane	(T)
K095	Distillation bottoms from the production of 1,1,1-trichloroethane	(T)
K096	Heavy ends from the heavy ends column from the production of 1,1,1-trichloroethane	(T)
K030	Column bottoms or heavy ends from the combined production of trichloroethylene and perchloroethylene	(T)
K083	Distillation bottoms from aniline production	(T)
K103	Process residues from aniline extraction from the production of aniline	(T)
K104	Combined wastewater streams generated from nitrobenzene/aniline production	(T)
K085	Distillation or fractionation column bottoms from the production of chlorobenzenes	(T)
K105	Separated aqueous stream from the reactor product washing step in the production of chlorobenzenes.	(T)
Inorganic chemicals		
K071	Brine purification muds from the mercury cell process in chlorine production, where separately prepurified brine is not used	(T)
K073	Chlorinated hydrocarbon waste from the purification step of the diaphragm cell process using graphite anodes in chlorine production	(T)
K106	Wastewater treatment sludge from the mercury cell process in chlorine production	(T)
Pesticides:		
K031	By-product salts generated in the production of MSMA and cacodylic acid	(T)
K032	Wastewater treatment sludge from the production of chlordane	(T)
K033	Wastewater and scrub water from the chlorination of cyclopentadiene in the production of chlordane	(T)
K034	Filter solids from the filtration of hexachlorocyclopentadiene in the production of chlordane	(T)
K097	Vacuum stripper discharge from the chlordane chlorinator in the production of chlordane	(T)
K035	Wastewater treatment sludges generated in the production of creosote	(T)
K036	Still bottoms from toluene reclamation distillation in the production of disulfoton	(T)
K037	Wastewater treatment sludges from the production of disulfoton	(T)
K038	Wastewater from the washing and stripping of phorate production	(T)
K039	Filter cake from the filtration of diethylphosphorodithioic acid in the production of phorate	(T)
K040	Wastewater treatment sludge from the production of phorate	(T)
K041	Wastewater treatment sludge from the production of toxaphene	(T)
K098	Untreated process wastewater from the production of toxaphene	(T)

Industry and EPA hazardous waste No	Hazardous waste	Hazard code
K042	Heavy ends or distillation residues from the distillation of tetrachlorobenzene in the production of 2,4,5-T	(T)
K043	2,6-Dichlorophenol waste from the production of 2,4-D	(T)
K099	Untreated wastewater from the production of 2,4-D	(T)
Explosives		
K044	Wastewater treatment sludges from the manufacturing and processing of explosives	(R)
K045	Spent carbon from the treatment of wastewater containing explosives	(R)
K046	Wastewater treatment sludges from the manufacturing, formulation and loading of lead-based initiating compounds.	(T)
K047	Pink/red water from TNT operations	(R)
Petroleum refining		
K048	Dissolved air flotation (DAF) float from the petroleum refining industry	(T)
K049	Slop oil emulsion solids from the petroleum refining industry	(T)
K050	Heat exchanger bundle cleaning sludge from the petroleum refining industry	(T)
K051	API separator sludge from the petroleum refining industry	(T)
K052	Tank bottoms (leaded) from the petroleum refining industry	(T)
Iron and steel		
K061	Emission control dust/sludge from the primary production of steel in electric furnaces.	(T)
K062	Spent pickle liquor generated by steel finishing operations of plants that produce iron or steel.	(C,T)
Secondary lead:		
K069	Emission control dust/sludge from secondary lead smelting	(T)
K100	Waste leaching solution from acid leaching of emission control dust/sludge from secondary lead smelting.	(T)
Veterinary pharmaceuticals:		
K084	Wastewater treatment sludges generated during the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds	(T)
K101	Distillation tar residues from the distillation of aniline-based compounds in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
K102	Residue from the use of activated carbon for decolorization in the production of veterinary pharmaceuticals from arsenic or organo-arsenic compounds.	(T)
Ink formulation: K086	Solvent washes and sludges, caustic washes and sludges, or water washes and sludges from cleaning tubs and equipment used in the formulation of ink from pigments, driers, soaps, and stabilizers containing chromium and lead.	(T)
Coking:		
K060	Ammonia still lime sludge from coking operations	(T)
K087	Decanter tank tar sludge from coking operations	(T)

[46 FR 4618, Jan. 16, 1981, as amended at 46 FR 27476–27477, May 20, 1981; 49 FR 37070, Sept. 21, 1984; 50 FR 42942, Oct. 23, 1985; 51 FR 5330, Feb. 13, 1986; 51 FR 19322, May 28, 1986]

EFFECTIVE DATE NOTE: At 51 FR 5330, Feb. 13, 1986, in § 261.32, waste streams "K117, K118, and K136" in the subgroup "Organic Chemicals" were added, effective August 13, 1986.

§ 261.33 Discarded commercial chemical products, off-specification species, container residues, and spill residues thereof.

The following materials or items are hazardous wastes if and when they are discarded or intended to be discarded, when they are mixed with waste oil or used oil or other material and applied to the land for dust suppression or road treatment, or when, in lieu of their original intended use, they are produced for use as (or as a component of) a fuel, distributed for use as a fuel, or burned as a fuel.

(a) Any commercial chemical product, or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section.

(b) Any off-specification commercial chemical product or manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

(c) Any container or inner liner removed from a container that has been used to hold any commercial chemical product or manufacturing chemical intermediate having the generic names listed in paragraph (e) of this section, or any container or inner liner removed from a container that has been used to hold any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) of this section, unless the container is empty as defined in § 261.7(b)(3) of this chapter.

[*Comment:* Unless the residue is being beneficially used or reused, or legitimately recycled or reclaimed; or being accumulated, stored, transported or treated prior to such use, re-use, recycling or reclamation, EPA considers the residue to be intended for discard, and thus a hazardous waste. An example of a legitimate re-use of the residue would be where the residue remains in the container and the container is used to hold the same commerical chemical product or manufacturing chemical product or manufacturing chemical intermediate it previously held. An example of the discard of the residue would be where the drum is sent to a drum reconditioner who reconditions the drum but discards the residue.]

(d) Any residue or contaminated soil, water or other debris resulting from the cleanup of a spill into or on any land or water of any commercial chemical product or manufacturing chemical intermediate having the generic name listed in paragraph (e) or (f) of this section, or any residue or contaminated soil, water or other debris resulting from the cleanup of a spill, into or on any land or water, of any off-specification chemical product and manufacturing chemical intermediate which, if it met specifications, would have the generic name listed in paragraph (e) or (f) of this section.

[*Comment:* The phrase "commercial chemical product or manufacturing chemical intermediate having the generic name listed in . . ." refers to a chemical substance which is manufactured or formulated for commercial or manufacturing use which consists of the commercially pure grade of the chemical, any technical grades of the chemical that are produced or marketed, and all formulations in which the chemical is the sole active ingredient. It does not refer to a material, such as a manufacturing process waste, that contains any of the substances listed in paragraph (e) or (f). Where a manufacturing process waste is deemed to be a hazardous waste because it contains a substance listed in paragraph (e) or (f), such waste will be listed in either § 261.31 or § 261.32 or will be identified as a hazardous waste by the characteristics set forth in Subpart C of this part.]

(e) The commercial chemical products, manufacturing chemical intermediates or off-specification commercial chemical products or manufacturing chemical intermediates referred to in paragraphs (a) through (d) of this section, are identified as acute hazardous wastes (H) and are subject to be the small quantity exclusion defined in § 261.5(e).

[*Comment:* For the convenience of the regulated community the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), and R (Reactivity). Absence of a letter indicates that the compound only is listed for acute toxicity.]

