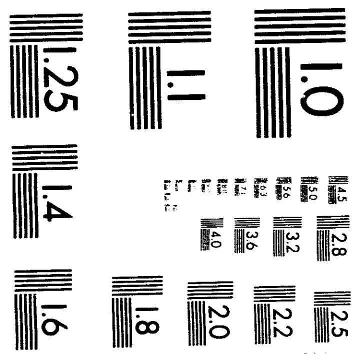

WHC-EP-0063-4

Hanford Site Solid Waste Acceptance Criteria

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

Westinghouse
Hanford Company Richland, Washington

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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Westinghouse
Hanford Company

P.O. Box 1970 Richland, WA 99352

JAN 07 1994
OSTI

November 17, 1993

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Distribution

RELEASE OF WHC-EP-0063-4 "HANFORD SITE SOLID WASTE ACCEPTANCE CRITERIA"

Revision 4 of WHC-EP-0063 *Hanford Site Solid Waste Acceptance Criteria* has been approved and is being issued as an attachment to this letter. Full implementation of the requirements of this manual will begin on January 1, 1994. Implementation of the Waste Certification Assessment Program in section 3.2 will commence immediately. Storage/Disposal Approval Records (SDAR) issued for the remainder of 1993 may also be written to the requirements of WHC-EP-0063-4. A detailed summary of the changes that have been incorporated in this years revision is attached to this letter.

Unlike past years, SDARs will continue to be valid until replacement SDARs are prepared to the new requirements. In those cases where there is no required change to the SDAR, the SDAR will remain in affect. Please contact Acceptance Services by January 1, 1994 with a prioritized list of the SDARs that should remain valid for your facility. SDARs will be revised to allow multiple waste generators to use a single SDAR. Submittal of a properly completed Waste Storage/Disposal Request (WSDR) for new multiple generator SDARs will be required as with any other SDAR.

This version of WHC-EP-0063 implements several minor changes in the shipping forms and in the WSDR. The old forms will be accepted until the new forms are available on Jet Forms on the Hanford Local Area Network (HLAN). The new forms were generated as WordPerfect 5.1 tables and can be obtained from Acceptance Services as hard copies or on floppy disks.

WHC-EP-0063-4 is being issued this year in 3 ring binder format. This will allow us to make page changes in the document as it becomes necessary rather then waiting until the end of the year. The document will initially be issued to everyone on the distribution list. It is impractical, however, to keep all of the copies up to date. To help this problem, page changes will only be issued to selected short list individuals. These individuals are identified on the distribution list with an asterisk. As much as possible the remaining long list individuals will be notified that a change has been made but will not receive the actual revised pages. Please contact a person on the short

 9359795

list to get a copy of the page changes if you need them. Also, please notify Generator and Waste Acceptance Services if you no longer have a use for the document. This will allow us to maintain an up to date distribution list.

If you have any questions, concerning the new revision of WHC-EP-0063-4 contact N. P. Willis at (509) 372-0669.

Very truly yours,

R. D. Pierce, Manager
Generator and Waste Acceptance Services
Solid Waste Disposal

lkd

Attachment

RL - R. O. Puthoff (w/o attachment)

ATTACHMENT 1

SUMMARY OF WHC-EP-0063-3 SECTIONS ELIMINATED IN WHC-EP-0063-4

Summary of WHC-EP-0063-3 Sections Eliminated in WHC-EP-0063-4

In general all information that is not strictly waste acceptance criteria has been eliminated. This includes organization responsibilities, transportation requirements and generator waste management requirements and guidelines not strictly related to acceptance by the TSD facility.

Specifically, the information from the following sections of revision 3 has been deleted from the new revision of WHC-EP-0063:

Section 1.2.1.1 - bullets 7, 10 and 11
These include transportation, minimization and training requirements that are not strictly associated with acceptance criteria.

Section 1.2.1.2 - bullets 4, 5 and 6
These are minimization and segregation requirements that are not treatment, storage, or disposal (TSD) acceptance criteria driven.

Section 1.2.1.3 - bullets 3 and parts a, c, f, g, h and i of bullet 4
This information covers minimization, 90 day clock issues, record keeping, inspections and waste management costs not associated with acceptance criteria.

Section 1.2.3 through 1.3 inclusive
These sections identified responsibilities of various nongenerator organizations within Westinghouse Hanford Company. This information was not directly related to acceptance criteria.

Section 2.5 first 3 paragraphs
These sections relate to transportation requirements.

Section 2.5.5
These are actions that are completed by the TSD and not generator acceptance criteria.

Section 3.2 - bullets 1, 2, 4 and 6
These are minimization, treatment, segregation and Transuranic (TRU) management requirements not related to waste acceptance criteria.

Section 4.2 - except the last bullet
These are waste minimization, segregation, treatment and audit requirements not associated with the acceptance criteria.

Section 4.4.4 - Bullet 1
This requirement no longer applies.

Section 4.9
The Waste Certification program has been included in its own section.

Section 5.2 - All but the first two bullets
These requirements cover waste minimization, segregation and treatment.

Section 5.9
This will be combined into one section with the Low-Level Waste (LLW) Certification Program.

Chapter 6
This chapter covered Radioactive Mixed Waste (RMW) disposal. This information will not be used until a liner leachate collection trench is completed. Criteria will be provided for the trench when it comes on line.

Chapter 7
This chapter provided generator guidelines for handling hazardous waste within their facilities. It was not acceptance criteria.

Section 8.3.4
This section covers transportation requirements.

Section 8.6.5
This section also covers transportation requirements.

Chapter 9
This chapter was on waste minimization and not acceptance criteria.

Appendix G
The incompatible waste combinations appendix was not used.

Appendix H
The radioactive mixed waste documentation is described elsewhere and not required in a separate appendix.

Appendix I
This information was included in the body of the document.

Appendix M
Adequate information on the Hazardous Waste Disposal Analysis Record is included in the body of the document.

Appendix N
Radiation release documentation is discussed and controlled by other Westinghouse manuals.

Summary of Significant Changes to WHC-EP-0063-3

1. The format has been changed to indicate Regulations, Hanford Site Practices and the background for the Hanford Site Practices.

2. Rigging safety margins were removed and the national standards referenced.

3. A section has been added to allow waiver of the Hanford Site Practices. This is similar to the old waiver policy but it adds a requirement that the cognizant organization within Solid Waste Disposal (SWD) approve the waiver along with Solid Waste Management, Safety, Quality Assurance, Environmental, and the generator involved. RL has also been added to the approval list.

4. A process overview flowchart has been added to assist people in finding information in the document.

5. A section has been added implementing the new container management program for Westinghouse Hanford Company (WHC) generators. This program replaces the old format of the Package Identification Number (PIN) with a container identification number that allows tracking waste containers from purchase through disposal. The old PIN only tracked the container after it was filled. The new program also requires that containers be obtained through Material Control personnel. This program will be phased in as the new Container Management System is implemented. Barcoding will be required for all waste packages. Generator Services will assist generators in complying with this requirement. Performance based packaging will be phased in with full compliance required in October 1996. This will allow generators to work off their existing stock of design based packaging until the Department of Transportation (DOT) deadline.

6. A section has been added on verification sampling. This sampling will be conducted by the TSD to verify the documentation provided by the generators. This section is included to let the generators know their responsibilities for this program.

7. A section has been added explaining the new Difficult Waste Program. This program can only be used by Hanford Site generators of mixed waste. It involves a field analysis and is used to allow temporary permitted waste storage when the required detailed analysis results cannot be obtained within the 90 day time limit. The detailed Difficult Waste Management Program Procedure has been included as an appendix.

8. The LLW Certification program has been revised to delete the requirement that WHC approve the generator LLW Certification Plans. Eight basic elements of a LLW Certification Program are provided and assessments will be conducted to determine if the eight elements are present in generator programs. A new certification category of "restricted" has been added. This category will allow generators to ship waste based on a surveillance of the individual waste package or stream.

9. Details are provided on Category 3 waste stabilization. This includes the use of High Integrity Containers (HIC) and solidification of Category 3 waste.

10. Radionuclide characterization requirements have been changed to eliminate the reporting of daughter products in secular equilibrium with the parent. An appendix has been added to give guidance on preparing a radionuclide characterization plan. This plan is to be adapted to the specific characteristics of the generator's waste streams. An updated radionuclide category limit table and worksheets have been added to allow easier calculation of the waste category. An alternative radionuclide classification method based on the Nuclear Regulatory Commission (NRC) classification system has been added as an appendix.

11. An appendix has been added that gives requirements on having nonradioactive hazardous and Polychlorinated Biphenyl Waste (PCB) waste disposed directly offsite. This provides the Hanford Site moratorium waste protocol.

12. A chapter has been added that addresses disposal of nonradioactive, nondangerous sanitary waste in the landfill.

13. An index has been added to allow users of the manual to more easily find information.

14. The appendix on marking and labeling has been simplified.

15. The appendix on sampling has been expanded to include information on approved sampling techniques.

16. The appendix on void fillers and absorbents now includes a detailed section on selecting appropriate absorbents.

17. The document now requires waste generators to make appropriate Land Disposal Restriction (LDR) notifications and provides a debris checklist to use in determining if a mixed waste is a debris or not.

18. Requirements for Type B waste receipt at the Central Waste Complex (CWC) have been added. Tables have been also been added to allow waste generators to calculate the Dose Equivalent Curie content of their Type B Mixed Waste. This will allow them to ship Type B amounts of radionuclides to the CWC.

19. SDARs will be made applicable to more then one generator but only to one waste stream.

20. Generators are now responsible for arranging waste transportation unless they request help from SWD.

21. WHC-EP-0063-4 will not require transportation inspections of all Dangerous Waste packages. Only for those generators who have consistent problems with spotted loads. Additional requirements may be imposed by Hazardous Materials Operation (HMO).

22. Offsite generators who are going out of business will be required to ship their Hanford waste shipment records to Hanford.

23. An appendix was added that gives a decision tree for determining if a dangerous waste can be shipped to an offsite TSD.

24. An appendix was added giving a list of facilities where an unconditional release survey is not required.

WHC-EP-0063-4 Eratta Sheet

Page 3-11 Table 3-1 Change "^{133}B" to "^{133}Ba"

Page 3-12 Table 3-1 After the ^{152}Eu entry add the following row to the table:

^{154}Eu	8.3 E-01	

Page 3-13 Table 3-1 Change "^{242}Pu°" to "^{242}Pu*"

Page C-10 The half-life of ^{235}U should be 7.038 E+8y

Page 3-10 section 3.4.2.2.3 b) and d) Change "Table K-1" to "Table 3-1" three places.

WHC-EP-0063-4

UC-721

Hanford Site Solid Waste Acceptance Criteria

Date Published
November 1993

Prepared for the U.S. Department of Energy
Office of Environmental Restoration
and Waste Management

Westinghouse Hanford Company P.O. Box 1970
Richland, Washington 99352

Hanford Operations and Engineering Contractor for the
U.S. Department of Energy under Contract DE-AC06-87RL10930

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WHC-EP-0063-4

List attachments.

Date Release Required
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Title Hanford Site Solid Waste Acceptance Criteria	Unclassified Category UC-721	Impact Level 2

New or novel (patentable) subject matter? [X] No [] Yes
If "Yes", has disclosure been submitted by WHC or other company?
[] No [] Yes Disclosure No(s).

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Author/Requestor (Printed/Signature) Date
Norman P. Willis Norman P. Willis September 24, 1993

Intended Audience
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ACRONYMS

ADR	Asbestos Disposal Request
ALARA	as low as reasonably achievable
ALO-TSD	U.S. Department of Energy Albuquerque Operations Office - Transportation Safeguards Division
ANSI/ASQC	American National Standard Institute/American Society for Quality Control
ASTM	American Society for Testing & Materials
BDAT	best demonstrated available technology
CAMU	Corrective Active Management Unit
Ci	curie
CERCLA	*Comprehensive Environmental Response, Compensation and Liability Act of 1980*
CFR	*Code of Federal Regulations*
CH	contact-handled
CH-TRU	contact-handled transuranic (waste)
CMP	Container Management Program
COC	Certificate of Compliance
CWC	Central Waste Complex
DFWMP	Defense Facility Waste Management Plant
DOE	U.S. Department of Energy
DOT	U.S. Department of Transportation
dpm	disintegrations per minute
DW	Dangerous Waste
Ecology	Washington State Department of Ecology
EPA	U.S. Environmental Protection Agency
ESSS	Excess, Surplus Sales and Shipping
GTCC	Greater-than-Class C
HDPE	high density polyethylene
HEPA	high-efficiency particulate air (filter)
HMO	Hazardous Materials Operations
HSP	Hanford Site Practices
HWDAR	Hazardous Waste Disposal Analysis Record
IDB	Integrated Database
LDR	Land Disposal Restrictions
LLW	low-level waste
LLWSDR	Low-Level Waste Storage/Disposal Record
LSA	low specific activity
MSDS	Material Safety Data Sheet
MW	mixed waste
NCR	Nonconformance Report
NRC	U.S. Nuclear Regulatory Commission
NRDWSF	Nonradioactive Dangerous Waste Storage Facility
ORSR	Operation Ready Safety Review
OSHA	Occupational Safety and Health Administration
PA	performance assessment
PCB	polychlorinated biphenyl
PE-Ci	plutonium equivalent curies
PIN	package identification number
POC	point-of-contact

QA	Quality Assurance
RCRA	*Resource Conservation and Recovery Act of 1976*
RH	remote-handled
RH-TRU	remote-handled transuranic (waste)
RL	U. S. Department of Energy, Richland Operations Office
RMWAS	Radioactive Mixed Waste Attachment Sheet
SAR	Safety Analysis Report
SARP	Safety Analysis Report for Packaging
SEP	Safety Evaluation for Packaging
SDAR	Storage/Disposal Approval Record
SST	Safe Secure Transport
SWB	standard waste box
SWD	Solid Waste Disposal
SWITS	Solid Waste Information Tracking System
SWM	Solid Waste Management
SWPM	Solid Waste Projection Model
TCLP	Toxic Characteristic Leaching Procedure
TRU	transuranic (waste)
TSD	treatment, storage, and disposal
TWSR	Transuranic Waste Storage Record
TRUSAF	Transuranic Waste Storage and Assay Facility
TSCA	*Toxic Substances Control Act*
UHWM	Uniform Hazardous Waste Manifest
WAC	*Washington Administrative Code*
WAC	Waste Acceptance Criteria
WAP	Waste Analysis Plan
WHC	Westinghouse Hanford Company
WIPP	Waste Isolation Pilot Plant
WRM	Westinghouse radioactive material
WSDR	Waste Storage/Disposal Request
wt%	weight percent

DEFINITIONS

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DEFINITIONS

$\underline{A_2}$. The maximum activity of radioactive material, other than special form or low specific activity radioactive material, permitted in a Type A package. These values are either listed in 173.435 or may be derived in accordance with the procedure prescribed in 173.433. (49 CFR 173.403)

Accountable Nuclear Material. Any material that contains 0.05 times or more of the reporting unit of any one or more of the materials, elements or isotopes listed in Figure 1 of DOE Order 5633.4. See Figure 2 of DOE Order 5633.4.

Act or RCRA. The Solid Waste Disposal Act, as amended by the *Resource Conservation and Recovery Act of 1976*, as amended, 42 USC section 6901 et seq. (40 CFR 260.10)

Active Portion. That portion of a facility where treatment, storage, or disposal operations are being or have been conducted after the effective date of 40 CFR Part 261 and that is not a closed portion. (40 CFR 260.10)

Ancillary Equipment. Any device including, but not limited to, such devices as piping, fittings, flanges, valves, and pumps, that is used to distribute, meter, or control the flow of hazardous waste from its point of generation to a storage or treatment tank(s), between hazardous waste storage and treatment tanks to a point of disposal on-site, or to a point of shipment for disposal off-site. (40 CFR 260.10)

Asbestos Containing Waste Material. Any waste that contains more than one percent asbestos by weight and that can be crumbled, pulverized, or reduced to powder when dry, by hand pressure. (WAC 173-303-040)

Bag. A flexible packaging made of paper, plastic film, textiles, woven material or other similar materials. (49 CFR 171.8)

Below Regulatory Concern. A definable amount of low-level waste that can be deregulated with minimal risk to the public. (DOE Order 5820.2A Attachment 2)

Bottle. An inner packaging having a neck of relatively smaller cross section than the body and an opening capable of holding a closure for retention of the contents. (49 CFR 171.8)

Box. A packaging with complete rectangular or polygonal faces, made of metal, wood, plywood, reconstituted wood, fiberboard, plastic, or other suitable material. (49 CFR 173.403)

Bulk Packaging. a packaging, other than a vessel or a barge, including a transport vehicle or freight container, in which hazardous materials are loaded with no intermediate for containment and which has: A maximum capacity greater than 450 L (119 gallons) as a receptacle for a liquid. Or, a maximum net mass greater than 400 kg (882 pounds) and a maximum capacity greater than 450 L (119 gallons) as a receptacle for a solid.

Carcinogenic. A material known to contain an IARC positive or suspected, human or animal carcinogen. (WAC 173-303-040)

Certification. A statement of professional opinion based upon knowledge and belief. (40 CFR 260.10)

Certified Waste. Waste that has been confirmed to comply with disposal site waste acceptance criteria (e.g., the WIPP-WAC for transuranic waste) under an approved certification program. (DOE Order 5820.2A Attachment 2)

Chelating Agent. Amine polycarboxylic acids (e.g., EDTA, DTPA), hydroxy-carboxylic acids, and polycarboxylic acids (e.g., citric acid, carbolic acid, and glucinic acid). (10 CFR 61.2)

Closure. The requirements placed upon all TSD facilities to ensure that all such facilities are closed in an acceptable manner. (WAC 173-303-040)

Compatibility Group Letter. A designated alphabetical letter used to categorize different types of explosive substances and articles for purposed of stowage and segregation. (49 CFR 171.8)

Compressed Gas. Any material (or mixture) that exerts in the packaging an absolute pressure of 280 kPa (41 psia) or greater at 20°C (68°F), and is not flammable or poisonous. (49 CFR 171.8)

Consignee. The person designated in the shipping papers to receive the shipment. (DOE Order 1540.1(5))

Constituent or Dangerous Waste Constituent. A chemically distinct component of a dangerous waste stream or mixture. (WAC 173-303-040)

Container. Any portable device in which a material is stored, transported, treated, disposed of, or otherwise handled. (WAC 173-303-040) (40 CFR 260.10)

Containment System. The components of the packaging intended to retain the radioactive contents during transportation. (49 CFR 173.403)

Corrosive Material. A liquid or solid that causes visible destruction or irreversible alterations in human skin tissue at the site of contact, or a liquid that has a severe corrosion rate on steel or aluminum. (49 CFR 171.8)

Cylinder. A pressure vessel designed for pressures higher than 40 psia and having a circular cross section. It does not include a portable tank, multi-unit tank car tank, cargo tank, or tank car. (49 CFR 171.8)

Dangerous Waste. Dangerous waste (DW) means any discarded, useless, unwanted, or abandoned nonradioactive substances, including but not limited to, any residues or containers of substances that are disposed of in a quantity or concentration posing a substantial present or potential hazard to human health, wildlife, or the environment because such wastes or constituents or combinations of such wastes have the following characteristics: Short-lived, toxic properties that may cause death, injury, or illness; have mutagenic, teratogenic, or carcinogenic properties: Corrosive, explosive, flammable, or may generate pressure through decomposition or other means. (SD-WM-SAR-019 (App B))

Dangerous Waste Constituents. Those constituents listed in WAC 173-303-9905 and any other constituents that have caused a waste to be a dangerous waste under WAC 173-303. (WAC 173-303-040)

Dangerous Waste. Those solid wastes designated in WAC 173-303-070 through 173-303-103 as dangerous or extremely hazardous waste. As used in WAC 173-303, the words "dangerous waste" will refer to the full universe of wastes regulated by WAC 173-303 (including dangerous and extremely hazardous waste). (WAC 173-303-040)

Decontamination. The removal of radioactive contamination from facilities, equipment, or soils by washing, heating, chemical or electrochemical action, mechanical cleaning, or other techniques. (DOE Order 5820.2A Attachment 2)

Disposal. The discharging, discarding, abandoning, depositing, injecting, dumping, spilling, leaking, or placing of any solid waste or hazardous waste, or the treatment, decontamination, or recycling of such wastes once they have been discarded or abandoned, into or on any land or water so that such solid waste or hazardous waste or any constituent thereof may enter the environment or be emitted into the air or discharged into any waters, including ground waters. (WAC 173-303-040) (40 CFR 260.10) The emplacement of radioactive waste in a manner that ensures isolation from the biosphere, inhabited by man and containing his food chains, for the foreseeable future with no intent of retrieval and that requires deliberate action to regain access to the waste. (DOE Order 5820.2A Attachment 2) (10 CFR 61.2)

Disposal Facility. The land, structures, and equipment comprising a facility or part of a facility at which hazardous waste is intentionally placed into or on any land or water, and at which waste will remain after closure. (DOE Order 5820.2A, Attachment 2) (40 CFR 260.10)

Disposal Site. That portion of a disposal facility that is used to dispose of waste. For low-level waste, it consists of disposal units and a buffer zone. (DOE Order 5820.2A, Attachment 2)

Drum. A flat-ended or convex-ended cylindrical packaging made of metal, fiberboard, plastic, plywood, or other suitable materials. This definition also includes packagings of other shapes made of metal or plastic (e.g., round taper-necked packagings or pail-shaped packagings) but does not include cylinders, jerricans, wooden barrels or bulk packagings. (49 CFR 171.8)

Environment. Any air, land, water, or ground water. (WAC 173-303-040)

EPA Hazardous Waste Numbers. The number assigned by EPA to each hazardous waste listed in 40 CFR 261, Subpart D, and to each characteristic identified in 40 CFR 261, Subpart C. (40 CFR 260.10)

Exclusive Use. The sole use of a conveyance by a single consignor and for which all initial, intermediate, and final loading and unloading are carried out in accordance with the direction of the consignor or consignee. Any loading or unloading must be performed by personnel having radiological training and resources appropriate for safe handling or the consignment. Specific instructions for maintenance of exclusive use shipment controls must be issued in writing and included with the shipping paper information provided to the carrier by the consignor. (49 CFR 173.403)

Explosive Material. Any chemical compound, mixture, or device, that produces a substantial instantaneous release of gas and heat spontaneously or by contact with sparks or flame. (10 CFR 61.2)

Extremely Hazardous Waste. Extremely hazardous waste is the Washington State category of severe hazard. The category applies to waste designated as such by the regulations. The disposal of extremely hazardous waste material on the Hanford Site is prohibited. (SD-WM-SAR-019 Extremely hazardous waste includes any dangerous waste with the following characteristics: A hazardous form for several years or more at a disposal site: A significant environmental hazard and may be concentrated by living organisms through a food chain or may affect the genetic makeup of man or wildlife: Highly toxic to man or wildlife: An extreme hazard to man or the environment if disposed of at a disposal site in such quantities. (SD-WM-SAR-019 (App B))

Facility. All contiguous land, and structures, other appurtenances, and improvements on the land, used for recycling, reusing, reclaiming, transferring, treating, storing, or disposing of hazardous waste. A facility may consist of several treatment, storage, or disposal operational units (e.g., one or more landfills, surface impoundments, or combinations of them). (WAC 173-303-040) (40 CFR 260.10)

Fissile Material. Any material consisting of or containing one or more fissile radionuclides. Fissile radionuclides are plutonium-238, plutonium-239, plutonium-241, uranium-233, and uranium-235. Neither natural nor depleted uranium are fissile material. Fissile material are classified according to the controls needed to provide nuclear criticality safety during transportation, as provided in 49 CFR 173.455. (49 CFR 173.403)

Flammable Liquid. A liquid having a flash point of not more than 60.5°C (141°F), or any material in a liquid phase with a flash point at or above 37.8°C (100°F) that is intentionally heated and offered for transportation at or above its flash point in a bulk packaging. (49 CFR 171.8)

Flammable Solid. Any of the following types of materials: Wetted explosives, self-reactive materials that are liable to undergo a strongly exothermal decomposition caused by excessively high temperatures or contamination, or readily combustible solids that may cause a fire through friction. (49 CFR 171.8)

Flash Point. The minimum temperature at which a substance gives off flammable vapors which, in contact with sparks or flame, will ignite. (49 CFR 171.8)

Free Liquids. Liquids that readily separate form the solid portion of a waste under ambient temperature and pressure. (40 CFR 260.10) (DOE Order 5820.2A Attachment 2)

Generator. Any person, by site, whose act or process produces hazardous waste identified or listed in 40 CFR Part 261, or whose act first causes a hazardous waste to become subject to regulation. (WAC 173-303-040) (40 CFR 260.10)

Government Agency. Any executive department, commission, independent establishment, or corporation, wholly or partly owned by the United States of America which is an instrumentality of the United States; or any board, bureau, division, service, office, officer, authority, administration, or other establishment in the executive branch of the government. (10 CFR 61.2)

Gross Weight or Gross Mass. The weight of a packaging plus the weight of its contents. (49 CFR 171.8)

Ground Water. Water which fills voids below the land surface and in the earth's crust in a zone of saturation. (WAC 173-303-040) (40 CFR 260.10)

Hanford Site Practices. Requirements specific to the Hanford Site treatment storage and disposal facilities administered by Westinghouse Hanford that can be waived or modified under the sole authority of Westinghouse Hanford Company and RL. These requirements are not optional, but can be waived with proper documentation and approvals.

Hazard Class. The category of hazard assigned to a hazardous material under the definitional criteria of 49 CFR 173 and the provisions of Table 172.101. A material may meet the defining criteria for more than one hazard class but is assigned to only one hazard class. (49 CFR 171.8)

Hazardous Material. a substance or material, including a hazardous substance, that has been determined by the Secretary of Transportation to be capable of posing an unreasonable risk to health, safety, and property when transported in commerce, and which has been so designated. (DOE Order 1540.1(5)) (49 CFR 171.8)

Hazardous Substances. Any liquid, solid, gas, or sludge, including any material, substance, product, commodity, or waste, regardless or quantity, that exhibits any of the physical, chemical, or biological properties described in WAC 173-303-090, 173-303-101, 173-303-102, or 173-303-103. (WAC 173-303-040)

Hazardous Waste. Those solid wastes designated by 40 CFR 261, and regulated as hazardous waste by the United States EPA. (WAC 173-303-040) (40 CFR 260.10) (10 CFR 61.2) (DOE Order 5820.2A Attachment 2) (49 CFR 171.8)

Horsetailing. A method of closing plastic bags. The top of the bag is twisted and a piece of cloth reinforced plastic tape is wrapped around the twisted portion. The remainder of the plastic above the tape is twisted and folded down over the tape. A new piece of tape is then wrapped around the newly twisted portion and the original taped portion of the bag.

Ignitable Waste. A dangerous waste that exhibits the characteristic of ignitability described in WAC 173-303-090(5). (WAC 173-303-040)

Inadvertent Intruder. A person who might occupy the disposal site after closure and engage in normal activities, such as agriculture, swelling construction, or other pursuits in which the person might be unknowingly exposed to radiation from the waste. (10 CFR 61.2)

Incinerator. Any enclosed device that uses controlled flame combustion and neither meets the criteria for classification as a boiler, sludge dryer, or carbon regeneration unit, nor is listed as an industrial furnace. Or, meets the definition of infrared incinerator or plasma arc incinerator. (WAC 173-303-040) (40 CFR 260.10)

Incompatible Waste. A hazardous waste which is unsuitable for placement in a particular device or facility because it may cause corrosion or decay of containment material (e.g., container inner liners or tank walls). Or, commingling with another waste or material under uncontrolled conditions because the commingling might produce heat or pressure, fire or explosion, violent reaction, toxic dusts, mists, fumes, gases or mists, or flammable fumes or gases. (WAC 173-303-040) (40 CFR 260.10)

Inner Liner. A continuous layer of material placed inside a tank or container which protects the construction materials of the tank or container from the contained waste or reagents used to treat the waste. (WAC 173-303-040) (40 CFR 260.10)

Land Disposal. Placement in a facility or on the land with the intent of leaving the dangerous waste at closure, and includes, but is not limited to, placement for disposal purposes in a: Landfill; surface impoundment; waste pile; injection well; land treatment facility; salt dome or salt bed formation; underground mine or cave; concrete vault; bunker; or miscellaneous unit. (WAC 173-303-040)

Land Disposal Facility. The land, buildings, and equipment which is intended to be used for the disposal of radioactive wastes into the subsurface of the land. A geologic repository as defined in 10 CFR Part 60 is not considered a land disposal facility. (10 CFR 61.2)

Landfill. A disposal facility or part of a facility where hazardous waste is placed in or on land and which is not a pile, a land treatment facility, a surface impoundment, an underground injection well, a salt dome formation, a salt bed formation, an underground mine, or a cave. (WAC 173-303-040) (40 CFR 260.10)

License. A license issued under the regulations in 10 CFR 61. (10 CFR 61.2)

Licensee. The holder of a license issued under the regulations in 10 CFR 61. (10 CFR 61.2)

Limited Quantity. The maximum amount of a hazardous material for which there is a specific labeling or packaging exception (49 CFR 171.8). For radioactive material this means a quantity of radioactive material not exceeding the materials package limits specified in 49 CFR 173.423 and which conforms with the requirements of 49 CFR 173.421.

Liner. A continuous layer of natural or man-made materials, beneath or on the sides of a surface impoundment, landfill, or landfill cell, which restricts the downward or lateral escape of hazardous waste, hazardous waste constituents, or leachate through the sides, bottom, or berms of a surface impoundment, waste pile, or landfill. (WAC 173-303-040) (40 CFR 260.10)

Liquid. A material that has a vertical flow of over 2 inches (50mm) within a three minute period, or a material having one gram (1g) or more liquid separation, when determined in accordance with the procedures specified in ASTM D 4359-84, "Standard Test Method for Determining whether a Material is a Liquid or Solid," 1984 edition. (49 CFR 171.8)

Low-Level Waste (LLW). Waste that contains radioactivity and is not classified as high-level waste, transuranic (TRU) waste, or spent nuclear fuel or 11E(2) byproduct material as defined by DOE Order 5820.2A. Test specimen of fissionable material irradiated for research and development only, and not for the production of power or plutonium, may be classified as LLW provided the concentration of transuranic is less than 100 nCi/g. (DOE Order 5820.2A Attachment 2)

Management or Hazardous Waste Management. The systematic control of the collection, source separation, storage, transportation, processing, treatment, recovery, and disposal of hazardous waste. (40 CFR 260.10)

Manifest. The shipping document EPA form 8700-22 and, if necessary, EPA form 8700-22A, originated and signed by the generator in accordance with the instructions included in 40 CFR 262, which is used to identify the quantity, composition, origin, routing, and destination of a dangerous waste while it is being transported to a point of transfer, disposal, treatment, or storage. (WAC 173-303-040) (40 CFR 260.10)

Manifest Document Number. The US EPA twelve digit identification number assigned to the generator plus a unique five digit document number assigned to the Manifest by the generator for recording and reporting purposes. (40 CFR 260.10)

Marking. A descriptive name, identification number, instructions, cautions, weight, specification, or UN marks, or combinations thereof, required by 49 CFR on outer packagings or hazardous material. (49 CFR 171.8)

Material. Any material, hazardous or nonhazardous, or article that requires transportation to, from, or between DOE facilities for which DOE pays or reimburses transportation charges. (DOE Order 1540.1(5))

Mixed Waste. Waste containing both radioactive and hazardous components as defined by the Atomic Energy Act (ATEA) and the Resource Conservation and Recovery Act (RCRA), respectively. (DOE Order 5820.2A Attachment 2)

Mixture. A material composed of more than one chemical compound or element. (49 CFR 171.8)

Movement. That hazardous waste transported to a facility in an individual vehicle. (40 CFR 260.10)

N.O.S.. Means not otherwise specified. (49 CFR 171.8)

Near-Surface Disposal. Disposal in the upper 30 meters of the earth's surface, (e.g., shallow land burial). (DOE Order 5820.2A Attachment 2)

Occurrence. An accident, including continuous or repeated exposure to conditions, which results in bodily injury or property damage which the owner or operator neither expected nor intended to occur. (WAC 173-303-040)

Organic Peroxide. Any organic compound containing oxygen (O) in the bivalent -O-O- structure and which may be considered a derivative of hydrogen peroxide, where one or more of the hydrogen atoms have been replaced by organic radicals. (49 CFR 171.8)

Onsite. The same or geographically contiguous, or bordering property which may be divided by public or private right-of-way, provided the entrance and exit between the properties is at a cross-roads intersection, and access is by crossing as opposed to going along, the right-of-way. Non-contiguous properties owned by the same person but connected by a right-of-way which he controls and to which the public does not have access, is also considered on-site property. (WAC 173-303-040) (40 CFR 260.10)

Operational Safety Requirements (OSR). Those requirements that define the conditions, safe boundaries, and bases thereof and the management or administrative controls required to ensure the safe operation of a nuclear facility. (WHC-SD-WM-SAR-049 (chapter 7))

Operator. The person responsible for the overall operation of a facility. (WAC 173-303-040) (40 CFR 260.10)

Outer Packaging. The outer-most enclosure of a composite or combination packaging together with any absorbent materials, cushioning and any other components necessary to contain and protect inner receptacles or inner packagings. (49 CFR 171.8)

<u>Overpack</u>. An enclosure that is used by a single consignor to provide protection or convenience in handling of a package or to consolidate two or more packages. Overpack does not include a freight container. (49 CFR 171.8)

<u>Owner</u>. The person who owns a facility or part of a facility. (40 CFR 260.10)

<u>Package</u>. The package, together with its contents, as presented for transportation. (DOE Order 1540.1(5))

<u>Packaging</u>. The assembly of containers and any other components attached thereto, including inner receptacles, absorbent material, supporting structure, thermal insulation, and supplementary attached equipment necessary for the receptacle to perform its containment function in conformance with the minimum packing requirements of 49 CFR. (DOE Order 1540.1(5)) (49 CFR 171.8)

<u>Packaging or Outside Package</u>. A packaging plus its contents. (49 CFR 171.8)

<u>Performance Assessment</u>. 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. (DOE Order 5820.2A Attachment 2)

<u>Permit</u>. An authorization which allows a person to perform dangerous waste transfer, storage, treatment, or disposal operations, and which typically will include specific conditions for such facility operations. Permits must be issued by one of the following:

The department, pursuant to this chapter;
United States EPA, pursuant to 40 CFR Part 270; or
Another state authorized by EPA, pursuant to 40 CFR Part 271.
(WAC 173-303-040)

<u>Persistence</u>. The quality of a material that retains more than one-half of its initial activity after one year (365 days) in either a dark anaerobic or dark aerobic environment at ambient conditions. (WAC 173-303-040) (SD-WM-SAR-019 (App B))

<u>Person</u>. (1) Any individual, corporation, partnership, firm, association, trust, estate, public or private institution, group, government agency other than the Commission or the Department of Energy (except that the Department of Energy is considered a person within the meaning the meaning of the regulations in this part to the extent that its facilities and activities are subject to the licensing and related regulatory authority of the Commission pursuant to law), and State or any political subdivision of or any political entity within a State, any foreign government or nation or any political subdivision of any such government or nation, or other entity; and (2) any legal successor, representative, agent, or agency of the foregoing. (WAC 173-303-040) (40 CFR 260.10) (10 CFR 61.2)

<u>Personnel or Facility Personnel</u>. All persons who work, at, or oversee the operations of, a hazardous waste facility, and whose actions or failure to act may result in noncompliance with the requirements of 40 CFR 264 or 265. (40 CFR 260.10)

Proper Shipping Name. The name of the hazardous material shown in Roman print (not italics) in 49 CFR 172.101. (49 CFR 171.8)

Pyrophoric Liquid. Any liquid that ignites spontaneously in dry or moist air at or below 130°F (54.5°C). A pyrophoric solid is any solid material, other than one classed as an explosive, 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 hazards. Included are spontaneously combustible and water-reactive materials. (10 CFR 61.2)

Pyrophoric Material. A liquid or solid that, even in small quantities and without an external ignition source, can ignite within five (5) minutes after coming in contact with air, and 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. (DOE Order 5820.2A Attachment 2) (49 CFR 171.8)

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. (DOE Order 5820.2A Attachment 2)

Radioactive Material. Any material having a specific activity greater than 0.002 microcuries per gram (uCi/g). (49 CFR 173.403)

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. (DOE Order 5820.2A Attachment 2)

Reactive Waste. A dangerous waste that exhibits the characteristic of reactivity described in WAC 173-303-090(7). (WAC 173-303-040)

Recycle. To use, reuse, or reclaim a material. (WAC 173-303-040)

Repository. A facility for the permanent deep geologic disposal of High Level or Transuranic Waste. (DOE Order 5820.2A Attachment 2)

Representative Sample. A sample of a universe or whole (e.g., waste pile, lagoon, ground water) which can be expected to exhibit the average properties of the universe or whole. (WAC 173-303-040) (40 CFR 260.10)

Residue. The hazardous material remaining in a packaging, including a tank car, after its contents have been unloaded to the maximum extent practicable and before the packaging is either refilled or cleaned of hazardous material and purged to remove any hazardous vapors. (49 CFR 171.8)

Secular Equilibrium. Equilibrium that occurs between a parent radionuclide and daughter radionuclide where the half life of the parent is significantly longer than the daughter.

Shipper. The person (or his or her agent) who tenders a shipment for transportation. The term includes persons who prepare packages for shipment, and offer packages to a carrier for transportation by signature on the shipping paper. (DOE Order 1540.1(5))

Shipping Paper. A shipping order, bill of lading, manifest or other shipping document serving a similar purpose and containing the information required by 49 CFR 172.202, 172.203, and 172.204. (49 CFR 171.8)

Sludge. Any solid, semi-solid., or liquid waste generated from a municipal, commercial, or industrial wastewater treatment plant, water supply treatment plant, or air pollution control facility exclusive of the treated effluent from a wastewater treatment plant. (40 CFR 260.10)

Solid. A material which has a vertical flow of two inches (50mm) or less within a three-minute period, or a separation of one gram (1g) or less of liquid when determined in accordance with the procedures specified in ASTM D 4359-84 "Standard Test Method for Determining Whether a Material.is a Liquid or Solid," 1984 edition. (49 CFR 171.8)

Solution. Any homogeneous liquid mixture of two or more chemical compounds or elements that will not undergo any segregation under conditions normal to transportation. (49 CFR 171.8)

Specific Activity. The activity of the radionuclide per unit mass of that nuclide. The specific activity of a material in which the radionuclide is essentially uniformly distributed is the activity per unit mass of the material. (49 CFR 173.403)

Spontaneously Combustible Material. A pyrophoric or self-heating material. (49 CFR 171.8)

Stabilization and Solidification. A technique that limits the solubility and mobility of dangerous waste constituents. Solidification immobilizes a waste through physical means and stabilization immobilizes the waste by bonding or chemically reacting with the stabilizing material. (WAC 173-303-040)

State. Any of the several States, the District of Columbia, the Commonwealth of Puerto Rico, the Virgin Islands, Guam, American Samoa, and the Commonwealth of the Northern Mariana Islands. (40 CFR 260.10)

Storage. The holding of hazardous waste for a temporary period, at the end of which the hazardous waste is treated, disposed of, or stored elsewhere. (40 CFR 260.10) (DOE Order 5820.2A Attachment 2) "Accumulation" of dangerous waste, by the generator on the site of generation, is not storage as long as the generator complies with the applicable requirements of WAC 173-303-200 and 173-303-201. (WAC 173-303-040)

Storage Facility. Land area, structures, and equipment used for the storage of waste. (DOE Order 5820.2A Attachment 2)

Toxic. Having the properties to cause or to significantly contribute to death, injury, or illness of man or wildlife. (WAC 173-303-040)

Transport Vehicle. The conveyance (motor vehicle, rail car, aircraft, barge, or seagoing vessel) used for the transportation of property. Each cargo-carrying body (trailer, van, boxcar, freight container, barge, or ship's hold) is a separate vehicle. (40 CFR 260.10) (DOE Order 1540.1(5)) (49 CFR 171.8)

Transportation. The movement of hazardous waste by air, rail, highway, or water, from one point to another. (WAC 173-303-040) (40 CFR 260.10) (DOE Order 1540.1(5))

Transporter. A person engaged in the off-site transportation of hazardous waste by air, rail, highway, or water. (WAC 173-303-040) (40 CFR 260.10)

Transuranic Waste. Without regard to source or form, waste that is contaminated with alpha-emitting transuranium radionuclides with a Z number >92 and with half-lives greater than 20 years and concentrations greater than 100 Nci/g at the time of assay. In addition to TRU radionuclides, radium sources and ^{233}U in concentrations greater than 100 nCi/g of the waste matrix are managed as TRU waste.

Treatment. Any method, technique, or process, including neutralization, designed to change the physical, chemical, or biological character or composition of any hazardous waste so as to neutralize such waste, or so as to recover energy or material resources from the waste, or so as to render such waste non-hazardous, or less hazardous; safer to transport, store, or dispose of; or amenable for recovery, amenable for storage, or reduced in volume. (WAC 173-303-040) (40 CFR 260.10) (DOE Order 5820.2A Attachment 2)

Treatment Facility. The specific area of land, structures, and equipment dedicated to waste treatment and related activities. (DOE Order 5820.2A Attachment 2)

Triple Rinsing. The cleaning of containers in accordance with the requirements of WAC 173-303-160 (2)(b). (WAC 173-303-040)

U. S. 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. (DOE Order 5820.2A Attachment 2)

Used Oil. Oil that has been refined from crude oil, used, and, as a result of such use, is contaminated by physical or chemical impurities. (WAC 173-303-040)

Verify/Verified/Verification. A qualitative assessment to confirm or substantiate, in accordance with established procedures, specific facility conditions exist. This includes to read and record on a log or data sheet and to evaluate the subject information in accordance with procedures. (WHC-SD-WM-SAR-049 (chapter 7))

Waste Container. A receptacle for waste, including any liner or shielding material that is intended to accompany the waste in disposal. (DOE Order 5820.2A Attachment 2)

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. (DOE Order 5820.2A Attachment 2)

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. (DOE Order 5820.2A Attachment 2)

Waste Stream. A waste stream is any consistent set of waste material that does not change in its physical, radionuclide or chemical designation or in its means of packaging.

Water or rail (Bulk Shipment). The bulk transportation of dangerous waste which is loaded or carried on board a vessel or rail car without containers or labels. (WAC 173-303-040)

Water Reactive Material. A material that, by contact with water, is liable to become spontaneously flammable or to give off flammable or toxic gas at a rate greater than 1 liter per kilogram of the material, per hour, when tested in accordance with 49 CFR 171 Appendix E. (49 CFR 171.8)

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HANFORD SOLID WASTE ACCEPTANCE CRITERIA

1.0 INTRODUCTION

1.1 PURPOSE

Westinghouse Hanford Company (WHC) manages the Hanford Site treatment, storage, and disposal (TSD) facilities for the U.S. Department of Energy (DOE) Richland Operations Office (RL), under contract DE-AC06-87RL10930. These facilities include hazardous waste storage facilities, radioactive solid waste disposal (SWD) sites, mixed waste (MW) storage areas, a waste compaction facility, radioactive and nonradioactive polychlorinated biphenyl (PCB) storage facilities, and a sanitary waste landfill. The radioactive SWD sites and MW storage areas are used by offsite as well as onsite DOE waste generators. As specified by RL, only radioactive and MW will be accepted from non-Hanford offsite waste generators, and then only on a not-to-affect Hanford Site operations basis. WHC is committed to safe, environmentally sound, and cost-effective waste management, in a manner that is in compliance with federal, state and local regulations, and DOE Orders. To fulfill this commitment, it is necessary to define the criteria that must be met for hazardous and radioactive solid waste to be accepted for treatment, storage, and/or disposal at Hanford Site TSD facilities.

This manual defines the Hanford Site radioactive, hazardous, and sanitary solid waste acceptance criteria. Criteria in the manual represent a guide for meeting state and federal regulations; DOE Orders; Hanford Site requirements; and other rules, regulations, guidelines, and standards as they apply to acceptance of radioactive and hazardous solid waste at the Hanford Site. It is not the intent of this manual to be all inclusive of the regulations; rather, it is intended that the manual provide the waste generator with only the requirements that waste must meet in order to be accepted at Hanford Site TSD facilities.

This document does not include Department of Transportation (DOT) requirements except where those requirements overlap with the acceptance criteria. DOT requirements are found in 40 CFR 173.

1.2 SCOPE

The scope of this manual is limited to solid waste acceptance criteria. Solid waste includes radioactive, hazardous, and sanitary waste. The manual is not intended to provide complete information on transportation, safety, nuclear material accountability, waste management at the generator's facility, or other generator requirements. Waste generators must be cognizant of, and comply with, applicable state and federal waste handling and transportation regulations and directives before shipping waste to Hanford Site TSD facilities. Packaging, transportation, and waste management requirements are not identical for different categories of solid waste; therefore, waste generators must be knowledgeable of all applicable requirements.

The criteria sections of this manual have been divided into three parts. The first part contains the regulations that the TSD facility must follow. These are requirements that are imposed on WHC, and which WHC cannot change on its own authority. These regulations include the requirements of the Chapter 173-303 *Washington Administrative Code* (WAC), DOE Orders, permit requirements, Safety Analysis Report (SAR) requirements, and other federal laws governing solid waste. It is understood that DOE Orders and SAR requirements are not equivalent to the Nuclear Regulatory Commission (NRC) regulations in the *Code of Federal Regulations* (CFR) 10 CFR Part 61. However, in the absence of codified federal regulations DOE Orders and the SAR requirements will be treated as regulations.

The second part of each section contains the Hanford Site Practices (HSPs) and implementation requirements that have been imposed by RL or WHC. These are requirements that could be waived or modified under the sole authority of WHC or RL. These requirements have been established to ensure safe and efficient operation of the Hanford Site TSD facilities. Although these requirements are not mandated by law, the HSPs will be followed by generators to ensure the best possible operation of the TSD facilities and allow the TSD facilities to provide the best service possible to generators.

The third part of each section contains an explanation and background for each of the HSPs.

The criteria in this manual are to be used by the following parties:

1. Waste generators who are preparing waste for treatment, storage, or disposal

2. WHC Acceptance Services staff who evaluate and approve waste for acceptance and prepare waste designations

3. TSD facility personnel who receive the waste

1.3 GENERATOR RESPONSIBILITIES AND AUTHORITIES

A summary of the responsibilities and authorities of generators of hazardous and radioactive solid waste as they pertain to waste acceptance are presented in the following sections.

1.3.1 General Requirements

The waste generator (an individual, corporation, government agency, or other institution that is preparing waste for shipment to the Hanford Site TSD facilities) is responsible for the following.

1. Supply complete and accurate information on the Waste Storage/Disposal Request (WSDR) form.

2. Meet all applicable transportation requirements in addition to meeting the criteria in this manual. Approval of waste packages

for storage or disposal does not signify or imply transportation approval.

3. Designate an individual to serve as the primary contact for all communications with RL and WHC involving packaging and shipment of waste packages for treatment, storage or disposal.