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous waste No	Substance
P023	Acetaldehyde, chloro-
P002	Acetamide, N-(aminothioxomethyl)-
P057	Acetamide, 2-fluoro-
P058	Acetic acid, fluoro-, sodium salt
P066	Acetimidic acid, N-[(methylcarbamoyl)oxy]thio-, methyl ester
P001	3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts, when present at concentrations greater than 0.3%
P002	1-Acetyl-2-thiourea
P003	Acrolein
P070	Aldicarb
P004	Aldrin
P005	Allyl alcohol
P006	Aluminum phosphide
P007	5-(Aminomethyl)-3-isoxazolol
P008	4-Aminopyridine
P009	Ammonium picrate (R)
P119	Ammonium vanadate
P010	Arsenic acid
P012	Arsenic (III) oxide
P011	Arsenic (V) oxide
P011	Arsenic pentoxide
P012	Arsenic trioxide
P038	Arsine, diethyl-
P054	Aziridine
P013	Barium cyanide
P024	Benzenamine, 4-chloro-
P077	Benzenamine, 4-nitro-
P028	Benzene, (chloromethyl)-
P042	1,2-Benzenediol, 4-[1-hydroxy-2-(methylamino)ethyl]-
P014	Benzenethiol
P028	Benzyl chloride
P015	Beryllium dust
P016	Bis(chloromethyl) ether
P017	Bromoacetone
P018	Brucine
P021	Calcium cyanide
P123	Camphene, octachloro-
P103	Carbamimidoselenoic acid
P022	Carbon bisulfide
P022	Carbon disulfide
P095	Carbonyl chloride

Hazardous waste No	Substance
P033	Chlorine cyanide
P023	Chloroacetaldehyde
P024	p-Chloroaniline
P026	1-(o-Chlorophenyl)thiourea
P027	3-Chloropropionitrile
P029	Copper cyanides
P030	Cyanides (soluble cyanide salts), not elsewhere specified
P031	Cyanogen
P033	Cyanogen chloride
P036	Dichlorophenylarsine
P037	Dieldrin
P038	Diethylarsine
P039	O,O-Diethyl S-[2-(ethylthio)ethyl] phosphorodithioate
P041	Diethyl-p-nitrophenyl phosphate
P040	O,O-Diethyl O-pyrazinyl phosphorothioate
P043	Diisopropyl fluorophosphate
P044	Dimethoate
P045	3,3-Dimethyl-1-(methylthio)-2-butanone, O-[(methylamino)carbonyl] oxime
P071	O,O-Dimethyl O-p-nitrophenyl phosphorothioate
P082	Dimethylnitrosamine
P046	alpha, alpha-Dimethylphenethylamine
P047	4,6-Dinitro-o-cresol and salts
P034	4,6-Dinitro-o-cyclohexylphenol
P048	2,4-Dinitrophenol
P020	Dinoseb
P085	Diphosphoramide, octamethyl-
P039	Disulfoton
P049	2,4-Dithiobiuret
P109	Dithiopyrophosphoric acid, tetraethyl ester
P050	Endosulfan
P088	Endothall
P051	Endrin
P042	Epinephrine
P046	Ethanamine, 1,1-dimethyl-2-phenyl-
P084	Ethenamine, N-methyl-N-nitroso-
P101	Ethyl cyanide
P054	Ethylenimine
P097	Famphur
P056	Fluorine
P057	Fluoroacetamide
P058	Fluoroacetic acid, sodium salt
P065	Fulminic acid, mercury(II) salt (R,T)
P059	Heptachlor
P051	1,2,3 4,10,10-Hexachloro-6,7-epoxy-1,4 4a,5,6,7,8,8a-octahydro-endo,endo-1,4,5,8-dimethanonaphthalene
P037	1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-endo,exo-1,4·5,8-demethanonaphthalene
P060	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4,5,8-endo, endo-dimeth- anonaphthalene
P004	1,2,3,4,10,10-Hexachloro-1,4,4a,5,8,8a-hexahydro-1,4 5,8-endo,exo-dimethanonaphthalene
P060	Hexachlorohexahydro-exo,exo-dimethanonaphthalene
P062	Hexaethyl tetraphosphate
P116	Hydrazinecarbothioamide
P068	Hydrazine, methyl-
P063	Hydrocyanic acid
P063	Hydrogen cyanide
P096	Hydrogen phosphide
P064	Isocyanic acid, methyl ester
P007	3(2H)-Isoxazolone, 5-(aminomethyl)-
P092	Mercury, (acetato-O)phenyl-
P065	Mercury fulminate (R,T)
P016	Methane, oxybis(chloro-
P112	Methane, tetranitro- (R)
P118	Methanethiol, trichloro-
P059	4,7-Methano-1H-indene, 1,4,5,6,7,8,8-heptachloro-3a,4,7,7a-tetrahydro-
P066	Methomyl
P067	2-Methylaziridine
P068	Methyl hydrazine
P064	Methyl isocyanate
P069	2-Methyllactonitrile
P071	Methyl parathion
P072	alpha-Naphthylthiourea
P073	Nickel carbonyl
P074	Nickel cyanide
P074	Nickel(II) cyanide
P073	Nickel tetracarbonyl
P075	Nicotine and salts
P076	Nitric oxide
P077	p-Nitroaniline
P078	Nitrogen dioxide
P076	Nitrogen(II) oxide
P078	Nitrogen(IV) oxide
P081	Nitroglycerine (R)
P082	N-Nitrosodimethylamine
P084	N-Nitrosomethylvinylamine
P050	5-Norbornene-2,3-dimethanol, 1,4,5,6,7,7-hexachloro, cyclic sulfite
P085	Octamethylpyrophosphoramide
P087	Osmium oxide
P087	Osmium tetroxide
P088	7-Oxabicyclo[2.2.1]heptane-2,3-dicarboxylic acid
P089	Parathion
P034	Phenol, 2-cyclohexyl-4,6-dinitro-
P048	Phenol, 2,4-dinitro-
P047	Phenol, 2,4-dinitro-6-methyl-
P020	Phenol, 2,4-dinitro-6-(1-methylpropyl)-
P009	Phenol, 2,4,6-trinitro-, ammonium salt (R)
P036	Phenyl dichloroarsine
P092	Phenylmercuric acetate
P093	N-Phenylthiourea
P094	Phorate
P095	Phosgene
P096	Phosphine
P041	Phosphoric acid, diethyl p-nitrophenyl ester
P044	Phosphorodithioic acid, O,O-dimethyl S-[2-(methylamino)-2-oxoethyl]ester
P043	Phosphorofluoric acid, bis(1-methylethyl)-ester
P094	Phosphorothioic acid, O,O-diethyl S-(ethylthio)methyl ester
P089	Phosphorothioic acid, O,O-diethyl O-(p-nitrophenyl) ester
P040	Phosphorothioic acid, O,O-diethyl O- pyrazinyl ester
P097	Phosphorothioic acid, O,O-dimethyl O-[p-((dimethylamino)-sulfonyl)phenyl]ester
P110	Plumbane, tetraethyl-
P098	Potassium cyanide
P099	Potassium silver cyanide
P070	Propanal, 2-methyl-2-(methylthio)-, O-[(methylamino)carbonyl]oxime
P101	Propanenitrile
P027	Propanenitrile, 3-chloro-
P069	Propanenitrile, 2-hydroxy-2-methyl-
P081	1,2,3-Propanetriol, trinitrate- (R)
P017	2-Propanone, 1-bromo-
P102	Propargyl alcohol
P003	2-Propenal
P005	2-Propen-1-ol
P067	1,2-Propylenimine
P102	2-Propyn-1-ol
P008	4-Pyridinamine