4. Sustain all transportation costs, including those for the return of reusable transport overpacks.

5. Provide funding or special services to cover the cost of treatment, storage or disposal.

6. Provide assistance, and sustain all costs and liabilities incurred in the disposition of noncompliant waste packages.

7. Provide assigned WHC staff all reasonable aid in conducting waste management assessments for compliance with this manual at the generating facilities.

8. Provide an emergency number on the Uniform Hazardous Waste Manifest (UHWM) that can be reached on a 24-hour basis for all hazardous and MW shipments.

1.3.2 Radioactive Waste Generators

The following requirements apply to radioactive and MW generators only.

1. Prepare each radioactive solid waste package to comply with the appropriate criteria in this manual, the approved Storage/Disposal Approval Record (SDAR), and applicable state and federal regulations.

2. Ensure that the forms provided with each radioactive solid waste package contain all required information on waste form and content, and accurately reflect the contents of the waste package.

3. Provide an annual update of a 30-year waste forecast. The forecast will be sent to the Hanford Site SWD/Waste Characterization Section (due the third quarter of each fiscal year, see Chapter 2).

4. Characterize waste streams with sufficient accuracy to permit proper documentation of types and quantities of radionuclides, hazardous constituents, and physical and chemical characteristics. These attributes shall be documented for all stages of the waste management process.

5. Manage radioactive waste in accordance with a waste management program.

6. Provide a Low-Level Waste Storage/Disposal Record (LLWSDR), or a Transuranic Waste Storage Record (TWSR) and a Mixed Waste Attachment Sheet (MWAS) as applicable for each waste package.

7. Waste generators should notify the WHC scheduler at least 2 days before shipping.

1.3.3 Hazardous Waste Generators

The following requirements apply to nonradioactive dangerous waste and MW generators.

1. Package, label, and mark the waste according to state and federal regulations.
2. Properly complete the UHWM for each waste shipment.
3. Establish and mark a proper accumulation date on each package of hazardous waste.
4. Ensure that each hazardous waste package is marked in accordance with WAC 173-303-190 (3)(a)(b) (Washington State generators only) and bears a marking describing the risks associated with the waste (WAC 173-303-630 (3));
5. Prepare inventory lists of lab-packed wastes.
6. Properly complete and authorize the appropriate land disposal notification/certification for each waste shipment (for offsite wastes only).

1.4 WHC AND U.S. DEPARTMENT OF ENERGY RICHLAND OPERATIONS OFFICE CONTACTS

The WHC and RL contacts with responsibilities in specific areas of waste management are identified below. (Names and telephone numbers are subject to change, but were accurate at the time of publication). All correspondence with RL shall be addressed to the Director, Waste Management Division, unless otherwise indicated.

U.S. DEPARTMENT OF ENERGY

Richland Operations Office
P.O. Box 550/R3-80
Richland, Washington 99352

J. M. Hennig, Director
Waste Management Division
(509) 376-1366
(509) 372-1926 FAX

R. F. Guercia, Chief
Solid Waste and Transportation Branch
Waste Management Division
(509) 376-5454
(509) 372-1926

R. O. Puthoff, Operations Officer
Office of Assistant Manager for Waste Management
(509) 376-8853

S. K. Moy, Traffic Manager
Waste Management Division
(509) 376-8372

WHC

P. O. Box 1970
Richland, Washington 99352

Solid Waste Management:
P. L. Hapke, Manager
Solid Waste Management
(509) 373-3921

WHC Solid Waste Acceptance Services:
D. L. Allen, Manager
(509) 372-0677

Westinghouse Hanford Generator Services
H.C. Boynton, Manager
(509) 372-0478

Westinghouse Hanford Shipment Scheduler:
R. Pedraza
(509) 373-1881
FAX (509) 373-1091

Hazardous Materials Operations
E.F. Votaw, Manager
(509) 376-7171

WHC Production Operations Facsimile Transmissions:
Onsite Generators: (509) 373-1730 c/o M. D. Aichele
Verification: (509) 373-4585
Offsite Generators: (509) 372-0437
c/o D. L. Allen
Verification: (509) 372-0677

WHC Shipping Address:
U.S. Department of Energy
c/o WHC
2355 Stevens Drive
1163 Building, 1100 Area
Richland, Washington 99352
Solid Waste Management
(509) 376-7493

1.5 1100 AREA RECEIPT FACILITY

Figure 1-1 is a map showing how to get to the 1100 Area receiving facility, where all shipments of radioactive solid waste from offsite generators are received.

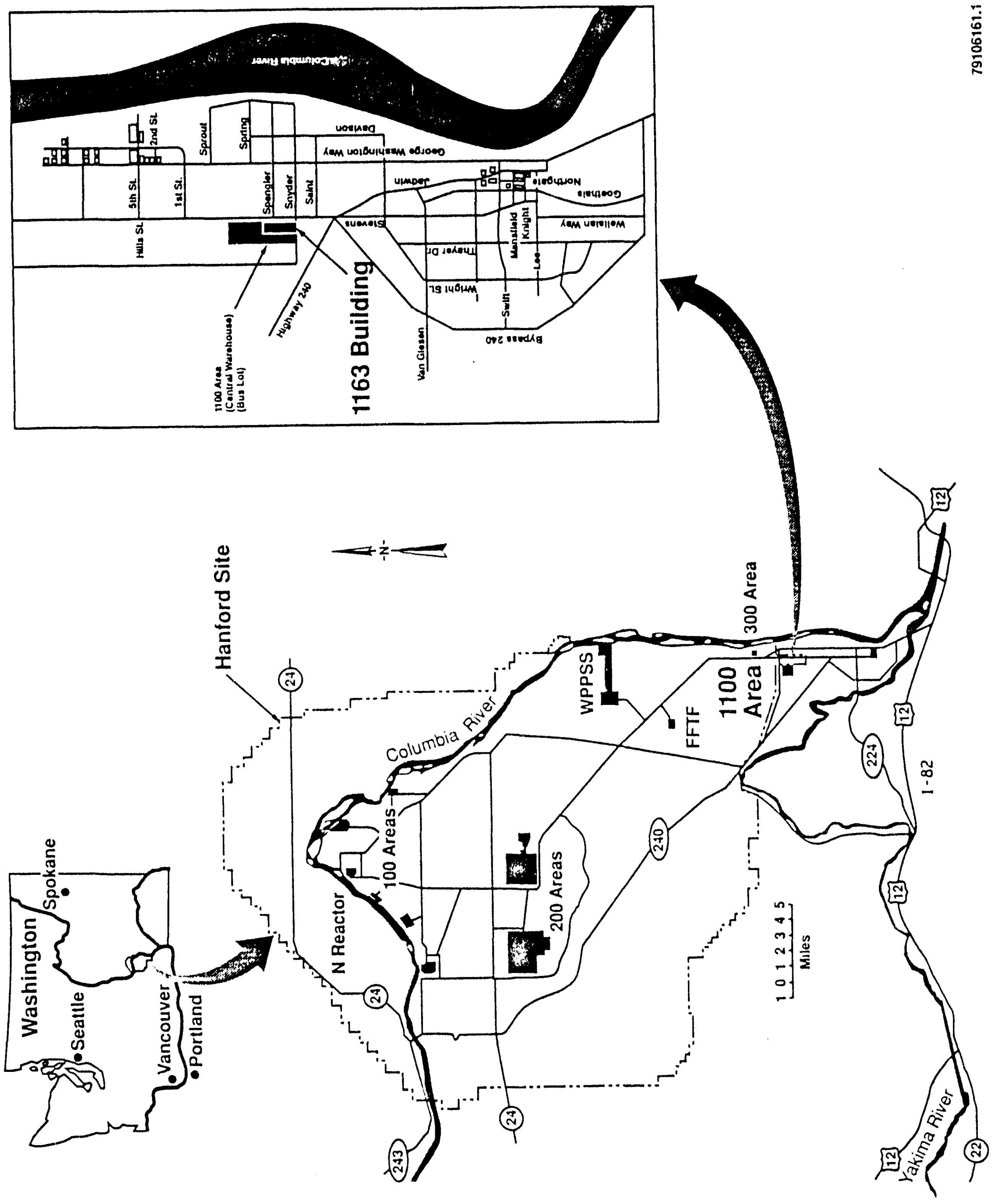
1.6 HANFORD SITE PRACTICE WAIVERS

Some cases may arise where the HSP indicated in the second part of each criteria section cannot be met. They may be impossible or impose an unreasonable burden on the waste generator or other facility. In only those cases the Hanford Site practices may be modified or waived altogether on a technical basis, and must not compromise safety or environmental compliance. Requests for waivers from offsite generators must go through RL.

To ensure that the best possible alternative is selected, the following process should be followed when seeking a waiver to the HSPs of this manual. The waste generator should provide a complete description of the desired waiver in writing to Acceptance Services. This document should include information on the desired equivalent technical action and how that action will provide an equivalent degree of safety if a safety system is involved, or environmental protection if the environment is involved. The request will be transmitted to Acceptance Services. That organization will take the lead in responding to the request. If a waiver of specific requirements is warranted, it will be handled on a case-by-case basis and will be formally documented by letter to the generator. The letter will require concurrence by the cognizant organization within SWD; Solid Waste Management (SWM); Packaging, Shipping and Waste Safety Assurance; Waste Operations Quality Assurance; Environmental Assurance and RL. Any appeal of decisions made by this process may be made to RL Waste Management Division. Additional charges may be assessed for waste handled under a waiver.

Because of the variability in waste type, form, content, and packaging, not all wastes are explicitly covered by this document. When requirements are not provided in this document for a particular waste, the generator should include a complete detailed description of the physical and chemical characteristics of the waste and other pertinent information in the request for treatment, storage or disposal. Acceptance Services will evaluate such requests on a case-by-case basis, and will provide specific requirements for individual waste packages in the SDAR if the request is approved. In those cases where the SDAR

Figure 1-1. 1100 Area Receiving Facility.



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conflicts with this document, the SDAR will take precedence. The SDAR may impose additional requirements but will not waive any requirements specified in this manual unless the waiver is documented and approved as indicated above.

1.7 PROCESS OVERVIEW FLOWCHARTS

Figure 1-2 is a flowchart of the process required for waste acceptance at Hanford Site TSD facilities. In addition, the flowchart refers to sections in this manual that correspond to each step of the process.

1.8 DISPOSITION OF NONCOMPLIANT WASTE

1. Radioactive solid waste packages received at the Hanford Site with noncompliant conditions will require resolution. Noncompliant conditions are physical conditions that are determined as not in compliance with the requirements in this manual, the applicable SDAR, State Dangerous Waste Regulations, and/or Hanford Site safety limits or when verification sampling shows that the waste does not match the documentation. The resolution will be handled by using 1 or more of the following alternatives, depending upon the seriousness of the condition:

   a) WHC may hold the waste packages and request that the waste generator provide written instructions for use by WHC to correct the condition before the waste package is accepted.

   b) WHC may require that the waste packages be returned to the generator's facilities for correction.

   c) If a noncompliant waste package is not returnable because of condition or packaging, and agreement on disposition cannot be reached between involved parties, the issue will be referred to RL; Washington State Department of Ecology (Ecology); and other appropriate regulatory agencies as necessary for resolution.

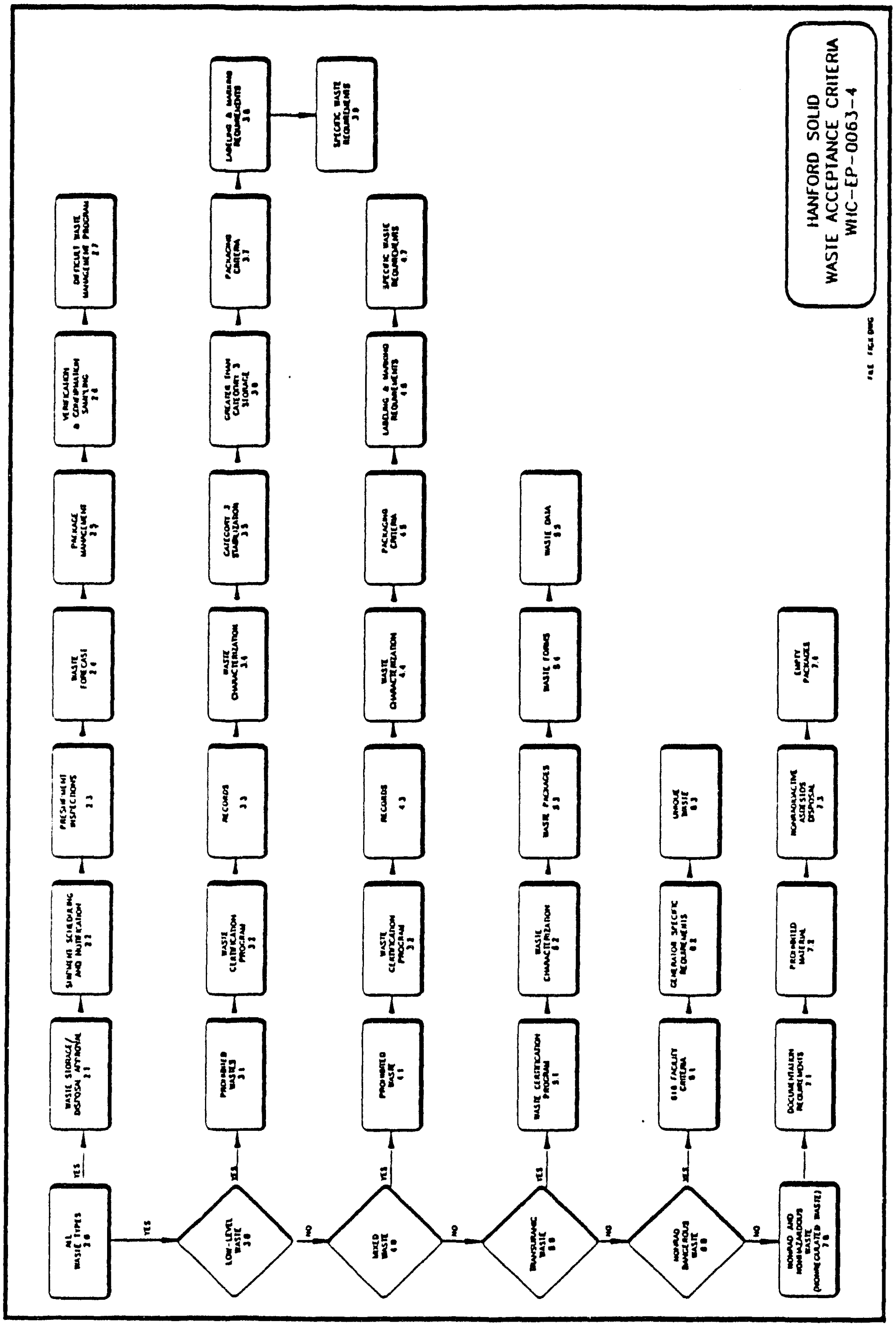
   d) WHC may correct the condition and will charge the waste generator for any costs incurred. (DOE Order 5820.2A III 3.e.(3)).

2. The waste generator will be backcharged for costs incurred for the following conditions:

   a) Decontamination costs incurred by the Hanford Site because of generator or transporter error

   b) Correction of deficiencies such as overpacking, paperwork correction, or any other Nonconformance Report condition

Figure 1-2. Flowchart of the process required for waste acceptance at Hanford Site TSD facilities.



c) Additional costs incurred due to remote handling of high activity waste

d) Other charges that may be added for unique waste streams with prior notification to the generator.

Each occurrence of a noncompliant package, as defined in the first paragraph of this section, requires the preparation of a Nonconformance Report (NCR) and an Off Normal Report. (Note: An NCR is not written in cases of noncompliant paperwork. It is only written if the waste package physically does not meet the requirements of this manual or of the SDAR). Serious or repeated instances of noncompliant conditions will result in an increased frequency of compliance waste management assessments or surveillances (see Chapter 3) and may result in a suspension of waste acceptance. Instances of noncompliance will be recorded and tracked to identify trends and severity. This information will be used in applying corrective action.

In those cases where the waste package is acceptable but the documentation is incorrect, the generator will be notified and will be required to correct the documentation. Repeated cases of incorrect documentation will be referred to SWM for inclusion in the next waste management assessment or surveillance.

2.0 REQUIREMENTS COMMON TO ALL WASTE TYPES

2.1 WASTE STORAGE/DISPOSAL APPROVAL

2.1.1 Regulatory Requirements

1. Generators must receive advance approval from the waste receiving facility to ship a waste package, and shall certify prior to shipment that the waste meets the receiving facility's waste acceptance criteria (DOE 5820.2A IIIg(3)). The approval for radioactive waste will be by transmittal of an approved SDAR and the certification will be on the shipping paper/manifest.

2. The facility owner or operator of the TSD facility shall confirm his/her knowledge about a dangerous waste (DW) before the facility treats, stores, or disposes of it(WAC 173-303-300 (1)). Confirmation will be by assessment, documentation, and waste verification sampling by the TSD facility.

3. The owner or operator shall obtain a detailed chemical, physical, and/or biological analysis of a DW before he/she treats, stores, or disposes of it. This analysis must contain the information necessary to manage the waste in accordance with the requirements of Chapter 173-303 WAC. The analysis may include or consist of existing published or documented data on the DW or on waste generated from a similar process, or data obtained by testing, if necessary (WAC 173-303-300 (2)).

2.1.2 Hanford Site Practices

1. The Hanford Site can only accept waste that is authorized by RL.

2. Authorized Waste generators shall submit a formal request for treatment, storage, or disposal of each waste or waste stream prior to shipment of waste to Hanford Site TSD facilities. Each request shall include a WSDR form, a WSDR Attachment Sheet (if applicable), and a cover letter or generator tracking number on the WSDR. Instructions for completing the WSDR and Attachment are found in Appendix A. Incomplete requests will be returned to the generator.

   Completed requests shall be submitted to the appropriate primary contact as listed below.

   a) Offsite Waste Generators. Submit requests to the Director, Waste Management Division, RL, through the waste generator's DOE Operations Office. After review by RL, the request will be transmitted with an official letter to WHC for evaluation. Established waste generators may request approval from RL (with concurrence of the generator's operations office) to send requests directly to WHC with copies to R. F. Guercia, RL Operations Office.

b) Onsite Waste Generators, including WHC, Kaiser Engineers Hanford and Battelle Pacific Northwest Laboratories (PNL). Submit requests, including cover letter, directly to Acceptance Services. The WHC cover letters must have an internal tracking number.

3. Each WSDR must be accompanied by the following information, as applicable, in addition to the completed WSDR:

   a) Westinghouse Radioactive Material (WRM) number issued by RL (offsite generators only)

   b) Waste characterization documents. All documents must be identified and a clear relationship to the waste established. For analytical data, the sample number applicable to the waste must be specified and a description of the sampling method provided

   c) Complete description of packaging, packages, and returnable transport overpacks. Drawings should be included for any nonstandard packages

   d) The document number to of the current Certificate of Compliance (COC), Safety Analysis Report for Packaging (SARP), or Safety Evaluation for Packaging (SEP) for any packaging requiring specific approval. Copies of these documents may be requested

   e) Detailed description of any special handling, loading, lifting or rigging procedures

   f) Other pertinent information such as previous storage or disposal of similar waste, any treatment the waste has received, or unusual properties of the waste.

4. If radioactive waste is determined to meet the requirements of this manual, it will be approved for receipt at the Hanford Site TSD facilities. Formal approval will be documented with the issuance of an SDAR. The SDAR will be issued under signature authority of the Acceptance Services Manager. An SDAR is not considered valid until issued under the appropriate signature authority.

   A separate SDAR is required for each waste of significantly different physical, chemical, or radiological characteristics. A unique waste stream from more than one generator may be approved under 1 SDAR. Limitations on the allowable number of packages, volume, or timing will be included in the SDAR as applicable.

2.1.3 Background

1. The procedure and protocol for submitting requests for waste treatment, storage, or disposal have been dictated by the DOE. These procedures allow for proper control of waste shipments.

2. The cover letter provides a way for the TSD facility and the waste generator to track the documentation associated with a waste shipment. It also provides a quick summary of the nature of the waste.

3. The WSDR provides a way for the TSD facility to obtain the detailed information they need to ensure that the waste is properly handled, treated, and finally disposed. The level of detail required has been shown to be necessary to meet all of the applicable regulations.

4. The SDAR documents the waste and packaging parameters and ensures that the waste meets the acceptance criteria of the TSD facility. It is specific to a given stream and may apply to more than one generator. Verification and recertification as necessary will be done on a waste stream basis.

2.2 SHIPMENT SCHEDULING AND NOTIFICATION

2.2.1 Regulatory Requirements

1. Prior to each shipment of fissile radioactive materials or shipments of more than Type A quantity of radioactive material, the shipper shall notify the consignee of the dates of the shipment and of expected arrival date. The shipper shall also notify each consignee of any special loading or unloading instructions prior to his/her first shipment (DOE Order 5480.3 10.g.(1)).

   Shipments of classified radioactive solid waste from offsite waste generators requiring Safe Secure Trailer (SST) transportation are scheduled through the DOE Albuquerque Operations Office-Transportation Safeguards Division (ALO-TSD).

2.2.2 Hanford Site Practices

1. All shipments of solid waste to the Hanford Site TSD facilities are scheduled through the WHC scheduler (refer to the list of contacts in Chapter 1).

2. Onsite and offsite waste generators should, if possible, schedule shipments with the WHC scheduler at least two days before shipping unless a lift is involved. Two week notification is required for shipments involving a lift.

3. Shipments that require special handling or unloading of waste packages in returnable overpacks should, if possible, be scheduled 6 to 8 weeks in advance and confirmed two weeks (minimum) before shipment.

4. Hanford Site waste generators shall notify the WHC scheduler at least one day before a scheduled shipment leaves the originating facility, and give the estimated time of arrival of the shipment. The generator should contact the scheduler with any concerns for unusual, expedited, or other shipping needs.

5. Offsite waste generators shall notify the WHC scheduler by telephone with faxed written confirmation at least one day before a scheduled shipment leaves the originating facility. The fax shall include the estimated date of arrival of the shipment.

2.2.3 Background

1. The WHC scheduler has been designated as the individual point-of-contact (POC) for scheduling waste shipments. This avoids conflicts and scheduling difficulties.

2. Two days are required to ensure that the personnel and equipment are available to received waste at the TSD facilities for routine shipments. Shipments requiring lifts need more time to schedule.

3. Additional time is required for shipments that require special handling or unloading of waste packages in returnable overpacks because of the specialized equipment required, and the demand for that type of equipment across the Hanford Site.

4. One-day notice is required of Hanford Site waste generators to confirm scheduling. This allows proper allocation of personnel and equipment during the daily planning. If the shipment does not arrive within one shift of the estimate, the scheduler will notify the waste generator.

5. Faxed confirmation allows proper scheduling of personnel and equipment to receive offsite waste shipments. The scheduler's fax number will be provided to the generators when they do the initial scheduling.

2.3 PRESHIPMENT INSPECTIONS

2.3.1 Regulatory Requirements

None.

2.3.2 Hanford Site Practices

1. Nonradioactive dangerous, low-level and MWs will be inspected on a random basis and as requested by SWD. The inspection will be by WHC Hazardous Materials Operations (HMO) and will be requested by letter.

2. Scheduling for inspections of nonradioactive dangerous, low-level and MWs can be done through the HMO specialists.

3. Scheduling of HMO for inspections requiring HMO's signature, shipments of waste to the 616 Facility, or shipments requiring an HMO specialist's signature on the Operational Ready Safety Review (ORSR), should be done at least one week prior to the requested inspection date.

2.3.3 Background

1. Inspections are part of surveillances required on waste generators, with an approval status that is less than fully approved. Random inspections may be done to ensure continued compliance for those waste generators that are in the full approved status.

2. Individual HMO inspectors are responsible for scheduling inspections.

3. One week notice is required at a minimum to allow proper scheduling of personnel and equipment.

2.4 WASTE FORECAST

2.4.1 Regulatory Requirements

1. All waste generators shall provide an annual 30 year forecast of low-level waste (LLW) in the third quarter of the fiscal year to the field organizations managing the offsite disposal facility to which the waste is to be shipped (DOE Order 5820.2A III 3.g.(2)).

2.4.2 Hanford Site Practices

1. The Annual Solid Waste Forecast shall be provided to the Waste Characterization group within the SWD Division of WHC. The forecast shall include all applicable waste classes (LLW, low-level mixed waste, transuranic (TRU) waste, TRU MW, and Dangerous Waste) pertinent to each waste generator and should be submitted in the 3rd quarter of the year. The Generator should inform the Waste Characterization group of changes in their forecast on a semi-annual basis. Waste not identified in the forecast may not be received.

2. The Annual Solid Waste Volume Forecast shall be legible (typed or printed) and shall contain the following signatures:

   a) The Waste Generator contact person (the individual who completes the forecast)

   b) The level 3 manager for WHC generators or the manager of the contact person for non WHC generators

   c) The individual responsible for financial concurrence.

2.4.3 Background

1. The purpose of the Solid Waste Volume Forecast is to provide, but is not limited to, the following:

   a) Providing SWD the essential data to establish billing rates for those onsite and offsite waste generators who currently ship or plan to ship their waste to the Hanford Site for treatment, storage, or disposal.

   b) Data as input to the Solid Waste Projection Model (SWPM). Data extracted from the SWPM provides vital information to the TSD facilities and ad-hoc reports for engineering construction of new facilities.

   c) Provides Data to the Integrated Database (IDB). The IDB is a national DOE database that compiles current data on waste inventories. Waste not identified in the forecast may not be accepted because adequate preparations (facility construction etc.) may not have been made.

2. The forecast must be legible, as these records become permanent Quality Assurance (QA) records. Signature authorization is required to ensure that the forecast is accurate and that adequate finances exist.

2.5 PACKAGE MANAGEMENT

2.5.1 Regulatory Requirements

None

2.5.2 Hanford Site Practices

1. WHC shall convert to the Performance-Oriented (performance based) Packaging Standards. Design based packaging will be accepted until generator stocks are exhausted or until October 1996. This does not include waste shipped under the authority of a SARP or a SEP.

2. When the Container Management Program (CMP) is implemented, WHC Waste Generators shall acquire new packages, whether fabricated onsite or offsite, through WHC Material Control. Generators will

obtain these packages by submitting to Material Control a Store Order or a Purchase Requisition. This package distribution does not apply to non-WHC waste generators although non-WHC generators may choose to purchase packages through WHC. Waste generators will be notified when this system is implemented.

3. The following numbering systems shall apply to all waste packages:

a) **WHC Material Control Packaging**

Each packaging purchased through WHC Material Control shall receive a unique packaging identification number (PIN) in the form of a Code 39 barcode. The numbering system for packages acquired for use on the Hanford Site will be a 14-field number divided as follows (see WHC-CM-3-34-1.25):

P.O. _#YY-XXXXX

- P.O._# = This six (6) field number is a unique purchase order or work order number that WHC Procurement used to acquire packages.
- YY = This two (2) field number is the item number associated with a particular purchase order or work order number.
- XXXXX = This five (5) field number is associated with a particular purchase order or work order number. This number ranges from one to the total number of packages associated with the subject purchase order or work order.

No other PIN will be required for these packages.

b) **Existing Packaging Stock Not Obtained under the Package Management Program**

Until the Package Management Program (PMP) is fully implemented, WHC waste generators will use the following numbering system.

The numbering system consists of a 14-field number as follows:

CCCC-YY-XXXXXX

The number consists of a 3- or 4- character prefix code indicating the origin of the waste (building, plant, or project identifier), followed by the year the PIN is assigned (e.g., 90) and then a sequence number (up to 6 digits) that starts with one each year for each prefix code. For example, 222s-90-00385 indicates that 385th package assigned a PIN from the 222S Building in 1990. Please use a zero leader if the sequential number is less than 10000 (such as 00048). This will allow access of sequential files on the database.

c) **Non-WHC waste generators**

Barcoding is required for offsite generators. Generator Services will provide assistance to non-WHC waste generators in meeting this requirement if necessary. If a non-WHC Generator chooses to obtain packaging from WHC that are already barcoded, the generator shall use the existing barcode as the PIN. Otherwise, the numbering system for packages originating from non-WHC waste generators will be a 14-field number divided as follows:

OSWRM#-S#-XXXX

- OS = Indicates the package originates from a non-WHC waste generator.
- WRM# = The four-field numeric WRM number issued by RL to the various generators (a new number is issued each fiscal year).
- S# = A two-field numeric number that identifies the number of the shipment for that year (e.g., 01 would be the first shipment of the fiscal year; 02 would be the second shipment).
- XXXX = A four-field numeric number identifying the specific package within the shipment previously designated. Use all four digits. Use a zero leader if the number is less than 1000 (such as 0023).

2.5.3 Background

1. On December 21, 1990, the DOT published the final rule to Docket HM-181, "Performance-Oriented Packaging Standards; Changes to Classification, Hazardous Communication, Packaging and Handling Requirements Based on United Nations Standards and Agency Initiative." This rulemaking was again amended on December 20, 1991. This final rule comprehensively revised the Hazardous Material Regulations (49 CFR Parts 100 - 199) with respect to hazard communication, classification, and packaging requirements. The changes are based on the United Nations Recommendations on the Transport of Dangerous Goods and DOT's own initiative. These new regulations are already in force for all international shipments and domestic air shipments.

   The purpose of this section is to inform the waste generators that WHC is changing its nonbulk-packaging requirements from the DOT design specification packages to the new DOT performance specification packages. Although the deadline for full DOT compliance with performance based packages is not until October

1996, WHC considers it advisable to start phase in of performance-based packaging immediately.

The DOT packaging specifications were previously defined in terms of design (i.e. dimensions, materials, wall thickness). Now DOT requires a specific performance level appropriate for the packaging's lading (i.e. drop test, pressure test). Essentially, the change requires proving that a specific packaging performs at a level appropriate for the material contained therein.

2. The CMP provides the Hanford Site with the service of knowing the types and quantities of packages (empty or full) at any location on the site at any one time. The Solid Waste Information Tracking System (SWITS) is the database the CMP employs to track packaging from acquisition to shipment offsite or final disposal. Tracking involves assigning a package to a location and a generator. The CMP will ensure that each package receives a barcode. The development of the CMP resulted from a desire to provide generators with an improved method to account for and manage packages. The CMP provides the Hanford Site generators a tool by which they can manage both empty and filled packages. The CMP also facilitates the purchasing and standardizing of packages. This is accomplished by channeling the acquisition and approval of all packages through Generator Services. The impetus behind the development of the CMP stemmed from a mandate from WHC Corporate to develop a method for managing the use of packages.

   All packages that could be used for waste shall receive a PIN. Unless exempted by the SDAR, SWD will enforce this requirement by refusing any packages for treatment, storage, or disposed that are not labeled with a PIN.

3. The PIN allows the Package Management System to track waste packages from distribution to the waste generator to final disposal. The barcode allows rapid error free entry of the PIN into the computer system. Any information required about the package, or the waste inside is immediately available on SWITS. Detailed procedures and training will be provided to users of this system.

   Packaging identification number examples are as follows. A package barcoded with 30818301-00003 would be the third package, first item procured under the purchase order number 308183. A package barcoded with 0M171701-00005 would be the fifth package, first item procured under the work order number M1717 (the zero is a place holder). A package barcoded 0S6508-02-0057 would be a package shipped from a non-WHC waste generator that had been issued the WRM number 6508 for the current fiscal year. The package would be included in the second shipment of radioactive waste from that particular generator in the current fiscal year. Finally, the package would be the 57th individual package within that shipment.

2.6 WASTE VERIFICATION AND CONFIRMATION

1. Waste shipped from onsite and offsite generators to Hanford Site TSD facilities will be subjected to a verification and confirmation program on receipt to ensure that these wastes can be safely and effectively managed by the TSD facility. Within this document a convention has been adopted of using the words "verify" and "verification" to refer to the gathering of information necessary to ensure proper identification of wastes as they are received from onsite and/or offsite generators units. "Confirm" and "confirmation" are used within the context of gathering information necessary to ensure that a waste can be safely and effectively managed at Hanford Site TSD units. In many cases, the same information can be used for both verification and confirmation purposes.

   Waste verification and confirmation includes the following elements.

   a) A generators certification program will ensure that generators are designating and characterizing their wastes in a manner conducive to safe and effective treatment.

   b) Criteria will be used for process knowledge to designate wastes and determine if they can be managed at Hanford Site Facilities TSD units.

   c) Sampling strategies will be used if process knowledge does not adequately characterize a waste.

   d) Criteria will be used to ensure that waste sampling and analysis are consistent with as low as reasonably achievable (ALARA) goals.

   All onsite and offsite generators will be certified by the receiving TSD unit prior to shipping wastes. The certification process, including the content of generating unit document submittals, is described in Chapter 3. In general, generators will be required to provide detailed information supporting the characterization of their waste streams to the receiving TSD unit for review and approval prior to receiving certification. Generators will be subject to periodic audits by the TSD facility to ensure that wastes are being managed in a manner consistent with certification documentation. As a part of the certification process, the waste verification and confirmation procedures to be used at the receiving TSD facility will be determined.

   In cases where the information provided for certification is deemed acceptable for verifying a waste's identity and confirming that the waste can be safely and effectively managed, waste verification at the TSD facility will consist of a review of the information specific to a waste batch or shipment. For example, if a generators certification documents state that detailed logs are kept of waste additions to a given waste package, information from these logs will be reviewed. Sampling and analysis will occur in those instances where generator provided information is not acceptable, or where obvious discrepancies between the waste received and the generators provided information are noted in the normal course of waste management activities at the TSD facility.

2.6.1 Regulatory Requirements

1. Regulatory requirements related to waste confirmation sampling are outlined in this section. These are requirements for the TSD facility but are included here because of their potential impact on waste generators.

   a) A TSD facility receiving dangerous or MWs must confirm its knowledge about a waste before the waste is treated, stored, or disposed of. The purpose of this confirmation is to ensure that the waste can be managed properly. The TSD facility must obtain a detailed chemical, physical, and/or biological analysis of the DW to verify that the wastes can be safely managed prior to treating, storing, or disposing of the waste. This verification may rely upon existing data on the waste, or on similar wastes, or data obtained through testing the waste. If required, samples of the waste will be collected using procedures and methods specified in WAC 173-303-110 (WAC 173-303-300(1),(2) and (5)(c)).

   b) The owner or operator of a TSD facility must confirm, by analysis if necessary, that the waste received from an offsite generator matches the identity of the waste described on the shipping papers (WAC 173-303-300(3)).

   c) Confirmation of the initial waste characterization is required when the operation generating the waste has changed significantly or when the DW received at the TSD facility does not match the identity of the waste as specified on the manifest (WAC 173-303-300(4)).

2.6.2 Hanford Site Practices

1. Generators of DWs and MWs are responsible for providing the receiving TSD facility with all data necessary for initial waste stream characterization; periodic recharacterizing of routine waste streams; confirming the identity of the wastes shipped; and verifying that wastes can be treated. If required to be performed by the TSD facility because of inadequate characterization by the waste generator, sampling and analysis costs will be borne by the generator. Costs for verifying that wastes have been effectively treated to meet Land Disposal Restrictions (LDR) requirements, will be borne by the TSD facility. Waste characterization requirements for MWs are outlined in Chapter 4. Waste characterization requirements for DWs are outlined in Chapter 6.

2. Prior to agreeing to receive a waste stream from a DW or MW generator, the TSD facility must first confirm the generators initial waste stream characterization to determine if the waste

stream may be safely and effectively managed at the facility and to identify those compounds or characteristics whose presence or concentration will impact the management of the wastes.

The initial waste stream characterization may rely upon generator data, including previous waste samples and process knowledge, subject to the requirements outlined in Chapters 4 and 6. Sampling and analysis of a representative batch of the waste may also be required. The constituents for which data are required may be limited to those constituents necessary to ensure that the wastes can be safely managed at the TSD facility. For example, if the TSD facility is only storing the wastes, required characterization data may be limited to those constituents or parameters necessary to ensure that wastes can be safely stored in compliance with the facility operating permit and limitations and that constituents requiring treatment are identified.

The sampling strategies used to initially characterize a waste stream will be outlined in the receiving TSD facility waste analysis plan (WAP). Initial waste stream characterization will generally rely upon a methodology such as the Students' T-Statistical test. Those constituents or waste parameters that cannot be shown to be within the TSD facility waste acceptance criteria at the desired level of confidence will be subject to sampling and analysis.

3. Each lot of waste received at the TSD facility must be characterized to the extent necessary to confirm that the wastes received are those itemized on the shipping papers or manifest. The requirement that TSD facilities confirm waste identity is not meant to require full characterization or confirmation that wastes have been properly designated by the generator. Confirmation of waste identity may be accomplished by visual observations, nondestructive analysis, or simple field tests.

   Sampling strategies for confirming waste identity will generally be based upon one of the following methods:

   a) ASTM Standard D140 -70

   b) ANSI/ASQC Standard Z1.4-1981

   c) Table 5-4 Method from the draft *Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968).

   When using the SW-968 Table 5-4 Method, the confidence level and acceptable fraction of incorrectly characterized items will be stated in the TSD facility WAP. Other sampling strategies may be appropriate for an individual TSD facility and/or generator; sampling strategies used by an individual TSD facility will be outlined in the TSD facility WAP.

4. The initial waste characterization may identify constituents or parameters that could potentially fall outside acceptable ranges.

For these wastes, each lot of waste received at the TSD facility must be characterized to the extent necessary to determine that the individual waste lot can be safely and effectively managed. The requirement that TSD facilities verify that the wastes can be safely and effectively managed is not meant to require full characterization or confirmation that wastes have been properly designated by the generator. Verification that the wastes can be safely managed will generally be limited to those parameters identified as potential problems by the initial waste characterization. Waste verification may involve either simple field tests or more detailed analysis, consistent with the TSD facility's data needs and data quality objectives.

Sampling strategies for verifying that wastes can be safely and effectively managed will generally be based upon one of the following methods

a) ASTM Standard D140-70

b) ANSI/ASQC Standard Z1.4-1981

c) Table 5-4 Method from the draft *Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968).

When using the SW-968 Table 5-4 Method, the confidence level and acceptable fraction of incorrectly characterized items will be stated in the TSD facility WAP. Other sampling strategies may be appropriate for an individual TSD facility and/or generator; sampling strategies used by an individual TSD facility will be outlined in the TSD facility WAP. Samples collected to verify that wastes can be safely and effectively managed may be collected at the same time as those used to confirm waste identity.

5. Each waste stream will be recharacterized on a regularly scheduled basis to confirm that the waste generating process has not significantly changed and the waste matrix has stayed within the allowable limits. Recharacterization may involve a review and update of available process knowledge information, sampling and analysis, or both.

   Recharacterization sampling plans will be based on the sampling strategies outlined in this chapter for initial waste characterization or on a risk-based method similar to that described in the Environmental Protection Agency (EPA) document *Waste Analysis Plans - A Guidance Manual* (EPA/530-SW-84-012, EPA, 1984).

2.6.3 Background

1. Agency guidance clearly states that generator data (either process knowledge or waste-specific sampling and analysis) may be used by a TSD facility to determine if the wastes can be safely

and effectively treated and that a TSD facility can require generators to supply this data (*Federal Register*, Vol. 45, No. 98, p. 33179).

2. In the past, confirmation of radioactive waste characterization has relied on an annual audit or assessment of the generator's waste management practices. Nonradioactive dangerous waste stream characteristics, however, have been verified by sample analysis. In the future, sample analysis will be used in place of the annual assessment in ensuring that generator radioactive waste characteristics are accurate. There is no regulatory requirement that mandates a method for selecting the appropriate number of samples for generating/TSD facility initial waste stream characterizations. Both Chapter 173-303 WAC and 40 CFR Part 264 require that samples of a waste stream be "representative" of the waste; regulations governing TSD facility waste characterizations do not require that waste stream "variability" be addressed. In general, the representativeness of a sample is governed by the sampling equipment and method for choosing sampling locations (e.g., random sampling). How accurately waste stream variability is characterized is generally governed by the number of samples collected.

   The suggested sampling strategies for initial waste characterization are those outlined in EPA's *Test Methods for the Evaluation of Solid Wastes - Physical/Chemical Methods*, commonly known by its EPA document number, SW-846 (EPA 1985). Test methods and certain sampling equipment from SW-846 have been formally adopted into the Chapter 173-303 WAC regulations by reference as approved methods for use in characterizing wastes (see WAC 173-303-110). Guidance contained in SW-846 for determining the appropriate number of samples to collect for waste characterization has not been formally adopted for either waste designations or TSD facility waste characterizations. However, SW-846 is recognized by both Ecology and EPA as an authoritative reference source for all facets of DW characterization. Therefore, it is appropriate to consider SW-846 guidance. The sampling strategies proposed in SW-846 are similar to those for generator waste designations described in Ecology's *WAC 173-303-075 Certification Guidelines Supplement*, dated June 1991. Both documents suggest Students' T-test methodologies.

3. Confirming shipment identity through simple field tests is supported by the original regulation proposed by EPA, which involved simple measurements of pH, specific gravity, vapor pressure, and visually observing the physical appearance of the waste (*Federal Register*, Vol. 45, No. 98, p. 33180). Agency guidance also suggests visually inspecting the wastes for physical state, phase separation, texture, color, and odor, and measuring pH and specific gravity (*Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968)). By recommending these simple tests, the intent of the shipment confirmation requirement is clearly not to revisit the generator's waste designation. The recommended sampling

strategies are based on those referenced in the agency documents *Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968), *Waste Analysis Plans - A Guidance Manual* (EPA/530-SW-84-012), or those in general industry use for quality control purposes that are based upon statistical principles similar to those described for the methods found in agency guidance documents.

4. The sampling strategies referenced in this chapter are based on those found in the *Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968), and those in general industry use for quality control purposes.

5. Regular waste recharacterization is recommended in the various agency guidance documents listed above. The sampling strategies listed in this chapter are those found in the *Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968), *Waste Analysis Plans - A Guidance Manual* (EPA/530-SW-84-012), or those in general industry use for quality control purposes, which are based upon statistical principles similar to those described for the methods found in agency guidance documents.

2.7 HANFORD SITE ONLY DIFFICULT WASTE MANAGEMENT PROGRAM

NOTE: The Difficult Waste Management Program (DFWMP) only applies to Hanford Site waste generators including Pacific Northwest Laboratories, WHC, Kaiser Engineers, and other site contractors. Other waste generators should contact Generator Services for help in resolving problems with difficult waste and other programmatic issues.

2.7.1 Regulations

1. The TSD facility shall confirm its knowledge about a DW before it is stored, treated, or disposed (WAC 173-303-300 (1)).

2. The TSD facility shall obtain a detailed chemical, physical, and/or biological analysis of a DW before it stores, treats, or disposes of it. This analysis must contain the information necessary to manage the waste in accordance with the requirements of Chapter 173-303 WAC (WAC 173-303-300 (2)).

3. For wastes received from offsite sources, the TSD facility must confirm (by analysis, if necessary) that the DW identity matches the manifest or shipping paper information (40 CFR 264.13(a)(4); 40 CFR 265.13(a)(4); WAC 173-303-300(3)).

4. LLW shall be characterized with sufficient accuracy to permit proper segregation and storage. 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 (DOE Order 5820.2A III 3.d.(1)).

2.7.2 Hanford Site Practices

1. Mixed waste generated by WHC that cannot receive a complete detailed analysis within 90 days from the time it was generated shall be considered for the DFWMP. Contact SWD for information on getting waste accepted in this program. Appendix O contains the Difficult Waste Procedure.

2. All DFWMP waste shall receive sufficient field screening and analysis to allow a worst case designation, and sorting into compatibility groups. All DFWMP waste must also have been sampled for the required detailed analyses.

3. Unknown waste will not be accepted into the DFWMP.

4. Generators will be charged a fee to use the DFWMP. This will be in addition to the regular waste charge.

5. Waste that cannot receive a confirmation of the initial worst case waste designation within 90 days of being accepted into the DFWMP will not be accepted in the program.

6. Generators must determine if their waste is a designated DW, determine all applicable DW designations, and assign all proper DW numbers as required by 40 CFR 262.11 and WAC 173-303-070(1)(b) and 173-303-170(1). The generator must notify the TSD facility about what other regulatory programs have jurisdiction over the management of the DW.

2.7.3 Background

1. Mixed waste in some cases cannot receive a complete chemical and/or radiological analysis in the 90-day time allowed by regulation. For this reason a program has been established to allow this waste to be moved to a permitted storage area until the complete analysis is received. At the time the analysis is received, the waste is processed into the waste management system in the usual manner. This program provides for better management of the waste and complete and accurate analysis.

2. Regulations require that the waste receive sufficient analysis to ensure that it can be handled properly. This analysis can be accomplished by field screen tests. Although these test are not strictly quantitative in nature, they can allow for a worst case designation. This designation will ensure that the material is handled properly and sorted by compatibility group. Once the detailed laboratory results are received, the waste designation can be refined.

3. Unknown waste that cannot be segregated into compatibility groups or handled properly, cannot be accepted into the DFWMP.

4. DFWMP waste may require additional handling and storage facilities. Funding for any additional work and equipment will be the responsibility of the waste generators that generate this type of waste.

5. The program cannot be used as a method to avoid complete analysis of the waste. The 90-day time period is believed to be adequate when added to the initial 90 days that the waste can reside at the waste generator. The waste generator will need to show that appropriate steps including samples have been taken to obtain the complete analysis within the 90-day time frame, or the waste will not be accepted into the program.

6. The TSD facility is required to obtain the chemical, physical, and other data necessary to properly manage a DW. This information will include at least the designation information about the DW. Westinghouse Hanford relies primarily on information provided by the generators of DWs, and may require the generator to develop (including laboratory analyses, if necessary) designation information needed by the TSD facility to determine appropriate storage, treatment, and disposal procedures. (See Chapter 6 for more detail on chemical and physical characterization requirements).

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3.0 LOW-LEVEL WASTE ACCEPTANCE CRITERIA

3.1 PROHIBITED WASTE

3.1.1 Regulatory Requirements

1. Waste will not be accepted for disposal when it contains free liquid in excess of one percent of the volume of the waste, or 0.5 percent of the volume of waste processed to a stable form (DOE Order 5820.2A III 3.i.(5)(b)).

2. Waste capable of detonation or of explosive decomposition or reaction at normal pressures and temperature, or of explosive reaction with water will not be accepted for disposal (DOE Order 5820.2A III 3.i.(5)(c)).

3. Waste capable of generating toxic gases, vapors, or fumes harmful to persons handling the waste will not be accepted for disposal (DOE Order 5820.2A III 3.i.(5)(d)).

4. Gaseous waste will not be accepted for disposal if it is packaged at a pressure in excess of 1.5 atmospheres (DOE Order 5820.2A III 3.i.(5)(e)).

5. Pyrophoric waste will not be accepted for disposal (DOE Order 5820.2A III 3.i.(5)(f)).

6. Waste exceeding the Class C limit as defined in 10 CFR 61.55 will not be accepted for disposal except as a special case justified by a specific performance assessment and with concurrence of DP-12 or NE-20, as applicable (DOE Order 5820.2A III 3.i.(4)).

3.1.2 Hanford Site Practices

1. Etiologic agents will not be accepted for disposal.

2. Gas cylinders or other pressure vessels will not be accepted that will exceed 1.5. atmospheres internal pressure during the life of the package (refer to Section 3.7.3.2 for package venting requirements).

3. Nonregulated free organic liquids will not be accepted for disposal. These materials will be accepted for storage and eventual treatment (refer to Section 3.9.2.2).

4. Packages containing more than one percent chelating compounds will not be accepted for disposal unless they have been solidified or stabilized (refer to Section 3.9.2; also see DOE Order 5820.2A III 3.e.(5)(g)).

5. Unidentified, uncharacterized, or poorly characterized waste will not be accepted.

6. Waste exceeding Class C limits will not be accepted by WHC from licensees of the U.S. NRC or Agreement States except upon specific written approval by RL with concurrence of DOE Headquarters. This does not apply to waste owned by DOE but loaned to private sector organizations.

3.1.3 Background

1. The Hanford Site disposal facilities are not equipped to handle this type of material.

2. In addition to not accepting pressurized waste packages as required by the referenced DOE order, The Hanford Site will not accept waste in packages that will pressurize with time and eventually exceed the 1.5 atmosphere limit. This requirement is intended to prevent future accidents and releases of radioactive materials to the environment.

3. Organic liquids can facilitate migration of radionuclides through the soil column. Therefore, organic liquids are stored until they can be treated, which will ensure that they are safely disposed. Properly stabilized organic liquids may be accepted for disposal (see Section 3.9.2).

4. Chelating agents can result in migration of radionuclides through the soil. For this reason they are not accepted for disposal unless it is shown that they will not cause radionuclide movement. Unstabilized chelating agents are stored until they can be treated.

5. Waste materials cannot be safely handled or properly disposed unless they are completely characterized.

6. LLW containing greater than Class C (GTCC) quantities of radionuclides is not generally suitable for near-surface disposal. Public Law 99-240 requires certain GTCC waste from licensees of the NRC or Agreement States to be disposed of in DOE facilities licensed by the NRC. To control disposal of this material, RL has directed WHC to obtain written approval prior to accepting this type of waste (Gerton 1990).

3.2 WASTE CERTIFICATION ASSESSMENT PROGRAM

3.2.1 Requirements

1. Generators of waste shall implement a LLW certification program to ensure that the waste acceptance criteria for any LLW TSD facility used by the generator are met (DOE Order 5820.2A III 3.e.(3)).

2. Generators are financially responsible for actions required because of nonconformance (DOE Order 5820.2A III 3.e.(3)).

3. Generator LLW certification programs shall be subject to a periodic audit by operators of facilities to which the waste is sent (DOE Order 5820.2A III 3.e.(4)).

3.2.2 Hanford Site Practices

1. Waste generators are assigned an approval status based on the results of a periodic assessment explained below. Waste Generators with LIMITED approval status may only ship those waste streams for which approval has been granted. Those generators whose status is RESTRICTED must comply with all requirements and restrictions specified in the Assessment Report to ship waste; these will generally require package/shipment-specific surveillances. All shipments must be made in accordance with an approved SDAR. Proper funding shall be in place prior to shipment. Costs associated with TSD facilities efforts to support shipments made from a generator in RESTRICTED status shall be borne by the generator. Waste Generators with a NOT APPROVED status will not be allowed to ship waste.

2. The Hanford Site can only accept waste as authorized by RL. In those instances where a generator produces both government and commercial waste, the generator shall develop and implement procedures to ensure that the government and commercial waste are segregated.

3.2.3 Background

3.2.3.1 Procedures

1. The Waste Certification Assessment Program is designed to ensure that waste received at the Hanford Site meets the waste acceptance criteria. Additionally it satisfies the Washington State regulatory requirement that the TSD facility verify that the waste received is accurately characterized, designated, packaged, labeled, etc.

2. The Waste Certification Assessment Program performs periodic assessments of generator's LLW certification programs. These assessments result in one of the following four approval status classifications:

   a) APPROVED: The generator has a waste management program that provides a high level of confidence that their waste will conform to the Hanford Site waste acceptance criteria. Shipment of waste is approved subject to an approved SDAR and an approved funding authorization.

      APPROVED status is attained through a program assessment and is based on documented evidence that the waste is accurately characterized, designated, packaged, labeled, segregated, and inventoried. Additionally the Waste Certification Assessment Program seeks objective evidence that the generator, has and is implementing an effective QA and training program.

b) LIMITED APPROVAL. The generator has a waste management program that, for specific waste streams, provides a high level of confidence that those waste streams will conform to the Hanford Site waste acceptance criteria. Shipment of those waste streams specified in the Assessment Report is approved, subject to an approved SDAR and an approved funding authorization.

LIMITED APPROVAL status is attained through a program assessment, and is based on documented evidence that a specific waste stream or streams have been accurately characterized, designated, packaged, labeled and inventoried.

c) RESTRICTED. The generator has a waste management program, but the program is inadequate to assure that their waste will conform to the Hanford Site waste acceptance criteria without additional controls. Shipments of limited amounts of wastes may be authorized, subject to conditions, limitations and restrictions as specified in the Assessment Report.

RESTRICTED status may be assigned as the result of a program assessment, scheduled or random surveillance, waste confirmation program analysis results, or other documented evidence which casts doubt on the reliability of the generator's waste management program.

d) NOT APPROVED. The generator was unable to demonstrate through their procedures and waste management documentation that their waste management program nsure that the generator's waste will conform to th rd Site waste acceptance criteria. The generator allowed to ship waste.

3. The Waste Certification Assessment Program performs two kinds of assessments. Program and Waste Stream/Package Specific.

a) PROGRAM ASSESSMENT. This type of assessment is performed at the generator's site, to verify that the generator has a LLW certification program that will ensure that the generator's waste will meet the Hanford Site waste acceptance criteria. A program assessment is funded by the Hanford Site and scheduled with the generator's concurrence. Assessments are conducted annually, or as determined necessary by waste shipment frequency. The program assessment establishes approval status.

To gain APPROVED status, the generator must have written procedures that address the basic elements of a LLW certification program. Additionally, the generator must submit, for TSD facility review, documentation that provides objective evidence that the generator has implemented the procedures. The required elements of a satisfactory LLW certification program are as follows.

1) Waste characterization. The generator must address waste characterization in the waste management procedures. As a minimum, the generator shall identify characterization methodology and sampling protocols; and calibration, documentation and recordkeeping requirements. Where process knowledge is used it shall be documented. The documentation shall describe the process and the logic that supports the characterization conclusions (refer to Section 3.4).

2) Waste Designation. The generator's procedures must require that waste destined for the Hanford Site be designated by an individual who is knowledgeable of the current Washington State Dangerous Waste Regulations, Chapter 173-303 WAC, designation requirements.

3) Waste Traceability. The generator's procedures must provide a system for controlling and recording the contents of waste packages destined for the Hanford Site. Typical systems consist of either locking packages and/or controlled access storage areas, coupled with an inventory sheet for each package.

4) Waste Segregation. The generator's procedures must require that waste be segregated to prevent cross contamination. Specifically, the following waste classifications must be separated. nonradioactive and nonregulated; radioactive and nonregulated; nonradioactive and regulated; and radioactive and regulated.

5) Waste Packaging. The generator's procedures shall establish controls and requirements to ensure that waste streams will be packaged in accordance with the applicable SDAR.

6) Waste Minimization. The generator's procedures shall establish requirements to ensure that the generator's waste generating processes produce as little radioactive and/or dangerous waste as possible. A typical waste minimization method is to review all dangerous wastes currently or proposed for use in radiological areas. Wherever possible a nonhazardous substitute should be used to minimize the possibility of MW.

7) Quality Assurance. The generator shall have a QA program that will ensure that waste sent to the Hanford Site meets the Hanford Site waste acceptance criteria. At the program assessment, the generator shall provide objective evidence that the QA program has been implemented with respect to the waste management program. Examples of objective evidence might include NCRs, audit and surveillance reports, and receiving and inspection reports.

8) Training. The generator's procedures shall identify the waste management training requirements and maintain employee training records to demonstrate that the waste management employees are trained in the procedures applicable to waste destined for the Hanford Site.

b) WASTE STREAM/PACKAGE SPECIFIC ASSESSMENTS. These assessments are routinely performed for generators on RESTRICTED status. The assessments are done at the generator's site, and address either a specific waste stream or a specific shipment. In the absence of an acceptable LLW certification program, a successful waste stream/package-specific assessment permits the shipment of limited quantities of a specific waste stream or an individual waste shipment.

At a minimum, the generator must be able to document acceptable waste characterization, implement a waste traceability system, and demonstrate that either a specific waste stream and/or a specific shipment meets the Hanford Site waste acceptance criteria, before waste can be shipped under a waste stream/package-specific assessment.

Waste stream/package-specific assessments under RESTRICTED status are funded by the generator and scheduled by the TSD facility. The assessment will be scheduled according to the availability of resources. Funding must be in place before work is initiated.

The Waste Certification Assessment Program also performs random waste stream/package-specific assessments of APPROVED and APPROVED (LIMITED) generators to verify continued compliance with the Hanford Site waste acceptance criteria. Random waste stream/package-specific assessments can be initiated at the request of any TSD facility representative or regulator. In instances where the TSD receives a waste that is not properly characterized and/or designated, or not packaged, labeled and/or marked in accordance with the applicable SDAR, the TSD can promptly schedule and perform a waste stream/package-specific assessment of the shipping generator. These assessments can impact the generator's approval status.

To define the scope and content of the certification program, generators shall develop a LLW certification plan. The Waste Certification Assessment Program office has diverse examples of how generators have structured waste management programs and have defined them in certification plans, and is prepared to provide recommendations and reviews as requested by the generator. The format, content and approval of the certification plan will be the responsibility of the generator.

4. Assessment Logistics.

   a) Assessment Announcements. The TSD facility shall formally announce all assessments sufficiently in advance to permit the generator to arrange for proper security and safety measures, and to ensure the health and safety of the assessment team during the visit to the generator's site. The assessment announcement shall include, a copy of the checklist that the TSD facility proposes to use during the assessment.

   b) Assessment Reports. After the assessment is complete the TSD shall prepare an assessment report documenting the generator's approval status and any observations and/or findings identified during the assessment. A copy of the report shall be provided to the generator.

   c) Assessment Team. The size and membership of a team shall reflect the complexity of the generator waste management program. At a minimum the team shall consist of one TSD representative. The TSD shall ensure that the assessment team has the experience and training required to perform a comprehensive assessment of the generator's waste management program.

3.3 RECORDS

3.3.1 Regulatory Requirements

1. Each field organization shall develop and maintain 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 the shipping papers/manifest (DOE Order 5820.2A (III)(m)).

2. Waste documents shall accompany each waste package from generator through final disposal. The documents shall contain data necessary to document the proper classification and assist in determining proper treatment, storage, and disposal of the waste. Waste documents will be kept as permanent records. At a minimum, the following data will be included (DOE Order 5820.2A (III)(m)).

   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)

e) Other data necessary to demonstrate compliance with waste acceptance criteria.

3.3.2 Hanford Site Practices

1. The generator shall supply the TSD facility with a DOE/NRC 741 form if the waste contains accountable nuclear material.

2. The waste generator shall supply the TSD facility with waste package surface dose rate documentation.

3. The waste generator shall supply the TSD facility with documentation of the category (e.g., Category 1, Category 3, Greater than Category 3). In addition, all LLW shall be accompanied by an LLWSDR.

4. All documentation submitted by the generator to the TSD facility for record retention shall be typed or clearly handwritten in black ink.

3.3.3 Background

1. DOE Order 5820.2A requires that the TSD facility maintain secure auditable files that document the amount, type, and location of accountable nuclear material.

2. To comply with ALARA requirements, each package's surface dose rate must be supplied by the generator and kept on file by both the TSD facility and the generating facility. The surface dose rate documentation allows for the safe and effective handling and storage of radioactive waste.

3. The waste classification system is used to forecast waste volumes and will be used in designing LLW disposal facilities that meet the requirements of DOE Order 5820.2A. The radionuclide category also allows proper disposal of the waste material in accordance with the performance assessment. Therefore, LLW waste categorization is required to provide for the storage, treatment, or disposal of LLW.

4. To enable safe and effective handling of LLW, all documentation needs to be clearly labeled, and all documentation needs to be either typed or printed clearly with black ink.

3.4 WASTE CHARACTERIZATION

3.4.1 Physical Characterization Requirements

3.4.1.1 Regulatory Requirements

1. Waste Characterization shall ensure that the physical characteristics of the waste are known and recorded during all stages of the waste management process (DOE Order 5820.2A III 3.d.(1)).

2. Physical characteristics of the waste shall be recorded on a waste record (DOE Order 5820.2A III 3.d.(2)(a)).

3.4.1.2 Hanford Site Practices

1. An inventory sheet shall be maintained for each waste package as the package is filled. This inventory shall include a physical description of the waste material that is added to the package.

2. The physical description of the waste must be entered on the appropriate waste record. This description must include the specific name or names of the contents of the waste package (e.g., pump with attached valving, latex gloves, blotter paper, lab glassware). It must also ensure that the physical form (e.g., plastic, carbon steel, absorbed liquid, rags) of the waste is described. The physical description should also include any internal packaging (i.e., plastic bags, rigid poly liners) absorbents and void space fillers.

3.4.1.3 Background

1. A waste inventory that is maintained as the waste is added to the package ensures that the description of the waste on the manifest is accurate.

2. The information recorded on the record is transferred to the waste database. This information is used in numerous reports and in planning the final cover of the burial ground. It is vital that this information be included and that it be accurate to ensure that the burial ground is maintained in a safe, efficient manner.

3.4.2 Radionuclide Content

3.4.2.1 Regulatory Requirements

1. LLW 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 major radionuclide content is recorded and known during all stages of the waste management process (DOE Order 5820.2A III 3.d.(1)).

2. The concentration of a radionuclide may be determined by direct methods or indirect methods such as scaling factors that relate the inferred concentration of one radionuclide to another that is measured, or by radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements (DOE Order 5820.2A III 3.d.(3)).

3.4.2.2 Hanford Site Practices

1. Each generator should prepare a radionuclide characterization document. This document shall include the process knowledge, analyses, and calculations used to determine the radionuclide

content of each waste stream. The document shall be included as part of the generator's waste certification plan and will be reviewed as part of the generator's Waste Certification Assessment (refer to Section 3.2). Appendix K provides a sample radionuclide analysis plan for low enrichment uranium fuel processing. Generators of this and other types of waste should use Appendix K as a guide in developing a radionuclide characterization document tailored to their specific waste streams.

2. Once the radionuclide composition of a waste stream is accurately known, the limits of Table 3-1 shall be used in a sum of the fractions calculation to determine the disposal category. Refer to Appendix K for instructions and work sheets for determining the disposal category. If the above sum of the fractions calculation indicates that the waste is slightly above the Category 1 limit, the approach in Appendix P may be used to determine the disposal category. Indicate on the WSDR that Appendix P was used to calculate the disposal category if applicable.

3. The disposal category and the reportable radionuclides on the LLWSDR must be reported as indicated below.

   a) Report all radionuclides with a half-life less than 5 years if process knowledge or analysis indicates they exist at greater than one percent of the total curie amount in the waste.

   b) Report only those radionuclides from Table K-1 that process knowledge indicates are present in the waste if they exist at greater than 1/100 of the Table K-1 Category 1 limit. Activities less than minimum detectable analysis limits but greater then the above limit should be reported based on scaling factors or process knowledge

   c) Daughter products in secular equilibrium with the parent radionuclide do not need to be reported.

   d) Cases may occur where no radionuclides are detected but the waste material cannot be released for nonradioactive disposal (e.g., an item with inaccessible areas which cannot be surveyed). In such cases, report only Table K-1 radionuclides and only those that would most likely be present based on process knowledge. Use the detection limit of the survey instrument involved and process knowledge to determine the reportable curie values. Indicate on the manifest article description that this is a "suspect waste."

Table 3-1. Category 1 and 3 Activity Limits for Disposal.

Nuclide	Activity Limits (Ci/m^3)	
	Category 1	Category 3
^{3}H	5.0 E+06	
^{10}Be	1.0 E+00	2.2 E+02
^{14}C	4.0 E-02	9.1 E+00
^{14}C°	4.0 E-01	9.1 E+01
^{36}Cl	4.0 E-04	8.3 E-02
^{40}K	1.7 E-03	3.4 E-01
^{60}Co	7.7 E+01	
^{59}Ni	4.0 E+00	8.3 E+02
^{59}Ni°	4.0 E+01	8.3 E+03
^{63}Ni	4.8 E+00	1.7 E+04
^{63}Ni°	4.8 E+01	1.7 E+05
^{79}Se	3.8 E+01	8.3 E+01
^{90}Sr	4.3 E-03	1.5 E+04
^{93}Zr	2.7 E+00	5.9 E+02
^{94}Nb	2.6 E-04	5.6 E-02
^{94}Nb°	2.6 E-03	5.6 E-01
^{93}Mo	3.0 E-01	7.1 E+01
^{99}Tc	5.6 E-03	1.2 E+00
^{99}Tc	5.6 E-03	1.2 E+00
^{107}Pd	4.8 E+00	1.0 E+03
^{113m}Cd	2.0 E-01	
^{121m}Sn	6.3 E+00	2.0 E+05
^{126}Sn	1.8 E-04	
^{129}I	2.9 E-03	5.9 E-01

Table 3-1. Category 1 and 3 Activity Limits for Disposal (Continued).

Nuclide	Activity Limit (Ci/m^3)	
	Category 1	Category 3
^{133}B	7.7 E-01	
^{135}Cs	1.9 E-01	4.2 E+01
^{137}Cs	6.3 E-03	1.3 E+04
^{147}Sm	1.6 E-02	3.4 E+00
^{151}Sm	3.8 E+01	1.8 E+05
^{150}Eu	1.6 E-03	7.7 E+02
^{152}Eu	8.3 E-01	
^{152}Gd	6.3 E-03	1.3 E+00
^{187}Re	5.3 E+00	1.1 E+03
^{209}Po	2.9 E-02	7.7 E+01
^{210}Pb	1.0 E-02	5.6 E+05
^{226}Ra	1.4 E-04	3.6 E-02
^{228}Ra	1.9 E+01	
^{227}Ac	4.5 E-03	3.2 E+05
^{229}Th	4.8 E-04	1.1 E-01
^{230}Th	2.1 E-03	1.3 E-01
^{232}Th	1.2 E-04	2.2 E-02
^{231}Pa	1.6 E-04	3.3 E-02
^{232}U	5.3 E-04	4.0 E+00
^{233}U*	7.7 E-03	1.1 E+00
^{234}U	9.1 E-03	2.1 E+00
^{235}U	3.2 E-03	5.9 E-01
^{236}U	1.0 E-02	2.2 E+00
^{238}U	6.3 E-03	1.4 E+00

Table 3-1. Category 1 and 3 Activity Limits for Disposal (Continued)

Nuclide	Activity Limits (Ci/m^3)	
	Category 1	Category 3
^{237}Np*	1.9 E-04	4.0 E-02
^{238}Pu*	9.1 E-03	4.5 E+01
^{239}Pu*	3.6 E-03	7.7 E-01
^{240}Pu*	3.6 E-03	7.7 E-01
^{241}Pu*	7.7 E-02	3.1 E+01
^{242}Pu°	3.8 E-03	8.3 E-01
^{244}Pu*	8.3 E-04	1.7 E-01
^{241}Am*	2.6 E-03	1.1 E+00
^{242m}Am*	2.6 E-03	2.4 E+00
^{243}Am*	1.3 E-03	2.8 E-01
^{243}Cm*	2.5 E-02	6.3 E+02
^{244}Cm*	2.3 E-01	2.9 E+02
^{245}Cm*	2.1 E-03	3.3 E-01
^{246}Cm*	3.3 E-03	7.7 E-01
^{247}Cm*	7.1 E-04	1.5 E-01
^{248}Cm*	9.1 E-04	2.0 E-01

° Limit for isotope in activated metal.
* Category 3 limit is the lower of this value and 100 nCi/g.

3.4.2.3 Background

Refer to Appendix K for the radionuclide background information.

3.4.3 Characterization Documentation

3.4.3.1 Regulatory Requirements

1. DOE order 5820.2A requires that a TSD facility have the necessary information and documentation to allow for the safe and effective storage, treatment, and disposal of LLW. Waste may be characterized through either process knowledge or analytical documentation.

2. "Low-level waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, storage, and disposal. The 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" (DOE 5820.2A (3)(d)(1)).

3. "The concentration of a radionuclide may be determined by direct methods or by indirect methods such as use of scaling factors that relate the inferred concentration of one radionuclide to another that is measured, or by radionuclide material accountability, if there is reasonable assurance that the indirect methods can be correlated with actual measurements" (DOE 5820.2A (3)(d)(3)).

3.4.3.2 Hanford Site Practices

1. Generator documents prepared under the waste certification process will, at a minimum, include the following information and its basis (e.g., measurement, process knowledge) and be included with the WSDR.

   a) Physical and chemical characteristics of the waste and any void-filling material or absorbent

   b) Volume of the waste (total of the waste and any solidification or absorbent media)

   c) Weight of the waste (total of the waste and any solidification or absorbent media)

   d) Major radionuclides distribution, concentration, and activity in the waste matrix

   e) Method of assay or analysis used to determine radionuclide distribution and concentration

   f) Documentation of waste classification according to Category 1, 3, and greater than Category 3 concentration limits

g) Transportation category (e.g., Low Specific Activity [LSA], Limited Quantity, Type A in accordance with 49 CFR 173).

3.4.3.3 Background

1. To ensure that waste can be managed safely and effectively, the TSD facility must receive accurate information on the waste. In addition, without complete and accurate information, the waste may have to be resampled or integrated by the TSD facility (at the generators expense) to determine the composition of the waste.

3.5 CATEGORY 3 STABILIZATION

3.5.1 Regulatory Requirements

None

3.5.2 Hanford Site Practices

1. All Category 3 Waste shall be stabilized. Waste may be stabilized by enclosing it in a high-integrity container (HIC), by processing into a stable waste form, or may be shown by analysis to be inherently stable.

2. Category 3 LLW may be completely enclosed in a HIC to meet stability requirements. Approved HICs certified by the NRC or WHC shall be used to stabilize Category 3 LLW.

   Generators may elect to have conventionally packaged waste overpacked for burial in a large volume HIC purchased by WHC. A percentage of volume HIC fee will be charged for use of WHC-purchased HICs. Generators may also choose to have packages of their own design tested to the requirements of WHC specification HS-V-P-0036 for WHC certification as a HIC.

3. Category 3 LLW may be solidified using an NRC or WHC-approved process to meet stability criteria. The final processed waste form must satisfy the performance testing criteria of the NRC Technical Position on Waste Form Section C.2 and Appendix A.

4. Waste forms that are by design inherently stable, such as activated metal or thick pressure vessels, may provide stability equivalent to HICs or solidified waste forms. Each item shall be evaluated on a case-by-case basis. The stability guidance of 10 CFR Part 61 shall apply when evaluating the adequacy of inherently stable waste forms.

3.5.3 Background

1. In accordance with DOE Order 5820.2A each DOE LLW disposal facility has initiated a site-specific radiological performance assessment (PA) to evaluate the adequacy of current disposal practices. Review of preliminary results from the WHC Burial

Ground W5 PA have shown that stabilization of Category 3 LLW will be required to meet all performance objectives (to prevent disposed radionuclides from exceeding intruder limits or infiltrating groundwater resources in excess of established limits). The following major options were open to SWD to address these findings.

a) Adopt interim stabilization requirements until final guidance from the PA becomes available.

b) Delay any policy decision regarding stabilization until final guidance from the PA becomes available.

SWD carefully weighed the advantages and disadvantages of each option and decided that adopting interim stabilization requirements best addressed the current situation. The interim stability requirements option was selected for the following reasons.

- Implementing the final PA stability requirements would be greatly simplified if some form of stability requirements were already in place. Even if the final PA requirements are more stringent than current NRC policy, small changes to the existing requirements would be much more easily accomplished than a short-notice, significant change in procedures.

- Phased implementation shows an aggressive concern for maximum safety in LLW disposal. Failure to act on the knowledge that future waste disposal practices may include some changes would not be in keeping with a safety-first philosophy.

The NRC stabilization system of HICs and solidified waste forms was adopted for use at WHC. This system has the benefits of being well established, clearly defined, and technically supported and has been subjected to intense scrutiny.

2. Both the NRC and WHC have established performance criteria for HICs. The NRC certification criteria may be found in the NRC Technical Position on Waste Form, Section C.4. Many HICs available in the open market are licensed by various states but not by the NRC. In general these HICs do not meet all the NRC requirements and would require burial in a concrete vault or other overpack to withstand soil overburden.

To make LLW disposal more cost-effective and permit generators more flexibility in meeting stability requirements, two additional HIC options were added to the NRC system.

a) WHC purchased HICs intended for use as large-volume burial overpacks for conventionally packaged waste

b) A system for WHC certification of generator-supplied package designs to site-specific HIC requirements.

To support these goals, a general HIC specification, HS-V-P-0036, was developed for use onsite. Although based on the NRC Technical Position on Waste Form, HS-V-P-0036 has been tailored to Hanford Disposal needs by WHC and includes some modifications of NRC requirements.

- HS-V-P-0036 does not require testing to DOT Type A criteria. The WHC HIC is intended to be used as a load-in-place burial package as opposed to a transport package, so DOT type A testing was judged to be unnecessary.
- The WHC HIC does not require the lid closure to allow inspection of the contents. The WHC HIC is intended to be filled, sealed, grouted, and buried, making inspection of the contents unnecessary.
- The WHC HIC does not allow for passive vents to relieve pressure buildup. Once the waste is grouted, vents would be of little value. Consequently, the WHC HIC is not designed or intended to accept wastes with appreciable gas generation. This is in accordance with the Burial Ground SAR requirements and the 1.5 psig limit of section 3.1.1.4, so it was not considered restrictive.
- The WHC HIC does not require prototype testing to demonstrate the package's ability to withstand design loads. The intent of this requirement can be met by data and analysis.

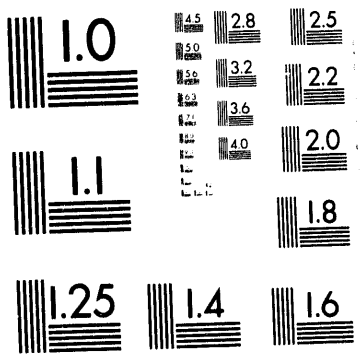
3. Solidification entails thorough mixing of the waste with a solidification medium such as Portland cement or various polymers with the end product intended for burial without a package. The *NRC criteria for solidified waste forms were considered acceptable for disposal at Hanford as written. The requirements of this section do not apply to containerized waste. For example, a waste package encased in cement does not meet waste solidification requirements; however, the concrete capsule may meet HIC requirements.

4. Placing a stable waste such as activated metal or a thick pressure vessel into another package for burial was considered overly conservative and unnecessarily expensive in some cases. Because of this, the option of demonstrating by analysis that a waste form will maintain structural stability and general identity for 300 years was added as a stability option. Because of the wide variety of waste that could fall under this category, the waste must be evaluated on a case-by-case basis.

3.6 GREATER THAN CATEGORY 3 STORAGE

3.6.1 Regulatory Requirements

1. 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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performance assessment through the *National Environmental Policy Act of 1969* (NEPA) 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 (DOE Order 5820.2A III 3.i.(4)).

3.6.2 Hanford Site Practices

1. Greater than Category 3 (GTC3) waste will generally only be accepted for storage and eventual transfer to a federal repository. Disposal of GTC3 waste in a near-surface facility must be justified by a specific performance assessment.

3.6.3 Background

1. Preliminary results of the Hanford Site PA have indicated that GTC3 waste will pose an unacceptable risk in near-surface disposal. For this reason, special disposal systems will be required. These systems will need review and approval on a national basis.

3.7 PACKAGING CRITERIA

3.7.1 Package Criteria

3.7.1.1 Regulatory Requirements

1. 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 (DOE Order 5820.2A III 3.i.(5)(a)).

3.7.1.2 Hanford Site Practices

1. Packages shall be in good condition with no visible cracks, holes, significant corrosion, or other damage that could compromise integrity. Any packages that are bulged, corroded, or otherwise damaged shall not be used. The waste package must be repaired, or the waste must be repackaged or overpacked in a package meeting the criteria in this section.

2. Packages shall be resistant to degradation to the point of structural failure or loss of containment by microbial action, moisture, radiation effects, or chemical reactions with the waste. External containment barriers shall not be jeopardized by wind, blowing sand, precipitation, sunlight, extreme temperatures, or stresses due to the weight or configuration of the package or its contents plus the loads associated with handling and transportation. This requirement only applies prior to actual disposal. For more details refer to DOE Order 5820.2A III 3.e.(5)(f).

3. Fifty-five-gallon drums should, if practical, be banded and palletized in groups of four by the generator.

4. Packages used for stored LLW (e.g. nonhazardous organics) shall meet the same requirements as packages used for MW (refer to Chapter 4 for criteria).

5. The LLW shall provide at least two containment barriers to prevent the release of contamination.

   The following packages may be exempted (as specified in the applicable SDAR) from the double-containment requirement, but shall provide at least one containment barrier.

   a) Packages that have been demonstrated by engineering analysis or testing to meet the appropriate DOT requirements in 49 CFR 173, Subpart I

   b) Self-contained and other waste packages containing DOT LSA or limited quantities of radioactive materials that only require strong, tight packages

   c) Heavy-walled, high-pressure equipment that meets all of the following requirements.

      - A life expectancy in excess of 300 years, when buried at the Hanford Site.
      - External wall thickness of 2.54 cm (1 in.) or more carbon or stainless steel with openings welded or otherwise securely closed using 2.54 cm (1 in.) thick or heavier covers, or an approved equivalent.

   Examples of items meeting these criteria include steam generators, high-pressure preheaters, high-pressure circulating pumps (canned-rotor type), high-pressure tanks, reactor vessels, and large-diameter piping.

6. Plastic bags or sheeting used for primary containment shall be 10-mil nylon reinforced plastic or as approved in the SDAR.

7. Packages used for LLW storage shall be designed to withstand the weight of two layers of 55-gal drums stacked on top with 454 kg (1,000 lb) in each drum. Packages used for LLW disposal must be able to withstand the weight of three layers of 55-gal drums each with the same weight as above.

8. All packages used for disposal of LLW, with the exception of plastic wrap, shall be constructed of metal or shall be fire retardant. All exterior surfaces of wooden packages shall be treated for fire retardation with a fire-retardant material having a maximum flame-spread index of 25 when tested to American Society for Testing Materials (ASTM) Standard E-84-89a (ASTM 1989).

9. All packages shall be capable of manual, forklift or crane offloading. Dumping of LLW in the burial ground will only be allowed for earth, vegetation, and building rubble. Each request

for disposal by dumping shall be accompanied by a justification of why the particular waste cannot be disposed in approved sealed waste packages, and will be evaluated on a case-by-case basis. Economic considerations will be judged as valid justification.

3.7.1.3 Background

1. Packages must be in good condition to ensure that they will survive handling until they are disposed, and/or are in good condition for safe and effective storage if required.

2. DOE Order 5820.2A, Section III 3.e.(5)(f), requires the waste acceptance criteria address chemical and structural stability of the waste packages, radiation effects, microbial activity, chemical reactions and moisture. The packages must maintain structural integrity and containment until the package is buried.

3. Fifty-five gallon drums are most efficiently handled by forklift. Banding and palletizing allow safer operations and faster turnaround of transport vehicles.

4. Waste that is to be stored for an extended period of time is subject to a greater degree of handling and exposure to the elements. The package must survive the period of storage and still maintain its integrity. For this reason packages of waste to be stored are subject to more stringent requirements.

5. Two containment barriers provide an extra degree of safety for personnel handling the waste. Examples of two containment barriers include a plastic bag or a plastic liner inside a steel drum, or a steel drum inside another steel drum. Because of the lower risk imposed by the quantity of the radioisotopes present or because of the nature of the waste or package, some waste does not require double containment.

6. A 10-mil nylon reinforced plastic used as the primary containment ensures that the containment will remain intact until the waste is disposed.

7. LLW package storage requirements for the Central Waste Complex (CWC) allow stacking of packages three high. Packages must be able to hold this load to allow efficient use of the CWC storage area.

8. The use of metal or fire retardant materials meets the combustible requirements for radioactive waste packages.

9. The use of drag-off boxes presents unacceptable risks that are not associated with other types of waste packages. For this reason only liftable waste packages will be accepted. Direct dumping involves placement of bulk, noncontainerized LLW into the burial ground. At one time, small equipment, piping, and other nonhomogeneous materials were disposed in this fashion. In the past, this practice has resulted in contamination spread and other problems for the burial ground operations personnel. As a

result, direct dumping is limited to soil, vegetation, building rubble, and other relatively homogeneous waste materials. Environmental Restorations operations involving large quantities of bulk materials will be accepted under the criteria established in a *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA) record of decision or a RCRA Closure Plan for disposal in a Corrective Action Management Unit (CAMU).

3.7.2 Rigging Requirements

3.7.2.1 Regulatory Requirements

1. Lead shall not be used in fabricating the rigging (Chapter 173-303 WAC).

3.7.2.2 Hanford Site Practices

1. Packages used for LLW that are designed to be unloaded by crane shall be equipped with lifting devices designed to safely lift the fully loaded package.

2. Below the hook lifting devises shall meet the requirements of ANSI/ASME B30.20 (ANSI/ASME, 1985). Slings and rigging shall meet the requirements of ASME B30.9 (ASME, 1990) and Occupational Safety and Health Administration (OSHA) 1910.184 (OSHA 1992).

3. Rigging details shall be included in generator WSDR, and provided to WHC by the generator at least 2 weeks before each shipment if special rigging or lifting is required. An additional copy shall be sent with the shipment. Details shall include a sketch showing overall dimensions, lift points, weights at each lift point, and centers of gravity of the object. If available, sketches of strong backs or lift rigs used for loading shall be furnished where applicable.

4. Remote handled (RH) radioactive packages shall include sacrificial rigging provided by the shipper. The rigging shall be packaged in such a manner that it may be attached to handling equipment without exposing field personnel to excessive radioactivity.

5. The inner packages of waste packages inside returnable overpacks shall be suitably rigged such that personnel shall not be exposed to a radioactive field in excess of 100 mrem/hr while removing overpacks or attaching prepared rigging to crane hooks or similar equipment.

3.7.2.3 Background

1. Lifting devices are to be included with packages designed to be unloaded by crane to allow safe, prompt unloading at the storage and disposal facilities.

2. These standards ensure the off-loading operations can be conducted in a safe manner.

3. Rigging details are required in advance so the necessary equipment, materials, and personnel can be efficiently scheduled. This also allows personnel to become familiar with the requirements of the lifting operation and faster turnaround of transport equipment.

4. Sacrificial rigging on a RH package is required to prevent undue exposure to operations personnel.

5. Packages that are delivered in returnable overpacks require additional close contact handling. The 100 mrem/hour limit ensures that personnel will not receive excessive exposure.

3.7.3 Content Criteria

3.7.3.1 Regulatory Requirements

1. Void spaces within the waste and between the waste and its packaging shall be reduced as much as practical (DOE Order 5820.2A III 3.i.(5)(a)).

2. Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be nonflammable (DOE Order 5820.2A III 3.i.(5)(f)).

3.7.3.2 Hanford Site Practices

1. The internal void space of any LLW package disposed at Hanford Site TSD facilities shall not exceed 10 percent of the total internal volume of the waste package. For the purpose of this requirement, the internal void space shall include any opening within the waste matrix that exceeds 5 cm (2 in.) in all dimensions. Spaces smaller than 5 cm (2 in.) such as small horizontal planar spaces (e.g., the space between a waste package and its overpack) do not need to be included in the void calculation. Spaces larger than 5 cm (2 in.) must be eliminated either by vacuum compression, compaction of the waste, or by filling with an approved void space filler (refer to Appendix G).

   The following waste packages may be exempted from this requirement in the applicable SDAR.

   a) Waste packages that will be crushed or filled during the scheduled burial procedure

   b) LLW packages that are intended for storage and later treatment

   c) High-efficiency particulate air (HEPA) filters, not covered by any other exemption, that pose hazards to personnel during filling and crushing operations

d) Waste packages for which the waste generator provides evidence that personnel exposure and potential contamination spread during the void space filling process is a greater threat than subsidence

e) Heavy-walled (high-pressure) vessels meeting one or both of the following criteria.

- Nominal wall thickness of 2.54 cm (1 in.) or more stainless or carbon steel

- For purposes of this exception, all penetrations in heavy-wall vessels shall be sealed with welded or otherwise secured plates at least 2.54 cm (1 in.) thick (including weld section), or no less than the nominal vessel wall, whichever is less. Examples of items that meet these criteria include high-pressure steam generators, high-pressure feed water heaters, reactor vessels, pumps, and heavy-walled pipe

- The vessel contains a high proportion of internals, such as tube bundles, that make satisfactory void-filling impractical.

f) Packages for which the generator has supplied an engineering analysis, which demonstrates that the intent of this section will not be compromised. The final determination shall be made by Acceptance Services. This determination shall be reflected in the SDAR.

2. The maximum surface-radiation dose rate or any accessible surface for any one package shall not exceed the following (or applicable SARP or SEP limits if more restrictive).

a) Contact handled (CH) radioactive waste packages sent to disposal facilities

- CH 55-gal drums or smaller packages. 200 mrem/hr at any point on the surface

- CH waste packages larger than 55-gal drums. Normal surface radioactivity shall not exceed 200 mrem/hour. However, a marked point with surface radioactivity up to 1,000 mrem/hour on the bottom and one side may be permitted with preapproval by Acceptance Services. Such points shall be marked with large red painted dots.

b) RH radioactive waste packages

- Dose rates for Hanford Site-generated packages may not exceed 3,000 mrem/hour at 1 m (3.3 feet) from a truck or 5,000 mrem/hr at 1 m (3.3 feet) from the side of a rail car being used to transport the waste package to the TSD facilities. All remote handled low-level waste (RH-LLW) packages shall be either unloaded by dump truck, or crane.

c) Waste packages sent to the CWC.

- 100 mrem/hour at any point (packages up to 200 mrem/hour may be received at the CWC. A justification for exceeding the 100 mrem/hour limit must accompany the request for storage of this waste. Approval by SWM will be required before receipt of waste packages that exceed 100 mrem/hour).

3. Removable contamination on the accessible exterior surfaces of all LLW packages shall not exceed the following limits.

   a) 220 disintegrations per minute (dpm)/100 cm^2 for alpha contamination

   b) 2,200 dpm/100 cm^2 for beta-gamma contamination.

   Fixation of surface contamination on returnable overpacks shall not be permitted. Smearable contamination on the interior surfaces of returnable overpacks and on the surface of the internal package when a returnable overpack is used, it should not exceed 49 CFR 173.4 requirements.

4. Acceptance criteria for any LLW with the potential to generate greater than 0.1 watts per cubic foot (W/ft^3) shall be included in the SDAR applicable to that waste. Refer to Appendix C for thermal power factors for selected radioisotopes.

5. All LLW with the potential to generate sufficient nonradioactive gas to pressurize the waste package greater than 1.5 atmospheres or to reach explosive concentrations of hydrogen and oxygen or other explosive gases shall be vented. Vents shall be sized to ensure adequate passage of generated gas. Catalyst packs to deplete free oxygen in LLW packages and prevent flammable concentrations of hydrogen and oxygen may be required in addition to, or in lieu of, vents. If required, the use of catalysts and/or vents will be specified in the applicable SDAR. If used, the catalyst packs will be palladium on alumina or platinum on silica, depending on the potential amount of moisture present in the waste package. The amount of catalyst required will be based on the amount of potential hydrogen generation and will be specified in the applicable SDAR. Liners other than plastic bags shall be provided with positive gas communication to the outer package.

6. Criticality safety limits for waste packages that contain more than 15 g of ^{235}U will be determined by WHC Criticality Engineering Analysis on a case-by-case basis. These limits will be indicated in the SDAR. Waste packages containing 15 g of ^{235}U or less will not require a separate criticality safety analysis.

3.7.3.3 Background

1. Significant void space within waste packages that are buried in the ground eventually results in subsidence of the surface of the burial ground. This subsidence may result in contamination spread and damage to the final cover and may impose a significant safety hazard to personnel working within the burial ground. The 10 percent void space limit is based on a similar requirement for dangerous waste landfills in 40 CFR 264.315.

   All void space will not result in subsidence. For example, Hanford Site soils are approximately 30 percent void space. The voids in soil, however, are small relative to the soil particle size. The 2-in. diameter limit on void space was chosen to provide a convenient, easy to measure lower limit on void space. Any opening smaller than that is not considered to be significant.

   There are a number of waste types that would pose an extreme hazard to personnel attempting to fill the void space. This hazard is actually greater than the hazard posed by subsidence. This type of material is exempt from the void space requirement. In addition there are waste types that by their nature will not collapse in the foreseeable future. These types of waste are also exempt from the void space requirement.

2. The radiation dose from waste packages is limited to reduce exposure to personnel handling the waste packages. The upper limit for CH waste is 200 mrem/hour at contact or any accessible surface. This number is taken from the DOT limit for exclusive use only shipments (49 CFR 173.441 (b)). Small spots with dose rates up to 1,000 mrem/hour at contact are allowable if appropriate notification and precautions are taken.

3. Surface contamination limits are based on the contamination limits allowed by the DOT on radioactive packages offered for shipment. These limits are the maximum allowed. In all cases the contamination should be kept as low as practical.

4. Waste materials that generate heat in excess of 0.1 W/ft^3 may require special packaging and disposal requirements to prevent excessive temperatures in the buried waste. Each waste will be different depending on the nature of the waste and the waste package. Because of this variability, requirements for heat generating waste must be developed on a case-by-case basis.

5. Gas generation, particularly of explosive gases, can result in ruptured packages, serious contamination spread, and personnel injury. The risk can be eliminated or reduced by the use of vents or, if appropriate, catalyst packs to recombine hydrogen or methane with oxygen. These alternatives will not generally be appropriate if the gas generated is radioactive. In these cases other alternatives will be identified and called out in the SDAR.

6. Criticality safety requirements depend on the nature of the waste and the spacing of the waste packages. These requirements must be developed on a case-specific basis. Packages with less than 15 g of ^{235}U can be safely handled with no restrictions for criticality safety.

3.8 LABEL AND MARKING REQUIREMENTS

3.8.1 Regulatory Requirements

1. Wastes managed by Hanford Site TSD facilities will be marked and labeled in conformance with 49 CFR Parts 172, 173, 174, DOE Orders 1540.1A and 5820.2A.

3.8.2 Hanford Site Practices

1. See Chapter 4 for label size requirements. This does not apply to preprinted stickers.

   Labeling in addition to the DOT requirements (e.g., PIN, weight, and "this end up") will be specified in the applicable SDAR. Refer to Appendix E for labeling examples.

   Some additional labeling requirements will be necessary to ensure safe, efficient handling of waste packages. These requirements are unique to the waste and package and thus will be specified in the SDAR.

3.9 SPECIFIC WASTE REQUIREMENTS

3.9.1 Regulatory Requirements

1. Liquid wastes or wastes containing free liquids must be converted into a form that contains as little freestanding and noncorrosive liquid as is reasonably achievable (DOE Order 5820.2A III 3.i.(5)(b)). Also refer to Section 3.1 of this document.

2. Free liquid shall be less than 1 percent of the volume of the waste when the waste is in a disposal package, or 0.5 percent of the volume of waste processed to a stable form (DOE Order 5820.2A III 3.i.(5)(b)).

3. Pyrophoric materials contained in waste shall be treated, prepared, and packaged to be nonflammable (DOE Order 5820.2A III 3.i.(5)(c)).

3.9.2 Hanford Site Practices

1. All liquids disposed of as LLW shall be solidified, absorbed, or otherwise bound in the waste matrix by inert materials. Small amounts of residual liquid are allowed in accordance with Section 3.9.1.

If liquids are bound by absorption, the absorbent material shall be placed in direct contact with the liquid. The quantity of absorbent material shall be sufficient to absorb twice the volume of liquid potentially present or as specified in the SDAR applicable to that waste. Refer to Appendix G for approved absorbents.

Absorbed or stabilized organic liquids may be accepted for disposal if the generator provides evidence that the organic liquid will not facilitate migration of radionuclides through the soil.

2. Nonhazardous liquid organics with properties incompatible with land disposal will be stored at Hanford Site TSD facilities. Liquids accepted for storage may be absorbed as described above packaged as described below, or packaged as described in the applicable SDAR. Liquids to be stored shall not be absorbed, solidified, or otherwise packaged without the concurrence of Acceptance Services.

   The liquid may be sealed in a leak resistant package(s) of not more than 19 L (5 gal) rated capacity for plastic or metal and 3.8 L (1 gal) rated capacity for glass. The total quantity of liquids per each 55-gal drum will not exceed 57 L (15 gal). The inner package(s) shall be packaged with a combustible absorbent. Sufficient absorbent shall be included in the package to absorb at least twice the maximum amount of liquid potentially present.

   Combustible absorbent (refer to Appendix G) shall be used with organic liquids accepted for storage. The applicable SDAR will specify the absorbent to be used.

3. Tritiated waste is waste containing greater than 20 mCi of tritium/m^3 of waste (4.2 mCi/55-gal of waste). The disposal acceptance criteria for tritiated waste are presented below.

   a) Liquid tritiated waste shall be absorbed on an inert absorbent material. The quantity of absorbent material shall be sufficient to absorb twice the quantity of liquid tritiated waste potentially present.

   b) Tritiated waste with less than 100 Ci tritium/m^3 (21 Ci/55-gal of waste) in either absorbed liquids or solids shall be sealed in one layer of 4-mil (nominal) or thicker polyethylene and disposed of in a steel or concrete package.

   c) Containment systems for tritiated waste with greater than or equal to 100 Ci tritium/m^3 (21 Ci/55-gal of waste) shall be specified in the SDAR on a case-by-case basis.

4. All LLW containing asbestos shall be packaged in accordance with the requirements of 40 CFR 61.150 (EPA 1991). If 40 CFR 61.150 section (a)(1) (EPA 1991) is used, then the following applies. The material shall be wetted with water, placed in a 4-mil or

heavier plastic bag, and sealed wet using 5-cm (2-in.) wide, fabric-reinforced tape, or approved equivalent. The material shall then be packaged in a leak-resistant package that meets applicable shipping requirements for the radioactive content of the package involved. Sharp edges and corners within the package shall be padded or otherwise protected to prevent damage to the plastic inner wrap during handling and shipping.

5. All ion exchange resins disposed as LLW shall be thoroughly drained and stable and shall not react with their surroundings to create excessive heat or corrosive-reactive products. Ion exchange resins with the potential for gas generation shall comply with Section 3.7.3.2.5 Adequate data will be required from the generator to determine if the resin is also a dangerous waste.

6. Waste items accepted for burial shall not have unreacted alkali metal contamination that would require regulation of the material as an MW.

7. Chelating agents that compose less than 1 percent of the waste matrix by weight or have been solidified or stabilized will be approved for disposal only on a case-by-case basis. The generator shall provide evidence that the chelating agents will not result in mobilization of radioisotopes.