Hazardous waste No	Substance
P075	Pyridine, (S)-3-(1-methyl-2-pyrrolidinyl)-, and salts
P111	Pyrophosphoric acid, tetraethyl ester
P103	Selenourea
P104	Silver cyanide
P105	Sodium azide
P106	Sodium cyanide
P107	Strontium sulfide
P108	Strychnidin-10-one and salts
P018	Strychnidin-10-one, 2,3-dimethoxy-
P108	Strychnine and salts
P115	Sulfuric acid, thallium(I) salt
P109	Tetraethyldithiopyrophosphate
P110	Tetraethyl lead
P111	Tetraethylpyrophosphate
P112	Tetranitromethane (R)
P062	Tetraphosphoric acid, hexaethyl ester
P113	Thallic oxide
P113	Thallium(III) oxide
P114	Thallium(I) selenite
P115	Thallium(I) sulfate
P045	Thiofanox
P049	Thiomidodicarbonic diamide
P014	Thiophenol
P116	Thiosemicarbazide
P026	Thiourea, (2-chlorophenyl)-
P072	Thiourea, 1-naphthalenyl-
P093	Thiourea, phenyl-
P123	Toxaphene
P118	Trichloromethanethiol
P119	Vanadic acid, ammonium salt
P120	Vanadium pentoxide
P120	Vanadium(V) oxide
P001	Warfarin, when present at concentrations greater than 0.3%
P121	Zinc cyanide
P122	Zinc phosphide (R,T)
P122	Zinc phosphide, when present at concentrations greater than 10%

(f) The commercial chemical products, manfacturing chemical intermediates, or off-specification commercial chemical products referred to in paragraphs (a) through (d) of this section, are identified as toxic wastes (T), unless otherwise designated and are subject to the small quantity generator exclusion defined in § 261.5 (a) and (g).

[*Comment:* For the convenience of the regulated community, the primary hazardous properties of these materials have been indicated by the letters T (Toxicity), R (Reactivity), I (Ignitability) and C (Corrosivity). Absence of a letter indicates that the compound is only listed for toxicity.]

These wastes and their corresponding EPA Hazardous Waste Numbers are:

Hazardous Waste No	Substance
U001	Acetaldehyde (I)
U034	Acetaldehyde, trichloro-
U187	Acetamide, N-(4-ethoxyphenyl)-
U005	Acetamide, N-9H-fluoren-2-yl-
U112	Acetic acid, ethyl ester (I)
U144	Acetic acid, lead salt
U214	Acetic acid, thallium(I) salt
U002	Acetone (I)
U003	Acetonitrile (I,T)
U248	3-(alpha-Acetonylbenzyl)-4-hydroxycoumarin and salts, when present at concentrations of 0.3% or less
U004	Acetophenone
U005	2-Acetylaminofluorene
U006	Acetyl chloride (C,R,T)
U007	Acrylamide
U008	Acrylic acid (I)
U009	Acrylonitrile
U150	Alanine, 3-[p-bis(2-chloroethyl)amino] phenyl-, L-
U328	2-Amino-1-methylbenzene
U353	4-Amino-1-methylbenzene
U011	Amitrole
U012	Aniline (I,T)
U014	Auramine
U015	Azaserine
U010	Azirino(2',3':3,4)pyrrolo(1,2-a)indole-4,7-dione, 6-amino-8-[((aminocarbonyl) oxy)methyl]-1,1a,2,8,8a,8b-hexahydro-8a-methoxy-5-methyl-,
U157	Benz[j]aceanthrylene, 1,2-dihydro-3-methyl-
U016	Benz[c]acridine
U016	3,4-Benzacridine
U017	Benzal chloride
U018	Benz[a]anthracene
U018	1,2-Benzanthracene
U094	1,2-Benzanthracene, 7,12-dimethyl-
U012	Benzenamine (I,T)
U014	Benzenamine, 4,4'-carbonimidoylbis(N,N-dimethyl-
U049	Benzenamine, 4-chloro-2-methyl-
U093	Benzenamine, N,N'-dimethyl-4-phenylazo-
U158	Benzenamine, 4,4'-methylenebis(2-chloro-
U222	Benzenamine 2-methyl- hydrochloride
U181	Benzenamine, 2-methyl-5-nitro
U019	Benzene (I,T)
U038	Benzeneacetic acid, 4-chloro-alpha-(4-chlorophenyl)-alpha-hydroxy, ethyl ester
U030	Benzene 1-bromo-4-phenoxy-
U037	Benzene chloro-
U190	1,2-Benzenedicarboxylic acid anhydride
U028	1,2-Benzenedicarboxylic acid, [bis(2-ethylhexyl)] ester
U069	1,2-Benzenedicarboxylic acid, dibutyl ester
U088	1,2-Benzenedicarboxylic acid, diethyl ester
U102	1,2-Benzenedicarboxylic acid, dimethyl ester
U107	1,2-Benzenedicarboxylic acid, di-n-octyl ester
U070	Benzene, 1,2-dichloro-
U071	Benzene, 1,3-dichloro-
U072	Benzene, 1,4-dichloro-
U017	Benzene, (dichloromethyl)-
U223	Benzene, 1,3-diisocyanatomethyl- (R,T)
U239	Benzene, dimethyl-(I,T)
U201	1,3-Benzenediol
U127	Benzene, hexachloro-
U056	Benzene, hexahydro- (I)
U188	Benzene, hydroxy-
U220	Benzene, methyl-
U105	Benzene, 1-methyl-1-2,4-dinitro-
U106	Benzene, 1-methyl-2,6-dinitro-
U203	Benzene, 1,2-methylenedioxy-4-allyl-
U141	Benzene, 1,2-methylenedioxy-4-propenyl-

Hazardous Waste No	Substance
U090	Benzene, 1,2-methylenedioxy-4-propyl-
U055	Benzene, (1-methylethyl)- (I)
U169	Benzene, nitro- (I,T)
U183	Benzene pentachloro-
U185	Benzene, pentachloro-nitro-
U020	Benzenesulfonic acid chloride (C R)
U020	Benzenesulfonyl chloride (C,R)
U207	Benzene, 1,2,4,5-tetrachloro-
U023	Benzene, (trichloromethyl)-(C,R,T)
0234	Benzene, 1,3,5-trinitro- (R,T)
U021	Benzidine
U202	1,2-Benzisothiazolin-3-one, 1,1-dioxide
U120	Benzo[j,k]fluorene
U022	Benzo[a]pyrene
U022	3,4-Benzopyrene
U197	p-Benzoquinone
U023	Benzotrichloride (C,R,T)
U050	1,2-Benzphenanthrene
U085	2,2'-Bioxirane (I,T)
U021	(1,1'-Biphenyl)-4,4'-diamine
U073	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dichloro-
U091	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethoxy-
U095	(1,1'-Biphenyl)-4,4'-diamine, 3,3'-dimethyl-
U024	Bis(2-chloroethoxy) methane
U027	Bis(2-chloroisopropyl) ether
U244	Bis(dimethylthiocarbamoyl) disulfide
U028	Bis(2-ethylhexyl) phthalate
U246	Bromine cyanide
U225	Bromoform
U030	4-Bromophenyl phenyl ether
U128	1,3-Butadiene, 1,1,2,3,4,4-hexachloro-
U172	1-Butanamine, N-butyl-N-nitroso-
U035	Butanoic acid, 4-[Bis(2-chloroethyl)amino] benzene-
U031	1-Butanol (I)
U159	2-Butanone (I,T)
U160	2-Butanone peroxide (R,T)
U053	2-Butenal
U074	2-Butene, 1,4-dichloro- (I,T)
U031	n-Butyl alchohol (I)
U136	Cacodylic acid
U032	Calcium chromate
U238	Carbamic acid, ethyl ester
U178	Carbamic acid, methylnitroso-, ethyl ester
U176	Carbamide, N-ethyl-N-nitroso-
U177	Carbamide, N-methyl-N-nitroso-
U219	Carbamide, thio-
U097	Carbamoyl chloride, dimethyl-
U215	Carbonic acid, dithallium(I) salt
U156	Carbonochloridic acid, methyl ester (I,T)
U033	Carbon oxyfluoride (R,T)
U211	Carbon tetrachloride
U033	Carbonyl fluoride (R,T)
U034	Chloral
U035	Chlorambucil
U036	Chlordane, technical
U026	Chlornaphazine
U037	Chlorobenzene
U039	4-Chloro-m-cresol
U041	1-Chloro-2,3-epoxypropane
U042	2-Chloroethyl vinyl ether
U044	Chloroform
U046	Chloromethyl methyl ether
U047	beta-Chloronaphthalene
U048	o-Chlorophenol
U049	4-Chloro-o-toluidine, hydrochloride
U032	Chromic acid, calcium salt
U050	Chrysene
U051	Creosote
U052	Cresols
U052	Cresylic acid
U053	Crotonaldehyde