8. Radioactive animal carcasses are to be packaged in accordance with the following procedure provided by the State of Washington.

   a) All packages must meet the performance based packaging requirements or DOT performance specification 7A. The final package will be a double-walled metal package with the outer package having a capacity at least 40 percent greater than the inner package (e.g., a 30-gal drum in a 55-gal drum or a 55-gal drum in an 85-gal drum).

   b) Line the inner drum with a 4-mil plastic liner.

   c) Place the animal carcass into the inner metal drum with absorbent and lime. Ratio. one part lime to ten parts absorbent.

   d) Seal plastic liner and inner drum.

   e) Place a minimum of 7.6 cm (3 inches) of absorbent on the bottom of the outer drum.

   f) Place the inner metal drum inside the outer metal drum.

   g) Place enough absorbent between the inner and outer drum to completely fill the void space.

   h) Seal the outer drum.

9. Waste generators shall include the fact that a waste is classified as part of their initial request for approval to store or dispose of the waste. To provide adequate security the request must include sufficient information about the nature of the classification, the type of packaging, and the way in which the waste will be shipped (i.e., SST or other method).

3.9.3 Background

1. Liquid waste can result in migration of radionuclides in the soil column. For this reason free liquids must be restricted as much as possible. Absorbents can be used as long as they will not release the liquid when subjected to the conditions found within the burial trenches. A list of acceptable absorbents and solidification agents is attached in Appendix G. The liquid is contained in enough sorbent material to sort at least twice the volume of the liquid contents. This is fashioned after the DOT requirement (49 CFR 173.412 (n)(2) and (3)) and is meant to provide an extra degree of safety.

2. Nonregulated organic liquids pose a risk of increasing radionuclide migration within the soil. For this reason, and because treatment facilities will be provided, it is often more desirable to store nonregulated organic liquids until they can be treated. Bulk packaged liquids pose a greater risk of leaking in the storage facility, and the radioactive waste treatment facility is not designed to handle liquids packaged this way. For this reason liquids should be package in small packages within 55-gal drums. This method is similar to the lab pack method described in 49 CFR 173.12. The 15-gal limit is based on the volume of absorbent required to absorb twice the volume of liquid present. Noncombustible absorbents will interfere with future processing of the liquid. The appropriate absorbent will be selected based on the best available knowledge of what the final treatment or disposal technology will be.

3. Tritium is not held within the soil column as are most other radioisotopes. For this reason wastes containing significant quantities of tritium require additional precautions to prevent release of the tritium. One containment method for tritium is to coat the waste completely with 2.54 cm (1 in.) thick (minimum) virgin asphalt and place it in a steel or concrete package. Alternative sealing systems not dependent on asphalt diffusion barriers may be used. All-welded structures, bellows-sealed valving, and flanged joints with metallic gaskets and knife-edged sealing surfaces may be required. Such systems are acceptable for disposing of tritium, provided suitable technical data are furnished by the generator to demonstrate that the tritium-containing capability of these systems is adequate.

4. Waste containing asbestos is considered a dangerous waste unless it is packaged so that it cannot become airborne (refer to WAC 173-303-071 (m); 40 CFR 61.150 provides ways of doing this. Using the water dampening method the water is considered to be

part of the packaging. However, the water should not exceed the 1 percent limit for free liquids.

5. Some ion exchange resins have the potential for generating explosive gases. In addition, resins may be regulated based on exposure to hazardous materials. Sufficient data is needed so that a regulatory designation can be performed in accordance with Chapter 173-303 WAC. Data provided should describe any materials absorbed on the resin in processing and chemical compositions of column washes. Nitrated organic resins are not normally suitable for disposal because of the potential for violent reaction.

6. Reactive metals cannot be disposed in the burial ground unless they are treated to remove the reactivity characteristic.

7. Disposal of chelating agents can result in migration of radionuclides through the soil. For this reason, chelating agents are not accepted if they exceed 1 percent of the waste unless it is shown that they will not cause radionuclide migration.

8. Decomposition of animal carcasses can result in package pressurization and other hazards to personnel handling the waste. The risks can be reduced by treating the waste with slaked lime. If calcium hydroxide is the only dangerous material present and it does not exceed 10 percent by weight of the waste, the carcass is not subject to regulation as a DW. Other methods of preserving carcasses may result in the material becoming a MW (Stanley 1989).

9. Some forms of LLW are classified for security reasons. Special packaging, shipping, and handling requirements for this waste form will be managed on a case-by-case basis and will be provided in the SDAR.

4.0 MIXED WASTE ACCEPTANCE CRITERIA

-- NOTE --

This section is for general guidance and is not intended to be a replacement for the EPA, DOT, DOE, or Ecology regulations. DOE, EPA and Ecology require proper designation of DWs, and require sufficient chemical characterization to ensure safe and proper management of DW. The EPA and Ecology generally reference and require that nonradioactive DW be assigned the proper shipping name, hazard class, and identification number in accordance with applicable DOT standards set forth in 49 CFR Parts 172 through 179.

In general, the generator of a DW, not the receiving TSD facility, is responsible under state and federal regulations for ensuring that DWs are designated properly, adequately characterized to ensure that the receiving TSD facility is appropriate for the waste involved, and prepared for transport in accordance with DOT requirements. In general, a TSD facility will evaluate conformance with applicable DOE, EPA, DOT, and Ecology regulations as a criteria for acceptance of a DW shipment.

4.1 PROHIBITED WASTE

The following waste are not acceptable for disposal. Prohibited waste only may be accepted on a case-by-case basis for storage, and eventual waste treatment with the exception of wastes in excess of Class C limit.

4.1.1 Regulatory Requirements

1. Waste capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures, or of explosive reaction with water will not be accepted for disposal (DOE Order 5820.2A III 3.i.(5)(c)).

2. Waste capable of generating toxic gases, vapors, or fumes harmful to persons handling the waste will not be accepted for disposal (DOE Order 5820.2A III 3.i.(5)(d).

3. Gaseous waste will not be accepted for disposal if it is packaged at a pressure in excess of 1.5 atmospheres (DOE Order 5820.2A III 3.i.(5)(e)).

4. Pyrophoric waste will not be accepted for disposal (DOE Order 5820.2A III 3.i.(5)(f)).

5. Waste exceeding the Class C limit as defined in 10 CFR 61.55 will not be accepted except as a special case justified by a specific performance assessment and with concurrence of EM-30 or NE-20 as applicable (DOE Order 5820.2A III 3.i.(4)).

4.1.2 Hanford Site Practices

None

4.1.3 Background

None

4.2 WASTE CERTIFICATION ASSESSMENT PROGRAM

4.2.1 Refer to Section 3.2 for LLW and Section 5.1 for TRU certification requirements.

4.3 RECORDS

4.3.1 Regulatory Requirements

1. The Solid Waste TSD facility must keep a written operating record at the TSD facility. The following information must be recorded as it becomes available, and maintained in the operating record until closure of the facility.

   a) Description of and quantity of dangerous (or mixed) waste received or managed (40 CFR 264.73(b)(1); 40 CFR 265.73(b)(1); WAC 173-303-380(1)(a); DOE Order 5820.2A)

   b) Records and results of waste analyses and trial tests required to manage the DW properly (including any generator supplied analytical and test data) (40 CFR 264.73(b)(3); 40 CFR 265.73(b)(3); WAC 173-303-380(1)(c))

   c) Copies of the notices, and certifications and demonstrations if applicable, required by an offsite generator or TSD owner/operator under 40 CFR 268.7 or 268.8 (land disposal restriction notifications) (40 CFR 264.73(b)(11),(13), and (15); 40 CFR 265.73(b)(9),(11), and (13))

   d) Information contained in the notices (except the manifest number), and certifications and demonstrations if applicable, required by an onsite generator or TSD owner/operator under 40 CFR 268.7 or 268.8 (land disposal restriction notifications) (40 CFR 264.73(b)(12),(14), and (16); 40 CFR 265.73(b)(10),(12), and (14)).

2. Shipping papers/manifest shall accompany each waste package from generator through final disposal. The shipping papers/manifest shall contain data necessary to document the proper classification, and assist in determining proper treatment, storage, and disposal of the waste. Shipping papers/manifest will be kept as permanent records by the TSD facility. At a minimum, the following data will be included: DOE Order 5820.2A III 3.d(2); 40 CRF 264.71(a)(5) and (b)(5); 40 CFR 265.71(a)(5) and (b)(5); WAC 173-303-370(2)(e) and (3)(e)

   (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)

(e) Other data necessary to demonstrate compliance with waste acceptance criteria.

3. The records cited in Section 4.3.1 must be kept by the TSD facility until closure of the facility (WAC 173-303-380(1); 40 CFR 264.73(b); 40 CFR 265.73(b); DOE Order 5820.2A).

4.3.2 Hanford Site Practices

1. The generator shall supply the TSD facility with a DOE/NCR 741 form if the waste contains accountable nuclear material.

2. The waste generator shall supply the TSD facility with waste package surface dose rate documentation, and radiological survey data.

3. The waste generator shall supply the TSD facility with documentation of the LLW waste category (e.g., Category 1, Category 3, Greater than Category 3).

4. All documentation submitted by the generator to the TSD facility for record retention, shall be typed or clearly hand written in black ink.

5. The waste generator shall maintain descriptions of waste content, including items such as package inventory sheets, or transfer and inventory data sheets for each waste package.

6. Any records retained solely by the generator and which are used to describe, quantify, or otherwise characterize a waste for purposes of designation, LDR, or proper management must be retained by the generator until closure of the TSD facility.

7. The waste generator shall maintain waste tracking data, including copies of waste shipping papers. These records must be shipped to the TSD facility prior to the generator going out of business.

8. Each copy (initial and TSD-signed-returned) of a UHWM must be retained for at least five years after delivery of the waste shipment covered by the manifest. The waste generator shall provide a UHWM with each shipment of MW. LLWSDR and a MWAS shall be provided with each package of MW. The LLWSDR and the MWAS constitute the radioactive manifest/shipping papers.

4.3.3 Background

1. DOE orders series 5633 require that the TSD facility maintain secure auditable files which document the amount, type, and location of accountable nuclear material. The amount and type information needs to be provided by the waste generator on the DOE/NCR 741 form.

2. Documentation of each package's accessible surface dose rate must be supplied by the generator, and kept on file by both the TSD facility and the generating facility. The accessible surface dose rate documentation allows for the safe handling and storage of radioactive material.

3. The waste classification system is used to forecast waste volumes and will be used in designing LLW disposal facilities that meet the requirements of DOE Order 5820.2A.

4. To enable safe and effective handling of MW, all documentation must be legible.

5. The data from the content inventory sheet will confirm that the waste package can be safely and effectively handled as indicated by the package markings and SDAR.

6. State and federal regulations require that the owner/operator of a TSD facility obtain waste identity confirmation, information needed to safely manage the waste, and information necessary to comply with the LDR. The required information and confirmation can be accomplished either by detailed analysis or by obtaining published or documented data on the DW, or on waste generated from similar processes or data obtained by testing.

   The records that must be retained to comply with these criteria, as a minimum, include the required TSD facility documentation and the corresponding required generator records (e.g., UHWM, waste analyses). In addition, the backup data and records supporting these mandatory documents need to be available. These will typically include such items as logs of what is placed in the waste packages and any analytical results from any source used to characterize DWs. Where process knowledge is used to characterize the waste, process knowledge documentation will be required. Examples of process knowledge documents are laboratory books, operations procedures, and chemical/radiological process flowcharts. These records are considered quality records.

   Records associated with these waste characterization and confirmation activities must be retained until closure of the TSD facility. Most of this information is provided to and retained by the TSD facility. Some analytical data and other records are kept only by the generator of the waste. Records retained <u>solely</u> by the generator must be kept until closure of the TSD facility or must be shipped to the TSD prior to closure of the generator facility. This ensures compliance with the TSD operating record requirements of state and federal regulations.

7. The TSD facility places waste tracking data, including copies of waste shipping papers, into an auditable file. The tracking data provides additional waste information for regulating agencies.

8. Although the regulations only require retention of the signed UHWM by the initial transporter for a period of three years, WHC practices require that these records must be kept at each TSD facility for a minimum period of 5 years. Under WHC practices, waste generators must also retain the signed original manifest in an auditable file for a minimum of 5 years (Refer to Section WHC-CM-7-5, Environmental Compliance Manual, Sections 7.4.2.7d and 8d).

   The UHWM, the LLWSDR, and the MWAS provided the information that the TSD facility needs to properly document and handle the waste.

4.4 WASTE CHARACTERIZATION

4.4.1 Physical/Chemical Characterization Requirements (refer to Chapter 6).

4.4.1.1 Regulatory Requirements

1. Waste Characterization shall ensure that the physical characteristics of the waste are known and recorded during all stages of the waste management process (DOE Order 5820.2A III 3.d.(1)).

4.4.1.2 Hanford Site Practices

1. An inventory must be maintained for each waste package as the package is filled. This inventory should include a physical description of the waste material that is added to the package.

2. The physical description of the waste must be entered on the appropriate shipping paper/manifest (refer to Section 4.3.2). This description must include the specific name or names of the contents of the waste package (e.g., pump with attached valving, latex gloves, blotter paper, laboratory glassware). Ensure that the physical form (e.g., plastic, carbon steel, absorbed liquid, rags) of the waste is described. The physical description should also include any internal packaging (i.e., plastic bags, rigid poly liners, etc.), absorbents, and void space fillers.

4.4.1.3 Background

1. A waste inventory that is maintained as the waste is added to the package ensures that the description of the waste on the manifest is accurate.

2. The information recorded on the manifest is transferred to the waste database. This information is used in numerous reports and in planning the final cover of the burial ground. It is vital that this information be included and that it be accurate to ensure that the burial ground is maintained in a safe, efficient manner.

4.4.2 **Chemical Content** (refer to Chapter 6)

4.4.3 **Radionuclide Content** (refer to Chapter 3)

4.4.4 Characterization Documentation

4.4.4.1 Regulatory Requirements

1. Waste shall be characterized with sufficient accuracy to permit proper segregation, treatment, storage, and disposal. The 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 (DOE 5820.2A (3)(d)(1)).

2. 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 (DOE 5820.2A (3)(d)(3)).

3. Before an owner or operator treats, stores, or disposes of any dangerous wastes...he must obtain a detailed chemical and physical analysis of a representative sample of the waste...The analysis may include data developed under 40 CFR Part 261 of this chapter and existing published or documented data on the dangerous waste or on dangerous waste generated from similar processes... (40 CFR 264.13(a)).

4. The owner or operator shall obtain a detailed chemical, physical, and/or biological analysis of a DW before he/she stores, treats, or disposes of it. This analysis must contain the information necessary to manage the waste in accordance with the requirements of Chapter 173-303. The analysis may include or consist of existing published or documented data on the DW, or on waste generated from similar processes, or data obtained by testing, if necessary.. (WAC 173-303-300(2)).

4.4.4.2 Hanford Site Practices

1. Generator documents prepared under the waste certification process will, at a minimum, include the following information and its basis (e.g., measurement, process knowledge).

   a) Physical and chemical characteristics of the waste and any void-filling material or absorbent

b) Volume of the waste (total of the waste and any solidification or absorbent media)

c) Weight of the waste (total of the waste and any solidification or absorbent media)

d) Major radionuclides distribution, concentration, and activity in the waste matrix;

e) Method of assay or analysis used to determine radionuclide distribution and concentration;

f) Packaging details;

g) Packaging date, package weight, and external volume;

h) Documentation of waste classification according to Category 1, 3, and greater than Category 3 concentration limits.

i) Transportation category (e.g., LSA, Limited Quantity, Type A per 49 CFR 173).

2. Process knowledge must be backed up by acceptable evidence. Confirmation may include a comparison of measured process control variables to those which would be predicted using the same method as that used for the characteristics of interest. The measurements or analyses used to confirm process knowledge will document the generators process knowledge and/or waste characterization. Copies of this documentation should be provided to Acceptance Services with the WSDR. These secondary measurements are not required for every package but only as necessary to confirm the process knowledge.

3. Some means must be provided for ensuring that all contributors to a waste stream are known and accounted for. Control over waste additions is generally provided either through physical or administrative measures. Physical controls would include storing a waste package in a locked cabinet or storage room. Administrative controls include such items as ensuring that all additions to a waste package are noted on an inventory sheet.

4. Waste generators shall have an approved LLW certification program in place to ensure that the basis for waste characterization are clearly understood, and auditable.

4.4.4.3 Background

1. To ensure that waste can be managed safely and effectively, the TSD facility must receive accurate information on the waste. In addition, without complete and accurate information, the waste may have to be resampled by the TSD facility (at the generators expense) to determine the composition of the waste.

2. Documentation of secondary measurements allows the TSD facility to confirm the waste packages contents using ALARA principals, and documents the generator package control, and process knowledge. Detailed Documentation of process knowledge must be provided to Acceptance Services with the WSDR.

3. Placement of physical and administrative controls on waste packages ensures that waste is being properly segregated, and allows for the safe and effective waste handling. Physical and administrative package controls will help eliminate noncompliant waste from being placed into a package, and helps eliminate punitive actions. Documentation on how waste package controls are implemented can be verified during audits, and provides additional basis for process knowledge. The use of waste package controls documents that the generator is complying with their waste certification program, and provides additional documentation on waste characterization and process knowledge.

4.4.5 Waste Designation Requirements

4.4.5.1 Regulatory Requirements.

1. The Hanford TSD facility must have information (including analyses, as appropriate) describing the chemical nature of each DW received (40 CFR 264.13(a)(1); 40 CFR 265.13(a)(1); WAC 173-303-300(2)).

   For wastes received from offsite sources, the TSD facility must confirm (by analysis, if necessary) that the DW identity matches the manifest or shipping paper information (40 CFR 264.13(a)(4); 40 CFR 265.13(a)(4); WAC 173-303-300(3)).

4.4.5.2 Hanford Site Practices.

1. Generators must determine if their waste is a designated DW, determine all applicable DW designations, and assign all proper DW numbers as required by 40 CFR 262.11 and WAC 173-303-070(1)(b) and 173-303-170(1). The generator must notify the TSD facility about what other regulatory programs have jurisdiction over the management of the DW.

2. Generators must determine if the treatment, storage, and disposal of their waste is regulated under any other federal or state program with jurisdiction over the waste (e.g., PCBs, asbestos).

4.4.5.3 Background.

1. The EPA and Ecology have promulgated and administer regulations in 40 CFR Part 261 and WAC 173-303-070 through 173-303-104 requiring that any material which is a solid waste be checked for designation as dangerous (federal hazardous) wastes. The term "solid waste" includes solids, liquids, and contained gases. Any material is a solid waste once it is discarded, abandoned, recycled, inherently waste-like, or not exempted by regulations.

The 40 CFR 261.2 and WAC 173-303-016 provide detailed direction on what materials are considered to be solid waste.

Everyday wastes such as leather, wood, cloth, paper, plastic, aluminum, and most ferrous metals are not subject to regulation, provided they are not contaminated by or mixed with a DW, and may be discarded to a proper trash receptacle. If there is any suspicion that everyday waste has been contaminated by hazardous chemicals, a WSDR form (refer to Appendix A) must be submitted to Acceptance Services. All MW, whether from a process, a spill or off the shelf products shall be submitted to Acceptance Services for designation. Use a WSDR.

Chapter 173-303 WAC operates in lieu of, and is generally broader than, the counterpart federal regulations. The state regulations require that generators designate wastes in accordance with WAC 173-303-070. To designate a waste, the generator must have sufficient chemical data or process knowledge on the waste in question to determine whether the waste is regulated as a listed characteristic, or state-only DW. For designating waste mixtures against the state-only criteria of acute toxicity, persistence, and carcinogenicity, WAC 173-303-084 requires only that the generator use data currently available to designate the waste; sampling and analysis for waste constituents, or biological testing of the wastes, is not required unless specifically directed by Ecology. A slightly higher standard is set in WAC 173-303-101 and WAC 173-303-102. Under these sections, the generator need not account for all constituents of the waste, but must demonstrate that the constituents about which he/she has no knowledge will not significantly impact the waste designation (e.g., refer to WAC 173-303-101(4)(a)(iii)). Sampling and test methods for the designation of solid wastes are specified in WAC 173-303-110. Generators must ensure that the proper DW number is assigned; all applicable DW numbers must be assigned to the waste.

The TSD facility is required to obtain the chemical, physical, and other data necessary to properly manage a DW. This information will include at least the designation information about the DW. Westinghouse Hanford relies primarily on information provided by the generators of DWs, and may require the generator to develop (including laboratory analyses, if necessary) designation information needed by the TSD facility to determine appropriate storage, treatment, and disposal procedures (Refer to Chapter 6 for more detail on chemical and physical characterization requirements).

Dangerous wastes are generally prohibited from land disposal unless they have been treated and certified to meet various treatment limits and/or technologies. The designation of a DW can significantly affect its regulation under the LDRs, so proper designation is critical.

The WHC SWD Acceptance Services will assist waste generators in preparing waste designations based on information provided by the waste generator. This does not relieve the generator of the responsibility for assuring an accurate waste designation.

2. If a DW is also subject to regulation under another regulatory program because it is mixed or commingled with materials or wastes regulated by the additional program(s) (e.g., PCBs under TSCA, asbestos under NESHAP), then the generator must notify the TSD facility about what other regulatory programs have jurisdiction over the management of the DW.

4.4.6 Debris Rule

4.4.6.1 Regulatory Requirements

1. Waste must be determined to be debris or not by the generator at the point of generation. Once waste has been identified as being debris then it must be so stated as part of the LDR notification. Debris is defined as follows.

   "Debris means solid material exceeding a 60 mm particle size that is intended for disposal and that is. A manufactured object or plant or animal matter or natural geologic material. However, the following materials are not debris. Any material for which a specific treatment standard is provided in Subpart D, part 268 of 40 CFR process residuals such as smelter slag and residues from the treatment of waste, wastewater, sludges, or air emission residues and intact packages of dangerous waste that are not ruptured and that retain at least 75 percent of their original volume. A mixture of debris that has not been treated to the standards provided by Sec. 268.45 and other material is subject to regulation as debris if the mixture is comprised primarily of debris, by volume, based on visual examination." (40 CFR 268.2(g)).

4.4.6. Hanford Site Practices

1. Appendix I "Debris Checklist" must be completed by the generator and submitted to Acceptance Services with the WSDR for MW.

2. Unless it is difficult or impractical, debris must be segregated from non debris waste and packaged into one of four types. The four types are. hard porous (bricks, wood, etc.), hard nonporous (metal, some plastics, etc.), soft porous (paper, cloth, etc.), and soft nonporous (plastic, rubber, etc.). Nonsegregated debris must be justified in documentation attached to the WSDR.

4.4.6.3 Background

1. The debris rule was developed by the EPA to address the difficulty of managing debris under the existing LDRs per Part 268 of 40 CFR. The application of the contained-in and derived from rule causes solid material, or debris, that has been surface contaminated with a LDR prohibited waste, to require the LDR standard treatment. However, the matrix of the debris may be

significantly different than the waste contaminant for which the standard is applicable. Also, sampling of debris or media that is surface contaminated with a land disposal prohibited waste is very difficult but is often required to comply with LDR requirements. To address these problems, the EPA finalized the hazardous debris rule, per FR 37194. The new rule provides alternate treatment standards for land disposal of prohibited hazardous debris. these standards are more appropriate for debris and may be used in lieu of the LDR treatment standards. The final rule became effective on November 9, 1992.

For the debris treatment standards to be applicable the material must satisfy the criteria of being land disposal prohibited hazardous debris. The EPA states a "Prohibited hazardous debris is defined generally as solid material (that is not a process waste) having a particle size of 60 mm or larger and that is intended for land disposal and exhibits a prohibited characteristic of dangerous waste or that is contaminated with a prohibited hazardous waste." The rule does not mandate that these debris treatment standards be applied to debris, the treater may instead choose to comply with the existing LDR treatment standards of 40 CFR 268 Subpart D.

The debris treatment standards, 40 CFR 268.45, state 17 Best Demonstrated Available Technologies (BDATs) for the treatment of debris waste. The application of BDAT must comply with the performance and operating standards stated in 40 CFR 268.45. The technology or technologies to be applied in the case where multiple treatments are employed is at the discretion of the treater. Sampling of treated debris to demonstrate compliance is not required, however documentation and certification of conformance with the technology performance and operating or design standards is required.

Under the rule, treated hazardous debris is excluded from the definition of hazardous waste provided that. the debris is treated to the performance or design and operation standards by an extraction or destruction technology and the treated debris does not exhibit a characteristic of hazardous waste. The excluded debris can be disposed in an industrial landfill (Subtitle D) rather than a RCRA permitted landfill (Subtitle C).

The rule requires that treatment residue be separated from debris before disposal or further treatment of the debris and that the residue be treated to comply with LDR except under specific situations. As stated by the EPA "residuals generated by the treatment of hazardous debris are subject to the numerical treatment standards for the waste contaminating the debris."

As with LDR notification and certification requirements, debris rule regulations are promulgated under the LDR section of the regulations of 40 CFR Part 268. These regulations are administered by the EPA not by Ecology. The debris rule treatment standards do not apply to state only waste codes.

The debris checklist is required to assure that waste material is properly designated as debris or nondebris waste.

2. The segregation of debris from nondebris waste is required if as part of the generation process the segregation still facilitates quick identification and is easily applied. The EPA is concerned that debris will be deliberately mixed with other waste in order to avoid treatment of the waste. Unless it can be shown to be difficult to segregate waste from debris it must be done. The four waste types assist in the efficient treatment of the waste.

4.5 PACKAGING REQUIREMENTS

-- NOTE --

This section is for general guidance and is not intended to be a replacement for DOT regulations. The EPA and Ecology generally reference and require nonradioactive DW to be packaged prior to transport in accordance with applicable standards set forth in 49 CFR Parts 172 through 179.

The generator of a DW, not the receiving TSD facility, is responsible under state and federal regulations for ensuring that DWs are prepared for transport in accordance with DOT requirements. In general, a TSD facility will evaluate conformance with applicable DOT regulations as a criteria for acceptance of a DW shipment.

4.5.1 Regulatory Requirements

1. Waste packages will meet, as a minimum, all the applicable requirements of 49 CFR 173.425 (DOT 1988) for LSA and 49 CFR 173.412 (Dot 1988) for Type A packaging or have an approved SARP.

   Waste packages targeted for storage in the CWC will normally be metal drums or metal boxes.

   All interior and exterior surfaces will be made of a corrosion-resistant material (such as stainless steel) or will be painted, aluminized, or galvanized (minimum coating 1.25 oz/ft^2). Galvanized drums will be used for TRU packages. If waste has corrosive properties, a secondary packaging (barrier) will be required (WHC-SD-WM-SAR-049, 4.2.2).

4.5.2 Hanford Site Practices

1. Packages shall be in good condition with no visible cracks, holes, dents, bulges, corrosion, or other damage that could compromise integrity. Any packages that are bulged, corroded, or otherwise damaged shall not be used.

2. All MW accepted for storage at Hanford Site TSD facilities shall be packaged in galvanized 30- or 55-gal drums, unless alternate packages are dictated by size, shape, or form of waste. Alternate packages shall be approved by Acceptance Services. Protective coatings for waste packages other than 30- and 55-gal drums shall be specified in the SDARs for individual waste streams. Packages shall be resistant to degradation to the point of structural failure or loss of containment by microbial action, moisture, radiation effects, or chemical reactions. External containment barriers shall not be jeopardized by wind, blowing sand, precipitation, sunlight, extreme temperatures, or stresses due to the weight or configuration of the package or its contents plus the loads associated with handling and transportation. Refer to DOE Order 5820.2A III 3.e.(5)(f).

3. MW packages shall provide at least two containment barriers or equivalent, as specified in the SDAR, to prevent the release of contamination.

4 The secondary containment for dry MW shall be a 10-mil nylon reinforced polyethylene fabric. The 10-mil liners for drums shall be sealed by horsetailing and secured by 2" cloth reinforced plastic tape or equivalent closure mechanism as specified in the SDAR.

5. Secondary containment for liquid containing MW in drums shall be a 90-mil high density polyethylene (HDPE) rigid liner if the liquid exceeds 1 percent of the waste.

6. Fifty-five-gal drums should, if practical, be banded and palletized in groups of four by the generator.

7. A small amount of absorbent shall be placed between the liner and the drum. The type and amount of absorbent will be specified in the SDAR.

8. Packages used for MW shall be designed to withstand the weight of two layers of 55-gal drums stacked on top with 454 kg (1,000 lb) in each drum.

9. Liners for MW packages with the potential for gas generation or pressurization shall provide positive gas communication to the outer package.

10. If glass is required as an internal package, it shall be protected with a suitable packaging material.

11. Packages for MW shall be constructed of metal or other noncombustible material. Additional materials shall be consistent with TSD facility fire code requirements.

4.5.3 Background

1. Packages must be in good condition to assure that they will survive handling and storage until they are disposed.

2. Waste generators were at one time allowed to use painted drums for the storage of MW. However, several of these drums containing waste were found to be leaking. A study was made to determine the best material available for the long-term storage of MW. This study selected galvanized packages. The use of other packages needs to be justified on a case-by-case basis. DOE Order 5820.2A section III 3.e.(5)(f) requires the waste acceptance criteria address chemical and structural stability of the waste packages, radiation effects, microbial activity, chemical reactions and moisture. The justification for use of other packages needs to address these areas.

3. Two containment barriers provide an extra degree of safety for personnel handling the waste and additional assurance that the waste package will survive the storage period.

4. The investigation of waste package failure showed that the 4-mil plastic drum liners were inadequate. The 10-mil nylon reinforced liners provide a greater degree of safety and assurance that the package will remain intact.

5. The use requirement for a 90-mil liner for liquid containing MW is based on the investigation of waste package failure.

6. Fifty-five-gal drums are most efficiently handled by forklift. Banding and palletizing allow safer operations and faster turnaround of transport vehicles.

7. Liquid condensation between the liner and the outside package can result in failure of the outside package. An absorbent between the liner and the outside package will lessen the risk of this happening.

8. Package storage requirements for the CWC allow stacking of packages 3 high. Packages must be able to hold this load to allow efficient use of the CWC storage area.

9. Waste with the potential to generate gas must be packaged to allow the gas to escape or to reach a catalyst pack if one is present.

10. Glass is often used to package liquids in a "lab pack form". These glass packages must be protected from physical damage. An absorbent compatible with the waste liquid must be packed around the glass to protect it and absorb any potential liquid leakage (refer to Section 4.7).

11. Packages for MW must meet the fire code requirements for the CWC.

4.5.4 Content Criteria

4.5.4.1 Regulatory Requirements

1. A CWC Dose Equivalent Curie (DE-Ci) value shall be derived for each package containing in excess of the Type A quantity (refer

to 49 CFR 431) or the specific CWC package limit for radionuclides. Refer to Appendix L for DE-Ci conversion factors and CWC package limits. (Central Waste Complex FSAR ECN 173274, Section 2.13 b).

2. The total content inventory on a vehicle delivering a waste shipment shall not exceed 40 CWC DE-Ci. (Central Waste Complex FSAR ECN 173274 Chapter 7 LCO 3.4.2).

3. For vehicles delivering low flashpoint waste, the total content inventory shall not exceed 3.5 CWC DE-Ci. (Central Waste Complex FSAR ECN 173274 Chapter 7 LCO 3.4.2).

4. The TRU waste packages shall not exceed 35.0 Plutonium Equivalent Curies (PE-Ci). Refer to Appendix C for PE-Ci calculation instructions (Central Waste Complex FSAR ECN 173274, Section 6.2.14).

5. All liquids must be packaged in approved absorbent materials having twice the volume capacity of the liquid, or the liquids are limited to a maximum volume of 56.8 L (15 gal) packaged in inner packages and nested in absorbent material (WHC-SD-WM-SAR-049 (5.4.1)).

6. Radioactive wastes with a gas generating potential must be identified and the requirement for gas recombiners specified in the SDAR for radioactive waste. This is required of each generator in order to comply with the requirements for disposal of the material at the Hanford Site (WHC-SD-WM-SAR-049 (6.2.10)).

7. Where the potential for hydrogen (H_2) gas generation is present, hydrogen-oxygen recombiners will be added by the waste generator/packager to packages to maintain H_2 gas at safe concentrations and to prevent the package from reaching a flammable concentration. In addition, the waste generator/packager may use NRC and DOT approved filter-vents to allow H_2 gas to escape as well as to prevent over-pressurization. (WHC-SD-WM-SAR-049(4.2.2)).

4.5.4.2 Hanford Site Practices

1. The maximum accessible surface-radiation dose rate for any one MW package shall not exceed 100 mrem/hour at any point. Packages up to 200 mrem/hour may be received at the CWC. A justification for exceeding the 100 mrem/hour storage limit must accompany the request for storage of this waste. Approval by SWM will be required before receipt of waste packages that exceed 100 mrem/hour.

2. Removable contamination on the accessible exterior surfaces of MW packages shall not exceed the following limits.

   a) 220 dpm/100 cm^2 for alpha contamination.

b) 2,200 dpm/100 cm^2 for beta-gamma contamination.

Fixation of surface contamination on returnable overpacks shall not be permitted.

3. Acceptance criteria for any LLW with the potential to generate greater than 0.1 W/ft^3 shall be included in the SDAR applicable to that waste. Refer to Appendix C for thermal power factors for selected radioisotopes.

4. All MW with the potential to generate sufficient nonradioactive gas to pressurize the waste package greater than 1.5 atmospheres, or to reach explosive concentrations of hydrogen and oxygen or other explosive gases shall include catalyst packs. The catalyst packs will be palladium on alumina or platinum on silica, depending on the potential amount of moisture present in the waste package. The amount of catalyst required will be based on the amount of potential hydrogen generation and will be specified in the applicable SDAR. Liners other than plastic bags shall be provided with positive gas communication to the outer package.

5. Criticality safety limits for waste packages that contain more than 15g of ^{235}U will be determined by WHC Criticality Engineering Analysis on a case-by-case basis. These limits will be indicated in the SDAR. Waste packages containing 15g of ^{235}U or less will not require a separate criticality safety analysis.

6. Packages shall not contain materials of two or more incompatible hazard classes, the mixture of which would be liable to cause a dangerous evolution of heat or gas, or produce corrosive materials (49 CFR 173.21). Contents shall be segregated to be compatible with future treatment processes (i.e., similar materials only in a common package).

7. If the waste package exceeds the Type A quantity of radioisotopes in accordance with 49 CFR 173.431, calculate and record the DE-Ci value on the MWAS.

4.5.4.3 Background

1. Areas with radiation fields in excess of 100 mrem/hour are considered high radiation areas and as such require additional precautions for entry. Solid Waste Operations personnel will need to be notified if a package will exceed this limit so that they can take appropriate actions. Also the CWC is not currently equipped to meet the WHC requirements for High Radiation Areas. Because of this, packages intended for storage in the CWC cannot exceed the 100 mrem/hour limit without special approvals and arrangements made by the operations personnel.

2. Surface contamination limits are based on the contamination limits allowed by DOT on radioactive packages offered for transport. These limits are the maximum allowed. In all cases the contamination should be kept as low as practical.

3. Waste materials that generate heat in excess of 0.1 W/ft^3 may require special packaging and storage requirements to prevent excessive temperatures in the waste. Each waste will be different depending on the nature of the waste and the waste package. Because of this variability, requirements for heat generating waste must be developed on a case-by-case basis.

4. Gas generation, particularly of explosive gases, can result in ruptured packages, serious contamination spread and personnel injury. The risk can be eliminated or reduced by the use of vents or, if appropriate, catalyst packs to recombine hydrogen or methane with oxygen. These alternatives will not generally be appropriate if the gas generated is itself radioactive. In these cases other alternatives will be identified and called out in the SDAR.

5. Criticality safety requirements depend on the nature of the waste and the spacing of the waste packages. These requirements must be developed on a case-specific basis. Packages with less than 15g of ^{235}U can be safely handled with no restrictions for criticality safety.

6. Waste packages must contain materials in the same compatibility and treatment groups to assure safe handling and efficient treatment.

7. The DE-Ci values are used to assure that the CWC does not exceed its Low Hazard Facility Classification. The DE-Ci value is calculated by multiplying the curie amount for each radioisotope in a package by its corresponding DE-Ci conversion factor found in Appendix L. The sum of the DE-Ci values for each radioisotope is the DE-Ci value for that package. The DE-Ci values are only required for packages that exceed Type A quantities.

4.6 LABEL AND MARKING REQUIREMENTS

-- NOTE --

This section is for general guidance and is not intended to be a replacement for DOT regulations. The EPA and Ecology generally reference and require nonradioactive DW to be marked and labeled in accordance with applicable standards set forth in 49 CFR Parts 172 through 179.

The generator of a DW, not the receiving TSD facility, is responsible under state and federal regulations for ensuring that DWs are prepared for transport in accordance with DOT requirements. In general, a TSD facility will evaluate conformance with applicable DOT regulations as a criteria for acceptance of a DW shipment.

4.6.1 Regulatory Requirements

4.6.1.1 None

4.6.2 Hanford Site Practices

1. A waste numbering system shall be used to provide unique Package Identification Numbers (PINs) for all shipping packages (refer to Chapter 2). Smaller miscellaneous packages (including aerosols) within labpacks shall be assigned ID numbers. Inventory lists must be attached to the outer shipping package. For prepackaged labpacks, assign an ID number to the outer shipping package as well as inside packages.

2. Packages must be clearly marked with the words "dangerous waste" or "hazardous waste". Each DW package must bear a marking describing the risks associated with the waste. All labeling and marking requirements applicable to other DWs also apply to labpacks.

3. Consistent with DOT and Ecology regulations, labels shall be located where they can be readily observed, of sufficient size to be readily identified and readable at a reasonable distance, legible and easy to read, and of sufficient durability to withstand normal weather and temperature conditions.

4. Labels and markings shall be permanently applied with paint or other materials that have a predicted 20-year life expectancy in storage environment and are compatible with the package and protective coating. Epoxy-Polyamide paint or Electromark[1] plastic stickers are examples of 20-year labeling and marking.

5. All labels and markings shall be in clear, legible English in a color contrasting with the background. Stencils (for paint-applied markings) or adhesive labels shall be used for all markings.

6. All labels and markings shall be nonfading, nonsmearing, and water resistant.

7. Drums being banded to pallets shall be positioned to permit visual inspection of the labels and markings.

8. Characters used in labeling and marking drums or cylindrical packages greater than or equal to 30-gal and less than or equal to 85-gal shall be at least 1 in. high. Characters used in labeling and marking drums or cylindrical packages greater than 85-gal shall be 2 in. high. Characters used in labeling shall be legible at a distance of 5 feet.

   a) Characters used in labeling and marking drums or cylindrical packages less than 30-gal shall be large enough to be legible at a distance of 5 feet.

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[1]Electromark is a registered trademark of Electromark Co. Box 25, Wolcott, NY 14590

b) Characters used in labeling and marking noncylindrical packages smaller than 12 ft^3 shall be at least 1 in. high.

c) Characters used in labeling or marking packages greater than or equal to 12 ft^3, or cylindrical packages greater than 55-gal drums, shall be at least 2 in. high.

4.6.3 Background

1. The waste numbering system is used to provide unique PINs for all shipping packages and to consolidate and standardize package numbering systems used onsite. Chapter 2 explains the required package identification number system. The PINs shall be used to identify all shipping packages. The PINs when available should be recorded in the appropriate block of the WSDR when submitting a waste for analysis. Individual package weights when available must be recorded on the WSDR or WSDR attachment. Refer to Appendix A for WSDR and WSDR attachment instructions.

   Smaller miscellaneous packages (including aerosols) within labpacks shall be assigned ID numbers. Inventory lists must be attached to the outer shipping package. For prepackaged labpacks, assign an ID number to the outer shipping package (refer to Appendix A) as well as inside packages. Inner package ID numbers may be assigned in one of two ways.

   a) Assign each package its own consecutive number. Identical wastes may be treated as a 'lot', with one ID number (e.g., 10 cans Lectraclean with ID # 30818301-00003).

   b) For prepackaged labpacks, the inner ID numbers may be derived from the outer package number (e.g., outer package ID # 30818301-00003 with inner package numbers 30818301-00003A, 30818301-00003B, 30818301-00003C, etc.).

3. The TSD facility may need to place waste packages in storage locations that could affect labels and markings on waste packages. Labels and markings need to be of high quality to ensure that after extended storage times, label and marking information on waste packages will be legible.

4. To allow for safe and effective waste package handling, all labels and markings need to be in clear, legible English in a color contrasting with the background. Contrasting painted markings and labels allow the TSD facility to quickly identify waste package contents, and any special handling precautions that may be required.

5. To provide the necessary label life expectancy, labels and markings need be nonfading and nonsmearing.

6. The TSD facility needs to be able to easily identify waste packages that may be banded together. The waste package labels and markings need to be oriented in a manner that will permit visual inspection of the labels and markings. Identification of

waste package markings, allow the TSD facility to handle waste safely and effectively.

7. For uniformity reasons and ALARA concerns, characters used in labeling and marking drums or cylindrical packages greater than or equal to 30-gal and less than or equal to 55-gal need be at least 1 in. high.

   a) To address ALARA concerns during visual inspections, characters used in labeling and marking drums or cylindrical packages less than 30 gal. need be large enough to be legible at a distance of 5 feet.

   b) For waste handling and ALARA concerns, characters used in labeling and marking noncylindrical LLW packages smaller than 12 ft^3 need be at least 1 in. high.

   c) To aid visual inspections and waste handling, characters used in labeling or marking LLW packages greater than or equal to 12 ft^3, or cylindrical packages greater than 55-gal drums, need be at least 2 in. high.

4.7 SPECIFIC WASTE REQUIREMENTS

4.7.1 Regulatory Requirements

4.7.1.1 None

4.7.2 Hanford Site Practices

1. Liquid MW may be absorbed or otherwise bound in the waste matrix by compatible materials. The resultant waste matrix shall not be capable of spontaneous combustion, decomposition, explosion, liquid desorption, or affecting the integrity of the containment barriers in any way. If liquids are bound by absorption, the absorbed material shall be placed in direct contact with the liquid. The quantity of absorbent material shall be sufficient to absorb twice the volume of liquid potentially present or as specified in the applicable SDAR. Combustible absorbent shall be used with organic liquids. The applicable SDAR will specify the absorbent to be used. Acceptance Services must be contacted to assure that the waste is in a form that will be compatible with the eventual treatment requirements.

2. Liquids accepted for storage may be in "lab pack" form as described below.

   Liquids shall be sealed in leak-tight inner packages. Inner packages shall be limited in size such that remaining drum volume shall accommodate twice the amount of absorbent required to absorb the maximum amount of liquid potentially present (do not exceed 15-gal of liquid per 55-gal drum). Inner packages shall be of metal, poly-coated glass or plastic. Inner packages shall be filled to a suitable level such that the package shall have adequate liquid expansion space to ensure against overpressurization to a temperature of at least 130 °F. The inner packages shall be placed upright in a DOT specification 55-gal drum lined with a 90-mil HDPE plastic liner. Absorbent shall be placed around the inner packages sufficient to absorb twice the amount of the liquid present and to prevent damage to the inner packages. Additional restrictions may apply and will be indicated on the SDAR.

Poly-coated glass inner packages shall not exceed 1-gal capacity each. The closures for glass packages shall be Teflon[2] lined polyethylene lids that are taped. The inner packages shall be labeled with their contents.

3. Waste form requirements for individual packages containing alkali metal waste will be included in the applicable SDAR.

4. Radioactively contaminated lead preferably will be packaged in 55-gal drums for storage and future treatment. If the quantity or form of the lead-bearing item(s) prohibits use of 55-gal drums, alternate equivalent packaging shall be used as specified in the applicable SDAR. Lead, when used purely for shielding purposes in existing fuel casks and in reactor vessels, must be identified and documented on the WSDR, LLWSDR and MWAS forms. The use of lead as shielding material in waste packages will be approved by WHC only on the basis of overriding technical justification (i.e., ALARA) that demonstrates the technical nonapplicability of other alternatives such as steel or concrete.

5. Before packaging, mercury shall be solidified by amalgamation with zinc or tin powder or other approved material to prevent migration from the package in event of a leak. The amalgam shall be placed and sealed inside a wide-mouthed plastic package compatible with the waste amalgam or labpacked in bottles for future treatment. The package shall then be sealed inside a secondary containment barrier such as a 4-mil plastic bag or equivalent. The doubly contained amalgam in turn shall be packaged inside a 90-mil plastic lined galvanized drum. Large quantities of mercury may be packaged in a form similar to lab packing. Instructions for this form of packaging will be provided in the SDAR.

6. If asbestos is included in an MW package because of previous MW contamination of the asbestos, the material shall be prepackaged in accordance with Chapter 3, including the requirements of 40 CFR 61.150. Outer packaging shall be marked with an asbestos warning label.

7. Waste rags that are contaminated with listed or characteristic waste or a Washington State regulated waste are to be handled as

[2]Teflon is a registered trademark of E.I. duPont de Nemours & Company, Wilmington, Delware.

DW unless sampling and analysis are performed and show otherwise. If the mixture of the rag and/or waste demonstrates that the material is not a dangerous waste, then the waste need not be handled as dangerous waste.

8. Cases may occur where waste is sent to an offsite TSD for treatment with the plan that the radioactive residue would be returned to Hanford for disposal. SWD must approve any plan to send radioactive waste offsite and must certify appropriate generators including the offsite TSD prior to sending waste offsite.

9. HEPA Filter Management

   1. HEPA filters must be evaluated to determine if they should be managed as a dangerous or MW. This evaluation shall be performed on a checklist provided by Acceptance Services except as indicated below. The checklist shall be supplied with the WSDR for the HEPA filter waste.

   a) HEPA filters that have been tested only with DOP from the manufacturer will not be designated as a Washington state carcinogen (WC02) due to DOP in every case except one. The one case is when a HEPA filter fails the installation test and for some reason, the filter media is removed from the housing. If the filter media is removed from the HEPA filter housing on a filter that was never installed, the filter media will be designation as WC02.

   b) All other HEPA filters, except as indicated below, should be designated as a DW Washington State carcinogen (WC02) unless analytical data determines otherwise.

   c) The HEPA filters that have been tested only with DOP by the manufacturer and which have been used only to filter air for nonmechanized or nonvapor generating processes will not be considered for DW designation. These filters will be disposed as LLW and will not require the checklist indicated above. Information must be provided with the WSDR to show that these filters were one time only DOP tested and that they came from a benign source.

   d) Unless a HEPA filter directly contacts listed waste, the HEPA filter and associated HVAC ducting should not be considered as "derived from" listed wastes except in one case. This case is when condensate is collected from a listed waste source and the condensate is visible on the HEPA filter.

10. At the present time, remote handled-mixed waste (RH-MW) must be packaged to be CH for purposes of transfer and storage or disposal. Special requirements can be accommodated, but only on a case-by-case basis. Contact Acceptance Services for guidelines to help avoid problems in meeting the Contact Handled requirement. Remote handled MW that cannot be shielded will be

evaluated for disposal. Ecology and RL approval will be required.

4.7.3 Background

1. Absorbed liquids must be absorbed by materials that are compatible and will not result in a hazard to the personnel handling the waste. Noncombustible absorbent should not be used with organic liquids since this material will interfere with future processing of that liquid. A list of acceptable absorbents and void fillers is attached in Appendix G. Absorption or solidification of MW liquid waste may cause the waste to be difficult to treat.

2. Lab packing is a convenient method for packaging radioactive liquid waste materials. It results in a smaller waste volume and facilitates eventual treatment of the liquid.

3. Free-alkali metals are hazardous because they react with air and water and form basic solutions and compounds that are hazardous to living organisms. The reaction associated with these materials results in the potential generation of explosive gases and corrosives. Currently, the storage capability at the Hanford Site for these materials is very limited and acceptance is on a case-by-case basis. Generator treatment or process controls are suggested as options for management of this material. Refer to Chapter 3 or treatment of alkali metal contaminated wastes. If accepted for storage, waste form requirements for individual packages containing alkali metal waste will be included in the applicable SDAR.

4. Waste elemental lead is classified as extremely hazardous waste based on concentration levels identified in WAC 173-303-090(8). Lead, when used purely for shielding purposes in existing fuel casks or other packages, is still MW.

5. Amalgamation of small amounts of mercury is required to assure that the material can be safely stored until ultimate disposal. Large quantities of mercury, however, present an unacceptable hazard due to generation of heat during the amalgamation process. This material must be packaged in small packages in a manner similar to lab packing.

6. When properly handled and packaged, asbestos is not a "dangerous" waste according to Chapter 173-303 WAC. Packaging it in this manner reduces the hazard to waste operations personnel.

7. Waste rags must be designated the same as the material they are contaminated with unless analytical data indicates otherwise. This provides a conservative designation and assures compliance with the law.

8. Generators that plan to send radioactive waste offsite for treatment with the radioactive residue being sent back to Hanford must meet all of the requirements of other waste generators.

This includes certification of the offsite TSD as part of the onsite generator certification.

8. Because of their use, HEPA filters have the potential for being a regulated waste under the laws of the State of Washington. For this reason HEPA filters must be evaluated against the State of Washington Dangerous Waste Regulations. A detailed checklist is required to assure that all potential DW materials are considered. The three general areas in the designation process that concern HEPA filters include. 1) Concentrations of bis(2-ethylhexyl) phthalate CASRN 117-81-7 (commonly referred to as di-octyl phthalate or DOP) 2) Concentrations of other chemical contaminants and 3) Listed, "derived from" waste considerations.

   a) Bis(2-ethylhexyl)phthalate - WC02

   This chemical is applied by the manufacturer. This chemical was also applied during vent and balance testing on site with respect to the tabulated dates listed below. Either Emory 3004 or DOS (Di-octyl sebacate) replaced DOP. Emery 3004 and DOS are not carcinogens in accordance with the DW designation procedures, however hazard communication programs may recognize these as carcinogens.

   1) Hanford Environmental Health Foundation (HEHF) terminated DOP use after September 1980.

   2) Pacific Northwest Laboratories (PNL) terminated DOP use after November 1980.

   3) Westinghouse Hanford Vent and Balance terminated DOP use after.

      - North of the Wye barricade - February 1989.

      - South of the Wye barricade - November 1980.

   b) Other chemical contaminants

   Although DOP is the most likely chemical contaminant, other chemical contaminants can also create a designation concern. Processes which grind, saw, boil, distill or otherwise result in copious generation of airborne particulates or vapors must be evaluated for DW characteristics (DXXX, WTXX, WCXX, and WPXX waste codes). Process knowledge, and in some cases sampling, will still be required to complete waste designations on HEPA filters for these other chemical contaminants.

   c) Listed waste considerations

   The EPA has determined that condensate collected from a listed waste source is indeed a "derived from" listed waste. In this case, the HEPA filters that have been contaminated with the condensate shall be designated as a listed waste just as the source is (e.g. F001 - F005 for waste tank HEPA filters meeting the visible condensate criteria).

1) A Hanford Site sample analysis data point has shown a DOP concentration of 210 ppm on filter media that had only been tested with DOP by the manufacturer and that was removed from the housing. To avoid generating a DW when a HEPA fails the installation test, do not remove the filter media from the housing.

2) HEPA filters should not be designated as an extremely hazardous waste (EHW-WC01) based on Hanford Site data. Contact Acceptance Services to help determine what weight percent of DOP should be reported on the Waste Storage Disposal Request by obtaining checklists and associated DOP data.

3) There are situations that do not pose other chemical contaminant concerns for HEPA filters. These are those cases where there is no possibility of a chemical of concern being caught on the filter. This includes HEPA filters which are taken out of service from a general building exhaust system, a HEPA filter generated from a static system, or a HEPA filter removed from a system with properly functioning source controls such as pre-heaters, demisters, and/or other source controls intended to extend the life of HEPA filters.

4) The HEPA filters are not derived from waste unless there is evidence that they came in contact with a listed waste or with condensate from a listed waste.

9. The problem of disposing of RH-MW is difficult for both the generator and TSD facility. Use of the TSD facility requires that the waste streams prepared by the generator fall within the safety envelope of the SAR for the receiving facility. Any new or different waste streams offered to the facility must not compromise the continued operation of the facility within its safety limits unless amendments to the SAR can be requested and approved.

Until other facilities are available, MW is only accepted for storage at the CWC as CH packages with routine handling limits at 100 mrem/hour at the surface of the package. On a case-by-case basis packages up to 200 mrem/hour may be accommodated by nonroutine operations.

Mixed waste that exceeds 200 mrem/hour can be disposed but only with Ecology and RL approval.

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5.0 TRANSURANIC WASTE

The purpose of the following requirements is to establish policies and guidelines for managing DOE transuranic (TRU) waste starting with its generation, and continuing through the disposal of the waste. Transuranic wastes that are also MW are subject to the requirements in Section 4.0 of this document.

Without regard to source or form, TRU waste is waste contaminated with alpha-emitting TRU radionuclides with half-lives greater than 20 years and in concentrations greater than 100 nCi/g of the waste matrix at the time of assay. The TRU radionuclides are radionuclides having an atomic number greater than 92. In addition to TRU radionuclides, radium sources and ^{233}U in concentrations greater than 100 nCi/g of the waste matrix are managed as TRU waste.

The lower concentration limit for TRU waste (>100 nCi/g of the waste) shall apply to the contents of any single waste package at the time of assay. The mass of the waste package, including shielding, shall not be used in calculating the specific activity of the waste (DOE Order 5820.2A (II)(3a)(2)).

The concentration limit (>100 nCi/g of waste matrix) for TRU waste applies to the item at the time it is packaged for disposal. Additional processing of the waste (i.e., grouting) cannot be used to reduce the concentration (dilution) of the fissile material of the waste package. The only acceptable method to be used in reducing the concentration of fissile material in a waste package is an approved decontamination process. The mass of the waste package shall not be used in calculating the specific activity of the waste.

DOE Order 5820.2A defines TRU waste with a surface dose rate that does not exceed 200 mrem/hour as CH-TRU and TRU waste with an external dose rate in excess of 200 mrem/hour as remote-handled (RH-TRU). Transuranic waste intended for storage in the Transuranic Waste Storage and Assay Facility (TRUSAF) is limited to a surface dose rate of 100 mrem/hour. This manual does not provide specific criteria for RH-TRU waste. Specific criteria for acceptance of RH-TRU waste packages will be developed on a case-by-case basis and provided to waste generators in the SDAR for each individual waste stream. The preferred method of packaging RH-TRU waste will be to shield the waste to CH levels and store it until facilities are available to treat this waste form.

5.1 WASTE CERTIFICATION PROGRAM

The following sections apply to CH-TRU waste accepted for storage at the Hanford Site. The SDAR for an individual CH-TRU waste stream may be more, but not less, restrictive than these criteria. All CH-TRU solid waste to be stored at the Hanford Site shall comply with the SDAR applicable to that waste.

5.1.1 Regulatory Requirements for Certification

1. TRU and TRU MW shall be certified in compliance with the Waste Isolation Pilot Plant (WIPP)-Waste Acceptance Criteria (WAC) (DOE Order 5820.2A (II)(2a)).

2. TRU waste shall be certified, pursuant to the WIPP-WAC, placed in interim storage, and sent to the WIPP when it becomes operational (DOE Order 5820.2A (II)(3c)(1)).

3. Certified waste from offsite 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 WIPP. The generator of the certified waste is responsible for describing the waste form and waste package content (DOE Order 5820.2A (II)(3g)(6)).

4. TRU 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 (DOE Order 5820.2A (II)(3b)(4)).

5. The DOE/WPIO, which includes the Waste Acceptance Criteria Certification Committee (WACCC), has the authority to grant or suspend the TRU waste generator and/or storage site's authority to certify waste to the WAC (WIPP-DOE-069, Rev. 4.0 (2.5)).

5.1.2 Regulatory Requirements for Certification Plan

1. All TRU waste certification sites shall prepare a certification plan that describes how the waste meets each waste acceptance criterion described in the WIPP-DOE-069 (DOE Order 5820.2a (II)(3c)(3)).

2. Each certification plan shall define controls and other measures to ensure that each element of the certification plan is performed adequately as described (DOE Order 5820.2A (II)(3c)(4)).

3. Certification plans, including associated QA plans, shall be submitted for review, comment, and approval by the WIPP-WAC Certification Committee (DOE Order 5820.2A (II)(3c)(5) and WIPP-DOE-069, Rev. 4.0 (2.5)).

4. Approved certification and associated QA plans shall be implemented by the generating sites using specific, written operational procedures (DOE Order 5820.2A (II)(3c)(8)).

5. TRU waste operations shall be conducted in accordance with applicable requirements of the ANSI/American Society of Mechanical Engineers Nuclear Quality Assurance-1 (NQA-1) and other appropriate national consensus standards (DOE Order 5820.2A (II)(3j) and WIPP-DOE-069, Rev. 4.0 (4.1)).

5.1.2.1 Hanford Site Practices

1. Generators shall submit a TRU certification plan to the TRU Certification Review Committee (CRC) for approval.

2. At Hanford Site TSD facilities, approval for acceptance of TRU waste generated by offsite DOE facilities will be made on a case-by-case basis by RL. Offsite TRU certification shall be the responsibility of the generator, and will be in accordance with WHC manual WHC-SD-WM-PAP-046, current revision, *Plan for Accepting Small Stream Certified Contact-Handled Transuranic Solid Waste.*

5.1.2.2 Background

1. To ensure that TRU waste will be accepted at the Hanford Site, the TRU CRC will ensure that all generators of TRU waste meet all of the appropriate requirements. The TRU CRC is mandated under the "Transuranic Waste Certification Review Committee" charter in manual WHC-CM-1-2, Rev. 4 Section CHCC.6.

2. Because of the limited interim storage at the Hanford Site for TRU waste, shipments of offsite TRU waste must be done on a case-by-case basis. In addition, each offsite generator must be a certified/approved TRU waste generator.

5.1.3 Regulatory Requirements for Program Auditing

1. 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 WIPP-WAC Certification Committee. An Environmental Evaluation Group representative may accompany the WIPP-WAC Certification Committee audit team as an observer during site audits. The WIPP-WAC Certification Committee may grant certifying authority to the site following successful completion of an audit (DOE Order 5820.2A (II)(3c)(9) and WIPP-DOE-069, Rev. 4.0 (2.5)).

2. The WIPP-WAC 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 WIPP-WAC 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 WIPP-WAC Certification Committee shall institute a tracking system to ensure timely resolution of findings, observations, recommendations, and the resultant corrective actions (DOE Order 5820.2A (II)(3c)(10)).

3. Failure to resolve and closeout previous audit findings and recommendations or sending noncomplying waste to the WIPP when judged by the WAC Certification Committee to be a serious

violation shall result in suspension of certifying authority, pending satisfactory resolution (DOE Order 5820.2A (II)(3c)(11)).

5.1.3.1 Hanford Site Practices

1. The TRU CRC shall conduct assessments as mandated under the "Transuranic Waste Certification Review Committee" charter in manual WHC-CM-1-2, CHCC.6, Rev. 4.

2. The TRU CRC shall use manual WHC-IP-0881, *Reference Guide for the Hanford TRU Waste Handling Certification Program*, as the basis for determining the scope of the assessments.

3. The TRU CRC shall issue a formal report to the waste generator following the completion of an assessment. The report will describe the activities of the TRU CRC assessment team and include a record of any findings, observations, and recommendations. Corrective actions taken as a result of a finding or observation will be verified on subsequent assessments.

4. Failure to resolve and closeout previous assessment findings or sending noncomplying waste to the TSD could result in suspension of certifying authority, pending satisfactory resolution.

5.1.3.2 Background

1. As a complete oversight activity, the assessment process of the TRU waste program has been established to assist the waste generators to meet all of the requirements. These assessments are conducted in accordance with the "Transuranic Waste Certification Review Committee" charter in manual WHC-CM-1-2, CHCC.6, Rev. 4. The WIPP-WACCC recognizes the TRU CRC as an independent approval authority for certifying TRU waste.

2. The guidance document WHC-IP-0881, *Reference Guide for the Hanford TRU Waste Handling Certification Program*, has been developed to assist the waste generators as well as the assessment team. The manual standardizes the scope of the assessments.

3. To maintain records of the assessments, written reports of the assessments will be issued. Written responses are also required to closeout an action item. A final written report will be issued upon the closeout of the assessment.

5.1.4 Regulatory Requirements for Acceptance of Noncertified Waste

1. Uncertified TRU waste shall not be sent to the WIPP except by special permission granted in response to a formal documented request to the WIPP-WAC Certification Committee and the WIPP Waste Operations (DOE Order 5820.2A (II)(3c)(2))

5.1.4.1 Hanford Site Practices

1. All noncertified TRU waste sent to Hanford Site TSD facilities will be from certified/approved generators. The acceptance of noncertified TRU waste will be determined and documented in the SDAR on a case-by-case basis.

5.1.4.2 Background

1. It is recognized that all TRU waste cannot be certified at the time of generation. In these cases, special written approvals will be issued to accept noncertified TRU waste at a Hanford Site TSD.

5.1.5 Regulatory Requirements for Records

1. The data package with certification verifying that the waste package meets the requirements of these criteria shall be transmitted to the WIPP operator in advance of shipment. This data package/certification shall be based upon a QA program subject to audit (WIPP-DOE-069, Rev. 4.0 (3.5.1.1)).

2. The data package prepared by the generators for the WIPP shall include information of the kinds and quantities of hazardous components contained in a waste package in accordance with applicable RCRA regulations (DOE Order 5820.2A (II)(3a)(4)(b)).

3. Operators of interim storage facilities shall receive data package information 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 WIPP (DOE Order 5820.2A (II)(3g)(5) and WIPP-DOE-069, Rev. 4.0 (3.5)).

4. Records shall be maintained by the TSD facility until closure (40 CFR 264.73, 265.73, and WAC 173-303-380).

5. If the TRU is MW, refer to Section 4.0 for additional regulatory requirements.

5.1.5.1 Hanford Site Practices

1. Refer to Sections 3.0 and 4.0, applicable records in Sections 3.3 and 4.3, respectively, for HSPs.

2. In addition to shipping papers, the following documentation shall be prepared accurately and completely by the waste generator for each TRU waste package accepted for storage at the Hanford Site.

   a) DOE/NRC 741 form or equivalent if the waste contains accountable nuclear material. The contents of more than one waste package may be included on this form.

   b) Waste Isolation Pilot Plant Contents Inventory Sheet

c) Waste Isolation Pilot Plant Certification Checksheet

d) TWSR

e) MWAS sheet for TRU MW.

Instructions for completing the WIPP contents inventory sheet and the WIPP certification checksheet are provided in Appendix D. Instructions for completing the TWSR are found in Appendix B.

5.1.5.2 Background

1. Refer to Sections 3.0 and 4.0, applicable records in Sections 3.3 and 4.3, respectively, for background.

5.2 REGULATORY REQUIREMENTS FOR WASTE CHARACTERIZATION

1. Any material that is known to be, or suspected of being, contaminated with TRU radionuclides shall be evaluated by assay, laboratory analysis, or process knowledge as soon as possible in the generating process (DOE 5820.2A (II)(3.a.(1)).

2. Packages of TRU waste shall contain no dangerous wastes unless they exist as co-contaminants with the TRU waste (i.e., hazardous materials shall not be added to a TRU waste stream). All TRU-contaminated corrosive, reactive, and ignitable materials shall be treated to remove the hazardous characteristic (WIPP-DOE-069, Rev. 4.0 (3.3.5.1)).

3. Determining whether TRU waste exhibits any hazardous characteristics or contains listed hazardous components may be based on knowledge of the waste generating process. If the history of the waste is not known, an analysis shall be performed for proper identification (RCRA).

4. Any material that is known to be, or suspected of being, contaminated with transuranium radionuclides shall be evaluated to avoid commingling with other waste types (DOE 5820.2A (II)(3.a)(1)).

5.2.1 Hanford Site Practices

1. All TRU waste packages containing hazardous co-contaminants shall also meet the criteria in Section 4.0 of this manual.

5.2.2 Background

1. Refer to Section 4.0 of this manual.

5.3 REGULATORY REQUIREMENTS FOR WASTE PACKAGES

1. Newly generated TRU waste shall be placed in noncombustible packaging that meets DOT requirements (DOE Order 5820.2A (II)(3d)(1) and WIPP-DOE-069, Rev. 4.0 (3.2.1.1)).

2. All Type A TRU waste packages shall be equipped with a method to prevent pressure buildup. Acceptable pressure-relief devices include permeable gaskets, vent clips, and filtered vents (DOE Order 5820.2A (II)(3d)(2)).

3. All TRU waste packages will be made of noncombustible materials. Liner(s) will be a minimum of 5-mils as dictated by the TRUPACT-II SARP. Liners that cannot be closed via the twist and taped method (i.e., 90-mil liners) will be vented with a composite filter that meets the requirements in the TRUPACT-II SARP, or the liner will have a minimum 0.3-inch hole in the lid. Heat sealing of plastic layers is not permitted (TRUPACT-II SARP, Appendix 1.3)

4. The 55-gal (208 liter) drum and the WIPP standard waste box (SWB) are the only two approved TRU waste packages (WIPP-DOE-069, Rev. 4.0 (3.2.1.2)).

Transuranic Waste Package Volume Calculations.

Waste packages		
55-gal drum	7.35 ft^3	0.208 m^3
SWB	67.21 ft^3	1.90 m^3

Do not round off the values in the table. Drum equivalent volumes are calculated by dividing the volume in cubic feet by 7.35. The conversion factor used for cubic feet to cubic meters is. 35.31 $ft^3 = 1\ m^3$ (WIPP Directive).

5. All packages shall be handled in accordance with 49 CFR Part 173 and/or WHC-EP-0558 requirements. After sealing the drum or SWB, the package(s) shall be stored in an area that will prevent damage to or degrade the package(s) (49 CFR Part 173 and WIPP-DOE-069, Rev. 4.0 (3.2.1.1)).

5.3.1 Hanford Site Practices

1. Two containment barriers shall be used. The 55-gal drum or SWB in conjunction with a 90-mil liner or minimum 5-mil plastic liner constitutes the two-barriers.

2. Packages shall meet DOT Standard UN 1A2. The generator shall ensure that DOT and Hanford Site standards are met by documented visual inspection. All other packages shall meet the requirements for the transport vehicle to the TSD facility.

3. Packages will have no cracks, holes, bulges, corrosion or other damage before the package is used or after the package is approved for transport.

4. Packages other than the 55-gal drum and the SWB will be considered when safety and ALARA factors mandate the use of a larger package.

5. Bulky or heavy waste items shall be blocked inside the package to prevent shifting during handling and transport. Also, sharp corners and edges on waste items shall be padded to protect the containment barriers, and waste shall be placed in packages in a manner that will not degrade the service lifetime of the package.

6. There are no limits on void spaces in TRU waste packages. If void space filler is used to provide padding or shoring, it shall not be considered as part of the waste matrix for purposes of calculating radioactive material concentrations.

7. The waste matrix must be compatible with the material in which the waste package is constructed. The waste will not jeopardize the integrity of the package through corrosion, pressurization, or any chemical reaction. Placing diatomaceous earth in the bottom of the package and the bottom of the liner prevents the accumulation of liquids and could buffer chemical reactions that may jeopardize package integrity.

5.3.2 Background

1. There are regulatory and safety drivers for the HSPs above. The two-barrier concept is from an accident and storage study that dealt with the release of radioactive material (Booth 1993). The two-barrier concept reduces the risk of airborne radioactive particulates to an acceptable level.

2. The DOT standard for the 55-gal drums ensures that packages used for the TRU waste program will meet the DOT and WIPP requirements for transportation, handling, and storage.

3. Blocking heavy items and padding sharp corners is a very important safety issue. Shifting items inside a package could cause injury and/or breach of containment resulting in a radiation release.

4. Void space filler is not a requirement of the DOE order or of the WIPP-WAC. However, these techniques are used for safe handling of the packages.

5. The ALARA practice is very much a part of the TRU waste program. The TRU waste items that cannot fit into one of the approved packages and cause an unreasonable amount of radiation exposure for size reduction will be packaged in a larger, approved package. Shielding in these packages is always an ALARA consideration.

6. The corrosion of the package causes significant safety concerns. The waste must be characterized and packaged to minimize pressurization of the package. The release of radionuclides from corroded packages is unacceptable.

5.4 REGULATORY REQUIREMENTS FOR WASTE FORMS

1. Powders, ashes, and similar particulate waste materials are immobilized if more than 1 wt% of the waste matrix in each package is in the form of particles below 10 microns in diameter, or if more than 15 wt% in the form of particles 200 microns in diameter (WIPP-DOE-069, Rev. 4.0 (3.3.1.1)).

2. The TRU waste shall not be in free-liquid form. Minor residual liquids remaining in well-drained inner packages shall not exceed 1 vol% and the total liquid in the waste package shall not exceed 1 vol% (WIPP-DOE-069, Rev. 4.0 (3.3.2.1)).

3. Pyrophoric materials, other than radionuclides, shall be rendered safe by mixing them with chemically stable materials (e.g., concrete, glass) or shall be processed to remove their hazardous properties. Not more than 1 percent by weight of the waste in each waste package may be pyrophoric forms of radionuclides, and these shall be generally dispersed in the waste (WIPP-DOE-069, Rev. 4.0 (3.3.3.1)).

4. TRU waste shall contain no explosives or compressed gases as defined by 49 CFR 173, Subparts C and G (WIPP-DOE-069, Rev. 4.0 (3.3.4.1)).

5. TRU waste shall contain no dangerous waste unless they exist as a co-contaminate with TRU. Waste packages containing dangerous waste shall be identified with the appropriate DOT label. All TRU-contaminated corrosive, reactive, and ignitable materials shall be treated to remove the hazardous characteristics. Dangerous wastes to be reported are listed in 40 CFR Part 261, Subparts C and D (WIPP-DOE-069, Rev. 4.0 (3.3.5.1)).

6. For purpose of TRU waste certification, the lower limit of >100 nanocuries/g (nCi/g) of TRU radionuclides in the waste shall be interpreted as >100 nCi/g of the waste matrix. The weight of added external shielding and the waste packages (including rigid liners) shall be subtracted prior to performing the nCi/g calculation. This is also applicable to waste managed as TRU under the provisions of DOE Order 5820.2A (e.g., U^{233} and Ra-^{226}) (WIPP-DOE-069, Rev. 4.0 (3.3.6.1)).

5.4.1 Hanford Site Practices

1. Free liquids in excess of 1 percent in the TRU waste will not be accepted. Liquids will be solidified, absorbed, or otherwise bound in the waste matrix by an inert material. The resultant waste matrix will not be capable of spontaneous combustion, decomposition, desorption, explosion, or affecting the integrity of the package. If liquids are bound by absorption, the absorbed material shall be placed in direct contact with the liquid. The quantity of absorbent material shall be sufficient to absorb twice the volume of liquid potentially present or as specified in the SDAR applicable to that waste. The absorbent will be selected based on the final treatment or disposal technology employed. The applicable SDAR will specify the absorbent to be used. Liquids shall not be absorbed or solidified without the concurrence of Acceptance Services.

2. The method proposed to convert pyrophoric materials to a stable form shall be included in the WSDR to store the waste in Hanford Site TSD facilities.

3. No pressurized vessels shall be permitted in TRU waste. Pressure vessels (such as aerosol cans and other gas cylinders) must be permanently vented.

5.4.2 Background

1. Liquids in the packages will increase the potential of corrosion and jeopardize the integrity of the package. Because the operational phase of the WIPP site is undetermined at this time, the longevity of the packages is of the utmost importance.

2. A validated process that converts pyrophoric compounds to a nonpyrophoric form can be used to meet this criterion. This process may either change the chemical form of the pyrophoric material or mix and bind it within an inert matrix.

3. Documentation of Real Time Radiography (RTR) and/or administrative controls and operational procedures are used as the basis for certifying that TRU waste does not contain pressurized packages, explosives, or combination of materials that could form explosive compounds within the waste package. Explosives should be controlled administratively at each facility. At present, no facility has identified explosives in their TRU waste process.

5.5 REGULATORY REQUIREMENTS FOR WASTE DATA

1. The following weight limits shall apply for waste package assemblies transported in the TRUPACT-II.

   a) 1,000 lb/drum

   b) 1,450 lb/drum overpacked in a SWB

c) 4,000 lb/SWB
(WIPP-DOE-069, Rev. 4.0 (3.4.1.2)).

2. The fissile or fissionable radionuclide content of CH-TRU waste in the TRUPACT-II, including 2 times the measurement error, shall be less than 200 g for a 55-gal drum or less than 325 grams for a SWB. The sum of the fissile equivalent of all waste packages in the entire payload quantity including 2 times the error may not exceed 325 g (WIPP-DOE-069, Rev. 4.0 (3.4.2.2)).

3. Waste packages will not exceed 1,000 Ci of ^{239}Pu equivalent activity (PE-Ci) (WIPP-DOE-069, Rev. 4.0 (3.4.3.1)).

4. Waste packages shall have a maximum surface dose rate at any point no greater than 200 mrem/hour. Neutron contributions of greater than 20 mrem/hour to the total waste package dose rate shall be reported in the data package (WIPP-DOE-069, Rev. 4.0 (3.4.4.1)).

5. Removable surface contamination on waste packages or package assemblies to be emplaced in WIPP shall not be greater than 50 picocuries per 100 cm^2 for alpha-emitting radionuclides and 450 picocuries per 100 cm^2 for beta-gamma emitting radionuclides. Fixation of surface contamination to meet the above is not permitted (WIPP-DOE-069, Rev. 4.0 (3.4.5.1))

6. There are two thermal limits for decay heat. 1) the total heat from the radioactive decay of the radioisotopes within an individual waste package and 2) the total decay heat from all waste packages in a TRUPACT-II (refer to DOE/WIPP 89-004 Rev. 3 Table 5). In determining whether or not a waste package or a group of waste packages meets the limits, the error must be added to the measured value (WIPP-DOE-069, Rev. 4.0 (3.4.6.2)).

7. All waste packages, including any overpacks, shall be vented with filters that meet the specifications described in the TRUPACT-II SARP. The minimum number of filters shall be one per drum, two per overpacked experimental bin in a SWB, and two per SWB.

   Any rigid drum liners used in the waste packages shall either be filtered or punctured, as specified in the TRUPACT-II SARP.

   Any confinement layers (as defined in the TRUPACT-II SARP) used in the waste packages shall be closed only by a twist and tape or fold and tape closure. No sealed packages greater than 1-gal in size shall be present as part of the waste.

   The maximum number of confinement layers in the waste packages shall be known and shall conform to the shipping category description provided in the TRUPACT-II SARP and the TRUPACT-II Content Codes document.

8. Any chemical/material existing in the waste >1 wt% must be evaluated to ensure that no adverse reactions could take place during transportation and that the chemical/material or any products of reactions are compatible with the materials of construction of the TRUPACT-II.

   If the combined total quantity of all trace chemicals/materials (chemicals/materials that occur in the waste in quantities < 1 wt%) in any waste package is > 5 wt%, these chemicals/materials must also be evaluated to ensure that no adverse reactions could take place and that the materials are compatible with the liner.

   Chemicals and materials present in concentrations > 1 wt% shall conform to the allowable chemicals in each waste material type, as defined in the TRUPACT-II SARP.

9. The total concentration of potentially flammable volatile organic compounds (VOCs) shall be limited to 500 parts per million (ppm) in the headspace of a waste package.

   Verify that any waste package to be emplaced in the WIPP during the experimental period does not exceed 50 percent of the lower explosive limit (LEL) in any layer of confinement for hydrogen (H_2) and methane (CH_4), when potentially flammable Volatile Organic Compounds (VOCs) as a class are <500 ppm. A layer of confinement is defined as a bagging layer that has waste inside that layer. The methodology for demonstrating compliance with this flammability requirement is presented in the Quality Assurance Program Plan (QAPP).

   If the potentially flammable VOCs occur in the headspace in concentrations greater than 500 ppm as a class, then a flame test must be performed prior to acceptance of that waste package for emplacement underground in the WIPP for experimental purposes. The 500 ppm potentially flammable VOC limit in the TRUPACT-II SARP is generally more restrictive than this requirement. If flammable VOCs exceed 500 ppm in the headspace of a waste package, that waste cannot be shipped under the current COC.

   If the summed value for potentially flammable VOCs exceeds 500 ppm, a theoretical LEL shall be calculated using the concentrations of the flammable VOCs plus hydrogen and methane, as outlined in the QAPP (WIPP-DOE-069, Rev. 4.0 (3.4.7)).

10. The bar code identification labels will be placed at three locations about 120 degrees apart within 5 in. of the bottom, and one label on the top surface of each drum. Labels are required on all sides and the top of rectangular packages (WIPP-DOE-069, Rev. 4.0 (3.4.8.5)).

    In addition to DOT labeling, each waste package shall be uniquely identified by means of a label permanently attached in a conspicuous location. The package identification number shall be in medium to low density Code 39 barcode symbology in accordance with MIL-STD-1189B in characters at least 1 in. high, and alphanumeric characters at least 1/2 in. high.

The identification marking must be reasonably expected to remain legible and affixed to the package for a period of 10 years under anticipated conditions of interim storage before shipment to the WIPP and emplacement underground (WIPP-DOE-069, Rev. 4.0 (3.4.8.1)).

5.5.1 Hanford Site Practices

1. The TRU waste packages will weigh no more than.

   a) 700 lb/drum for inter-area transfers

   b) 1,450 lb/drum for intra-area transfers

   c) 4,000 lb/SWB

   The gross weight of each package shall be reported and marked on each package as specified on the SDAR.

   All internal packages placed into a package should be weighed and the appropriate information recorded on the Contents Inventory Sheet.

   More restrictive weight limits can be established because of equipment restrictions, floor loading, or handling capabilities.

2. The 55-gal drum and the SWB shall contain fissile or fissionable radionuclide content no greater than the following WIPP criteria limits in ^{239}Pu fissile gram equivalents.

   a) 55-gal drum = 200 g

   b) SWB = 325 g

   The fissile gram equivalent will be calculated using the methods detailed in Appendix C.

   one hundred g is the maximum allowed in 55-gal drums that are lead-lined, contain absorbed liquid organics, or where the fissile material is contained within less than 20 percent of the drum volume.

   SWB limit. Contact Generator Services

   If more restrictive, all packages will comply with the facility-specific criticality specification.

3. **Plutonium-239 Equivalent Activity.** All reported values will include two times the measurement error.

For all TRU waste destined for the CWC, the following DE-Ci limits will apply.

a) 55-gal drum = 29 DE-Cis of 12.9% ^{240}Pu

b) SWB = 35 DE-Cis of 12.9% ^{240}Pu

NOTE. Compliance to the most restrictive limit of ^{240}Pu Fissile Gram Equivalents (FGEs) or DE-Cis shall be the responsibility of the generator. Correction factors for PE-Cis and FGEs are supplied in Appendix C. Tables for DE-Cis are found in Appendix L.

4. Waste packages shall have a maximum surface dose rate at any point no greater than 100 mrem/hour (beta, gamma, and neutron). All neutron dose rates shall be reported.

5. Removable contamination is limited to 2200 dpm/100 cm^2 beta/gamma and 220 dpm/100 cm^2 alpha.

6. The thermal power for each package shall be calculated/determined.

7. Liners, such as the 90 mil liner, will be vented with an approved filter, venting device, or will have a minimum 0.3 in. hole in the lid. In the unfiltered ports of the SWB, a "plugged" label will be affixed. All filters and plugs will be installed internally. The maximum number of confinement layers in the waste package shall be known.

   For purposes of transportation and storage, there shall not be mixtures of gases or vapors in any package which could, through any spontaneous increase of heat or pressure, or through an explosion, significantly reduce the effectiveness of the packaging.

   All plastic bagging shall have a positive gas communication to the outer package.

8. Durability/Size/Location

   All labels and markings shall be permanently applied to the waste package with materials that have a predicted 10-year life in the expected environment and are compatible with the package and protective coating.

   All labels and markings shall be in clear, legible English in a color contrasting with the background.

   All labels and markings shall be nonfading and nonsmearing.

   Characters used in labeling and marking 55-gal drums or SWBs shall be at least 1 in. high.

The following information will be required on the package.

WRM number. (offsite waste generators)

Point of origin. (Hanford Site waste generators)

PIN. Each waste package shall bear a unique PIN. The numbering system used for the PIN is given in Chapter 2.

Gross weight in pounds or kilograms, located below the PIN and point of origin

Additional labeling or marking requirements may be included in specific SDARs

55-Gal Drums. All markings and labels shall be placed on the side of the package, aligned with the locking bolt on the drum lid. The PIN, WRM (or point of origin), and gross weight shall also be placed on the top of the package.

SWBs. All markings and labels shall be placed on the upper two-thirds of both flat sides of the waste package. The PIN and gross weight shall be placed on the top of the package. No markings or labels are to be placed within the bottom 15 cm (6 in.) of the waste package to leave a clear space for the required WIPP barcode label.

Rectangular waste packages. For other than 55-gal drums and SWBs, labeling information will be provided to the waste generator via the SDAR.

Examples of labeling and marking radioactive waste packages are given in Appendix E.

5.5.2 Background

1. The weight limits for onsite comply with the WIPP criteria. There are several sources that control weight of TRU waste packages. Some of the limiting considerations are transportation, facility equipment, and storage capabilities. There are also a number of weight limits involved with internal packaging such as the organics. All of the weight limit information is vital to proper handling and management of the waste.

2. Criticality Safety is controlled by the facility criticality specifications. However, if the TRUSAF, CWC, or WIPP criteria is more restrictive, these limits will be evaluated to determine which limit is applicable for maximizing safety, package capacity, and interim storage space.

3. The PE-Ci limit has been established by WIPP for placing the waste into their repository. More restrictive PE-Ci/DE-Ci limits have been established for TRUSAF or the CWC. These limits will be stated in the SDAR.

4. Contact-handled TRU waste is defined as having a maximum surface dose rate of 200 mrem/hour. To minimize the number of high radiation areas on site, the 100 mrem/hour dose rate limit has been established for the CWC and TRUSAF. The neutron dose rate for all TRU waste packages will be reported. This information is valuable for a number of reasons with ALARA heading the list.

5. For movement of TRU waste on the Hanford Site, the 2200 dpm/100 cm^2 beta/gamma and 220 dpm/100 cm^2 alpha limits will be used.

6. For the isotopic distribution of plutonium at the Hanford Site, wattage limits do not impose a problem. The transportation requirements found in SD-RE-SARP-033 for decay heat restricts the accessible surface temperatures to 180 °F and 158 °F at the closure seal. These limits comply with 49 CFR 173.442.

7. All of the requirements for the prevention of gas generation in TRU waste packages are directly involved with safety. The venting of all TRU waste packages is essential for responsible waste management. Thus, the compatibility of the items placed into the package with each other as well as the package must be known.

8. Labeling provides the only way to determine the origin of the package and the means for proper handling. The proper labeling ensures that personnel handling the waste packages, after the package has been closed, will have the information necessary to transport and store the waste safely.

6.0 NON-RADIOACTIVE DANGEROUS WASTE ACCEPTANCE CRITERIA
(Hanford Site Generator Only)

6.1 616 NON-RADIOACTIVE DANGEROUS WASTE STORAGE FACILITY (NRDWSF) SPECIFIC CRITERIA

NOTE. Polychlorinated biphenyl waste is stored at the 616 NRDWSF.

6.1.1 Prohibited Waste

6.1.1.1 Regulatory Requirements

1. Waste capable of detonation or of explosive decomposition or reaction at normal pressures and temperatures (including peroxide-forming chemicals), or of explosive reaction with water will not be accepted for disposal (29 CFR 1910.109).

2. Class 4 oxidizers (e.g., ammonium perchlorate, ammonium permanganate, hydrogen peroxide solutions (>90 percent)) in quantities greater than 10 lb (NFPA 43A, 1990).

6.1.1.2 Hanford Site Practices

1. The following waste types can not be received or handled at the NRDWSF.

   a) Bulk waste

   b) Radioactive Waste

6.1.1.3 Background

1. The storage and/or operational limits at the 616 NRDWSF do not permit or allow the above waste to be stored at the facility.

6.1.2 616 NRDWSF Records

6.1.2.1 Regulatory Requirements

1. The TSD Facility (616 NRDWSF) must keep a written operating record. The following information must be recorded as it becomes available, and maintained in the facility (note, the term "facility" denotes anywhere within the contiguous property of the Hanford Site).

   a) Description of and quantity of DW received or managed (40 CFR 264.73(b)(1); 40 CFR 265.73(b)(1); WAC 173-303-380(1)(a))

   b) The location of each DW within the facility and the quantity at each location (updated facility inventory) (WAC 173-303-380(1)(b))

c) Records and results of waste analyses and trial tests required to manage the DW properly (including any generator supplied analytical and test data) (WSDR and supporting documents) (40 CFR 264.73(b)(3); 40 CFR 265.73(b)(3); WAC 173-303-380(1)(c))

d) Summary reports and details of all incidents that require implementing the contingency plan (daily operating logbook and or spill logbook) (WAC 173-303-380(1)(d))

e) Records and results of inspections (daily/weekly inspection records) (WAC 173-303-380(1)(e))

f) Monitoring, testing, or analytical data, and corrective actions where required (daily operating logbook and or spill logbook) (WAC 173-303-380(1)(f))

g) Copies of the notices, and certifications and demonstrations if applicable, required by an offsite generator or TSD owner/operator under 40 CFR 268.7 or 268.8 (land disposal restriction notifications) (40 CFR 264.73(b)(11),(13), and (15); 40 CFR 265.73(b)(9),(11), and (13))

h) Information contained in the notices (except the manifest number), and certifications and demonstrations if applicable, required by an offsite generator or TSD owner/operator under 40 CFR 268.7 or 268.8 (land disposal restriction notifications) (40 CFR 264.73(b)(12),(14), and (16); 40 CFR 265.73(b)(10),(12), and (14))

i) A copy of the signed UHWM (and signed shipping paper for water or rail shipments) must be provided with each waste shipment. The waste manifest shall accompany each waste package from generation through final disposition. 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 (40 CFR 264.71(a)(5) and (b)(5); 40 CFR 265.71(a)(5) and (b)(5); WAC 173-303-370(2)(e) and (3)(e)).

   1) Waste physical and chemical characteristics

   2) Weight of the waste (total of waste and any solidification or absorbent media)

   3) Other data necessary to demonstrate compliance with Chapter 173-303 WAC.

2. The records must be kept until closure of the facility (WAC 173-303-380(1); 40 CFR 264.73(b); 40 CFR 265.73(b)).

6.1.2.2 Hanford Site Practices

None

6.2 GENERATOR SPECIFIC REQUIREMENTS

NOTE. Generator requirements are outlined in a decision tree in Appendix M

6.2.1 Generator Solid Waste Identification

6.2.1.1 Regulatory Requirements.

1. Any material is a "solid waste" once it is discarded, abandoned, recycled, inherently waste-like, or not exempted by regulations. A "solid waste" may be a solid, liquid, and/or a contained gas. Generators must ensure that their solid wastes meet the following requirements. (40 CFR Part 261 and WAC 173-303-070 through 173-303-104).

   a) Solid wastes subject to regulation as DWs must be designated correctly

   b) Solid waste designated as dangerous must have all proper DW numbers as required by 40 CFR 262.11 and WAC 173-303-070(1)(b) and 173-303-170(1)

   c) Solid waste regulated under any other federal or state program with jurisdiction over the waste (e.g., PCBs, asbestos) must be properly identified.

6.2.1.2 Hanford Site Practice.

1. Everyday wastes such as leather, wood, cloth, paper, plastic, aluminum, and most ferrous metals are not subject to regulation, provided they are not contaminated by or mixed with a DW, and may be discarded to a proper trash receptacle. If there is any suspicion that everyday waste has been contaminated by hazardous chemicals, a WSDR form (refer to Appendix A for instructions) must be submitted to Acceptance Services.

   All <u>chemical</u> waste, whether from a process, a spill, or off the shelf product shall be submitted to Acceptance Services for designation. A WSDR form (refer to Appendix A for instructions) must be submitted to Acceptance Services.

6.2.2 Generator Shipment Documentation Requirements

6.2.2.1 Regulatory Requirements. Wastes will not be accepted at the 616 NRDWSF without the documentation addressed in this section.

1. All generators classifying their waste as "nonradioactive" must complete a waste radiation release certification in accordance with the requirements specified in Appendix J of this document. (DOE Order 5820.2A).

2. The generator is responsible for obtaining radiological release documentation. Due to the fact that nonradioactive DW is eventually shipped offsite, every DW package and its contents **MUST** be unconditionally released using one of the methods defined below (DOE Order 5400.5).

   a) The waste must have an Unconditional Radiological Release Survey Sticker signed by authorized personnel on the day the waste is offered for transportation. Transportation must occur within 24 hours to ensure the validity of the radiological release.

   b) The waste is both generated and stored in a facility where radiation protection clearance is not required. Verbal approval from authorized Health Physics personnel is required. The generator must record the name of the authorizing personnel granting verbal approval. Block 15 of the UHWM or a document attached to the UHWM must contain the following.

      - The statement "Certified Free of Contamination"

      - The generator's signature

      - The name of the Approver.

   c) The waste must have an Exemption from Radiation Protection Unconditional Survey signed by authorized personnel. The Health Physics Department publishes a site-wide list of personnel who are authorized to certify that specific materials have not been in a radiation area or are free of contamination.

3. These requirements are **only** applicable to Hanford Site generators on properties noncontiguous to the Hanford Site (these generators have an EPA ID number different than WA7890008967) and/or Hanford Site generators who transport waste on public access roadways. The 616 NRDWSF will not accept waste without the following.

   a) A UHWM signed by the generator for each waste shipment. (WAC 173-303-180).

   b) A properly completed notification for wastes which are prohibited from land disposal under the requirements of 40 CFR 268.7 or 268.8 (40 CFR 268.7.1).

6.2.2.2 Hanford Site Practices. These requirements are applicable to all Hanford Site generators. When a generator has identified that he/she has a regulated solid waste (reference Section 6.2.1), the steps in this section must be performed by the generator.

1. The generator must prepare a WSDR in accordance with the direction given in Appendix A. A copy of the WSDR, signed by the generator, must be forwarded to Acceptance Services for characterization.

2. The waste designation is documented on a HWDAR. The HWDAR is prepared from the regulatory requirements. This documentation normally consists of a cover transmittal with general instructions, and a Waste Shipping Summary which contains waste-specific packaging, labeling, and marking instructions. The information transmitted and the arrangement of the form may change from time to time as need arises. The Waste Shipping Summary contains information on various waste containers separated by bars as indicated below.

   ═ This bar is used to separate items which are to be labpacked in the same outer package.

   ▬ This bar is used to separate compatibility groups under the same shipping name.

   ▬▬ This bar is used to separate items or labpacks under separate shipping names.

   The HWDAR is prepared and distributed by Acceptance Services. The original HWDAR is transmitted to the generator; copies are distributed to the inspector, as applicable, the transporter, and each applicable facility operator; and a copy is retained in the Acceptance Services auditable file.

   When approved and distributed, the disposal analysis documentation officially represents the waste shipment and is used by the generator to package the waste for transport and to complete the UHWM. The generator must notify Acceptance Services in writing (letter, memorandum, marked-up copy of the disposal analysis, or electronic mail transmission) of any changes to the waste shipment prior to inspection and transport.

3. For generators of frequent and identical wastes, "routine" waste analysis will speed up the processing of wastes. Approval is given only for a specific waste in a specific package, and must

be reviewed annually. The necessary steps for setting up a routine shipment are as follows.

a) Each year the generator submits a waste storage/disposal analysis request marked "Routine Waste" to Acceptance Services.

b) Acceptance Services returns to the generator an assigned waste disposal analysis routine identification number, and an approved routine HWDAR.

c) The generator packages the waste in accordance with the HWDAR.

d) On all subsequent shipments when a "routinely" generated waste is ready, an Acceptance Services representative is contacted who will assign a UHWM number (If contact is made by telephone, follow up with a written notice to Acceptance Services).

   When contacting Acceptance Services, the following should be provided.

   1) Routine Disposal Analysis Reference Number (provided by Acceptance Services).

   2) Specific waste type

   3) Number, size and type of package for each waste

   4) Total quantity of each waste

   5) Accumulation date for each waste

   6) Upon receipt of proper documentation from Acceptance Services, the generator is expected to complete the UHWM for shipment.

4. The completed UHWM (refer to Appendix H) will be initialed by the generator and presented at the time of inspection. The manifest must be initialed by the Inspector, if applicable, to verify compliance with packaging instructions. When ready to transport, the generator must sign the manifest, obtain the transporter's signature, and retain the generator copy of the manifest. The original and all remaining copies must accompany the shipment. The original copy of the manifest will be returned to the generator when the shipment is complete.

5. Packages that are labpacks, or that were used to receive mixtures of wastes from multiple waste streams and that rely on process knowledge to properly designate the DW, must have a package inventory sheet documenting the contents.

6.2.2.3 Background.

1. Chapter 173-303 WAC operates in lieu of, and is generally broader than, the counterpart federal regulations. The state regulations require that generators designate wastes in accordance with WAC 173-303-070. To designate a waste, the generator must have sufficient data on the chemical characteristics and source of the waste to determine if the various waste lists, waste characteristics, or waste criteria apply. For designating waste mixtures against the state-only criteria of acute toxicity, persistence, and carcinogenicity, WAC 173-303-084 requires only that the generator use data currently available to designate the waste; sampling and analysis for waste constituents, or biological testing of the wastes, is not required unless specifically directed by Ecology. A slightly higher standard is set in WAC 173-303-101 and WAC 173-303-102. Under these sections, the generator need not account for all constituents of the waste, but must demonstrate that the constituents about which he/she has no knowledge will not significantly impact the waste designation (e.g., refer to WAC 173-303-101(4)(a)(iii)). Sampling and test methods for the designation of solid wastes are specified in WAC 173-303-110. Generators must ensure that the proper DW number is assigned; all applicable DW numbers must be assigned to the waste.

   The generator must provide any other chemical constituents and characteristics data necessary for the 616 NRDWSF to manage the waste properly. The 616 NRDWSF unit-specific WAP and waste-specific correspondence between the 616 NRDWSF and the generator will define the required chemical data parameters for most waste shipments.