Hazardous Waste No	Substance
U055	Cumene (I)
U246	Cyanogen bromide
U197	1,4-Cyclohexadienedione
U056	Cyclohexane (I)
U057	Cyclohexanone (I)
U130	1,3-Cyclopentadiene, 1,2,3,4,5,5-hexa- chloro-
U058	Cyclophosphamide
U240	2,4-D, salts and esters
U059	Daunomycin
U060	DDD
U061	DDT
U142	Decachlorooctahydro-1,3,4-metheno-2H-cyclobuta[c,d]-pentalen-2-one
U062	Diallate
U133	Diamine (R,T)
U221	Diaminotoluene
U063	Dibenz[a,h]anthracene
U063	1,2,5,6-Dibenzanthracene
U064	1,2,7,8-Dibenzopyrene
U064	Dibenz[a,i]pyrene
U066	1,2-Dibromo-3-chloropropane
U069	Dibutyl phthalate
U062	S-(2,3-Dichloroallyl) diisopropylthiocarbamate
U070	o-Dichlorobenzene
U071	m-Dichlorobenzene
U072	p-Dichlorobenzene
U073	3,3'-Dichlorobenzidine
U074	1,4-Dichloro-2-butene (I,T)
U075	Dichlorodifluoromethane
U192	3,5-Dichloro-N-(1,1-dimethyl-2-propynyl) benzamide
U060	Dichloro diphenyl dichloroethane
U061	Dichloro diphenyl trichloroethane
U078	1,1-Dichloroethylene
U079	1,2-Dichloroethylene
U025	Dichloroethyl ether
U081	2,4-Dichlorophenol
U082	2,6-Dichlorophenol
U240	2,4-Dichlorophenoxyacetic acid, salts and esters
U083	1,2-Dichloropropane
U084	1,3-Dichloropropene
U085	1,2:3,4-Diepoxybutane (I,T)
U108	1,4-Diethylene dioxide
U086	N,N-Diethylhydrazine
U087	O,O-Diethyl-S-methyl-dithiophosphate
U088	Diethyl phthalate
U089	Diethylstilbestrol
U148	1,2-Dihydro-3,6-pyridazinedione
U090	Dihydrosafrole
U091	3,3'-Dimethoxybenzidine
U092	Dimethylamine (I)
U093	Dimethylaminoazobenzene
U094	7,12-Dimethylbenz[a]anthracene
U095	3,3'-Dimethylbenzidine
U096	alpha,alpha-Dimethylbenzylhydroperoxide (R)
U097	Dimethylcarbamoyl chloride
U098	1,1-Dimethylhydrazine
U099	1,2-Dimethylhydrazine
U101	2,4-Dimethylphenol
U102	Dimethyl phthalate
U103	Dimethyl sulfate
U105	2,4-Dinitrotoluene
U106	2,6-Dinitrotoluene
U107	Di-n-octyl phthalate
U108	1,4-Dioxane
U109	1,2- Diphenylhydrazine
U110	Dipropylamine (I)
U111	Di-N-propylnitrosamine
U001	Ethanal (I)
U174	Ethanamine, N-ethyl-N-nitroso-
U067	Ethane, 1,2-dibromo-

Hazardous Waste No.	Substance
U076	Ethane, 1,1-dichloro-
U077	Ethane, 1,2-dichloro-
U114	1,2-Ethanediylbiscarbamodithioic acid
U131	Ethane, 1,1,1,2,2,2-hexachloro-
U024	Ethane, 1,1'-[methylenebis(oxy)]bis[2-chloro-
U003	Ethanenitrile (I, T)
U117	Ethane,1,1'-oxybis- (I)
U025	Ethane, 1,1'-oxybis[2-chloro-
U184	Ethane, pentachloro-
U208	Ethane, 1,1,1,2-tetrachloro-
U209	Ethane, 1,1,2,2-tetrachloro-
U218	Ethanethioamide
U247	Ethane, 1,1,1,-trichloro-2,2-bis(p-methoxy-phenyl)
U227	Ethane, 1,1,2-trichloro-
U043	Ethene, chloro-
U042	Ethene, 2-chloroethoxy-
U078	Ethene, 1,1-dichloro-
U079	Ethene trans-1,2-dichloro-
U210	Ethene, 1,1,2,2-tetrachloro-
U173	Ethanol, 2,2'-(nitrosoimino)bis-
U004	Ethanone, 1-phenyl-
U006	Ethanoyl chloride (C,R,T)
U359	2-Ethoxyethanol
U112	Ethyl acetate (I)
U113	Ethyl acrylate (I)
U238	Ethyl carbamate (urethan)
U038	Ethyl 4,4'-dichlorobenzilate
U359	Ethylene glycol monoethyl ether
U114	Ethylenebis(dithiocarbamic acid)
U067	Etylene dibromide
U077	Ethylene dichloride
U115	Ethlene oxide (I,T)
U116	Ethylene thiourea
U117	Ethyl ether (I)
U076	Ethylidene dichloride
U118	Ethylmethacrylate
U119	Ethyl methanesulfonate
U139	Ferric dextran
U120	Fluoranthene
U122	Formaldehyde
U123	Formic acid (C,T)
U124	Furan (I)
U125	2-Furancarboxaldehyde (I)
U147	2,5-Furandione
U213	Furan, tetrahydro- (I)
U125	Furfural (I)
U124	Furfuran (I)
U206	D-Glucopyranose, 2-deoxy-2(3-methyl-3-nitro-soureido)-
U126	Glycidylaldehyde
U163	Guanidine, N-nitroso-N-methyl-N'nitro-
U127	Hexachlorobenzene
U128	Hexachlorobutadiene
U129	Hexachlorocyclohexane (gamma isomer)
U130	Hexachlorocyclopentadiene
U131	Hexachloroethane
U132	Hexachlorophene
U243	Hexachloropropene
U133	Hydrazine (R,T)
U086	Hydrazine, 1,2-diethyl-
U098	Hydrazine, 1,1-dimethyl-
U099	Hydrazine, 1,2-dimethyl-
U109	Hydrazine, 1,2-diphenyl-
U134	Hydrofluoric acid (C,T)
U134	Hydrogen fluoride (C,T)
U135	Hydrogen sulfide
U096	Hydroperoxide, 1-methyl-1-phenylethyl- (R)
U136	Hydroxydimethylarsine oxide
U116	2-Imidazolidinethione
U137	Indeno(1,2,3-cd)pyrene
U139	Iron dextran