   WHC relies primarily on information provided by the generators of DWs, and may require the generator to develop (including laboratory analyses, if necessary) designation information needed by the 616 NRDWSF to determine appropriate storage, treatment, and disposal procedures.

   Dangerous wastes are generally prohibited from land disposal unless they have been treated and certified to meet various treatment limits and/or technologies. The designation of a DW can significantly affect its regulation under the LDRs, so proper designation is critical.

6.2.3 Generator Packaging Requirements

6.2.3.1 Regulatory Requirements.

1. This section is for general guidance and is not intended to be a replacement for DOT regulations. EPA and Ecology generally

reference and require nonradioactive DW to be packaged prior to transport in accordance with applicable standards set forth in 49 CFR Parts 172 through 179.

The generator of a DW, not the receiving TSD facility, is responsible under state and federal regulations for ensuring that DWs are prepared for transport in accordance with DOT requirements. In general, a TSD facility will evaluate conformance with applicable DOT regulations as a criteria for acceptance of a DW shipment.

6.2.3.2 Hanford Site Practices.

1. Wastes must be packaged prior to shipment in accordance with DOT requirements specified in 49 CFR Parts 173, 178, and 179. The Hazardous Materials Table in 49 CFR 173 references the DOT regulations for specific packaging of hazardous materials. 49 CFR Part 178 specifically addresses the types of packages acceptable for use in the transport of particular types of hazardous materials and DWs. The HWDAR for each shipment will provide specific instructions on proper packaging for the DW.

2. Packages must meet DOT standards and specifications for the type of waste contained, and generally be in good, undamaged condition. In addition to DOT standards, EPA and Ecology regulations require that packages be in good condition and that the package be appropriate for the contents. Although these requirements only directly apply during accumulation or storage, a TSD facility will not accept shipments of DW in packages if the following requirements of this section are not met.

    a) Liquids must always be managed in bung-type drums (Acceptance Services may grant an exception to this on a case-by-case basis). Generators may place viscous/sludge-like wastes in open head drums when the use of bung drums is not possible. Bungs and seals must not leak when the drum is tipped for loading. Generators should inspect all packages for damage (e.g., dents, bulges, bad seams, poor or missing bungs) prior to shipment. Packages cannot be leaking when transported. Packages cannot be dented, bulging, or otherwise damaged to an extent that could pose a potential to leak during transport.

    b) Generators should ensure that the package material is compatible with the DW to be placed inside. Packages, inner liners, and waste contents must be compatible. Different wastes packaged in the same package must be compatible, and must not be capable of generating heat, gas, or explosive mixtures in the event they commingle during transport.

c) In general, reused packages should be avoided for transporting DW shipments. Certain conditions specified in 49 CFR 173.12(c) must be met if a reused package is used to ship DWs. Generally, reused packages can only be used for highway transport, must be authorized for the material being shipped, and must be in good condition for reuse as allowed in 49 CFR 173.28. In addition, a reused package must not be shipped sooner than 24 hours after it is finally closed for transport and must be inspected for leakage immediately before being loaded onto the transport vehicle.

3. Small packages of DW may be overpacked together into packages as labpacks in accordance with 49 CFR 173.12(b) and WAC 173-303-161. In general, labpacks may be transported only by highway, can only contain wastes of the same DOT hazard class, must have sufficient quantity of a chemically compatible absorbent material to completely absorb all the liquid contents of the inside packages, and must not include reactive wastes (other than cyanide- or sulfide-bearing wastes) or incompatible wastes. An itemized list of the labpack contents must be kept by the generator and readily available during shipment. The TSD facility will require the generator to provide this list when a labpack is shipped.

   Dangerous waste packages may be packaged in overpacks for transport. Overpacks must be prepared in accordance with the requirements of 49 CFR 173.25

6.2.3.3 Background.

1. As specified in part 6.2.3.1, the packaging requirements specified above are derived from specific regulations, but this section is not to be used in lieu of DOT regulations.

6.2.4 Generator Waste Package Marking and Labeling Requirements

NOTE. Reference Appendix E for examples of package marking and labeling.

6.2.4.1 Regulatory Requirements.

This section is for general guidance and is not intended to be a replacement for DOT regulations. EPA and Ecology generally reference and require nonradioactive DW to be marked and labeled in accordance with applicable standards set forth in 49 CFR Parts 172 through 179.

The generator of a DW, not the receiving TSD facility, is responsible under state and federal regulations for ensuring that DWs are prepared for transport in accordance with DOT requirements. In general, a TSD facility will evaluate conformance with applicable DOT regulations as a criteria for acceptance of a DW shipment.

1. The 40 CFR 262.31 and 262.32, and WAC 173-303-190(2) and (3) require the generator to properly label each package and package prior to shipment as stipulated in 49 CFR Part 172. The Hazardous Materials Table references the DOT regulations for specific packaging of hazardous materials. The HWDAR for each shipment will provide specific instructions on proper labeling and marking for the DW.

   All labeling and marking requirements applicable to other DWs also apply to labpacks. Inside packages must be labeled as to contents. A generic proper shipping name from the DOT Hazardous Materials Table (49 CFR 172.101) may be used in place of specific chemical names when two or more waste materials in the same hazard class are placed in the same labpack. This proper shipping name will be used for marking the package and completing the UHWM. If a more specific name is available, (e.g., a labpack of several packages of the same chemical) it must be used.

2. The 40 CFR 262.31 and 262.32, and WAC 173-303-190(2) and (3) require the use of proper shipping names for all nonradioactive DW shipments in accordance with 49 CFR Part 172. The Hazardous Materials Table (49 CFR 172.101) is a listing of hazardous materials by their proper DOT shipping name. The "List of Hazardous Substances and Reportable Quantities" (Appendix to 49 CFR 172.101) contains CERCLA designated hazardous substances. Only names listed on the Hazardous Materials Table may be used as proper DOT shipping names. For wastes that are Washington State waste only, the proper shipping name will be non-RCRA waste liquid or non-RCRA waste solid.

3. The 40 CFR 262.31 and 262.32, and WAC 173-303-190(2) and (3) require use of the Hazardous Materials Table to assign a hazard class to each material according to its proper shipping name. Hazard classes are defined in 49 CFR Part 173. Wastes may have more than one hazard; however, the hazard class that will be associated with the proper shipping name must be the highest priority hazard determined in accordance with DOT standards.

4. When the proper shipping name and the appropriate hazard class have been identified, 40 CFR 262.31 and 262.32, and WAC 173-303-190(2) and (3) require assignment of the related identification number from the Hazardous Materials Table.

5. The EPA and Ecology regulations require that packages be marked and labeled with certain information. Although these requirements only directly apply during accumulation or storage, a TSD facility will not accept shipments of DW in packages if these requirements are not met.

   Packages must be clearly marked with the words "dangerous waste" or "hazardous waste," as required in 40 CFR 262.34(a)(3) and WAC 173-303-200(1)(d). Any DW package must bear a properly completed hazardous waste sticker. This sticker is available as a fill-in-the-blank type of label and should be completed as indicated in Appendix E, Figure E-1. When the generic proper shipping name is used, the constituent(s) that qualify the waste should be included in parentheses. This information **MUST** appear on all shipping papers and be clearly marked on the hazardous waste sticker.

6. No markings should be placed on the middle section of drums greater than or equal to 30 gal.

   Consistent with DOT regulations, labels should be of sufficient size to be readily identified and readable at a reasonable distance (e.g., 2 to 5 feet). Labels should be legible and easy to read. Handwritten labels and markings must be printed.

   Consistent with DOT regulations, labels must be of sufficient durability to withstand normal weather and temperature conditions that would be expected during transport and during extended storage outside. Use waterproof permanent ink. When replacing a package label because of damage or to include addition information, the old label must be completely removed (WAC 173-303 -190, 49 CFR 172-304).

7. Each DW package must bear a marking describing the risks associated with the waste as required by WAC 173-303-200(1)(d) and 173-303-630(3). Packages holding a waste designated with any of the "W" codes specified below must be marked with the associated risk.

   a) "PERSISTENT," if the codes WP01, WP02, or WP03 are applicable

   b) "TOXIC," if the codes WT01 or WT02 are applicable

   c) "CARCINOGENIC," if the codes WC01 or WC02 are applicable.

6.2.4.2 Hanford Site Practices

The generator of a DW shipment is required to satisfy applicable EPA, DOT, and Ecology requirements in preparing the waste for shipment. A TSD facility may refuse to accept a DW shipment for which the generator has not performed the following.

1. The top and side of each package must be marked with a number. This number shall correspond to the manifest number, page number, and section of the manifest that describes the contents of the package, and the package unit number. Unit numbers will be recorded as needed on the UHWM. For example, manifest #12345, page 1, section A describes a waste packaged in two packages.

The numbers placed on these packages would be 12345-1A-1 for package 1 and 12345-1A-2 for package 2. This number enables the waste package to be matched with the proper documentation.

All labeling and marking requirements applicable to other DWs also apply to labpacks. Inside packages must be labeled as to contents. Empty packages that have not been cleaned must be labeled in the same manner as when they were full. Refer to Section 6.6.2.8 for onsite disposal of empty packages.

Package numbering should be marked on the top and side of each waste package and on the upper right hand corner of the EPA label.

2. The waste numbering system is used to provide unique PINs for all shipping packages and to consolidate and standardize package numbering systems used onsite. Section 2.5 explains the required package identification number system. The PINs shall be used to identify all shipping packages. The PINs should be recorded in the appropriate block of the WSDR when submitting a waste for analysis. Individual package weights must be recorded on the WSDR or WSDR attachment. Refer to Appendix A for WSDR and WSDR attachment instructions.

   Smaller miscellaneous packages (including aerosols) within labpacks shall be assigned PIN numbers. Inventory lists must be attached to the outer shipping package. For prepackaged labpacks, assign a PIN number to the outer shipping package as well as inside packages. Inner package PIN numbers may be assigned in one of two ways.

   - Assign each package its own consecutive number. Identical wastes may be treated as a 'lot', with one PIN number (e.g., 10 cans 1-1 trichlor with PIN # 30818301-00003).

   - For prepackaged labpacks, the inner PIN numbers may be derived from the outer package number (e.g., outer package PIN# 30818301-00003 with inner package numbers 30818301-00003A, 30818301-00003B, and 30818301-00003C).

   The PIN number must be marked on the top and side of each package.

3. Each package of waste being shipped to the 616 NRDWSF must have the gross weight legibly marked on the top and side of the packaging.

6.2.4.3 **Background.**

1. The package and PIN numbering systems are required to facilitate waste tracking, package inspection, and inventory control at the 616 NRDWSF. The gross weight marking is used to determine the proper placarding and to facilitate transporter/operator safety.

6.2.5 Generator Shipment Requirements

6.2.5.1 **Regulatory Requirements.** None.

6.2.5.2 **Hanford Site Practices.**

1. Inspections will be required for generators that have had difficulty in meeting DOT requirements. Generators will be notified when this is the case. When required, the shipment must be inspected by the WHC Hazardous Materials Operations department prior to transport. The inspector is responsible for ensuring that all shipments of nonradioactive DW comply with the applicable packaging and transportation requirements of the EPA, Ecology, and DOT regulations (primarily 49 CFR Parts 172 through 178). The Inspector also ensures that packages designated as "empty" are empty.

   The generator arranges for inspection of waste shipments by contacting the Hazardous Materials Operations inspection representative. Inspections are conducted at the generator's facility. NOTE. It is important that the generator or designated representative be readily available at the appointed inspection time and site to avoid unnecessary delay.

   At the time of the inspection, the generator must present a properly completed UHWM to the inspector. The inspector must initial or sign the manifest to show approval to transport the waste shipment as packaged and labeled. Following inspection and approval of the waste shipment, transportation arrangements must be made by the generator.

2. The generator can arrange transportation for inspected and approved shipments by contacting the transportation representative specified on the HWDAR. Transportation arrangements should be made at least one week prior to the anticipated transport date. Waste shipments must be scheduled well in advance of the 90-day shipping deadline to prevent violations caused by scheduling conflicts or situations outside the control of the transporter or the storage facility.

3. Reference paragraph 6.2.2.1.2 for instructions on radiation release requirements.

4. The waste generator's responsibilities are as follows.

   - Ensure that the waste packages loaded on the transport vehicle are properly reflected on the UHWM.
   - Ensure that the waste load is secure.
   - Identify/provide the proper placard for the waste and ensuring that it is secured to the transport vehicle.
   - Ensure that the transport vehicle service record is up-to-date.
   - Ensure that the transport vehicle has a spill kit.

6.2.5.3 Background

1. The requirements of this section ensure compliance with applicable DOT requirements and 616 NRDWSF storage and/or operational limits.

6.2.6 Generator Record Retention Requirements

6.2.6.1 Regulatory Requirements

1. An offsite nonradioactive DW generator shall keep a copy of the following records.

   - A copy of the UHWM used for each shipment of DW (The manifest must be signed by an authorized representative of the receiving facility (WAC 173-303-210(1)).
   - A copy of each annual report and exception report (WAC 173-303-210(2))
   - Copies of test results, waste analysis (including radionuclide analysis), or other determinations made in accordance with WAC-173-303-170(1).

   Generators must retain records for all sample data used to characterize wastes for shipment to Hanford Site nonradioactive DW TSD facilities. Guidance on sampling found in SW-846, and in EPA QAAMS-005 for preparing QA project plans, also suggest the need to keep any records associated with environmental samples. These records should include. a description of the sampling procedures used, sample chain-of-custody documentation, the standard analytical procedures used; and QA data provided with the sample results. In addition, information to develop and demonstrate the use and adequacy of process knowledge probably incorporate some original sampling and analysis data. Records for these data should also be maintained.

d) Any other records required for generators accumulating wastes on site in accordance with WAC-173-303-170(4)(b) or WAC-173-303-200 (WAC 173-303-210(4)).

2. The records cited in 6.2.2 must be retained for five years after the waste is transported to permitted storage (WAC 173-303-210).

6.2.6.2 Hanford Site Practices

1. Onsite generators are required to maintain all records associated with Section 6.2.6.1 with the exception of the annual report. Records must be maintained for a minimum of five years. It should be noted that Acceptance Services maintains these records as lifetime quality records (Refer to WHC-CM-3-5, Section 9).

2. All information submitted with waste packages should be printed legibly, in dark ink, or typed on 8 1/2 by 11 in. sheets. This will facilitate paper handling and microfilming.

Note. Blank forms can be obtained from the Acceptance Services contact listed in Section 1.4 or, when the new version becomes available, may be accessed on the Jetform option on the Hanford Local Area Network (HLAN). The forms are also available as a WordPerfect[3] File. If the WordPerfect file is used, the original format of the form must not be changed by the generator or the form will not be accepted.

6.2.6.3 Background

1. The requirements of this section ensure that records will be available to various compliance inspectors at the generating facilities.

6.3 MANAGEMENT OF UNIQUE WASTES

Some wastes on the Hanford Site are managed uniquely. The following directions will aid in managing unique wastes. Not all unique wastes will be transported to the 616 NRDWSF. Not all unique wastes will be covered in this section. Whenever there are questions regarding the handling of an unique waste, those questions can be directed to Acceptance Services.

6.3.1 Regulatory Requirements

1. The requirements of 40 CFR and Chapter 173-303 WAC are reflected in Section 6.3.2.

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[3]Wordperfect is a trademark of Wordperfect Corporation, Orem, Utah

6.3.2 Hanford Site Practices

1. Although waste rags, shop towels, and wipe cloths may appear to be "practically clean," or the solvent may appear to have evaporated, these rags may still be designated as DW under WAC 173-303-070. The following practices apply.

   - Rags that have been contaminated with chemicals or wastes designated as dangerous must be assumed to be dangerous until determined otherwise. Designations of this type of waste are required.

   - When rags are used to clean up a spill of DW or to wipe solvents from equipment, the rags must be managed as DW until designated as nonregulated.

   - Store waste rags in accordance with the waste characteristic of the contaminant (e.g., rags with corrosive waste will be stored as corrosive).

   - Know or estimate the weight percent of contaminant on waste rags. This information is needed for disposal purposes.

   - Do not mix DW rags with nonregulated rags.

   - Do not mix DW rags with EHW rags.

   - Have the chemicals or wastes predesignated to avoid costly analysis later.

   - Do not air dry rags to get rid of a DW contaminant.

2. Empty aerosol cans are normally not hazardous and may be discarded to trash. Discharging aerosol cans into the air for the sole purpose of emptying them is not allowed. To dispose of nonregulated empty aerosol cans, place the cans in a plastic bag, place in the bag a note signed by the generator stating the cans are not regulated, horsetail the bag, and discard in a dumpster.

   Any empty aerosol can that held an Acutely Hazardous Waste as the sole ingredient is regulated as a DW. Trace ingredients, water, and inert materials do not count as ingredients. Refer to Section 6.6.2.8, Empty Packages, for proper discard technique.

   Aerosol cans that have lost propellent but still contain material (shake the can) may be regulated. Therefore, a WSDR must be submitted to Acceptance Services for a waste designation. If aerosol cans are punctured before disposal, any product that would be designated as a dangerous waste when discarded must be captured and a WSDR submitted to Acceptance Services.

3. Storage and handling of PCB wastes in most cases are governed by the TSCA regulations under 40 CFR Part 761. Refer to WHC-CM-7-5, *Environmental Compliance Manual*, Part Y, "Asbestos and Polychlorinated Biphenyls," for additional rules on handling and storing PCB wastes. The following guidelines must be followed by generators.

   - Waste containing greater than 50 ppm PCB or that contains PCB which originated from a source with a concentration of greater than 50 ppm (TSCA-regulated), and which is not mixed with a DW must be managed in accordance with the TSCA 40 CFR Part 761 requirements.

   - TSCA-regulated waste that is mixed with a DW must be managed in accordance with both the TSCA and the DW regulations.

   - Waste containing PCB in a concentration of 1 to 50 ppm and that originated from a transformer or capacitor containing less than 50 ppm PCB (W001) must be managed in accordance with the DW regulations unless it is managed in a manner equivalent to the TSCA regulations.

     TSCA-regulated waste must be managed at its source concentration. For example, a transformer containing oil with 1,000 ppm PCBs is drained and flushed with a solvent. Even though the actual PCB concentration in the solvent is 200 ppm, it must be designated and disposed of as waste containing 1,000 ppm. These wastes must be shipped to the 616 NRDWSF Facility within 30 days of the out of service date. Bulk liquid PCB wastes with PCB concentrations of ≥ 500 ppm must be transported directly into storage.

     Although W001 DW is regulated for PCB in a concentration of 1 to 50 ppm, the lower regulatory limit for PCBs may be 2 ppm. Refer to WAC 173-303-071(3)(k)(ii) for more information. When managed as a DW under the requirements of Chapter 173-303 WAC, W001 wastes may be shipped to permitted storage at the NRDWSF. When managed in a manner equivalent to a TSCA-regulated waste, W001 is exempted from Chapter 173-303 WAC requirements as specified in WAC 173-303-071(k)(iii). These wastes must be shipped to the 616 NRDWSF within 30 days of the out of service date.

4. At this time, all discarded fluorescent light ballasts (or small capacitors) are regulated. The following requirements are applicable.

   - Unmarked ballasts must be assumed to contain PCBs.

   - PCB ballasts must be collected and stored separately from PCB-free ballasts.

- Non-leaking PCB ballasts and non-PCB light ballasts are regulated as a waste by Chapter 173-303 WAC and must be managed accordingly (satellite storage, 90-day accumulation, etc.).

- Leaking PCB ballasts are regulated by TSCA and must be assigned an out-of-service date.

- Leaking PCB ballasts must be shipped to the 616 NRDWSF within 30 days of the out-of-service date.

5. Some chemicals react with atmospheric oxygen to form shock sensitive organic peroxides. Some of the peroxide forming chemicals found most frequently at the Hanford Site are as follows.

   - Ethers
   - Tetrahydrofuran
   - 1,4-Dioxane
   - Sodium amide
   - Vinylidene chloride
   - Cyclohexane
   - Cyclopentene
   - Tetrahydronaphthalene
   - Butadiene
   - Vinyl acetate
   - Vinyl acetylene
   - Vinyl chloride
   - Vinyl pyridine
   - Picric acid.

   Peroxide formation is affected by heat, light, concentration, and exposure to air. Normally, the package label and/or the Material Safety Data Sheet (MSDS) will reflect the peroxide formation hazard of a chemical. As a rule, peroxide forming chemicals should be disposed of within 1 year of purchase, or, within 30 days after opening the package. If there is any question as to whether a chemical may have formed organic peroxides, contact Generator Services for additional information and assistance. **DO NOT OPEN THE PACKAGE.**

6. Ordinary light bulbs may be DWs because of the presence of lead contacts, mercury, other heavy metals, or because they exhibit other dangerous characteristics or criteria. The following types of bulbs will be managed as DW unless Toxic Characteristic Leaching Procedure (TCLP) or other characteristic testing or process knowledge indicate otherwise.

   - Incandescent Bulbs. In general, burned out bulbs are collected by workers who replace them. They are then carried to satellite storage areas and stored until a 55-gal drum of waste is collected.

- Sodium Bulbs. Sodium bulbs may be crushed into a drum containing water. This will be done according to a state-approved procedure. Where no procedure exists, bulbs will be disposed of without water reaction treatment.

- Mercury Bulbs. Mercury bulbs are crushed into DOT specification drums according to procedure until a 55-gal drum of waste is collected.

7. Waste for recycle or reclamation may require RCRA management prior to recycling or reclamation. If the waste requires management in a satellite area, it must be labeled, handled, and stored just as any other dangerous waste. Each waste destined for a recycling or reclamation activity must be evaluated against the DW requirements to determine if RCRA management prior to recycling is required.

   - Generators with silver wastes from photographic processes should establish a "routine" shipment system (refer to Section 6.3.2.2.5) to move it quickly and easily.

   - WHC Excess, Surplus Sales and Shipping (ESSS), 1167-A Building, 1100 Area accepts lead scraps and batteries (lead acid only). Mercury, Ni-Cd, and some glass type batteries are hazardous and will not be accepted for recycle. Contact ESSS for guidelines on packaging, transportation, and acceptance criteria.

   - Used oil can be recycled for energy recovery use, provided that certain specifications are met. Table 6-1 summarizes the limits used to determine if used oil meets the required specifications.

   Used oils must be analyzed routinely for PCB content, flash point, halogenated hydrocarbons, cadmium, chrome, arsenic, and lead. If the oil has potentially been exposed to a hazardous material (lead bearings, chromium containing alloys), it must be analyzed to prove that the suspected contaminant does not exceed regulatory limits, unless analytical data from a similar process can be applied to determine the concentration. Grease must also be analyzed for heavy metals if contaminants are suspected. If used oil and grease are generated on a regular basis, the generator may use process knowledge in lieu of laboratory analysis.

Table 6-1. Determining Designation of Used Oils.

	Specification used oil	Off-specification used oil	Dangerous waste
Metals* arsenic cadmium chromium lead	Not to exceed. 5 ppm 2 ppm 10 ppm 100 ppm	Sum must not exceed 100 ppm	Sum > 100 ppm
Ignitability	≥ 140 °F	≥ 140 °F	<140 °F
Total halogens	<1,000 ppm	<1,000 ppm	≥ 1,000 ppm
PCBs	<2 ppm	<2 ppm	≥ 2 ppm

* Do TCLP analysis for additional heavy metals if they are suspected.

8. Packages that held acutely hazardous waste or pesticides bearing a danger or warning label should never be used to accumulate DW. The residue in the package, unless rendered empty, when mixed with the new waste, will cause all of the new waste to be designated EHW rather than DW. If the package is rendered empty according to WAC 173-303-160(2), any remaining residue will not be subject to the DW requirements and will not be considered as accumulated wastes for the purpose of calculating waste quantities.

   Dangerous waste may be accumulated in DOT-empty packages, as long as.

   - The package residue is compatible with the newly added waste
   - The package is acceptable packaging according to the DOT
   - The residue in the package will not alter the waste designation

6.3.3 Background.

1. The requirements of this section ensure uniform generator management of unique wastes at Hanford facilities.

7.0 SOLID SANITARY WASTE FOR DISPOSAL AT THE CENTRAL LANDFILL

This chapter outlines the requirements for disposing of nonradioactive wastes that are not subject to Chapter 173-303 WAC or federal hazardous waste regulations. General requirements applicable to all solid sanitary wastes are described in Sections 7.1 and 7.2. **THIS SECTION IS APPLICABLE TO HANFORD SITE FACILITIES ONLY.**

7.1 DOCUMENTATION REQUIREMENTS

7.1.1 Regulatory Requirements

1. All chemical wastes, or solid wastes that may have become contaminated with hazardous chemicals, whether from a process, spill, or off-shelf products, shall be designated by SWD prior to shipment for disposal in accordance with Chapter 173-303 WAC and Chapter 6.

2. A radiation release or exemption must be obtained before wastes are transported to the Central Landfill.

7.1.2 Hanford Site Practices

None

7.1.3 Background

1. The WAC 173-303-070 requires that generators of solid waste properly designate their wastes to determine if they are subject to Chapter 173-303 WAC. In instances where it may be argued that the wastes are subject to Chapter 173-303 WAC, such as those listed in Section 7.1, it is important that the waste designation be documented and defensible.

2. The DOE Order 5820.2A imposes management standards and requirements for the disposal of solid radioactive wastes that ensure the long-term protection of human health and the environment. To ensure that these standards are met, radioactive wastes must be disposed of at facilities specifically designated and managed as radioactive waste disposal areas. A radiation release ensures that only nonradioactive wastes are disposed of at nonradioactive waste management facilities.

7.2 PROHIBITED MATERIALS

7.2.1 Regulatory Requirements

1. Dangerous wastes may not be disposed of as sanitary waste.

2. Radioactive wastes may not be disposed of as sanitary waste.

7.2.2 Hanford Site Practices

No additional HSPs are applicable.

7.2.3 Background

Chapter 173-303 WAC prohibits the disposal of DWs at facilities that do not have a TSD permit. The active portion of the Central Landfill is not permitted as a TSD facility.

The DOE Order 5820.2A imposes management standards and requirements for the disposal of solid radioactive wastes that ensure the long-term protection of human health and the environment. To ensure that these standards are met, radioactive wastes must be disposed of at facilities specifically designated and managed as radioactive waste disposal areas. The Central Landfill is not currently designated or managed as a radioactive waste disposal facility.

7.3 NONRADIOACTIVE ASBESTOS DISPOSAL

7.3.1 Regulatory Requirements

1. Friable asbestos must be wetted and placed into leak-tight packages prior to shipment to the Central Landfill asbestos trench for disposal.

2. Friable asbestos waste must be labeled with an asbestos warning.

3. An asbestos disposal request (ADR) must be completed before asbestos wastes are shipped to the Asbestos Trench for disposal. If the asbestos waste is nonfriable, the words "NONFRIABLE" must be written in parenthesis along with the basic shipping description on the ADR.

4. A radiation release or exemption must be obtained before asbestos wastes are transported to the Asbestos Trench for disposal.

7.3.2 Hanford Site Practices

1. Friable asbestos should be wetted and double wrapped in plastic (or an equivalent method that provides two levels of containment) prior to shipment to the Asbestos Trench for disposal.

2. Generators who are aware of projects that produce large amounts of asbestos waste are required to notify Solid Waste prior to beginning asbestos removal activities.

7.3.3 Background

1. Federal air quality regulations in 40 CFR 61.150 require that asbestos wastes be wetted prior to packaging. Both 40 CFR 61.150 and DOT regulations in 49 CFR 173.1090 require that asbestos wastes be packaged in leak-tight packages prior to shipment. Properly closed plastic bags are acceptable leak-tight packages.

Double bagging or double wrapping in plastic is generally sufficient to ensure that airborne asbestos will not be released during transportation.

2. Federal air quality regulations at 40 CFR 61.150 require that asbestos wastes be labeled in accordance with OSHA regulations found in 29 CFR 1910.1001(j)(2) and 29 CFR 1926.58(k)(2)(iii). The labels must be of sufficient size and contrast to be readily visible and legible.

3. Federal air quality regulations in 40 CFR 61.150 and 40 CFR 61.154 require that asbestos waste generators and disposal sites maintaining shipping records for asbestos wastes that indicate the name, address, and phone number of the asbestos waste generator, transporter, and disposal site; the quantity of regulated asbestos wastes shipped; any noncompliant waste packages; the date the materials were shipped and received; the name and physical location of the disposal site; and a certification statement that the wastes have been packaged and shipped in accordance with applicable air quality and hazardous materials transportation requirements. These "manifesting" requirements are similar to those required by DOT regulations.

   WHC uses the ADR to make quarterly notification to the Benton County Air Pollution Control Authority. The quarterly report includes information about the amount of asbestos-containing waste disposed in the landfill during the quarter (by generating facility) and projections of the next quarters activities and volumes.

   Generators who are aware of projects that will produce large amounts of asbestos waste are required to notify Acceptance Services prior to removal activities.

7.4 EMPTY PACKAGES.

7.4.1 Regulatory Requirements

None

7.4.2 Hanford Site Practices

1. The Central Landfill Nonregulated Drum Storage Area is a staging location for drums destined for drum reclamation or metal salvage. To be accepted at this area, a drum must meet the following criteria.

   - The drum must be empty. Refer to Chapter 6 for details on determining when a drum is empty.

   - If the drum contained acutely hazardous waste, it must have been triple rinsed (refer to Chapter 6).

- If the drum contained a DOT regulated material, it must be marked and labeled to reflect the former contents in accordance with DOT regulations.
- The drum must be in good condition with no holes, punctures, large dents, and/or excessive corrosion that would compromise its structural integrity.
- The drum must have a bung or other closures in place.
- The drum must be accompanied by the proper disposal analysis documentation.
- The drum must be manifested to the storage area.

7.4.3 Background

1. Empty packages fall into two categories; (1) DOT regulated, and (2) nonregulated according to Ecology. The DOT regulated packages are defined in 49 CFR 173.29. The DW regulations, at 40 CFR 261.7 and WAC 173-303-160(2), define how a package or inner liner that held a dangerous or extremely hazardous waste may become empty. A waste package or inner liner is empty when all waste have been taken out that can be removed using methods commonly employed to remove materials from that type of package or inner liner (e.g., pumping, pouring, aspirating), and, whichever quantity is least, either less than 1 in. of waste remains at the bottom of the package, or the volume of waste remaining is no more than 1 percent of its capacity if it can hold under 110 gal, or no more than 0.3 percent of its capacity if it holds more than 110 gal. A compressed gas package (e.g., aerosol can) is empty when the pressure inside the package equals or nearly equals atmospheric pressure and there is no discernable material remaining in the package.

   If the package held acutely hazardous waste (Refer to the glossary), or pesticides bearing the danger or warning label, the package or inner liner must be triple rinsed to render the package empty. Triple rinsing is the only method for rendering Acutely Hazardous Waste packages empty. Triple rinsing is accomplished by rinsing the package with an appropriate cleaner or solvent using a minimum of 10 percent of the packages volume and repeating the process three times. Any rinsate or vacuumed residue resulting from the cleaning of packages shall, whenever possible, be reused in a manner consistent with the original intended purpose of the substance. Otherwise, the rinsate shall be checked against the designation requirements and if designated, managed according to the DW regulations.

2. Small empty packages will usually be disposed of in site trash cans and dumpsters and can potentially create operational problems if not disposed of correctly. Packages of 5-gal or less that have not held an Acutely Hazardous Waste may be discarded directly to the trash by the end user once they are rendered empty. Note: PACKAGES MUST BE EMPTY. Attach an EMPTY sticker or

mark "EMPTY" or "MT" on each package with a permanent marker. Puncturing and crushing are other ways to show that a package is empty. Empty spray cans do not need to be marked. Also, empty 5-gal cans should be separated from other waste and not thrown directly into a dumpster, as it is possible to damage the truck compactors.

3. An important part of managing packages is to ensure that normal use empties them in such a way that they meet the regulatory definition of "empty" as specified in 40 CFR 261.7 and WAC 173-303-160(2). Whenever possible, place liquid containing drums horizontally on racks, then tip them up to drain the last contents. Drums that are pumped must be tipped up to remove the last material. Once empty, close the package so that rainwater cannot enter.

NOTE. PREFERABLY DRUMS SHOULD BE COMPLETELY EMPTY WITH NO FREE LIQUID.

4. To determine if a package is empty, measure the depth of fluid in the drum. The drum must be on a level surface. Insert a waste compatible rod vertically into the drum. Remove the rod and measure the wetted part. The depth of residue must not exceed 1 percent of the total capacity of the package. For a DOT specification 55-gal steel drum, this is 0.33 in. For a 30-gal drum, the 1 percent measurement is 0.28 in. The 1 percent depth of other packages can be determined as needed.

5. The DOE Order 5820.2A imposes management standards and requirements for the disposal of solid radioactive wastes that ensure the long-term protection of human health and the environment. To ensure that these standards are met, radioactive wastes must be disposed of at facilities specifically designated and managed as radioactive waste disposal areas. A radiation release ensures that only nonradioactive wastes are disposed of at nonradioactive waste management facilities.

6. Prior notification for projects that will generate large quantities of asbestos waste allows Solid Waste to plan and schedule the required support. Note that 40 CFR 61.145 imposes notification requirements on the generator for asbestos removal or demolition projects that involve the removal of asbestos in excess of threshold quantities.

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8.0 MIXED WASTE DISPOSAL (RESERVED)

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APPENDIX A

WASTE STORAGE/DISPOSAL REQUEST

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INSTRUCTIONS FOR COMPLETING THE WASTE STORAGE/DISPOSAL REQUEST

Company. Enter the name of the Company requesting a Storage/Disposal Approval Record (SDAR) for Radioactive Solid Waste or Hazardous Waste Disposal Analysis Record (HWDAR) for hazardous waste.

Generator Log Number/Tracking Number. Enter the tracking number that is being used by your facility to track the request.

Qualified Generator/MSIN. Print or type the name and mail stop identification number (MSIN) of the qualified person who has been authorized by the generating facility to ship radioactive or hazardous waste to disposal facilities.

Accumulation Date. For mixed waste (MW) and nonradioactive hazardous waste, enter the accumulation date. For nonhazardous waste, enter N/A.

Approved Generating Facility. Enter the name of the generating facility as it appears on the facility Low-Level or Transuranic (TRU) Waste Certification Plan or the name of the Hanford Site facility generating the nonradioactive waste.

Signature/Date. The qualified shipper for the generating facility **must** sign and date the document.

Phone. Enter phone number of the qualified shipper.

Waste Type. Mark **all** that apply. The nonradioactive category is only for onsite generators. If this category is checked, there is no need to complete the Additional Information section of the request. If MW or nonradioactive is checked, the generator **must** complete and attach the Waste Storage/Disposal Request (WSDR) Attachment.

ADDITIONAL INFORMATION.[1]

General Waste Description. Enter a detailed description of the waste (example. cloth, plastic, glass laboratory ware, carbon steel pipe, soil, and concrete rubble).

---

[1]This section only needs be completed when LLW, MW, TRU, high-level waste or a combination of these types are checked in the Waste Type category.

Physical Properties. Mark the appropriate waste form and physical characteristics; pH, flashpoint in °F, and hazards (C-corrosive, I-ignitable, T-toxic, E-explosive, P-persistent, X-carcinogenic, U-unknown, and N/A-not applicable)[2]. Indicate whether this waste is debris waste in accordance with the definition in 40 CFR 268.2 (g).

Transport Category. Mark **all** transport categories that apply or may apply to the waste. If shipping under a Safety Analysis Report for Packaging (SARP) or Safety Evaluation for Packaging (SEP) the generator must include the number of that particular SARP or SEP.

Special Package Form. Mark the applicable form. If using an overpack, the generator must enter the Certificate of Compliance (COC) number in the space provided and attach a copy of the COC to the request package.

PIN (Specific Shipment). Enter the Package Identification Number (PIN) of all containers that are covered under this request if for a specific shipment; otherwise, place N/A in the space provided. If the room provided is not sufficient, the PINs may be placed on an attachment and included with the request package. PINs should follow the format described in Chapter 2.

Radionuclides. Check the appropriate radionuclide category for the waste package in accordance with Chapter 3. Only one category may be checked. List the radionuclides that occur in the waste.

Container Information (if applicable).

External Dimensions. Enter the dimensions in inches as follows. length/width/height or diameter/height.

Maximum Gross Weight. Enter the maximum gross weight the container will support in pounds.

Drawing/Specifications. Enter the drawing or specification number (e.g., Department of Transportation (DOT) 17C). Include a copy of the drawings if the container is not found in 49 CFR (DOT 1990).

General Description.. Enter a general description of the container (e.g., DOT 17C or 17H 55-gal painted steel drum).

Closure Mechanism.. Enter a description of the method used to close the container.

Special Rigging Requirements.. Enter a short description of any special rigging requirements needed to off-load the container. If no special rigging is required, place N/A in the space provided.

---

[2]Enter the letter or letters that apply to all the hazards the waste exhibits.

WASTE STORAGE/DISPOSAL REQUEST ATTACHMENT

Column A[3]**, Item Number.** The generator will enter ID numbers for each unique waste stream.

Column B[3]**, Number of Containers.** Indicate the number of containers for each unique waste, if applicable.

Column C[3]**, Container Description.** The volume capacity of each container specified in Column B is entered (e.g., 55-gal, 5-gal, pint). Proposed container information must include the type and material (i.e., glass bottles, steel drums, plastic drums, fiberboard drums, cardboard boxes) and the condition of the container (i.e., "damaged" containers will often need overpacking). The DOT specification numbers or UN specification should be entered when the waste is contained in a DOT specification container, such as a 17E or 17H drum. Specification numbers are usually stamped on the bottom of the drums.

Other useful container information could include identifying drums as bung or open-head type, and identifying drums that are designated as "single-trip" or "nonreusable," which are not reusable for "second-trip" packaging.

Column D[3]**, Kg Waste.** The total weight of the waste in <u>each</u> container must be entered in kilograms. Units of volume are not acceptable. It is advisable to weigh the waste on a scale to ensure accurate estimates of waste quantity.

To convert to kilograms use the following formulas.

lb x .454 = kg
lb ÷ 2.20 = kg
gal x 3.785 x specific gravity = kg.

NOTE. Containers, inner liners, and weight of absorbents are **not** considered part of the waste when computing total waste quantity.

Column E, Waste/Process Description. The generator must provide the trade name(s) (if available) and a general description of each unique waste. The generator must also include a general description of the process that created the waste.

Column F, Chemical Components. The generator **must** enter all constituents in each waste. Wastes may be categorized without testing only if all of the chemical constituents are known. This means that the estimated weight percent of all waste constituents must total at least 100 percent including water and inert ingredients. All available information describing the waste composition (Material Safety Data Sheets (MSDS), and laboratory analysis) **must** be attached

[3]Required only for "specific shipment" requests.

to the WSDR. Attached information must be clearly identified in this section (MSDS #, sample #).

1. Commercial Chemicals. Information about the chemical makeup of wastes can be found in specification sheets, on labels, and especially on MSDSs. The information provided must be specific for the commercial product used. MSDSs can be obtained from Hanford Environmental Health Foundation (HEHF).

   NOTE. Washington State Department of Ecology (Ecology) calls some chemicals "dangerous" even though they are not listed by the Environmental Protection Agency (EPA) or the Occupational Safety and Health Administration (OSHA).

2. Laboratory Reagents. Laboratory reagents can frequently be identified by ingredients listed on the label. If the label lists impurities, such as lead, arsenic, or other heavy metals, include these on the waste disposal request.

3. Waste Mixtures (SLOP JARS OR DRUMS). A log is not required when the slop jar accumulates waste from a single analytical process inside a laboratory. In this case, it is appropriate to calculate concentrations of reagents from the analytical procedure to determine the weight percent of each constituent. A log sheet is required if the slop jar accumulates waste from multiple procedures, because the frequency of procedure use is questionable. Only compatible, spent-liquid chemicals should be combined.

4. Used Oil and Grease. Oils should be identified by type and manufacturer, where possible. See Appendix F, "Sampling Methods for Known or Unknown Waste Materials," for hazardous contaminants that may require analysis if process knowledge cannot determine the concentration of contaminants. See Section 6-1 for contaminant limits for oil to be used for energy recovery.

5. Absorbent. If wastes are mixed with absorbent, the weight of the waste and weight of absorbent should be listed separately. The type of absorbent used must also be noted on the attachment.

6. Unknowns. Wastes of unknown or partially known composition must be sampled and analyzed according to Ecology-approved methods. Analyses must be completed according to methods approved by Ecology and the EPA.

Column G, Estimated Weight Percent. The generator must enter the weight percent of each chemical in the waste. Traces of pesticides, herbicides, heavy metals, and polychlorinated biphenyls (PCB) must be specified. Elements of particular importance are arsenic, barium, cadmium, silver, mercury, chromium, lead, and selenium. Components must add up to 100 wt. % or greater including water, soil, or other constituents. If weights are only available in ranges (e.g., methanol 10 percent to 20 percent), list the ranges. If the original product contained volatiles but is now dry then state "No volatiles present."

Column H, Physical Properties. The phases of the waste must be known (i.e., solid, liquid, gas, sludge, multilayered) to determine the proper designation.

The generator may use the proper abbreviation(s) from the list below.

Solid = S	Liquid = L	Gas = G

1. Show the pH of the waste. All aqueous and some organic solutions will have a pH. Washington Department of Ecology regulations require a pH on water soluble solids by mixing 50/50 with water.

2. Indicate the flashpoint of the waste. Indicate the flashpoint in °F and whether it is "Open Cup" or "Closed Cup." List the boiling point of flammable liquids. The main categories of flammable and combustible liquids are as follows.

   - Combustible Liquid
   - Class 1A Flammable Liquid
   - Class 1B Flammable Liquid
   - Flammable Liquid
   - Ignitable Liquid.

3. Density. Information on density or specific gravity may be obtained from the manufacturer, MSDS, chemical resource books, or material specifications.

Column I, Hazards. The generators should enter information on any hazards that they are aware of. One excellent source of information is the Hanford Local Area Network (HLAN) MSDS files. Another source of information is manufacturer's labels or literature. The proper abbreviations to describe waste hazards must be selected from the list below (more than one may be necessary).

Corrosive	C	Explosive	E
Ignitable	I	Persistent	P
Reactive	R	Carcinogenic	X
Toxic	T	Oxidizer	Ox
Toxic Characteristic Leaching Procedure			TCLP

Column J, Waste Status. The Generator may enter the appropriate abbreviations from the list below (more than one may be necessary).

Reacted	Rx	
Treated	T	
Used	U	(has been used for intended purpose)
Spill Material	S	(also indicate if Used or Old)
Old	O	(opened but unused material)
New(or expired)	N	(unopened and unused)

Column K, Cont. Status. The Generator may enter the container status abbreviations from the list below.

Full	F	
Partially Full	PF	
Empty	MT	(as defined in the Glossary)
Triple Rinsed	TR	

REFERENCES

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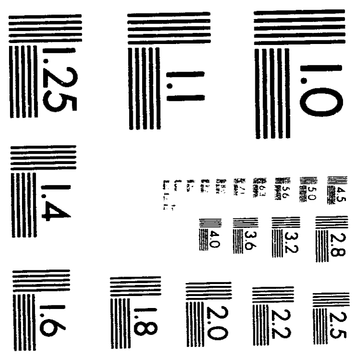

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WASTE STORAGE/DISPOSAL REQUEST (REV 1, 1/12/93)

COMPLETE AND SUBMIT TO: ACCEPTANCE SERVICES; N3-11/WHC; P.O. BOX 1970; RICHLAND, WA 99352. FOR DETAILS REFER TO WHC-EP-0063

WHC Tracking #

any Generator Log Number/Tracking Number	Qualified Generator/MSIN	Accumulation Date (If Applicable)
Approved Generating Facility (Per Cert. Plan)	Signature/Date	Phone

Waste Type

(Mark all that apply)

___ Low-Level
___ Transuranic
___ > Class C
___ High-Level
___ Nonradioactive (Include Attachment)
___ RMW (Include Attachment)
___ Compactible
___ Classified
___ Heat Generating Potential
___ Remote Handled
___ Contact Handled
___ Gas Generating Potential

Additional Information For Low-Level, RMW, TRU, and High-Level Waste ONLY

General Waste Description: ____________________

Physical Properties

___ Solid ___ Solidified
___ Debris (Attach Debris Checklist)
___ Absorbed Liquids
___ Labpacked Free Liquids
pH ____ Flashpoint ________°F
Hazards ____________________

Transport Category

(Mark all that apply)

___ < 2 nCi/g
___ Limited Quantity
___ Low Specific Activity
___ Type A ___ Type B
___ Highway Route Control
___ SARP #____________

Special Package Form

___ Lab Pack
___ Disposable Overpack
COC #____________
___ Returnable Overpack
COC #____________
___ Liner (______) mils

PIN (Specific Shipment): ____________

RADIONUCLIDES (CHECK APPROPRIATE CATEGORY) CATEGORY 1 ___ CATEGORY 3 ___ GREATER THAN CATEGORY 3___

List ____________________

Container Information

External Dimensions: ____________________
Maximum Gross Weight: ____________________
Drawing/Specification Number: ____________________
General Description: ____________________

Closure Mechanism: ____________________

Special Rigging Requirements: ____________________

WASTE STORAGE/DISPOSAL REQUEST ATTACHMENT (REV 1, 1/12/93)

WHC Tracking #

A Item No.	B Number of Containers	C Container Description	D Kg Waste	E Waste/Process Description	F Chemical Components	G Weight %	H Physical Properties	I Hazards	J Waste Status	K Cont. Status

APPENDIX B

RADIOACTIVE WASTE SHIPPING RECORDS AND INSTRUCTIONS

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LOW-LEVEL WASTE STORAGE/DISPOSAL RECORD AND INSTRUCTIONS

The following instructions apply to the Low-Level Waste Storage/Disposal Record (LLWSDR) shown in Figure B-1. Blank forms may be obtained from the Westinghouse Hanford Company (WHC) primary contacts listed in Chapter 1 as hard copies, as a WordPerfect[1] 5.1 file or on Jetform (if using the WordPerfect file DO NOT modify the form format). Offsite waste generators may contact WHC Acceptance Services to obtain information on obtaining the proper software to allow them to use the Jetform computer-generated versions of this form or the WordPerfect 5.1 version. Use a separate LLWSDR form for each LLW container or overpack. Use a separate LLWSDR form as an attachment if the initial form does not have sufficient space. Only the additional information need be indicated on the second form.

NOTE: Item 1 through 7 are entered by WHC Solid Waste Operations personnel responsible for waste receipt.

1. **Signature-acceptance**. The individual responsible for accepting the waste will sign here if the waste is accepted.

2. **Date**. The individual responsible for accepting the waste enters the date the waste is accepted.

3. **Area**. Enter the Hanford Site area designation for the storage and disposal facility (e.g., 200 West Area).

4. **Facility**. Enter the code for the facility (building or burial ground) where the waste is located.

5. **Unit**. Enter the identification of the unit (floor level or trench number) within the facility where the waste is located.

6. **Storage location**. Enter module, tier, and drum position for waste packages in storage facilities.

7. **Disposal location**--Enter the beginning and ending coordinates of the disposal location.

NOTE: Items 8 through 38 are to be completed by the waste generator.

8. **Page ___ of___**--Enter the current page number and total number of pages contained in the record.

9. **PIN**--Enter the package identification number (PIN).

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[1]Wordperfect is a registered trademark of Wordperfect Corporation, Orem, Utah.

10. **Waste generator**--Enter the name of the company responsible for generation of the waste.

11. **Charge Code, Sponsor Order number, or Memorandum Purchase Order number**. Hanford Site waste generators must enter the charge code to be billed for storage or disposal costs. Offsite waste generators must enter the sponsor order number or memorandum purchase order (MPO) number, as applicable.

12. **WRM Number**. Offsite waste generators must enter the Westinghouse Hanford Radioactive Material (WRM) Number.

13. **Name of contact**--Enter the name of the primary contact at the waste generator facilities.

14. **Address and phone**--Enter address (building number and area for Hanford Site waste generators) of facility generating waste and phone number for the generator's primary contact. Ensure that the phone number listed will be answered at all times.

15. **Signature and date**--Read certification statement, sign, and date form.

16. **Radioactive Shipment Record (RSR) number**. Hanford Site waste generators only must enter the applicable RSR number for this shipment.

17. **Storage/Disposal Approval Record (SDAR) approval number**. Enter the number from the approved SDAR applicable to the waste.

18. **DOE/NRC Form 741 or equivalent number**. Enter the number from Block 3 of Form 741. Enter NA if not applicable.

19. **Property Disposal Request (PDR) number**. Hanford Site waste generators only must enter the PDR number if capital equipment is in the waste or not applicable (NA) if no capital equipment is present.

20. **Radioactive Waste Category Designation**. Check the box(es) that are applicable to this record.

    - Category 1. waste classified Category 1 as indicated in Section 3 of this manual
    - Category 3. waste classified Category 3 as indicated in Section 3 of this manual
    - Greater than Category 3. waste classified as greater than Category 3 as indicated in section 3 of this manual

- MW--Mixed waste [A Radioactive Mixed Waste Attachment Sheet (RMWAS) must be attached to this form]
- Classified--waste contains classified constituents.

More than one box may be checked to designate the waste.

21. **Point of origin**--Hanford Site waste generators only must enter the point of origin of the waste package.

22. **Container type**--Enter a physical description of the waste container that will be stored or disposed (e.g., 55-gal drum, metal box). This is <u>not</u> the returnable overpack if one is used.

23. **LxWxH or DxL**--Enter length, height, and width of the waste package (enter diameter and length for cylindrical waste packages) and unit of measurement. Enter NA for 55-gal drums.

24. **Container volume**. Enter the total external volume of the waste package in cubic meters. This is the volume of the container that will be disposed or stored. Do not include the volume of the returnable overpack if one is used.

25. **Empty tare weight of container**--Enter the empty weight of the outer container in kilograms. This is the container that will be stored or disposed. Do not include the weight of any returnable overpack.

26. **Date packaged**. Enter the date that the full container was closed and sealed.

27. **Gross weight**. Enter the total weight of the waste package (container plus contents) in kilograms. Do not include the weight of any returnable overpack.

28. **Thermal power**. Enter the thermal power generation of the waste package in W/ft^3 if the power generation is greater than 1.0 W/ft^3. (If the power is less than 0.1 W/ft^3, check $<0.1\ W/ft^3$).

29. **Dose rate**. Enter the maximum total dose rates at 1 cm (contact-handled) or at 1 m (remote-handled) in mrem/hour.

30. **Waste type**. Check waste type box (one only) that best describes waste.

    - BW = Biological waste
    - CE = Contaminated equipment
    - DD = Decontamination debris
    - DS = Dry solids
    - SS = Solidified sludge
    - NC = Not classified by other categories.

31. **Waste matrix** . Check the waste code (one only) that best describes the predominant physical characteristic of the waste.

- FW = High-efficiency particulate air filters
- CL = Containerized liquid
- SL = Solidified (i.e., grouted) or absorbed liquids, including resins
- CM = Construction materials (e.g., concrete, asphalt, brick)
- DM = Dry compactible solids (e.g., plastic, paper, rubber)
- PB = Lead and equipment containing significant quantities of lead (potentially recoverable)
- LM = Metal waste with thickness <0.5 in.
- HM = Metal waste with thickness >0.5 in.
- WD = Wood
- GL = Glass
- TW = Tumbleweeds
- SO = Soil
- NC = Not classified by other categories
- PA = Particulate (ash, soot, powder)

32. **Seal Number**. Enter the seal number of the container if required for nuclear material accountability purposes.

33. **Article Description**. Enter the specific name or names of the contents of the waste package (e.g., pump with attached valving, latex gloves, blotter paper, lab glassware). Ensure that the physical form (e.g., plastic, carbon steel, absorbed liquid, rags) of the waste is described. Include in this column any internal packaging (i.e., plastic bags, rigid poly liners, etc.) absorbents and void space fillers. For polychlorinated biphenyl (PCB) and PCB-contaminated equipment, provide the date the equipment was removed from service. The word miscellaneous is not allowed. Any comments that need to be placed on this form may also be entered in this space.

34. **Estimated Volume**. Enter the estimated volume percent of the total waste matrix for each item listed in column 33. The volume percents must add up to 100. This is to be a best guess estimate and need not be accurately measured.

35. **Estimated Weight**. Enter the estimated weight in kilograms of each item listed in column 33. This is to be a best guess estimate and need not be accurately measured. The total should be within 10 percent of the difference between blocks 25 and 27.

36. **Radionuclide**. Enter each radionuclide in the waste package. See Chapter 3 for radionuclide reporting requirements.

37. **Ci**. Enter the total activity in curies of each fission/activation radionuclide in the space provided. For parent/daughter radionuclide pairs in secular equilibrium, enter only the parent radionuclide (e.g., for the parent/daughter pair Cs-137/Ba-137^m only enter the Cs). Curie values are not entered for transuranic (TRU) elements, uranium, or thorium. Values must be good for the date packaged to allow accurate decay calculations.

38. **Weight**. Enter the weight in grams of each TRU, uranium and thorium isotope listed. Do not list the weight of the fission and activation products.

39. **Totals**. Enter the total of the volume percent (must be 100), the total weight of the waste contents (include the weight of internal packaging, absorbents and void space fillers but exclude weight of the outer container and overpacks), the total curies of the fission and activation products, and the total weight in grams of the TRU, uranium, and thorium.

LOW-LEVEL WASTE STORAGE/DISPOSAL RECORD (REV 2, 6/25/93)

8. PAGE 1 OF ______

Storage/Disposal Site Information

I certify that a physical inspection of the waste package to the extent possible and a cross check of the applicable documentation have been performed in accordance with SW-100-050 or SW-100-110.

1. Signature-Acceptance		2. Date
3. Area	4. Facility	5. Unit
6. Storage Location (S01)		
Module	Tier	Position
7. Disposal Location		
Beginning Coordinates N	W	
Ending Coordinates N	W	

9. PIN

10. Waste Generator

11. Charge Code, SO No., or MPO No.

12. WRM No.

13. Name of Contact

14. Address/Phone

I certify that. (1) No capital property is included in this waste unless documented by a Property Disposal Request and described below. (2) To the best of my knowledge, the information entered below is complete and accurate, and the waste package is in compliance with WHC-EP-0063 and the Storage/Disposal Approval Record (SDAR). (3) Unless designated a Radioactive Mixed Waste (RMW), this waste is not a dangerous waste as defined by WAC 173-303 or other applicable state or federal regulation governing the management of hazardous waste. (4) The charge code is correct.

15. Signature | Date

REFERENCES

16. RSR No	17. SDAR No.
18. DOE/NRC 741 No.	19. PDR. No.

20. Waste Designation ☐ Category 1 ☐ Category 3 ☐ > Category 3 ☐ RMW ☐ Classified

21. Point of Origin	
22. Container Type	23. LxWxH or DxL
24. Cont. Vol. (m^3)	25. Tare Weight (kg)
26. Date Packaged	27. Gross Weight (kg)

30. Waste Category (Check One)
☐ BW ☐ DS
☐ DD ☐ NC
☐ CE ☐ SS

31. Waste Code (Check one)
☐ FW ☐ HM ☐ CL ☐ WD
☐ SL ☐ GL ☐ CM ☐ TW
☐ DM ☐ SO ☐ PB ☐ NC
☐ LM ☐ PA

28. Thermal Power ______ ☐ <0.1 W/ft³

29. Dose Rate (mrem/hr)______ at ______

32. Seal No.

WASTE CONTENTS DESCRIPTION

33. Article Description	34. Estimated Volume %	35. Est. Weight (kg)	36. Radio-nuclide	37. Curies (Fission/Activation Products only)	38. Weight (g) (TRU, Uranium, and Thorium only)
39. TOTAL			TOTAL		

TRANSURANIC WASTE STORAGE/DISPOSAL RECORD AND INSTRUCTIONS

The following instructions apply to the Transuranic Waste Storage Record (TWSR) shown in Figure B-2. Blank forms may be obtained from the WHC primary contacts listed in Chapter 1 as hard copies, as a WordPerfect 5.1 file or on Jetform (if using the WordPerfect file DO NOT modify the form format). Offsite waste generator may contact Acceptance Services to obtain information on obtaining the proper software to allow them to use the Jetform computer-generated versions or the WordPerfect file of this form. Use a separate TWSR form for each TRU container or overpack. Use a separate LLWSDR form as an attachment if the initial form does not have sufficient space. Only the additional information need be indicated on the second form.

NOTE. Item 1 through 6 of the following instructions are to be completed by WHC Solid Waste Operations personnel responsible for waste receipt.

1. **Signature-acceptance**. The individual responsible for accepting the waste will sign and date here if the waste is accepted.

2. **Date**. The individual responsible for accepting the waste enters the date the waste is accepted.

3. **Area**. Enter the Hanford Site area designation for the storage facility (e.g., 200 West Area).

4. **Facility**. Enter the code for the facility where the waste is located.

5. **Unit**. Enter the identification of the unit (floor level) within the facility where the waste is located.

6. **Storage location**. Enter module, tier, and drum position for waste packages in storage facilities.

NOTE. Items 7 through 46 are to be completed by the waste generator.

7. **Page ___ of___**. Enter the current page number and total number of pages contained in the record.

8. **Waste designation**. Check the box(es) that are applicable to this record.

    - RMW. Radioactive mixed waste
    - Classified. Contains classified constituents.

    More than one box may be checked to designate the waste.

9. **Waste generator**. Enter the name of the company responsible for generation of the waste.

10. **Charge Code, Sponsor Order number, or Memorandum Purchase Order number**. Hanford Site waste generators. Enter the charge code to be billed for storage or disposal costs. Offsite waste generators must enter sponsor order number or MPO number as applicable.

11. **WRM Number**. Offsite waste generators must enter the WRM number (if applicable).

12. **Name of contact**. Enter the name of the primary contact at the waste generator facilities.

13. **Address and phone**. Enter address (building number and area for Hanford Site waste generators) of facility generating waste and phone number for the generator's primary contact. Ensure that the phone number listed will be answered at all times.

14. **Signature and date**. Read certification statement, sign, and date form.

15. **Radioactive Shipment Record number**. Hanford Site waste generators only must enter the applicable RSR number for this shipment.

16. **SDAR approval number**. Enter the number from the approved SDAR applicable to the waste.

17. **DOE/NRC Form 741 number**. Enter the number from Block 3 of Form 741. Enter NA if not applicable.

18. **PDR number**. Hanford Site waste generators only must enter the PDR number if capital equipment is in the waste or NA if no capital equipment is present.

19. **PIN**. Enter the PIN.

20. **Empty tare weight of container**. Enter the empty weight of the container in kilograms. This is the storage container not the returnable overpack, if used.

21. **Container type**. Enter a physical description of the waste container that will be stored (e.g., 55-gal drum, SWB). Do not include the description of any returnable overpack.

22. **Gross weight**. Enter the total weight of the waste package (storage container plus contents) in kilograms.

23. **Organic material volume**. Enter the estimated volume of organic material in the waste.

24. **Point of origin**. Hanford Site waste generators only must enter the point of origin of the waste package.

25. **Organic material weight**. Enter weight in kilograms of organic material in the waste.

26. **LxWxH or DxL**. Enter length, height, and width of the waste package (enter diameter and length for cylindrical waste packages) and unit of measurement. Enter NA for 55-gal drums. These are the dimensions of the container to be stored, not of any returnable overpack.

27. **Container volume**. Enter the total volume of the waste package in m^3. This is the container to be stored not the returnable overpack, if one is used.

28. **Thermal power**. Enter the thermal power generation of the waste package in W/ft^3 if less than 0.1 W/ft^3 check <0.1 W/ft^3).

29. **Date packaged**. Enter the date that the full container was closed and sealed.

30. **Seal Number**. Enter the seal number of the container if required for nuclear material accountability purposes or if a tamper indicating devise with a seal number is used.

31. **Waste category**. Check waste category box (one only) that best describes waste.

    - BW = Biological waste
    - CE = Contaminated equipment
    - DD = Decontamination debris
    - DS = Dry solids
    - SS = Solidified sludge
    - NC = Not classified by other categories.

32. **Waste code**. Check the waste code (one only) that best describes the predominant physical characteristic of the waste.

    - FW = High-efficiency particulate air filters
    - CL = Containerized liquid
    - SL = Solidified (i.e., grouted) or absorbed liquids, includes resins
    - CM = Construction materials (e.g., concrete, asphalt, brick)

- DM = Dry compactible solids (e.g., plastic, paper, rubber)
- PB = Lead and equipment containing significant quantities of lead (potentially recoverable)
- LM = Metal waste with thickness <0.5 in.
- HM = Metal waste with thickness >0.5 in.
- WD = Wood
- GL = Glass
- TW = Tumbleweeds
- SO = Soil
- NC = Not classified by other categories
- PA = Particulate (ash, soot, powder)

33. **Article Description**. Enter the specific name or names of the contents of the waste package (e.g., pump with attached valving, latex gloves, blotter paper, laboratory glassware). Ensure that the physical form (e.g., plastic, carbon steel, absorbed liquid, rags) of the waste is described. Include in this column any internal packaging (i.e., plastic bags, rigid poly liners, etc.) absorbents and void space fillers. For PCB and PCB-contaminated equipment, provide the date the equipment was removed from service. <u>The word miscellaneous is not allowed</u>. Any comments that need to be placed on this form may also be entered in this space. At the bottom of block 33, enter the estimated volume in liters of absorbed liquid present in the container if any.

34. **Estimated Volume Percent**. Enter the estimated volume percent of the total waste matrix for each item listed in column 33. This is to be a best guess estimate and need not be accurately measured. Enter the total of the percentages at the bottom. The estimated volume percentages must add up to 100.

35. **Estimated Weight (Kg)**. Enter the estimated weight in kilograms of each identifiable item in the waste package. This is to be a best guess estimate and need not be accurately measured. Enter the total weight in kilograms of the waste contents at the bottom of the column. The total should be within 10 percent of the difference between blocks 20 and 22.

36. **Nuclide**. Enter each fission or activation product radionuclide in the waste package. See Chapter 3 for radionuclide reporting requirements.

37. **Ci**. Enter the total activity in curies (ci) of each fission/activation radionuclide in the space provided. For parent/daughter radionuclide pairs in secular equilibrium, enter only the parent radionuclide (e.g., for the parent/daughter pair $^{137}Cs/^{137}Ba$ only enter the Cesium). Curie values are not entered for TRU elements, uranium, and thorium. Enter the total curies of fission and activation products at the bottom of the column. Values must be good for the date packaged to allow accurate decay calculations.

38. **Element**. Enter the symbol for each TRU element, uranium, or thorium only (other radioisotopes are listed in block 37) present in the waste.

    NOTE. If the waste package contains uranium in two or more different enrichments, list each enrichment separately.

39. **Isotopic distribution (weight percent)**. Enter the radionuclide isotopic distribution for each element (uranium, thorium, and TRU elements) listed as a percentage of the total (100 percent) for that element.

40. **Weight**. Enter the weight in grams of each element listed and the total weight in grams of all of the elements listed.

41. **FGE**. Enter ^{239}Pu fissile gram equivalents (FGE) for each fissile element listed and the total FGE. Attach additional pages if necessary; see Appendix C for sample calculations and an example of how to enter the data.

42. **PE-Ci**. Enter ^{239}Pu equivalent curies (PE-Ci) for each TRU element and uranium, and the total PE-Ci for all the elements listed. Round to 5 places.

43. **Alpha Ci**. Enter total alpha activity in curies for each TRU element, thorium, and uranium and the total Alpha curies.

44. **Dose**. Enter the maximum total beta/gamma dose rates at 1 cm (contact-handled) or 1 m (remote-handled) in mrem/hour. Enter the distance at which the dose was measured. Enter the neutron dose rate contribution if over 20 mrem/h. our

TRANSURANIC WASTE STORAGE RECORD (REV 1, 1/15/93)

7. PAGE 1 OF ______

Storage/Disposal Site Information		
I certify that a physical inspection of the waste package to the extent possible and a cross check of the applicable documentation have been performed in accordance with SW-100-050 or SW-100-110.		
2. Signature-Acceptance		2. Date
3. Area	4. Facility	5. Unit
6. Storage Location (S01)		
Module	Tier	Position

8. Waste Designation ☐ RMW ☐ Classified

9. Waste Generator

10. Charge Code, SO No., or MPO No.

11. WRM No.

12. Name of Contact

13. Address/Phone

I certify that. (1) No capital property is included in this waste unless documented by a Property Disposal Request and described below. (2) To the best of my knowledge, the information entered below is complete and accurate, and the waste package is in compliance with WHC-EP-0063 and the Storage/Disposal Approval Record (SDAR). (3) Unless designated a Radioactive Mixed Waste (RMW), this waste is not a dangerous waste as defined by WAC 173-303 or other applicable state or federal regulation governing the management of hazardous waste. (4) The charge code is correct.

14. Signature	Date

REFERENCES

15. RSR No	16. SDAR No.
17. DOE/NRC 741 No.	18. PDR. No.

WASTE PACKAGE INFORMATION

19. PIN	20. Tare Weight (kg)
21. Container Type	22. Gross Weight (kg)
23. Organic Mtl. Vol. %	24. Point of Origin,
25. Organic Mtl. Wt. (kg)	26. LxWxH or DxL
27. Cont. Vol. (m^3)	28. Thermal Power ☐ <0.1 W/ft^3
29. Date Packaged	30. Seal Number

31. Waste Category (Check One)
☐ BW ☐ DS
☐ DD ☐ NC
☐ CE ☐ SS

32. Waste Code (Check one)
☐ FW ☐ HM ☐ CL ☐ WD
☐ SL ☐ GL ☐ CM ☐ TW
☐ DM ☐ SO ☐ PB ☐ NC
☐ LM ☐ PA

WASTE CONTENTS DESCRIPTION

33. Article Description	34.Est. Vol. %	35. Est. Wt. (kg)
Total Liquid Volume (Liters) TOTALS		

FISSION/ACTIVATION NUCLIDES
(Do not list Uranium, Thorium, or TRU Elements)

36. Nuclide	37. Curies	Nuclide	Curies
		TOTAL	

TRU/FISSILE/SOURCE MATERIAL (Uranium, Thorium and TRU Elements)

38. Element	39. Isotopic Distribution	40. Wt. (g)	41. FGE	42. PE-Ci	43. Alpha Ci
44. Dose (mrem/hr) ______ at ______ Neutron (> 20 mrem/hr) ______	TOTALS				

RADIOACTIVE MIXED WASTE ATTACHMENT SHEET

The following instructions apply to the RMWAS shown in Figure B-3. Blank forms can be obtained from the WHC primary contacts listed in Chapter 1 as hard copies, as a WordPerfect 5.1 file or on Jetform (if using the WordPerfect file DO NOT modify the form format). Offsite waste generators can contact WHC Acceptance Services to obtain information on obtaining the proper software to allow them to use the Jetform computer generated versions of this form or the WordPerfect 5.1 version. Use a separate RMWAS form for each LLW or TRU container or overpack. Use a separate RMWAS form as an attachment if the initial form does not have sufficient space. Only the additional information should be indicated on the second form. This form applies to both LLW and TRU. A RMWAS is required whenever hazardous materials as defined in the *Washington Administrative Code* (WAC) 173-303 (Ecology 1991) are present in the waste. All items on this form are to be completed by the waste generator.

1. **Page __ of __**. Enter the current page number and total number of pages (the LLWSDR or TWSR is p. 1).

2. **PIN**. Enter the unique PIN.

3. **Manifest number**. Enter the unique number from the Uniform Hazardous Waste Manifest for RMW.

4. **Manifest date**. Enter the date that the Uniform Hazardous Waste Manifest for RMW was signed (this date is entered by the waste generator).

5. **Land disposal restricted**. Check the box if the waste contains a land disposal restricted waste. Land disposal restricted wastes are listed in 40 CFR Part 268 (EPA 1993). Check appropriate boxes of the source of the restriction *Resource Conservation and Recovery Act of 1976* (RCRA), F-listed, or Washington State extremely hazardous waste (EHW). Check the Debris box if this waste is Debris according to 40 CFR Part 268.

6. **Designation**. Check DW, or EHW as appropriate. The EHW is checked if any EHW constituents occur in the waste package.

7. **Dose Equivalent Curies**. If the package contains radioisotopes in excess of the A_2 value in 49 CFR Part 173.435 indicating that it is greater than Type A, enter the Dose Equivalent Curie Value for the package. See Appendix L for Dose Equivalent Curie conversion factors.

8. **Waste number**. Enter the dangerous waste number (or numbers) from the applicable SDAR for this package.

9. **Hazardous Constituent**. Enter the specific chemical name for each hazardous constituent in the waste package. Use as many lines as needed. Enter each constituent only once.

10. **Weight**. Enter the weight in kilograms for each hazardous constituent in the waste package. If the weight of a specific component is unknown due to the proprietary nature of a product, enter the maximum weight that the component could be (this may be up to 100 percent of the weight of the product present in the waste). Enter a total weight of all hazardous constituents after the last entry. This value will not be the sum of the hazardous constituent weights if the weight of any one or more of those constituents was assumed (e.g., if there is 10 kg of product A in a waste package and product A consists of an unknown amount of component B and component C and 25 percent component D, report the weight of component B as 7.5 kg, the weight of component C as 7.5 kg and the weight of component D as 2.5 kg. The total weight would still only be 10 kg.)

11. **Physical Properties**. Describe the physical properties of each component. Indicate if the component is a free liquid, absorbed liquid or a solid. Provide the parts per million for PCBs and PCB-contaminated equipment.

12. **Estimated Liquid Volume**. Enter the estimated volume of any free or absorbed liquid present in the container. Indicate the volume in liters.

REFERENCES

Ecology, 1991, *Dangerous Waste Regulations*, WAC 173-303, Washington State Department of Ecology, Olympia, Washington.

EPA, 1993, *Land Disposal Restrictions*, Title 40, Code of Federal Regulation 268, U.S. Environmental Protection Agency,Washington, D.C.

Resource Conservation and Recovery Act of 1976, as amended, Public Law 94-580, 90 stat. 2795, 42 USC 6901 et seq.

RADIOACTIVE MIXED WASTE ATTACHMENT SHEET (REV 2, 6/24/93)

1. Page____of____

2. PIN	3. Manifest No.	4. Manifest Date

5. ☐ Land Disposal Restricted Source of Restriction ☐ RCRA, ☐ F-Listed, ☐ EHW
☐ Debris

6. Waste Designation ☐ EHW ☐ DW

7. Dose Equivalent Curies if applicable.

8. Waste numbers that apply to this package. ______________________________

WASTE DESCRIPTION

9. Hazardous Constituent	10. Weight (kg)	11. Physical Properties
TOTAL WEIGHT (Kg)		

12. Estimated Liquid Volume (Liters)

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APPENDIX C

CALCULATIONAL METHODS, FISSILE MATERIALS - EQUIVALENTS AND CONVERSION FACTORS

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CALCULATIONAL METHODS

Plutonium-239 equivalent curie (PE-Ci) content, ^{239}Pu fissile gram equivalents (^{239}Pu FGE), and alpha curies are to be reported for transuranic (TRU) waste shipments. Transuranic elements, uranium isotopes, and thorium are to be included in the calculations for the Transuranic Waste Storage Record (TWSR) form. The following examples show approved methods for calculating these values for plutonium. The same methods apply when calculating PE-Ci, ^{239}Pu FGE and alpha curies for the other elements that are to be entered on the TWSR. These examples are based on a shipment containing 1 g of plutonium isotopes (^{241}Am is included in the calculation of the plutonium isotopes when the ^{241}Am is an ingrowth of ^{241}Pu).

CALCULATION OF PLUTONIUM EQUIVALENT CURIE CONTENT

Table C-1. Plutonium-239 Equivalent Curie Content.

1	2	3	4	5	6
Isotope	Fraction*	Ci/g	Curies of each isotope	Correction factor	PE-Ci for each isotope
^{238}Pu	0.00028	17.12	0.0047936	1/1.1	0.0043578
^{239}Pu	0.9364	0.062	0.0580568	1/1	0.0580568
^{240}Pu	0.0575	0.227	0.0130525	1/1	0.0130525
^{241}Pu	0.0056	103	0.5768	1/52	0.0110923
^{242}Pu	0.0002	0.0039	0.00000078	1/1.1	0.0000007
^{241}Am	0.00009	3.42	0.0003087	1/1	0.0003087
Total	1.0000		0.6530		0.0869

*Total grams of plutonium/americium in the waste package = 1.

Column 1 is a list of the plutonium isotopes in the waste.
Column 2 is the weight fraction of each isotope of the total plutonium.
Column 3 is the curies per gram of each isotope (see table C-7).
Column 4 is the total grams of plutonium present in the waste package times column 2 times column 3.
Column 5 is the correction factor for PE-Ci.
Column 6 is column 4 times column 5 (PE-Ci of that isotope).

Columns 2, 4, and 6 are totaled; the total PE-Ci of plutonium is placed on the TWSR form.

The following correction factors are to be used to calculate PE-Ci if the waste package has different isotopes than in the example. Plutonium equivalent curies for each element are to be calculated separately and reported on the TWSR.

Table C-2. Correction Factors for Determining PE-Ci.

Isotope	Correction factor	Isotope	Correction factor
^{233}U	1/4	^{242}Pu	1/1.1
^{237}Np	1	^{241}Am	1
^{236}Pu	1/3.1	^{243}Am	1
^{238}Pu	1/1.1	^{242}Cm	1/29
^{239}Pu	1	^{244}Cm	1/1.9
^{240}Pu	1	^{253}Cf	1/3.5
^{241}Pu	1/52		

CALCULATION OF Pu-239 FISSILE GRAM EQUIVALENT

Table C-3. Plutonium-239 Fissile Gram Equivalents.

1	2	3	4	5
Isotope	Fraction	Grams of each isotope	Correction factor	^{239}Pu FGE of each isotope
^{238}Pu	0.00028	2.800 E-04	9/80	3.150 E-05
^{239}Pu	0.9364	9.364 E-01	1	9.364 E-01
^{240}Pu	0.0575	5.750 E-02	9/400	1.294 E-03
^{241}Pu	0.0056	5.600 E-03	9/4	1.260 E-02
^{242}Pu	0.0002	2.000 E-04	9/1200	1.500 E-06
^{241}Am	0.00009	9.000 E-05	9/480	1.688 E-06
Total	1.0000	1.000 E+00*		9.503 E-01

* Total grams of plutonium/americium in the waste package = 1.

Column 1 is a list of fissile isotopes of plutonium present in the waste.
Column 2 is the weight fraction of each isotope as a fraction of the total plutonium.
Column 3 is the total grams of fissile plutonium isotopes times column 2.
Column 4 is the correction factor for ^{239}Pu FGE.
Column 5 is column 3 times column 4 (^{239}Pu FGE for that isotope).

Columns 2, 3, & 4 are totaled. The total ^{239}Pu FGE for plutonium is placed on the TWSR.

The correction factors in Table C-4 are to be used to calculate ^{239}Pu FGE if the waste package contains different isotopes than in the example. As before, each element is to be calculated and reported separately on the TWSR.

Table C-4. Correction Factors for Determining Plutonium-239 Fissile Gram Equivalents.

Isotope	Correction factor	Isotope	Correction factor
^{233}U	1	^{242}Am	450/13
^{235}U	1	^{243}Am	9/700
^{238}Pu	9/80	^{243}Cm	5
^{239}Pu	1	^{244}Cm	9/100
^{240}Pu	9/400	^{245}Cm	15
^{241}Pu	9/4	^{247}Cm	1/2
^{242}Pu	9/1200	^{249}Cf	45
^{241}Am	9/480	^{252}Cf	90

CALCULATION OF ALPHA CURIE CONTENT

Table C-5. Alpha Curie Calculation.

1	2	3	4
Isotope	Fraction	Alpha Ci/g	Alpha curies*
^{238}Pu	0.00028	17.12	4.794 E-03
^{239}Pu	0.9364	0.062	5.806 E-02
^{240}Pu	0.0575	0.227	1.305 E-02
^{241}Pu	0.0056	0.0025	1.400 E-05
^{242}Pu	0.0002	0.0039	7.800 E-07
^{241}Am	0.00009	3.42	3.087 E-04
Total	1.0000		7.623 E-02

*Total grams of plutonium/americium in the waste package = 1.

Column 1 is a list of alpha-emitting plutonium isotopes in the waste.
Column 2 is the weight fraction of each plutonium isotope as a fraction of the total plutonium.
Column 3 is the factor for alpha curies per gram of each isotope.
Column 4 is the total grams of alpha emitting plutonium isotopes in the waste package times column 2 times column 3 (alpha curies of each isotope).

Columns 2 and 4 are totaled. The total alpha curies for plutonium will be placed on the TWSR.

The alpha curie-per-gram factors in Table C-6 are to be used if the waste package has different isotopes than in the example. Report each element separately on the TWSR.

Table C-6. Alpha Curie Content.

Isotope	Ci/g	Isotope	Ci/g
^{228}Th	8.21 E+02	^{240}Pu	2.2704 E-01
^{232}Th	1.10 E-07	^{241}Pu	2.3770 E-03
^{234}Th	2.32 E+04	^{242}Pu	3.9280 E-03
^{233}U	9.6371 E-03	^{241}Am	3.4330 E+00
^{234}U	6.2439 E-03	^{243}Am	1.9959 E-01
^{235}U	2.1607 E-06	^{242}Cm	3.3098 E+03
^{236}U	6.4872 E-05	^{243}Cm	5.1613 E+01
^{238}U	3.3615 E-07	^{244}Cm	8.0891 E+01
^{237}Np	7.0481 E-04	^{245}Cm	1.7164 E-01
^{236}Pu	5.3147 E+02	^{249}Cf	4.0896 E+00
^{238}Pu	1.7118 E+01	^{252}Cf	5.3725 E+02
^{239}Pu	6.2034 E-02		

TWSR Data Entry Format

The values calculated above would be entered in blocks 38 through 43 of the TWSR in the following manner:

38. Element	39. ISOTOPIC DISTRIBUTION	40. WT.(g)	41. FGE	42. PE-Ci	43. ALPHA Ci
Pu	^{238}Pu 0.028%, ^{239}Pu 93.64%, ^{240}Pu 5.75%	1	0.95	0.087	0.076
	^{241}Pu 0.56%, ^{242}Pu 0.02%, ^{241}Am 0.009%				

This format would then be repeated for the remainder of the elements requested, and the grand totals would be calculated and entered.

SPECIFIC ACTIVITY AND DECAY HEAT GENERATION RATES FOR SELECTED RADIONUCLIDES

Thermal power is calculated for each waste package and entered on the TWSR form in block 24. This calculation is made by determining the total curies of each radioisotope in the waste package, multiplying the curies by the watts-per-curie (W/Ci) value for each isotope, and then adding the individual amounts to find the total thermal power. Table C-7 is a list of power factors for selected radioisotopes. It is presented as an aid to waste generators in calculating thermal power. The plutonium and americium values in Table C-7 are from ANSI N15.22-1987, *Plutonium-Bearing Solids Calibration Techniques for Calorimetric Assay* (ANSI 1987).

Table C-7. Power Factors for Selected Radioisotopes.

Radionuclide	Half-life	Ci/g	W/Ci
^{60}Co	5.271y	1.13E+03	1.54E-02
^{85}Kr	10.72y	3.93E+02	1.50E-03
^{89}Sr	50.55d	2.90E+04	3.45E-03
^{90}Sr	28.6y	1.39E+02	1.16E-03
^{90}Y	64.1h	5.43E+05	5.53E-03
^{90}Sr, ^{90}Y	28.6y	2.78E+02	6.69E-03
^{91}Y	58.51d	2.45E+04	3.58E-03
^{95}Zr	64.01d	2.15E+04	5.04E-03
^{95}Nb	86.6h	3.81E+05	1.32E-03
^{95}Nb	35.06d	3.92E+04	4.79E-03
^{95}Zr, ^{95}Nb	64.02d	6.90E+04	1.56E-02
^{99}Tc	2.13E+05y	1.70E-02	5.01E-04
^{103}Ru	39.35d	3.22E+04	3.27E-03
^{103}Rh	56.119m	3.25E+07	2.30E-04
^{103}Ru, ^{103}Rh	39.35d	6.44E+04	3.50E-03
^{106}Ru	368.2d	3.35E+03	5.95E-05
^{106}Rh	29.92s	3.56E+09	9.55E-03
^{106}Ru, ^{106}Rh	368.2d	6.69E+03	9.61E-03
^{125}Sb	2.77y	1.03E+03	3.14E-03

Table C-7. Power Factors For Selected Radioisotopes

Radionuclide	Half-life	Ci/g	W/Ci
^{125}Te	58d	1.80E+04	8.42E-04
^{125}Sb, ^{125}Te	2.77y	1.28E+03	3.35E-03
^{127}Te	109d	9.43E+03	4.95E-04
^{127m}Te	9.35h	2.64E+06	1.35E-03
^{127}Te, ^{127m}Te	109.d	1.87E+04	1.83E-03
^{129}Te	33.6d	3.01E+04	7.73E-04
^{129m}Te	69.6m	2.09E+07	3.44E-03
^{129}Te, ^{129m}Te	33.6d	4.90E+04	2.94E-03
^{129}I	1.57E+07y	1.77E-04	4.68E-04
^{134}Cs	2.062y	1.30E+03	1.02E-02
^{135}Cs	2.3E+06y	1.15E-03	3.34E-04
^{137}Cs	30.17y	8.66E+01	1.01E-03
^{137}Ba	2.522m	5.38E+08	3.92E-03
^{137}Cs, ^{137}Ba	30.17y	1.69E+02	4.72E-03
^{141}Ce	32.5d	2.85E+04	1.46E-03
^{144}Ce	284.3d	3.19E+03	6.60E-04
^{144}Pr	17.28m	2.76E+10	7.33E-03
^{144}Ce, ^{144}Pr	284.3d	9.57E+03	7.99E-03
^{147}Pm	2.6234y	9.28E+02	3.67E-04
^{148}Pm	41.3d	2.23E+04	1.25E-02
^{152}Eu	13.6y	1.73E+02	4.52E-03
^{154}Eu	8.8y	2.64E+02	8.98E-03
^{155}Eu	4.96y	4.65E+02	7.23E-04
^{210}Po	138.378d	4.49E+03	3.14E-02
^{228}Th	1.9132y	8.21E+02	3.21E

Table C-7. Power Factors For Selected Radioisotopes

Radionuclide	Half-life	Ci/g	W/Ci
^{232}Th	1.405E+10y	1.10E-07	2.38E-02
^{234}Th	24.1d	2.32E+04	3.97E-04
^{232}U	72y	2.14E+01	3.16E-02
^{233}U	1.592E+05y	9.64E-03	2.84E-02
^{234}U	2.445E+05y	6.25E-03	2.83E-02
^{235}U	38E+08y	2.16E-06	2.71E-02
^{236}U	2.342E+07y	6.47E-05	2.67E-02
^{238}U	4.468E+09y	3.36E-07	2.49E-02
^{237}Np	2.14E+06y	7.05E-04	2.88E-02
^{238}Pu	87.74y	1.71E+01	3.32E-02
^{239}Pu	24,131y	6.20E-02	3.11E-02
^{240}Pu	6,569y	2.27E-01	3.12E-02
^{241}Pu	14.4y	1.03E+02	3.30E-05
^{242}Pu	3.763E+5y	3.93E-03	2.95E-02
^{241}Am	433.6y	3.42E+00	3.34E-02
^{242}Cm	163.2d	3.31E+03	3.62E-02
^{244}Cm	18.11y	8.10E+01	3.44E-02

d = days
h = hours
m = minutes
s = seconds
y = years

REFERENCES

ANSI, 1987, *American National Standard for Nuclear Materials-Plutonium-Bearing Solids-Calibration Techniques for Calorimetric Assay*, N15.22-1987, American National Standards Institute, New York, New York.

APPENDIX D

TRANSURANIC SOLID WASTE DOCUMENTATION REQUIREMENTS

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Transuranic (TRU) waste generators must provide an accurate and complete Transuranic Waste Storage Record (TWSR) (Appendix B), a Contents Inventory Sheet, and a Waste Isolation Pilot Plant (WIPP) Certification Checklist for each waste package. Transuranic waste that contains hazardous constituents as defined in Chapter 173-303 WAC must be accompanied by a Radioactive Mixed Waste Attachment Sheet. Blank forms may be obtained from the Westinghouse Hanford Company (WHC) primary contacts listed in Section 1.4 or may be accessed on the Jetform option on the Hanford Local Area Network (HLAN). Offsite waste generator may contact Solid Waste Engineering Analysis to obtain information on obtaining the proper software to allow them to use the Jetform computer-generated versions of this form. Instructions for completing the Contents Inventory Sheet and WIPP Certification Checklist are contained in the following subsections.

CONTENTS INVENTORY SHEET

The following instructions are number-keyed to Figure D-1. Example entries are provided in the figure.

1. **Page _____ of _____**. Enter the page number and the total number of pages.
2. **Waste generator/location**. Enter the company, building, and room location.
3. **Container number**. Enter the assigned container number. (This must be permanently labeled on the container.)
4. **Container type**. Enter the type of waste container used.
5. **Initials**. Enter the initials of persons bagging the waste.
6. **Article description**. Describe the physical condition of the waste placed in the container. Date each entry. Include an identifier for the hood or specific area from which the waste was removed.
7. **Content code**. Enter content code, as designated by the Storage/Disposal Approval Record.
8. **Mass of organics**. Enter the mass of organic material in the waste described in block 6 in kilograms.
9. **Volume of organics**. Enter the volume of organic material in the waste described in block 6 in cubic feet or cubic meters.
10. **Hazardous material**. Enter the major hazardous, corrosive, or toxic materials in the waste. If none, write "none."
11. **Quantity**. Enter the quantities of hazardous materials listed in block 9 in kilograms.

CONTENTS INVENTORY SHEET

(1) Page ______ of ______

(2) Waste Generator/Location ______________

Container No. (3) ______________________

Container Type (4) ______________________

Initials	Initials	Article Description	Content Code	Mass of Organics (Kgs)	Volume of Organics ☐ Ft3 ☐ M3	Hazardous Material		Radioactive Content	
						Name	Qty Kgs	TRU Isotopes	Grams
(5)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
		Page Total		(14) Kgs	(16)		(18)		(20) g
		Total (all pages)		(15) Kgs	(17)		(19) Kgs		(21) g

(22) ______________________________________
Plant Operations Authority, Signature/Date

(23) ______________________________________
Independent Reviewer, Signature/Date

(24) Other Radioactive Content ______________________

(25) ______________________

Distribution: White – Solid Waste Engineering Canary – Solid Waste Operations Pink – Retain - Shipper

BC-6400-131 (07/89)

Figure D-1. Contents Inventory Sheet.

12. **Transuranic isotopes**. Enter each TRU radioisotope present. If the element and its isotopic ratio (e.g., ^{239}Pu 94 percent, ^{240}Pu 5 percent, etc.) is the same for all articles placed in the container, only one entry is required.

13. **Grams**. Enter the grams of each TRU element present in each item listed in block 6.

14. **Mass of organics**. Enter the total mass of organic waste listed on this page.

15. **Total mass of organics**. Enter the total mass of organic waste from all pages (required on page 1 only).

16. **Volume of organics**. Enter the total volume of organic waste listed on this page.

17. **Total volume of organics**. Enter the total volume of organic waste from all pages (required on page 1 only).

18. **Quantity**. Enter the total of all hazardous materials listed on this page in kilograms.

19. **Total quantity**. Enter the total of all hazardous materials from all pages in kilograms (required on page 1 only).

20. **Grams**. Enter the total TRU material listed on this page in grams.

21. **Total grams**. Enter the total TRU material from all pages in grams (required on page 1 only). Alternately, the nondestructive assay (NDA) value may be used (if NDA value is used, note this information in block 25).

22. **Plant Operations Authority signature/date**. The Plant Operations Authority or delegate must sign and date the Contents Inventory Sheet indicating that the form has been properly completed.

23. **Independent reviewer signature/date**. The independent reviewer must sign and date each page signifying the Contents Inventory Sheet has been reviewed and verified.

24. **Other radioactive content**. Enter the isotope and curie content of any non-TRU isotope contained in the waste package. The radioactive content should be specified in grams for uranium or thorium.

25. **Comments**. Enter any other pertinent information.

WIPP CERTIFICATION CHECKLIST

The following instructions apply to Figure D-2.

1. **Container Number.** Specify the container number as labeled on the container.

2. **Date Container Sealed.** Enter the date the container was sealed.

NOTE: IF THE WASTE DOES NOT MEET THE CRITERIA LISTED BELOW, CHECK NO FOR THAT CRITERION.

3. **U.S. Department of Transportation (DOT) Type A container.** Check yes if the container meets all DOT Type A requirements.

4. **Heavy or bulky items are blocked to prevent shifting.** Check yes if the waste is loaded so that bulky and heavy items are blocked to prevent shifting. Check yes or enter "N/A" if there are no heavy or bulky items.

5. **Container is free of defects.** Check yes if the container has been inspected and no defects were found.

6. **Waste contains <1 percent by weight powders.** Check yes if powders, ashes, and particulates are <1 wt % or have been immobilized, or enter N/A if no powders are present.

7. **Waste does not contain any free liquids.** Check yes if the waste contains no free liquids.

8. **Waste does not contain any explosives or compressed gases .** Check yes if the waste contains no explosives or compressed gases.

9. **Waste does not contain any organic peroxides, oxidizers, flammable solids, or metal fines.** Check yes if the waste contains no pyrophoric materials.

10. **Waste does not contain any sludges with pH <4.0.** Check yes if all sludges present are neutralized and solidified. Enter "N/A" if no sludges are present.

11. **Waste contents will not react with each other or with the container .** Check yes if the waste package contains no materials chemically incompatible with each other or the container.

12. **Surface contamination is <50 pCi (100 dpm)/100 cm^2 alpha and <450 pCi (1,000 dpm)/100 cm^2 beta-gamma.** Check yes if the removable surface contamination on the container is less than the specified limits.

Figure D-2. WIPP Certification Checklist.

WIPP CERTIFICATION CHECKLIST

Container number ____________________ Date Container Sealed ____________________

YES	NO	WASTE ACCEPTANCE CRITERIA
☐	☐	DOT Type A Container
☐	☐	Heavy or bulky items are blocked to prevent shifting.
☐	☐	Container is free of defects.
☐	☐	Waste contains less than 1% by weight powders.
☐	☐	Waste does not contain any free liquids.
☐	☐	Waste does not contain any explosives or compressed gases
☐	☐	Waste does not contain any organic peroxides, oxidizers, flammable solids or metal fines.
☐	☐	Waste does not contain any sludges with pH ≤ 4.0.
☐	☐	Waste contents will not react with each other or with container
☐	☐	Surface contamination is ≤ 50 pCi (100 dpm) / 100 sq cm alpha and ≤ 450 pCi (1000 dpm) / 100 sq cm beta-gamma.
☐	☐	Proper labeling has been applied
☐	☐	Hazardous and corrosive co-contaminants are identified on Contents Inventory Sheet
☐	☐	Gross weight is less than qualified DOT Type A limit (kg)
☐	☐	Pu-239 Fissile Gram Equivalent content is less than WIPP specified limit (g)
☐	☐	Pu-239 equivalent TRU activity (PE-Ci) is less than the WIPP specified limit of 1000 PE-Ci
☐	☐	Surface dose rate is ≤ 200 mrem/hr (beta, gamma and neutron) at any point
☐	☐	Neutron dose rate contribution is ≤ 20 mrem/hr

The waste package described above is unclassified and meets all WIPP Waste Acceptance Criteria

☐ With no exceptions

☐ With the following exceptions:

____

____

____

____

____

____

____

Plant Operations Authority signature and date	Independent Reviewer signature and date

White WASU 2750E 200 E
Yellow TFS 272WA 200 W
Pink Retain Shipper

BC 6400-132 (11 87)

13. **Proper labeling has been applied** . Check yes if the proper labeling has been applied.

14. **Hazardous and corrosive co-contaminants are identified on the Contents Inventory Sheet**. Check yes if hazardous or corrosive co-contaminants present in the waste are listed on the Contents Inventory Sheet. Enter "N/A" if no hazardous or corrosive materials are present.

15. **Gross weight is less than qualified DOT Type A limit (kg)** . Check yes if the gross weight does not exceed the qualified Type A limit. Enter the Type A limit in the space provided.

16. **Plutonium - 239 fissile gram equivalent content is less than WIPP-specified limit (g)**. Check yes if the ^{239}Pu fissile gram equivalent content is less than the WIPP-specified limit. Enter the WIPP-specified limit in the spaces provided.

17. **Plutonium-239 equivalent TRU activity (PE-Ci) is less than the WIPP- specified limit of 1,00 PE-Ci**. Check yes if the ^{239}Pu equivalent TRU activity is <1,00 PE-Ci.

18. **Surface dose rate <200 mrem/h (beta, gamma and neutron) at any point**. Check yes if the combined beta, gamma, and neutron dose rate is <200 mrem/h at any point on the container.

19. **Neutron dose rate contribution is <20 mrem/h**. Check yes if the neutron dose rate is <20 mrem/h at any point on the container.

20. **Exceptions**. If any items do not fully comply with all waste acceptance criteria, check the appropriate box and provide a complete explanation. The lack of an approved certification plan is a deviation and must be listed. Check "no exceptions" if none exist.

21. **Plant Operations Authority signature and date**. The appointed Plant Operations Authority or delegate must sign and date the form.

22. **Independent reviewer signature and date**. The independent reviewer must sign and date the form verifying accuracy and completeness of the checksheet.

REFERENCES

Ecology, 1991, *Dangerous Waste Regulations*, WAC 173-303, Washington State Department of Ecology, Olympia, Washington.