Hazardous Waste No	Substance
U140	Isobutyl alcohol (I,T)
U141	Isosafrole
U142	Kepone
U143	Lasiocarpine
U144	Lead acetate
U145	Lead phosphate
U146	Lead subacetate
U129	Lindane
U147	Maleic anhydride
U148	Maleic hydrazide
U149	Malononitrile
U150	Melphalan
U151	Mercury
U152	Methacrylonitrile (I,T)
U092	Methanamine, N-methyl- (I)
U029	Methane, bromo-
U045	Methane, chloro- (I,T)
U046	Methane, chloromethoxy-
U068	Methane, dibromo-
U080	Methane, dichloro-
U075	Methane, dichlorodifluoro-
U138	Methane, iodo-
U119	Methanesulfonic acid, ethyl ester
U211	Methane, tetrachloro-
U121	Methane, trichlorofluoro-
U153	Methanethiol (I,T)
U225	Methane tribromo-
U044	Methane, trichloro-
U121	Methane, trichlorofluoro-
U123	Methanoic acid (C,T)
U036	4,7-Methanoindan, 1,2,4,5,6,7,8,8-octa-chloro-3a,4,7,7a-tetrahydro-
U154	Methanol (I)
U155	Methapyrilene
U247	Methoxychlor
U154	Methyl alcohol (I)
U029	Methyl bromide
U186	1-Methylbutadiene (I)
U045	Methyl chloride (I,T)
U156	Methyl chlorocarbonate (I,T)
U226	Methylchloroform
U157	3-Methylcholanthrene
U158	4,4'-Methylenebis(2-chloroaniline)
U132	2,2'-Methylenebis(3,4,6-trichlorophenol)
U068	Methylene bromide
U080	Methylene chloride
U122	Methylene oxide
U159	Methyl ethyl ketone (I,T)
U160	Methyl ethyl ketone peroxide (R,T)
U138	Methyl iodide
U161	Methyl isobutyl ketone (I)
U162	Methyl methacrylate (I,T)
U163	N-Methyl-N'-nitro-N-nitrosoguanidine
U161	4-Methyl-2-pentanone (I)
U164	Methylthiouracil
U010	Mitomycin C
U059	5,12-Naphthacenedione, (8S-cis)-8-acetyl-10-[(3-amino-2,3,6-trideoxy-alpha-L-lyxo-hexopyranosyl)oxyl]-7,8,9,10-tetrahydro-6,8,11-trihydroxy-1-methoxy-
U165	Naphthalene
U047	Naphthalene, 2-chloro-
U166	1,4-Naphthalenedione
U236	2,7-Naphthalenedisulfonic acid, 3,3'-[(3,3'-dimethyl-(1,1'-biphenyl)-4 4'diyl)]-bis (azo)bis(5-amino-4-hydroxy)-,tetrasodium salt
U166	1,4,Naphthaquinone
U167	1-Naphthylamine
U168	2-Naphthylamine
U167	alpha-Naphthylamine
U168	beta-Naphthylamine

Hazardous Waste No	Substance
U026	2-Naphthylamine, N,N'-bis(2-chloromethyl)-
U169	Nitrobenzene (I,T)
U170	p-Nitrophenol
U171	2-Nitropropane (I,T)
U172	N-Nitrosodi-n-butylamine
U173	N-Nitrosodiethanolamine
U174	N-Nitrosodiethylamine
U111	N-Nitroso-N-propylamine
U176	N-Nitroso-N-ethylurea
U177	N-Nitroso-N-methylurea
U178	N-Nitroso-N-methylurethane
U179	N-Nitrosopiperidine
U180	N-Nitrosopyrrolidine
U181	5-Nitro-o-toluidine
U193	1,2-Oxathiolane, 2,2-dioxide
U058	2H-1,3,2-Oxazaphosphorine, 2-[bis(2-chloroethyl)amino]tetrahydro-, oxide 2-
U115	Oxirane (I,T)
U041	Oxirane, 2-(chloromethyl)-
U182	Paraldehyde
U183	Pentachlorobenzene
U184	Pentachloroethane
U185	Pentachloronitrobenzene
See F027	Pentachlorophenol
U186	1,3-Pentadiene (I)
U187	Phenacetin
U188	Phenol
U048	Phenol, 2-chloro-
U039	Phenol, 4-chloro-3-methyl-
U081	Phenol, 2,4-dichloro-
U082	Phenol, 2,6-dichloro-
U101	Phenol, 2,4-dimethyl-
U170	Phenol, 4-nitro-
See F027	Phenol, pentachloro-
Do	Phenol, 2,3,4,6-tetrachloro-
Do	Phenol, 2,4,5-trichloro-
Do	Phenol, 2,4,6-trichloro-
U137	1,10-(1,2 phenylene)pyrene
U145	Phosphoric acid, Lead salt
U087	Phosphorodithioic acid, 0,0-diethyl-, S-methylester
U189	Phosphorous sulfide (R)
U190	Phthalic anhydride
U191	2-Picoline
U192	Pronamide
U194	1-Propanamine (I,T)
U110	1-Propanamine, N-propyl- (I)
U066	Propane, 1,2-dibromo-3-chloro-
U149	Propanedinitrile
U171	Propane, 2-nitro- (I,T)
U027	Propane, 2,2'oxybis[2-chloro-
U193	1,3-Propane sultone
U235	1-Propanol, 2,3-dibromo-, phosphate (3 1)
U126	1-Propanol, 2,3-epoxy-
U140	1-Propanol, 2-methyl- (I,T)
U002	2-Propanone (I)
U007	2-Propenamide
U084	Propene, 1,3-dichloro-
U243	1-Propene, 1,1,2,3,3,3-hexachloro-
U009	2-Propenenitrile
U152	2-Propenenitrile, 2-methyl- (I,T)
U008	2-Propenoic acid (I)
U113	2-Propenoic acid, ethyl ester (I)
U118	2-Propenoic acid, 2-methyl-, ethyl ester
U162	2-Propenoic acid, 2-methyl-, methyl ester (I,T)
See F027	Propionic acid, 2-(2,4,5-trichlorophenoxy)-
U194	n-Propylamine (I,T)
U083	Propylene dichloride
U196	Pyridine
U155	Pyridine, 2-[(2-(dimethylamino)-2-thenylamino]-
U179	Pyridine, hexahydro-N-nitroso-
U191	Pyridine 2-methyl-
U164	4(1H)-Pyrimidinone, 2,3-dihydro-6-methyl-2-thioxo-
U180	Pyrrole tetrahydro-N-nitroso-
U200	Reserpine
U201	Resorcinol
U202	Saccharin and salts
U203	Safrole
U204	Selenious acid
U204	Selenium dioxide
U205	Selenium disulfide (R,T)
U015	L-Serine, diazoacetate (ester)
See F027	Silvex
U089	4,4'-Stilbenediol, alpha,alpha'-diethyl-
U206	Streptozotocin
U135	Sulfur hydride
U103	Sulfuric acid, dimethyl ester
U189	Sulfur phosphide (R)
U205	Sulfur selenide (R,T)
See F027	2,4,5-T
U207	1,2,4,5-Tetrachlorobenzene
U208	1,1,1,2-Tetrachloroethane
U209	1,1,2,2-Tetrachloroethane
U210	Tetrachloroethylene
See F027	2,3,4,6-Tetrachlorophenol
U213	Tetrahydrofuran (I)
U214	Thallium(I) acetate
U215	Thallium(I) carbonate
U216	Thallium(I) chloride
U217	Thallium(I) nitrate
U218	Thioacetamide
U153	Thiomethanol (I,T)
U219	Thiourea
U244	Thiram
U220	Toluene
U221	Toluenediamine
U223	Toluene diisocyanate (R,T)
U328	o-Toluidine
U222	O-Toluidine hydrochloride
U353	p-Toluidine
U011	1H-1,2,4-Triazol-3-amine
U226	1,1,1-Trichloroethane
U227	1,1,2-Trichloroethane
U228	Trichloroethene
U228	Trichloroethylene
U121	Trichloromonofluoromethane
See F027	2,4,5-Trichlorophenol
Do	2,4,6-Trichlorophenol
Do	2,4,5-Trichlorophenoxyacetic acid
U234	sym-Trinitrobenzene (R,T)
U182	1,3,5-Trioxane, 2,4,5-trimethyl-
U235	Tris(2,3-dibromopropyl) phosphate
U236	Trypan blue
U237	Uracil, 5[bis(2-chloromethyl)amino]-
U237	Uracil mustard
U043	Vinyl chloride
U248	Warfarin, when present at concentrations of 0.3% or less
U239	Xylene (I)
U200	Yohimban-16-carboxylic acid, 11,17-dimethoxy-18-[(3,4,5-trimethoxy-benzoyl)oxy]-, methyl ester
U249	Zinc phosphide when present at concentrations of 10% or less

(Approved by the Office of Management and Budget under control number 2050-0047)

[45 FR 78529, 78541, Nov. 25, 1980, as amended at 46 FR 27477, May 20, 1981; 49

Appendix II

Subpart C—Characteristics of Hazardous Waste

§ 261.20 General.

(a) A solid waste, as defined in § 261.2, which is not excluded from regulation as a hazardous waste under § 261.4(b), is a hazardous waste if it exhibits any of the characteristics identified in this subpart.

[*Comment*: § 262.11 of this chapter sets forth the generator's responsibility to determine whether his waste exhibits one or more of the characteristics identified in this subpart]

(b) A hazardous waste which is identified by a characteristic in this subpart, but is not listed as a hazardous waste in Subpart D, is assigned the EPA Hazardous Waste Number set forth in the respective characteristic in this subpart. This number must be used in complying with the notification requirements of section 3010 of the Act and certain recordkeeping and reporting requirements under Parts 262 through 265 and Part 270 of this chapter.

(c) For purposes of this subpart, the Administrator will consider a sample obtained using any of the applicable sampling methods specified in Appendix I to be a representative sample within the meaning of Part 260 of this chapter.

[*Comment*: Since the Appendix I sampling methods are not being formally adopted by the Administrator a person who desires to employ an alternative sampling method is not required to demonstrate the equivalency of his method under the procedures set forth in §§ 260.20 and 260.21.]

[45 FR 33119, May 19, 1980, as amended at 48 FR 14294, Apr. 1, 1983]

§ 261.21 Characteristic of ignitability.

(a) A solid waste exhibits the characteristic of ignitability if a representative sample of the waste has any of the following properties:

(1) It is a liquid, other than an aqueous solution containing less than 24 percent alcohol by volume and has flash point less than 60°C (140°F), as determined by a Pensky-Martens Closed Cup Tester, using the test method specified in ASTM Standard D-93-79 or D-93-80 (incorporated by reference, see § 260.11), or a Setaflash Closed Cup Tester, using the test method specified in ASTM Standard D-3278-78 (incorporated by reference, see § 260.11), or as determined by an equivalent test method approved by the Administrator under procedures set forth in §§ 260.20 and 260.21.

(2) It is not a liquid and is capable, under standard temperature and pressure, of causing fire through friction, absorption of moisture or spontaneous chemical changes and, when ignited, burns so vigorously and persistently that it creates a hazard.

(3) It is an ignitable compressed gas as defined in 49 CFR 173.300 and as determined by the test methods described in that regulation or equivalent test methods approved by the Administrator under §§ 260.20 and 260.21.

(4) It is an oxidizer as defined in 49 CFR 173.151.

(b) A solid waste that exhibits the characteristic of ignitability, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D001.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.22 Characteristic of corrosivity.

(a) A solid waste exhibits the characteristic of corrosivity if a representative sample of the waste has either of the following properties:

(1) It is aqueous and has a pH less than or equal to 2 or greater than or equal to 12.5, as determined by a pH meter using either an EPA test method or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21. The EPA test method for pH is specified as Method 5.2 in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).

(2) It is a liquid and corrodes steel (SAE 1020) at a rate greater than 6.35 mm (0.250 inch) per year at a test temperature of 55°C (130°F) as determined by the test method specified in NACE (National Association of Corrosion Engineers) Standard TM-01-69 as standardized in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11) or an equivalent test method approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21.

(b) A solid waste that exhibits the characteristic of corrosivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D002.

[45 FR 33119, May 19, 1980, as amended at 46 FR 35247, July 7, 1981]

§ 261.23 Characteristic of reactivity.

(a) A solid waste exhibits the characteristic of reactivity if a representative sample of the waste has *any* of the following properties:

(1) It is normally unstable and readily undergoes violent change without detonating.

(2) It reacts violently with water.

(3) It forms potentially explosive mixtures with water.

(4) When mixed with water, it generates toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(5) It is a cyanide or sulfide bearing waste which, when exposed to pH conditions between 2 and 12.5, can generate toxic gases, vapors or fumes in a quantity sufficient to present a danger to human health or the environment.

(6) It is capable of detonation or explosive reaction if it is subjected to a strong initiating source or if heated under confinement.

(7) It is readily capable of detonation or explosive decomposition or reaction at standard temperature and pressure.

(8) It is a forbidden explosive as defined in 49 CFR 173.51, or a Class A explosive as defined in 49 CFR 173.53 or a Class B explosive as defined in 49 CFR 173.88.

(b) A solid waste that exhibits the characteristic of reactivity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number of D003.

§ 261.24 Characteristic of EP toxicity.

(a) A solid waste exhibits the characteristic of EP toxicity if, using the test methods described in Appendix II or equivalent methods approved by the Administrator under the procedures set forth in §§ 260.20 and 260.21, the extract from a representative sample of the waste contains any of the contaminants listed in Table I at a concentration equal to or greater than the respective value given in that Table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering, is considered to be the extract for the purposes of this section.

(b) A solid waste that exhibits the characteristic of EP toxicity, but is not listed as a hazardous waste in Subpart D, has the EPA Hazardous Waste Number specified in Table I which corresponds to the toxic contaminant causing it to be hazardous.

TABLE I—MAXIMUM CONCENTRATION OF CONTAMINANTS FOR CHARACTERISTIC OF EP TOXICITY

EPA hazardous waste number	Contaminant	Maximum concentration (milligrams per liter)
D004	Arsenic	5.0
D005	Barium	100.0
D006	Cadmium	1.0
D007	Chromium	5.0
D008	Lead	5.0
D009	Mercury	0.2
D010	Selenium	1.0
D011	Silver	5.0

APPENDIX I—REPRESENTATIVE SAMPLING METHODS

The methods and equipment used for sampling waste materials will vary with the form and consistency of the waste materials to be sampled. Samples collected using the sampling protocols listed below, for sampling waste with properties similar to the indicated materials, will be considered by the Agency to be representative of the waste.

Extremely viscous liquid—ASTM Standard D140-70 Crushed or powdered material—ASTM Standard D346-75 Soil or rock-like material—ASTM Standard D420-69 Soil-like material—ASTM Standard D1452-65

Fly Ash-like material—ASTM Standard D2234-76 [ASTM Standards are available from ASTM, 1916 Race St., Philadelphia, PA 19103]

Containerized liquid wastes—"COLIWASA" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods," * U.S. Environmental Protection Agency, Office of Solid Waste, Washington, D.C. 20460. [Copies may be obtained from Solid Waste Information, U.S. Environmental Protection Agency, 26 W. St. Clair St., Cincinnati, Ohio 45268]

Liquid waste in pits, ponds, lagoons, and similar reservoirs.—"Pond Sampler" described in "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods." *

This manual also contains additional information on application of these protocols.

APPENDIX II—EP TOXICITY TEST PROCEDURES

A. Extraction Procedure (EP)

1. A representative sample of the waste to be tested (minimum size 100 grams) shall be obtained using the methods specified in Appendix I or any other method capable of yielding a representative sample within the meaning of Part 260 [For detailed guidance on conducting the various aspects of the EP see "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).]

2. The sample shall be separated into its component liquid and solid phases using the method described in "Separation Procedure" below. If the solid residue [a] obtained using this method totals less than 0.5% of the original weight of the waste, the residue can be discarded and the operator shall treat the liquid phase as the extract and proceed immediately to Step 8.

3. The solid material obtained from the Separation Procedure shall be evaluated for its particle size. If the solid material has a surface area per gram of material equal to, or greater than, 3.1 cm^2 or passes through a 9.5 mm (0.375 inch) standard sieve, the operator shall proceed to Step 4. If the surface area is smaller or the particle size larger than specified above, the solid material shall be prepared for extraction by crushing, cutting or grinding the material so that it passes through a 9.5 mm (0.375 inch) sieve or, if the material is in a single piece, by subjecting the material to the "Structural Integrity Procedure" described below.

4. The solid material obtained in Step 3 shall be weighed and placed in an extractor with 16 times its weight of deionized water. Do not allow the material to dry prior to weighing. For purposes of this test, an acceptable extractor is one which will impart sufficient agitation to the mixture to not only prevent stratification of the sample and extraction fluid but also insure that all sample surfaces are continuously brought into contact with well mixed extraction fluid.

5. After the solid material and deionized water are placed in the extractor, the operator shall begin agitation and measure the pH of the solution in the extractor. If the pH is greater than 5.0, the pH of the solution shall be decreased to 5.0 ± 0.2 by adding 0.5 N acetic acid. If the pH is equal to or less than 5.0, no acetic acid should be added. The pH of the solution shall be monitored, as described below, during the course of the extraction and if the pH rises above 5.2, 0.5N acetic acid shall be added to bring the pH down to 5.0 ± 0.2. However, in no event shall the aggregate amount of acid added to the solution exceed 4 ml of acid per gram of solid. The mixture shall be agitated for 24 hours and maintained at 20°-40°C (68°-104°F) during this time. It is recommended that the operator monitor and adjust the pH during the course of the extraction with a device such as the Type 45-A pH Controller manufactured by Chemtrix, Inc., Hillsboro, Oregon 97123 or its equivalent, in conjunction with a metering pump and reservoir of 0.5N acetic acid. If such a system is not available, the following manual procedure shall be employed:

(a) A pH meter shall be calibrated in accordance with the manufacturer's specifications.

(b) The pH of the solution shall be checked and, if necessary, 0.5N acetic acid shall be manually added to the extractor until the pH reaches 5.0 ± 0.2. The pH of the solution shall be adjusted at 15, 30 and 60 minute intervals, moving to the next longer interval if the pH does not have to be adjusted more than 0.5N pH units.

(c) The adjustment procedure shall be continued for at least 6 hours.

(d) If at the end of the 24-hour extraction period, the pH of the solution is not below 5.2 and the maximum amount of acid (4 ml per gram of solids) has not been added, the pH shall be adjusted to 5.0 ± 0.2 and the extraction continued for an additional four hours, during which the pH shall be adjusted at one hour intervals.

6. At the end of the 24 hour extraction period, deionized water shall be added to the extractor in an amount determined by the following equation:

$V=(20)(W)-16(W)-A$

V = ml deionized water to be added

W = weight in grams of solid charged to extractor

A = ml of 0.5N acetic acid added during extraction

7. The material in the extractor shall be separated into its component liquid and solid phases as described under "Separation Procedure."

8. The liquids resulting from Steps 2 and 7 shall be combined. This combined liquid (or the waste itself if it has less than ½ percent solids, as noted in Step 2) is the extract and shall be analyzed for the presence of any of the contaminants specified in Table I of § 261.24 using the Analytical Procedures designated below.

Separation Procedure

Equipment: A filter holder, designed for filtration media having a nominal pore size of 0.45 micrometers and capable of applying a 5.3 kg/cm^2 (75 psi) hydrostatic pressure to the solution being filtered, shall be used. For mixtures containing nonabsorptive solids, where separation can be effected without imposing a 5.3 kg/cm^2 pressure differential, vacuum filters employing a 0.45 micrometers filter media can be used. (For

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Hazardous Waste Streams," EPA 600/2-80-018, January 1980.

[a] The percent solids is determined by drying the filter pad at 80°C until it reaches constant weight and then calculating the percent solids using the following equation:

Percent solids =

$$\frac{(\text{weight of pad + solid}) - (\text{tare weight of pad})}{\text{initial weight of sample}} \times 100$$

further guidance on filtration equipment or procedures see "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods" incorporated by reference, see § 260.11). Procedure:[1]

(i) Following manufacturer's directions, the filter unit shall be assembled with a filter bed consisting of a 0.45 micrometer filter membrane. For difficult or slow to filter mixtures a prefilter bed consisting of the following prefilters in increasing pore size (0.65 micrometer membrane, fine glass fiber prefilter, and coarse glass fiber prefilter) can be used.

(ii) The waste shall be poured into the filtration unit.

(iii) The reservoir shall be slowly pressurized until liquid begins to flow from the filtrate outlet at which point the pressure in the filter shall be immediately lowered to 10–15 psig. Filtration shall be continued until liquid flow ceases.

(iv) The pressure shall be increased stepwise in 10 psi increments to 75 psig and filtration continued until flow ceases or the pressurizing gas begins to exit from the filtrate outlet.

(v) The filter unit shall be depressurized, the solid material removed and weighed and then transferred to the extraction apparatus, or, in the case of final filtration prior to analysis, discarded. Do not allow the material retained on the filter pad to dry prior to weighing.

(vi) The liquid phase shall be stored at 4°C for subsequent use in Step 8.

[1] This procedure is intended to result in separation of the "free" liquid portion of the waste from any solid matter having a particle size >0.45 μm. If the sample will not filter, various other separation techniques can be used to aid in the filtration. As described above, pressure filtration is employed to speed up the filtration process. This does not alter the nature of the separation. If liquid does not separate during filtration, the waste can be centrifuged. If separation occurs during centrifugation, the liquid portion (centrifugate) is filtered through the 0.45 μm filter prior to becoming mixed with the liquid portion of the waste obtained from the initial filtration. Any material that will not pass through the filter after centrifugation is considered a solid and is extracted.

B. Structural Integrity Procedure

Equipment: A Structural Integrity Tester having a 3.18 cm (1.25 in.) diameter hammer weighing 0.33 kg (0.73 lbs.) and having a free fall of 15.24 cm (6 in.) shall be used. This device is available from Associated Design and Manufacturing Company, Alexandria, VA 22314, as Part No. 125, or it may be fabricated to meet the specifications shown in Figure 1.

Procedure

1. The sample holder shall be filled with the material to be tested. If the sample of waste is a large monolithic block, a portion shall be cut from the block having the dimensions of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder. For a fixated waste, samples may be cast in the form of a 3.3 cm (1.3 in.) diameter x 7.1 cm (2.8 in.) cylinder for purposes of conducting this test. In such cases, the waste may be allowed to cure for 30 days prior to further testing.
2. The sample holder shall be placed into the Structural Integrity Tester, then the hammer shall be raised to its maximum height and dropped. This shall be repeated fifteen times.
3. The material shall be removed from the sample holder, weighed, and transferred to the extraction apparatus for extraction.

Analytical Procedures for Analyzing Extract Contaminants

The test methods for analyzing the extract are as follows:

1. For arsenic, barium, cadmium, chromium, lead, mercury, selenium, silver, endrin, lindane, methoxychlor, toxaphene, 2,4-D[2,4-dichlorophenoxyacetic acid] or 2,4,5-TP [2,4,5-trichlorophenoxypropionic acid]: "Test Methods for the Evaluation of Solid Waste, Physical/Chemical Methods" (incorporated by reference, see § 260.11).
2. [Reserved]

For all analyses, the methods of standard addition shall be used for quantification of species concentration.

Appendix R

States with Mixed Waste Authorization

STATES WITH MIXED WASTE AUTHORIZATION

State/ Territory	FR Date	Effective Date	FR Cite
Colorado	10/24/86	11/7/86	51 FR 37729
Tennessee	6/12/87	8/11/87	52 FR 22443
S. Carolina	7/15/87	9/13/87	52 FR 26476
Washington	9/22/87	11/23/87	52 FR 35556
Georgia	7/28/88	9/26/88	53 FR 28383
Kentucky	10/20/88	12/19/88	53 FR 41164
Utah	2/21/89	3/7/89	54 FR 7417
Minnesota	4/24/89	6/23/89	54 FR 16361
Ohio	6/28/89	6/30/89	54 FR 27170
Guam	8/11/89	10/10/89	54 FR 32973
N. Carolina	9/22/89	11/21/89	54 FR 38993
Michigan	12/24/89	12/26/89	54 FR 48608

Appendix S

U.S. Environmental Protection Agency
Regional Radiation Program Managers

Appendix R

States with Mixed Waste Authorization

STATES WITH MIXED WASTE AUTHORIZATION

State/ Territory	FR Date	Effective Date	FR Cite
Colorado	10/24/86	11/7/86	51 FR 37729
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Georgia	7/28/88	9/26/88	53 FR 28383
Kentucky	10/20/88	12/19/88	53 FR 41164
Utah	2/21/89	3/7/89	54 FR 7417
Minnesota	4/24/89	6/23/89	54 FR 16361
Ohio	6/28/89	6/30/89	54 FR 27170
Guam	8/11/89	10/10/89	54 FR 32973
N. Carolina	9/22/89	11/21/89	54 FR 38993
Michigan	12/24/89	12/26/89	54 FR 48608
Texas	3/1/90	3/15/90	55 FR 7318
Illinois	3/1/90	4/30/90	55 FR 7320
Idaho	3/26/90	7/29/90	55 FR 11015
Arkansas	3/27/90	5/29/90	55 FR 11192
Oregon	3/30/90	5/29/90	55 FR 11909
Kansas	4/24/90	6/25/90	55 FR 17273

New Mexico 3/19/90, (55 FR 10076) - Notice of proposed rulemaking on authorization for mixed waste and other RCRA provisions. A final determination will be published in the FR around mid-June 1990.

New York
Nebraska

Appendix T

NRC Material Licenses by State

MATERIAL LICENSES BY STATE

STATE	NRC'S LICENSES	AGREEMENT STATES' LICENSES	STATE	NRC'S LICENSES	AGREEMENT STATES' LICENSES
Alabama	25	478	Missouri	409	0
Alaska	75	0	Montana	110	0
Arizona	21	306	Nebraska	6	170
Arkansas	12	224	Nevada	8	141
California	91	2256	New Hampshire	10	90
Colorado	53	460	New Jersey	710	0
Connecticut	298	0	New Mexico	32	275
Delaware	67	0	New York	75	1976*
District of Columbia	83	0	North Carolina	29	491
Florida	29	1020	North Dakota	3	99
Georgia	21	572	Ohio	758	0
Hawaii	74	0	Oklahoma	313	0
Idaho	10	130	Oregon	18	274
Illinois	127	1250	Pennsylvania	1026	0
Indiana	345	0	Rhode Island	4	55
Iowa	11	201	South Carolina	9	294
Kansas	24	367	South Dakota	57	0
Kentucky	20	353	Tennessee	47	538
Louisiana	17	531	Texas	79	1764
Maine	117	0	Utah	16	230
Maryland	67	529	Vermont	45	0
Massachusetts	568	0	Virginia	466	0
Michigan	676	0	Washington	32	372
Minnesota	242	0	West Virginia	225	0
Mississippi	15	319	Wisconsin	318	0
			Wyoming	115	0
*Regulated by four different agreements in the State of New York.			Total	8008	15,765

SOURCE: NRC 01/31/90

ATTACHMENT A

MIXED WASTE TRAINING COURSE DRAFT AGENDA

Day One

(Optional briefing for NRC personnel Introduction to RCRA)	8:00 - 9:00
Registration (EPA staff)	8:30 - 9:00
Introduction to the training course	9:00 - 9:15
Overview of mixed waste regulation	9:15 - 10:30
Break	10:30 - 10:45
Questions	10:45 - 11:15
Introduction to basic radiation concepts	11:15 - 12:30
Questions	12:30 - 1:00
Lunch	1:00 - 2:00
Potential mixed waste universe	2:00 - 3:00
Questions	3:00 - 3:30
Break	3:30 - 3:45
Presentation on Argonne National Lab	3:45 - 4:30

Day Two

Health physics, inspections, and on-site activities	9:00 - 10:00
Questions	10:00 - 10:30
Break	10:30 - 10:45
Inspections panel discussion	10:45 - 11:30
Questions	11:30 - 12:00
Lunch	12:00 - 1:00
Permitting	1:00 - 2:30
Break	2:30 - 2:45
Case study	2:45 - 3:45
Case study discussion	3:45 - 4:30
Course wrap-up	4:30 - 5:00

Day Three (optional)

Site visit to Argonne National Lab (Transportation to be provided)	9:00 - 12:00

ICF can make overheads into slides

1 hour to 1 hour, 15 minutes

Presume only basic knowledge of RCRA standards

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGIONAL RADIATION PROGRAM MANAGERS

REGION I (CT, ME, MA, NH, RI, VT)

TOM D'AVANZO U.S. ENVIRONMENTAL PROTECTION AGENCY JOHN F. KENNEDY FEDERAL BUILDING BOSTON, MA 02203	FTS-835-4502 COMMERCIAL 617-223-4502

REGION II (NJ, NY, PR, VI)

PAUL A. GIARDINA U.S. ENVIRONMENTAL PROTECTION AGENCY 26 FEDERAL PLAZA, 2AWM-RAD NEW YORK, NY 10278	FTS-264-4418 COMMERCIAL 212-264-4418

REGION III (DC, DE, MD, PA, VA, WV)

LEWIS FELLEISEN U.S. ENVIRONMENTAL PROTECTION AGENCY 841 CHESTNUT STREET, 3AH14 PHILADELPHIA, PA 19107	FTS-597-8326 COMMERCIAL 215-597-8326

REGION IV (AL, FL, GA, KY, MS, NC, SC, IN)

CHARLES L. WAKAMO U.S. ENVIRONMENTAL PROTECTION AGENCY 345 COURTLAND STREET, NE ATLANTA, GA 30365	FTS-527-3907 COMMERCIAL 404-347-3907

REGION V (IL, IN, MI, MN, OH, WI)

GARY GULEZIAN U.S. ENVIRONMENTAL PROTECTION AGENCY 230 SOUTH DEARBORN STREET, 5AR-26 CHICAGO, IL 60604	FTS-886-6258 COMMERCIAL 312-886-6258

REGION VI

GERALD FONTENOT U.S. ENVIRONMENTAL PROTECTION AGENCY 1445 ROSS AVENUE, 13TH FLOOR, 6T-AS DALLAS, TX 75202-2733	FTS-255-7504 COMMERCIAL 214-655-7204

REGION VII (IA, KS, MO, NE)

CARL WALTER U.S. ENVIRONMENTAL PROTECTION AGENCY 726 MINNESOTA AVENUE KANSAS CITY, KS 66101	FTS-757-2893 COMMERCIAL 913-236-2893

REGION VIII (CO, MT, ND, SD, UT, WY)

MILTON W. LAMMERING
U.S. ENVIRONMENTAL PROTECTION AGENCY
999 18TH STREET, SUITE 500, 8HWM-RP
ONE DENVER PLACE
DENVER, CO 80202-2413

FTS-564-1713
COMMERCIAL 303-2921713

REGION IX (AZ, CA, HI, NV, GV, AMERICAN SAMOA)

MICHAEL BANDROWSKI *
U.S. ENVIRONMENTAL PROTECTION AGENCY
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