APPENDIX E

MARKING AND LABELING EXAMPLES

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Figure E-1. Hazardous Waste Sticker Examples

22222-1a-1

HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY AUTHORITY, AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

GENERATOR INFORMATION:
NAME: U.S. DEPARTMENT OF ENERGY EPA ID NO: WA7890008967
ADDRESS: P.O. BOX 550, 2355 STEVENS DRIVE CITY: RICHLAND STATE: WA ZIP: 99352
MANIFEST DOCUMENT NO: ____ (PAGE: ____ ITEM: ____) ACCUMULATION START DATE: 5/31/93 E.P.A. WASTE NO: WT02
Non-RCRA WASTE SOLID
UN OR NA #: NONE
D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX

HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES

22222-1b-1

HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL.
IF FOUND, CONTACT THE NEAREST POLICE OR PUBLIC SAFETY AUTHORITY, AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY OR THE UNITED STATES ENVIRONMENTAL PROTECTION AGENCY.

GENERATOR INFORMATION:
NAME: U.S. DEPARTMENT OF ENERGY EPA ID NO: WA7890008967 ACCUMULATION START DATE: 5/31/93
ADDRESS: P.O. BOX 550, 2355 STEVENS DRIVE CITY: RICHLAND STATE: WA ZIP: 99352
PAGE: 1 ITEM: b-1 ONSITE DOC #: 22222
D.O.T. PROPER SHIPPING NAME / UN OR NA WITH PREFIX:
Corrosive Solid, N.O.S.
(calcium hydroxide) UN1759
E.P.A. WASTE NO: D002, WC01
MANIFEST DOCUMENT NO: ____

HANDLE WITH CARE!

22222-1c-1

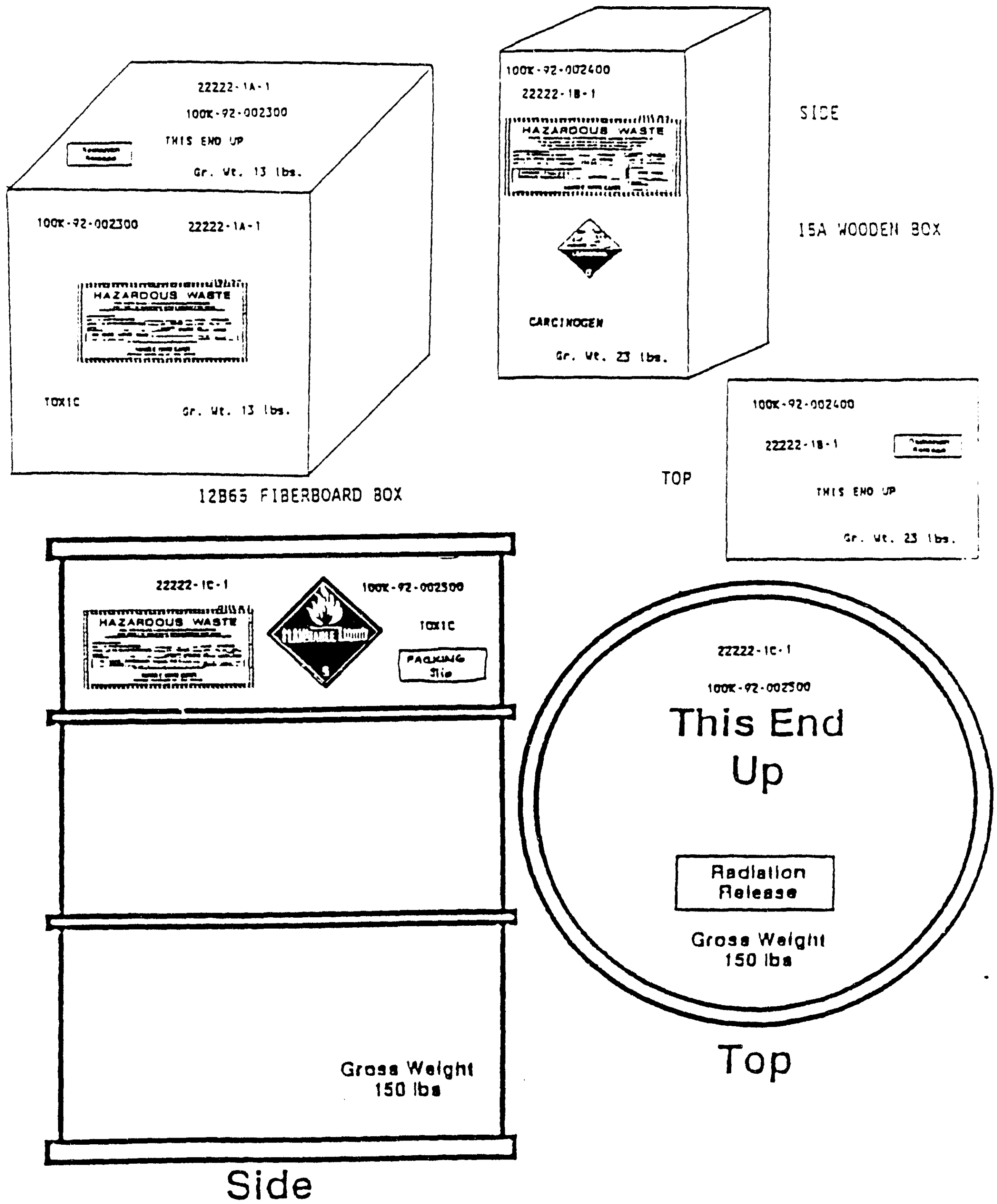
HAZARDOUS WASTE

STATE AND FEDERAL LAW PROHIBITS IMPROPER DISPOSAL
IF FOUND, CONTACT THE NEAREST POLICE, OR PUBLIC SAFETY AUTHORITY, AND THE WASHINGTON STATE DEPARTMENT OF ECOLOGY, OR THE U.S. ENVIRONMENTAL PROTECTION AGENCY.

GENERATOR INFORMATION:
NAME: U.S. DEPARTMENT OF ENERGY EPA ID NO: WA7890008967
ADDRESS: P.O. BOX 550, 2355 STEVENS DRIVE CITY: RICHLAND STATE: WA ZIP: 99352
MANIFEST DOCUMENT NO: ____ (PAGE: ____ ITEM: ____) ACCUMULATION START DATE: 5/31/93 E.P.A. WASTE NO: WT02, D001 D008
RQ Waste Flammable Liquid, N.O.S.
(D008)
UN ~~OR NA~~ #: 1993
D.O.T. PROPER SHIPPING NAME AND UN OR NA NO. WITH PREFIX

HANDLE WITH CARE!
CONTAINS HAZARDOUS OR TOXIC WASTES

Figure E-2. Container Labeling.



APPENDIX F

SAMPLING RECOMMENDATIONS FOR KNOWN OR UNKNOWN WASTE MATERIAL

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APPENDIX F

1.0 Sampling Recommendations for Known or Unknown Waste Material

1.1 Laboratory Analytical Methods

The following analytical methods are acceptable in accordance with the *Resource Conservation and Recovery Act of 1976* (RCRA) and Washington State Department of Ecology regulations (*Washington Administrative Code* (WAC) 173-303) (Ecology 1991). Process knowledge should be used to determine which of these methods to use.

1.1.1 Testing Requirements for Solids

- Test for mercury using Environmental Protection Agency (EPA) Methods 7470, 7471, selenium using EPA Methods 7740, 7741, and arsenic using EPA Methods 7060, 7061
- Toxic characteristic leaching procedure (TCLP)
- Total TCLP metals using EPA Method 6010
- Total organics using screen gas chromatograph/mass spectrometry (GC/MS)
- Semi volatiles using EPA Methods 8250, or 8270
- Volatiles using EPA Method 8240
- pH test for solids and semi-solids using "Test Method for determining pH of Solutions in Contact With Solids" in accordance with WAC 173-303-110
- Cyanide/sulfide using EPA Methods SW-846 7.33 and 7.34
- Inorganic anions (F, Cl, NO_3, NO_2, SO_4, PO_4)
- Test up to 200 °F for phase change
- Process knowledge search to determine if waste is contaminated with listed waste materials (included on U, P, F, or K lists in WAC 173-303).

1.1.2 Testing Requirements for Liquid Organics

- Flash point using 1010 Penski-Martins closed cup
- Cyanide/sulfide reactivity using EPA Methods SW-846 7.33 and 7.34
- TCLP
- Total TCLP metals using EPA Method 6010
- Mercury using EPA Methods 7470, 7471, selenium using EPA Methods 7740, 7741, and arsenic using EPA Methods 7060, 7061
- Total organics using GC/MS
- Semi volatiles using EPA Methods 8250, or 8270
- Volatiles using EPA Method 8240
- Inorganic anions (F, Cl, NO_3, NO_2, SO_4, PO_4)
- Polychlorinated biphenyls (PCB)
- Corrosive test based on process knowledge.

1.1.3 Testing Requirements for Aqueous Liquids

- pH
- Cyanide/sulfide using EPA test Methods SW-846 7.33 and 7.34
- TCLP
- Totals TCLP metals using EPA Method 6010
- Mercury using EPA Methods 7470, 7471, selenium using EPA Methods 7740, 7741 and arsenic using EPA Methods 7060, 7061
- Total organics using GC/MS
- Inorganic anions (F, Cl, NO_3, NO_2, SO_4, PO_4)
- PCB
- Hydrazine and Morpholine
- Glycol
- Ammonia
- Process knowledge search to determine if waste is contaminated with listed waste materials (included on U, P, F, or K lists in WAC 173-303).

1.2 Initial Waste Stream Characterization

Prior to the Treatment Storage Disposal (TSD) facility agreeing to receive a dangerous or mixed waste stream, the generator must characterize the waste stream through analysis or process knowledge to properly designate the waste. This characterization effort may also require demonstration that the waste stream may be safely and effectively managed at the receiving TSD facility, based upon the waste acceptance criteria and WAP requirements for the receiving TSD facility. The characterization effort must identify those compounds or characteristics whose presence or concentration will impact the management of the wastes. "Fingerprint parameters," those waste constituents and their concentrations that may be used later to confirm waste identity and verify treatability, are also generally identified at this time. Fingerprint parameters are selected based upon their ease of detections, and would include such things as pH, color, odor, radionuclides, physical form (e.g., solid, liquid, sludge), and conductivity. Based on these fingerprint parameters, a TSD facility can easily verify and confirm the contents of a waste container, minimizing the need for intensive laboratory analysis of the waste stream.

Initial waste characterizations may include information developed by a generator to determine if the wastes are dangerous, but are not limited to consideration of this information. Initial waste characterizations may also require data demonstrating that the waste stream in question can be safely and effectively treated. Such requirements are routinely imposed upon land treatment units (see WAC 173-303-655(3) and 40 CFR 264.272). Very specific initial waste characterization requirements have also been established for incinerators (see WAC 173-303-670(2) and 40 CFR 264.341).

Sampling strategies for confirming waste identity will generally be based upon one of the following methods:

- ASTM Standard D140-70
- ANSI/ASQC Standard Z1.4-1981 or

- Table 5-4 Method from the *Permit Applicants' Guidance Manual for the General Facility Standards of 40 CFR Part 264* (EPA SW-968).

When using the SW-968 Table 5-4 Method, the confidence level and acceptable fraction of incorrectly characterized items will be stated in the TSD facility waste analysis plan. Other sampling strategies may be appropriate for an individual TSD facility and/or generator; sampling strategies used by an individual TSD facility will be outlined in the TSD facility waste analysis plan.

1.3 Confirmation of Waste Identity

Each batch or shipment of waste received from generators at the TSD facility must be characterized to the extent necessary to confirm that the wastes received are those itemized on the shipping papers or manifest.

The requirement that the TSD facility confirm the identity of waste shipments from generators is not meant to require full waste characterization or confirmation upon receipt at the TSD facility that wastes have been properly designated by the generator. Originally, the EPA proposed that TSD facilities test or inspect each truckload of waste for four physical properties (physical appearance, specific gravity, pH and vapor pressure) to confirm waste identity; the final regulations were amended to allow facility-specific inspection procedures to be developed and justified in a facility WAP [*Federal Register*, Vol. 54, No. 98, p. 33180]. In the language of both the federal and state regulations it is clear that a simple physical inspection of the waste and/or waste containers may be justified as an adequate receiving confirmation procedure, and that actual sampling and laboratory analysis of the waste is not necessarily required. Published EPA guidance suggests that

> "To assess consistency between waste and manifest you should consider visually inspecting the wastes for physical state, phase separation, texture, color, and odor. Applicable analytical procedures that may be informative include pH and specific gravity...." [EPA 1983]

1.4 Verification That Waste Batches Can Be Managed

The initial waste stream characterization will often identify waste characteristics or constituents present in the waste whose concentrations may impact the TSD facility's ability to manage the waste stream. In such instances, verification that an individual waste can be safely and effectively managed by the TSD facility is necessary to ensure compliance with the sections of WAC 173-303-300 and 40 CFR 264.13. At a minimum, the verification must ensure the proper segregation and storage of compatible waste types within the TSD facility. This verification is typically limited to fingerprint parameters or the characteristics or constituents of interest that were identified during the initial characterization, such as flammable solids, flammable liquids, cyanides/sulfides, corrosives, oxidizers, and reactives.

1.5 Verification That Wastes And Residues Have Been Effectively Managed

In addition to the process monitoring requirements imposed by the various final RCRA TSD facility standards, treatment and disposal facilities may be required to verify that wastes and waste residues meet federal Land Disposal Restriction (LDR) standards established under 40 CFR Parts 264 and 268.

Based upon 40 CFR Parts 264 and 268, review of process knowledge information may not be used to determine if required levels of treatment have been achieved prior to disposal for wastes subject to the federal LDR standards. Periodic sampling and analysis prior to treatment may be required. Sampling and analysis after treatment of the wastes will be required to ensure that LDR requirements have been satisfied.

REFERENCES

Ecology, 1991, *Dangerous Waste Regulations*, WAC 173-303-110(3)(a), Washington State Department of Ecology, Olympia, Washington.

Resource Conservation and Recovery Act of 1976, as amended, Public Law 94-580, 90 stat. 2795, 42 USC 6901 et seq.

APPENDIX G

APPROVED VOID FILLERS AND ABSORBENTS

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APPROVED VOID SPACE FILLERS

The following list contains materials that are approved for use as void space fillers:

Diatomaceous earth, clean cat litter
Soil
Sand
Lava rock
Pyrofoam[1]
Tightly packed cellulose matter (rags, cardboard, fiberboard, coveralls, etc.) in some cases (advance approval must be obtained)
Clay
Concrete, cement, grout
Fine gravel
Others as specified in the Storage/Disposal Approval Record (SDAR).

[1]Pyrofoam is a trademark of Pyrofoam Inc., Kennewick, Washington.

RECOMMENDATION AND SELECTION OF SORBENT MATERIAL FOR LOW-LEVEL AND MIXED WASTE MANAGEMENT

Sorbent material is used in the packaging of liquid, sludge, and moisture-bearing waste. Sorbent is also used for spill control and absorption. At Hanford Site, diatomaceous earth, Conwed pads (cellulose), and vermiculite have been used in various applications. New developments in technology have produced new sorbent types with greatly improved sorbent properties.

Each type of sorbent material has certain characteristics that make it suitable for a specific application. Some examples are as follows.

- Sorbent used in Hanford Site storage waste packages must pass a 3 psi (minimum) pressure test, be incinerable, chemically compatible, and non-biodegradable. This will minimize the risk of container degeneration during storage because of corrosion. By using a sorbent that has little or no ash after incineration, future treatment will be minimized.

- Sorbent used in Hanford Site burial waste packages must pass a 20 psi (minimum) pressure test because of burial depth. A sorbent with a high efficiency ratio as well as pressure resistance would mean fewer waste packages and no leachable contamination in the future.

Sorbent efficiency will vary with the viscosity and chemical make up of the waste; therefore, the quantity of sorbent needed in each waste package must also be determined.

Safety, final disposal, eventual treatment, and cost can all be affected by the sorbent chosen.

This appendix reviews the technology behind sorption, the various types of sorbent, selection guidelines, and technical data on some known brands.

G1 SCIENTIFIC PRINCIPLES OF SORPTION

Sorption is a process by which liquids are contained in solids by absorption, adsorption, or encapsulation.

G1.1 Liquid/Vapor Transport. Absorption takes place as a liquid/vapor transports into the bulk of the material. The four transport parameters are

- Solid diffusion, which occurs by diffusion of liquid or vapor through the solid portion of the sorbent

- Surface diffusion, which enhances the migration process by a large surface-to-volume ratio

- Vapor diffusion, which enhances the vapor transport by the void inside the solid
- Capillary diffusion, which enhances migration of liquid on solid by capillary forces.

G1.2 Adsorption. Adsorption is a surface phenomenon. Liquid and gaseous molecules attract and retain themselves on the surface of a second substance by physical and/or chemical forces. The amount of adsorption depends on the surface-to-volume ratio. Finely divided porous materials, which have a high surface-to-volume ratio, exhibit very high adsorption.

The polarity of the molecular forces, chemical nature of the sorbent surface, and fluid/vapor type determine the adsorption rate.

G1.3 Encapsulation. The encapsulation process chemically binds liquids to polymer molecules to form new molecules. These new molecules will then hold on to the liquid under much higher pressure. The type of reaction found in sorbent such as polyacrylate encapsulating material tends to have a very high liquid/sorbent ratio. Some companies that produce encapsulating materials claim an astounding 200 to 1 ratio.

G2 TYPES OF SORBENT

There are many kinds and shapes of sorbent available in the market. This technical paper will review only some of the commonly used sorbent with special emphasis on Hanford Site applications.

In the past, sorbent in granular or loose form has been used extensively on the Hanford Site. Sorbent, however, is also available in other forms such as socks, pads, booms, pillows, and rolls/blankets.

The outer skin of the fabric that holds the sorbent material should be carefully evaluated. The fabric should be resistant to chemicals, allow liquids to pass through, and at the same time, limit dust. (Drop the sorbent on the floor to evaluate possible dust generation).

G2.1 Mineral Sorbent. Loose clay chips and mineral silica have been used in industry for a long time. Although relatively inexpensive, they absorb only 10 to 15 percent by weight and are very heavy. With waste minimization a mandatory requirement and waste disposal costs rapidly rising, mineral type sorbent has become very unattractive. Their use is also labor intensive and creates dust condition problems.

Vermiculite is light weight and absorbs over 300 percent by weight, but it is more compressible than diatomaceous earth, making it unsuitable when compression loads are to be considered in packaging.

Diatomaceous earth is more resistant to compression but is heavier and less sorbent i.e., 100 to 150 percent by weight.

Expanded mineral sorbent with a much higher sorption ratio is available and a good choice for some solidification.

It should be noted that certain hazardous materials, such as hydrofluoric acid and hydrazine, react with silica and iron in clay and diatomaceous earth, resulting in the generation of heat and/or gases. Compatibility should be carefully considered.

G2.2 Cellulose and Wood Base Sorbent. Cotton fiber (sometimes called polysaccharide), sawdust, wood pulp corn cob centers, moss, and biodegradable material are in the cellulose sorbent family. They are very combustible and are suitable where the primary means of disposal is incineration.

The Environmental Protection Agency (EPA) has proposed banning of biodegradable sorbent from hazardous waste landfills because of the potential release of dangerous chemicals to the environment.

Cellulose sorbent does not work well with acids. Since gaseous releases and fires may occur when nitric acid comes in contact with cellulosic fibers, their use should be carefully evaluated.

G2.3 Polymeric Sorbent. Polymeric sorbent usually contains the synthetic fiber of polyethylene or polypropylene as sorbent material. The synthetic sorbent material is produced by "melt blown" or, more recently, by "flash spinning." The sorbent made by the flash spinning process has greater surface areas and speed of absorbency.

Polymeric sorbent is inert to most chemicals, nonbiodegradable, lightweight, combustible, easy to use and has high-absorption efficiency. Polymeric sorbent, mixed with cellulose, is also available for use in certain applications.

Polyacrylates are a new form of polymer sorbent/desiccant material on the market. Polyacrylates are formulated to encapsulate liquid/vapor and hold it in a jelly-type form. It should be noted that the polyacrylates must have water present to activate. This type of product should not be used on oil-based products and some concentrated acids (see manufacturer's recommendation).

G3 SORBENT SHAPES AND SIZES

Various standard sorbent shapes are available on the market, and other shapes can be ordered to meet special applications. The following are some examples of the standard shapes and sizes available.

G3.1 Socks. Tubular socks are 2 to 3 in. in diameter and are available in lengths ranging from 12 to 60 in. These are used around spills to form a curb and prevent the spread of contamination. Depending on the type of sorbent, the tubular socks may float on water to prevent oil spills from spreading. Many manufacturers are willing to tailor the sock size to fit the situation.

G3.2 Pads. Pads come in various sizes and thicknesses (1/16 to 1 in.). They are used on floors, around machinery, in lab packs, and other places to prevent potential contamination. Pads are also used between containers and their liners to prevent condensation.

G3.3 Pillows. Pillows come in various sizes and thicknesses (2 to 4 in.) and are used for bulk fluid absorption. Pillows and pads are also used to package liquids in drums or containers depending on the application.

G3.4 Roll/Blanket. Absorbents are also available in roll or blanket form for cut-to-length applications. Purchasing sorbent in this form is usually the most economical.

G4 SORBENT SELECTION

G4.1 General Considerations. It is very important to carefully review and select the sorbent material for each application. The following factors should be considered in the selection process.

- Are the available sorbent materials compatible with the chemical liquids present at the facility?

- Is Material Safety Data Sheet (MSDS) information available on the sorbent to identify possible hazards. Is the sorbent nonhazardous according to by *Resource Conservation and Recovery Act of 1976* (RCRA) and the state regulations?

- Consider the sorbent efficiency. Sorbent with lower efficiency may generate more waste, which has to be disposed of at a premium price. The number of containers will also increase with a less efficient sorbent. All companies are now required to certify waste minimization through the hazardous waste manifest.

- Have labor and operation costs been evaluated? Some sorbent, such as loose clay, are more labor intensive than others.

- Liquid solidifiers are available for liquid, liquid/particle, and sludge-type wastes.

- Have disposal options been carefully evaluated? Some sorbent can be incinerated while others do not burn efficiently, leaving large quantities of waste residue (ash). Sorbent that can be recycled or burned for energy has definite advantages over sorbent products with high residual waste.

- Have volume and disposal costs been considered (i.e., overall cost, handling, material, packaging)? Bulk granular/powder, sheet (rolls), or other forms may be purchased at substantial savings.

- Evaluate the manufacturer of the sorbent product for product variety, quality control, experience with EPA and Occupational Safety and Health Administration (OSHA) regulations, quality of research, and previous experience.

- What sorbent shape will best fit the packaging criteria?

- Has the sorbent been pressure tested? Sorbent used for storage wastes must meet a minimum 3 psi liquid release test, while sorbent for burial waste must meet a minimum 20 psi test. This test procedure may be found in the EPA SW 846-9096 document.

G5 RECOMMENDED SORBENT

For the actual sorption of fluid waste, first consideration should be given to polypropylene-type material. This is because of high sorbent efficiency, inertness to chemicals, combustibility, nonbiodegradability, ease of handling, nonhazardous nature, and overall cost savings.

Polyacrylate (polymer) sorbent material should be considered for aqueous waste solidification and condensation removal. Polyacrylates are more expensive but have the highest sorbent efficiency of any of the sorbent types. Reduced volume, incineration, nonbiodegradability, and ease of use are the benefits of this sorbent. Condensation removal between container and liner would be an ideal use for this product.

If sorbent material is added as padding or potential moisture prevention measure, such as in lab pack-type packaging, mineral, cellulose or polymeric material may be used, depending on the application. Sorbent selection should be based first on the disposal method and then on overall cost of the product. The shape and size should be selected based on the type of waste package. For lab pack-type packages, particulate, shredded, or blanket/pad-type, sorbent work best.

A list of sorbent products, distributors and technical information is listed in Table 1.

Please note that the waste generator can use any sorbent as long as it meets the requirements established in this appendix and in the SDAR. The sorbent manufacturers given here are for reference only and this should in no way be taken as an endorsement.

G5.1 Specific Application

G5.1.1 Lab Pack Form Storage Waste

Cellulose-type sorbent is biodegradable and not suitable for 20-year storage packages destined for the Central Waste Complex (CWC). Cellulose-type sorbent should only be used for padding and incidental moisture in storage wastes packages containing no liquids.

The following are suggested sorbents to be used for lab pack form packages.

G5.1.1.1 Aggressive Waste

Universal-type polypropylene, polyethylene, and polyacrylates made specifically for **aggressive** liquids. All sorbent must be incinerable (<2 percent ash residue), nonbiodegradable, and should not be hydrophobic unless the waste contains no aqueous liquids. Sorbent to be used for storage must meet requirements as stated in Section G4.1, bullet 10.

G5.1.1.2 Non-Aggressive Waste

Universal or general purpose polypropylene, polyethylene, or polyacrylates made specifically for non-aggressive liquids. These sorbents must be incinerable (<2 percent ash residue) and should not be hydrophobic unless the waste contains no aqueous liquids. Sorbent to be used for storage must meet requirements as stated in Section G4.1, bullet 10.

G5.1.2 Moisture-Bearing Waste Storage

Polypropylene, polyethylene, or polyacrylate sorbent must be thoroughly mixed and in direct contact with the liquid waste. Sorbent to be used for storage must meet requirements as stated above.

G5.1.3 Absorbed Liquid/Sludge for Burial

Sorbent materials used in packaging liquid or sludge waste may vary depending on the application and/or container. If the waste consists of aqueous liquids, polyacrylates should be considered. This type of solidification does not appreciably increase the waste stream and can be easily applied. Expanded mineral sorbent may also be a good choice, depending on the waste. Even though burial packages will eventually decay, sorbent selected should tend to hold the waste without biodegrading. All sorbent used for burial waste must meet the requirements as stated in Chapter 4.

Expanded minerals such as Aquaset and Petroset are available for liquids and/or sludge waste. These products will stop the migration of heavy metals or solids that are present in the waste. Approximately 40 gallons of liquid can be solidified, leaving 55 gallons of stable waste. Aquaset products are designed for aqueous liquids/sludge and Petroset is designed for liquid/sludge waste containing petroleum products.

G5.1.4 Storage Drum Condensation Prevention

It is recommended that a mechanism be put in place to prevent moisture condensation between storage drums and their liners. A polyacrylate sheet could be placed between the bottom of the drum and liner and a polypropylene sheet placed on top of the liner lid before the drum is sealed to avoid future corrosion.

TABLE G-1 ABSORBENTS

MATERIAL/ TRADE NAME	VENDOR	PHYSICAL DATA	SORBENT RATIO passed 3 psi (wt liq/ wt)	SORBENT RATIO passed 20 psi (wt liq/ wt)	FORM CODE *	USE CODE *	HANDLING CODE *	NOTES - PRECAUTIONS
Polypropylene (Supper Soppers)	Conwed Bonded Fiber Riverside, NJ (609) 461-3400 Dist-Buffalo Ind. 99 S. Spokane St. Seattle, WA 98134 (Att. Gary Thompson) (206) 682-9900	Sp Gr = n/a Non-Hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	F	A,B	A	Cellulose/Poly mesh available in both Oil base specific and Universal types. (No cautions available)
Polyethylene Foam (Conwed D-Sorbent)	Conwed Bonded Fiber Riverside, NJ (609) 461-3400 Dist-Buffalo Ind. 99 S. Spokane St. Seattle, WA 98134 (Att. Gary Thompson) (206) 682-9900	Sp Gr = .82-.98 Non-Hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	Aqueous Liq = n/a Petroleum Based Fluids = n/a Haz. Mat.- Acids/Caustics/ Solvents = n/a	D	B	A	Will not absorb water-hydrophobic. (No cautions available)
Cellulose (Conwed Sorbent)	Conwed Bonded Fiber Riverside, NJ (609) 461-3400 Dist-Buffalo Ind. 99 S. Spokane St. Seattle, WA 98134 (Att. Gary Thompson) (206) 682-9900	Sp Gr = .82-.98 Non-Hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = 3:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	F	A,B	A	
Expanded Amorphous Silicate (CHEMSORB)	Precision Lab Co P.O. Box 127 North Brook, Il 60065 (Bob Gordon) 1-800-323-6280 (708) 498-1176 (Fax)	Sp Gr = 2.35 Non-Hazardous Non-combustible	Aqueous Liq = 5:1 Petroleum Based Fluids = 5:1 Haz. Mat.- Acids/Caustics/ Solvents = 5:1	Aqueous Liq = 5:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 5:1/Caustics 5:1/ Solvents = 3:1	C,E	A	B, C	Do not absorb hydrofluoric acid
Polypropylene (Universal Sorbent)	Precision Lab Co P.O. Box 127 North Brook, Il 60065 (Bob Gordon) 1-800-323-6280 (708) 498-1176 (Fax)	Sp Gr = .88-.92 Non-Hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 5:1/Caustics 5:1/ Solvents = 3:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 3:1/ Solvents = 1:1	A, D	A,B	B	

Form Code	Use Code	Handling Code
A - Blanket type sorbent B - Granular type sorbent C - Pillow type sorbent D - Wipe type sorbent E - Sock Type sorbent F - Various types	A - Acceptable for burial waste; meets minimum 20 psi test; may be non-combustible or combustible B - Acceptable for storage type waste; meets 3 psi test; must be combustible C - No pressure test information available D - Did not pass EPA type pressure test	A - No Special Equipment Needed B - Dust Mask Needed C - Skin Contact to be Avoided - Use Gloves D - Wear Eye Protection E - Threshold Limit Value on Exposure

TABLE G-1 ABSORBENTS

MATERIAL/ TRADE NAME	VENDOR	PHYSICAL DATA	SORBENT RATIO passed 3 psi (wt liq/ wt)	SORBENT RATIO passed 20 psi (wt liq/ wt)	FORM CODE *	USE CODE *	HANDLING CODE *	NOTES - PRECAUTIONS
Polypropylene (PETROSORB)	Precision Lab Co P.O. Box 127 North Brook, Il 60065 (Bob Gordon) 1-800-323-6280 (708) 498-1176 Fax	Sp Gr = .1 - .15 Non-hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.-Acids/Caustics/Solvents = 1:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.-Acids/Caustics/Solvents = 1:1	A, C, E	A,B	B, C	Do not absorb Hydrofluoric acid or oxidizing agents
Mineral-Amorphous Silicate (WYK Absorbent Series 600)	Upright, Inc. 2640 Creve Coeur Drive Rock Hill, MO 63144 (Att. Joe Lebric) 1-800-248-7007	Sp Gr = 2.35 Non-hazardous Non-combustible	Aqueous Liq = 5:1 Petroleum Based Fluids = 3:1 Haz. Mat.-Acids 5:1/Caustics 5:1/Solvents = 5:1	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.-Acids 3:1/Caustics 3:1/Solvents = 3:1	F	A	B, C	DO NOT ABSORB HYDROFLUORIC ACID (HF) (This is a universal sorbent for acids, caustics, oils, solvents, and toxic liquids)
Polypropylene (WYK general maintenance Series 200)	Upright, Inc. 2640 Creve Coeur Drive Rock Hill, MO 63144 (Att. Joe Lebric) 1-800-248-7007	Sp Gr = n/a Non-hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = n/a Haz. Mat.-Acids/Caustics/Solvents = n/a	Aqueous Liq = 1:1 Petroleum Based Fluids = n/a Haz. Mat.-Acids/Caustics/Solvents = n/a	A	A,B	B	For use on all non-aggressive fluids
Polypropylene (WYK Oil selective Series 700)	Upright, Inc. 2640 Creve Coeur Drive Rock Hill, MO 63144 (Att. Joe Lebric) 1-800-248-7007	Sp Gr = n/a Non-hazardous Incinerable	Petroleum Based Fluids = 3:1 Solvents = 1:1	Petroleum Based Fluids = 1:1 Solvents = 1:1	F	A,B	A	No oxidizers
Magnesium Alumino silicate (Blue PIG)	New Pig Corporation 2614 18th Street Altoona, PA 16601 1-800-468-4647 1-800-621-7447 Fax	Sp Gr = 4-10 Non-hazardous Non-combustible	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Solvents = 3:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Solvents = 1:1	E	A,B	B, D	This product may be affected by acids and bases. (for non-aggressive fluids)
Polypropylene (Pink Pig) (Skimming Pigs avail-oil only)	New Pig Corporation (Chris Ringkamp) 1-800-468-4647 1-800-621-7447 Fax	Sp Gr = 0.9 Non-hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.-Acids 1:1/Caustics 1:1/Solvents = 1:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 3:1/n/a Haz. Mat.-Acids 1:1/Caustics 1:1/Solvents = 1:1	F	A,B	A	Designed to absorb hydrocarbons, aqueous solutions or solvents. (oil specific is also available)

Form Code	Use Code	Handling Code
A - Blanket type sorbent B - Granular type sorbent C - Pillow type sorbent D - Wipe type sorbent E - Sock Type sorbent F - Various types	A - Acceptable for burial waste; meets minimum 20 psi test; may be non-combustible or combustible B - Acceptable for storage type waste; meets 3 psi test; must be combustible C - No pressure test information available D - Did not pass EPA type pressure test	A - No Special Equipment Needed B - Dust Mask Needed C - Skin Contact to be Avoided - Use Gloves D - Wear Eye Protection E - Threshold Limit Value on Exposure

TABLE G-[illegible]BSORBENTS

MATERIAL/ TRADE NAME	VENDOR	PHYSICAL DATA	SORBENT RATIO passed 3 psi (wt liq/ wt)	SORBENT RATIO passed 20 psi (wt liq/ wt)	FORM CODE *	USE CODE *	HANDLING CODE *	NOTES - PRECAUTIONS
Cellulose (Naturally occurring & treated) (Super & Orig Pig)	New Pig Corporation 1-800-468-4647 1-800-621-7447 Fax	Sp Gr = n/a Non-hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	F	A,B	A	
Polypropylene (MATASORB) (MATASORB$_{sr}$ for anti-static applic.- (EconoSorb)	Matarah Industries, Inc. (800) 222-4799 Dist.-Pacific Marine Enviro (206) 282-3191	Sp Gr = .9 Non-hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = 3:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	F	A,B	A	All absorb oil only (other shapes and pricing available) (MATASORB$_{sr}$ absorbs 15x its weight- pricing available)
Polypropylene (Sorbx^2- Haz Mat)	Matarah Industries, Inc. (800) 222-4799 Dist.-Pacific Marine Enviro (206) 282-3191	Sp Gr = .9 Non-hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 3:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	A,B	B	For use on all fluids- oil and water based
Polypropylene/ Cellulose Combination (Sorb$_x$)	Matarah Industries, Inc. (800) 222-4799 Dist.-Pacific Marine Enviro (206) 282-3191	Sp Gr = n/a Non-hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 3:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	A,B	A	Absorb only non-aggressive fluids
Polymer Type (SpillCat) (SpillCat-W)	Spill Containment Systems (800) 324-8730 Dist.-Pacific Marine Enviro (206) 282-3191	Sp Gr = <1 Non-hazardous Incinerable (Nitrogen content accel. the bio-remediation process)	Aqueous Liq = 10:1 Petroleum Based Fluids = 5:1/10:1 Haz. Mat.- Acids 5:1/Caustics 10:1/ Solvents = 5:1/10:1	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 1:1/Caustics 3:1/ Solvents = 3:1	F	A,B	B	(SpillCat-W, Sp Gr >1, will absorb aqueous liquids)
Polypropylene (Powersorb Maintenance Sorbent)	3M Brand O H & S Products Division Bldg 220-3E-04 3M Center St. Paul, MN 55144-1000 Rep (612) 733-9486 Order from Rice Safety (509) 535-8800 (Spokane)	Sp Gr = .07 water = 1 Non-Hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 3:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	A,B	A	Use only with non-aggressive liquids

Form Code	Use Code	Handling Code
A - Blanket type sorbent B - Granular type sorbent C - Pillow type sorbent D - Wipe type sorbent E - Sock Type sorbent F - Various types	A - Acceptable for burial waste; meets minimum 20 psi test; may be non-combustible or combustible B - Acceptable for storage type waste; meets 3 psi test; must be combustible C - No pressure test information available D - Did not pass EPA type pressure test	A - No Special Equipment Needed B - Dust Mask Needed C - Skin Contact to be Avoided - Use Gloves D - Wear Eye Protection E - Threshold Limit Value on Exposure

TABLE G-1 ABSORBENTS

MATERIAL/ TRADE NAME	VENDOR	PHYSICAL DATA	SORBENT RATIO passed 3 psi (wt liq/ wt)	SORBENT RATIO passed 20 psi (wt liq/ wt)	FORM CODE *	USE CODE *	HANDLING CODE *	NOTES - PRECAUTIONS
Polypropylene (Powersorb General Purpose Oil Sorbent)	3M Brand O H & S Products Division Rep (612) 733-9486 Order from Rice Safety (509) 535-8800 (Spokane)	Non-Hazardous Incinerable	Petroleum Based Fluids = 3:1 Solvents = 1:1	Petroleum Based Fluids = 1:1 Solvents = 1:1	F	A,B	A	Use for oil sorbent only
Polypropylene (Powersorb Universal Sorbent)	3M Brand O H & S Products Division Rep (612) 733-9486 Order from Rice Safety (509) 535-8800 (Spokane)	Sp Gr = .07 Non-Hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 1:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	A,B	A	Acids/caustics above 75% should not be absorbed
Sphagnum Moss (Oylgone)	Inter. Enviroguard Systems Corpus Christi, Texas (Tom White) (800) 345-5972 (512) 854-3547 Fax	Sp Gr = n/a Non-Hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = n/a	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = n/a	F	A,B	B, D	For hydrocarbons-do not absorb caustics or acids
Mineral Ore Fines (FumeAway)	Inter. Enviroguard Systems Corpus Christi, Texas (Tom White) (800) 345-5972 (512) 854-3547 Fax	Sp Gr = 2.3 Non-Hazardous High Ash	Aqueous Liq = 1:1 Oil Based Liq = n/a Haz. Mat.- Acids/Caustics/ Solvents = n/a	Aqueous Liq = 1:1 Oil Based Liq = n/a Haz. Mat.- Acids/Caustics/ Solvents = n/a	B, D	A	B, D	Do not absorb bleach (does not absorb oil based produces)
Polypropylene (Universal Sponge)	BREG International P.O. Box 607 Sparks, NV 89432-0607 Rep. Michael E. Neuman 1-800-443-2734	Sp Gr = N/A Non-Hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 3:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	C	B, C, D	For aggressive & non-aggressive fluids
Polypropylene (Oil Only Sponge)	BREG International P.O. Box 607 Sparks, NV 89432-0607 Rep. Michael E. Neuman 1-800-443-2734	Sp Gr = N/A Non-Hazardous Incinerable	Aqueous Liq =n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = n/a	Aqueous Liq =n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = n/a	F	C	B, C, D	For Petroleum based fluids only

Form Code	Use Code	Handling Code
A - Blanket type sorbent B - Granular type sorbent C - Pillow type sorbent D - Wipe type sorbent E - Sock Type sorbent F - Various types	A - Acceptable for burial waste; meets minimum 20 psi test; may be non-combustible or combustible B - Acceptable for storage type waste; meets 3 psi test; must be combustible C - No pressure test information available D - Did not pass EPA type pressure test	A - No Special Equipment Needed B - Dust Mask Needed C - Skin Contact to be Avoided - Use Gloves D - Wear Eye Protection E - Threshold Limit Value on Exposure

TABLE G-[illegible]BSORBENTS

MATERIAL/ TRADE NAME	VENDOR	PHYSICAL DATA	SORBENT RATIO passed 3 psi (wt liq/ wt)	SORBENT RATIO passed 20 psi (wt liq/ wt)	FORM CODE *	USE CODE *	HANDLING CODE *	NOTES - PRECAUTIONS
Cellulose (Basic Sponge)	BREG International P.O. Box 607 Sparks, NV 89432-0607 Rep. Michael E. Neuman 1-800-443-2734	Sp Gr = N/A Non-Hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = 3:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	F	C	B, C, D	For non-aggressive fluids
Superabsorbent polymer - polyacrylate type (RADPADS) (RADSORB)	ENVIRONMENTAL SCIENTIFIC INC. P.O. Box 13486 Research Triangle Park North Carolina 27709-3486 (919) 941-0847	Non-Hazardous Incinerable	Aqueous Liq = 30:1 Petroleum Based Fluids = n/a Haz. Mat.- Acids/Caustics/ Solvents = n/a	Aqueous Liq = 10:1 Petroleum Based Fluids = n/a Haz. Mat.- Acids/Caustics/ Solvents = n/a	F	A, B	B, D	No strong oxidizers Anti-corrosion Radpads available. Normal use should between pH 6 & 9. At Ph <1 or >14 this product will break down.
Polypropylene (Oil Dri)	Oil Dri Corp. 4035 Nine/Mcfarland Drive Alpharetta, Georgia 30201 1-800-233-1959 1-800-233-8550 Fax	Sp Gr = n/a Non-hazardous Incinerable	Aqueous Liq = n/a Petroleum Based Fluids = 3:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	Aqueous Liq = n/a Petroleum Based Fluids = 1:1 Haz. Mat.- Acids/Caustics/ Solvents = 1:1	A, C, D, E	A,B	A	Oil only sorbent
Treated Polypropylene & Polyethylene (Oil Dri-Haz Mat)	Oil Dri Corp. 4035 Nine/Mcfarland Drive Alpharetta, Georgia 30201 Steve Ashmore 1-800-634-0315	Sp Gr = n/a Non-hazardous Incinerable	Aqueous Liq = 3:1 Petroleum Based Fluids = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 1:1	Aqueous Liq = 1:1 Petroleum Based Fluids = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	A,B	A	For full Ph range fluids
Polypropylene (Universal SIR)	Sorbent Products Co., Inc. (Joe Clancy) (800) 333-7672 Globel Diving (Mike Helms) (206) 623-0621	Sp Gr = .88-.92 Non-hazardous Incinerable	Aqu Liq = 3:1 Petroleum Based = 5:1 Haz. Mat.- Acids 5:1/Caustics 5:1/ Solvents = 3:1	Aqu Liq = 1:1 Petroleum Based = 1:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 1:1	A	A,B	B	For non-aggressive fluids
Polypropylene (Universal Plus)	Sorbent Products Co., Inc. (Joe Clancy) (800) 333-7672 Globel Diving (Mike Helms) (206) 623-0621	Sp Gr = .90-.95 Non-hazardous Incinerable	Aqu Liq = 3:1 Petroleum Based = 3:1 Haz. Mat.- Acids 3:1/Caustics 3:1/ Solvents = 1:1	Aqu Liq = 1:1 Petroleum Based = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	F	A,B	B	No incompatibilities known

Form Code	Use Code	Handling Code
A - Blanket type sorbent B - Granular type sorbent C - Pillow type sorbent D - Wipe type sorbent E - Sock Type sorbent F - Various types	A - Acceptable for burial waste; meets minimum 20 psi test; may be non-combustible or combustible B - Acceptable for storage type waste; meets 3 psi test; must be combustible C - No pressure test information available D - Did not pass EPA type pressure test	A - No Special Equipment Needed B - Dust Mask Needed C - Skin Contact to be Avoided - Use Gloves D - Wear Eye Protection E - Threshold Limit Value on Exposure

TABLE G-1 ABSORBENTS

MATERIAL/ TRADE NAME	VENDOR	PHYSICAL DATA	SORBENT RATIO passed 3 psi (wt liq/ wt)	SORBENT RATIO passed 20 psi (wt liq/ wt)	FORM CODE *	USE CODE *	HANDLING CODE *	NOTES - PRECAUTIONS
Cellulose (K-Sorb)	Ecosorb International Corporation 11200 Westheimer, Suite 322 Houston, Texas 77045 (James Kuehne) (800) 551-9956	Sp Gr = >1 Non-hazardous Incinerable	Aqu Liq = 3:1 Petroleum Based = 3:1 Haz. Mat.- Acids 1:1/Caustics 3:1/ Solvents = 3:1	Aqu Liq = 1:1 Petroleum Based = 1:1 Haz. Mat.- Acids 1:1/Caustics 1:1/ Solvents = 1:1	B, C, E	A,B	B	For non-aggressive liquids

Form Code	Use Code	Handling Code
A - Blanket type sorbent	A - Acceptable for burial waste; meets minimum 20 psi test; may be non-combustible or combustible	A - No Special Equipment Needed
B - Granular type sorbent	B - Acceptable for storage type waste; meets 3 psi test; must be combustible	B - Dust Mask Needed
C - Pillow type sorbent	C - No pressure test information available	C - Skin Contact to be Avoided - Use Gloves
D - Wipe type sorbent	D - Did not pass EPA type pressure test	D - Wear Eye Protection
E - Sock Type sorbent		E - Threshold Limit Value on Exposure
F - Various types		

APPENDIX H

UNIFORM HAZARDOUS WASTE MANIFEST
For reference use by Hanford Site Generators

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A Uniform Hazardous Waste Manifest (Figure H-1) as required by Washington State Department of Ecology (Ecology), U.S. Environmental Protection Agency (EPA), and U.S. Department of Transportation (DOT) must accompany all shipments of wastes and mixed nonradioactive dangerous waste. Each waste shipment to a specific facility requires a separate manifest. The manifest is prepared by the generator and must be presented to the Hazardous Materials Operations (HMO) specialist at the time of the scheduled pretransport inspection.

NOTE: Segregation of hazardous materials is specified in 49 CFR 177.848. General requirements for loading and unloading hazardous materials are given in 49 CFR 177.834.

Required Information

NOTE: The manifest is a 5-carbon copy form. Use of a computer or typewriter when preparing manifests is strongly recommended. **All manifest copies must be legible. The transporter will not accept manifests that are illegible or contain numerous corrections.**

This information is provided for guidance for Hanford Site waste generators. The following information must be entered on each Uniform Hazardous Waste Manifest (the item numbers in parentheses refer to the item numbers in the manifest continuation page):

Item 1: (Item 21) — Enter the Hanford Site Generator EPA Identification Number,"WA 789 000 8967," and the unique manifest document number that is assigned by WHC Acceptance Services.

Item 2: (Item 22) — Enter the total number of pages used to complete the manifest (first page plus continuation sheets, excluding RMMA certifications).

Item 3: (Item 23) — Enter the generator's name and mailing address. For example:

DEPARTMENT OF ENERGY, RICHLAND OPERATIONS OFFICE
building/area
P.O. BOX 550, 2355 STEVENS DR., RICHLAND, WA 99352
(509) 373-#### ATT: I.M. GENERATOR MSIN

Item 4: (N/A) — Enter a telephone number where facility personnel may be reached.

Item 5: (Item 24) — Enter "Westinghouse Hanford Company" in this block. (Enter "Transporter __1__ in this block.)

Item D: (Item 0) — Enter the Transporter's telephone number.

Item 6: (Item 25) — Enter the Hanford USEPA ID number, "WA 789 000 8967."

Item 7:	Enter "N/A" in this block
Item 8: (Item 27)	Enter "N/A" in this block.

Item 9: (N/A) Enter the name and complete site address of the facility designated to receive the waste listed on the manifest.

Nonradioactive Dangerous Waste Storage Facility
616 Facility, 600 Area

Polychlorinated Biphenyl (PCB) Storage Facility
212-P Building, 200 North Area

Central Landfill Nonregulated Drum Storage Area
600 Area

Central Waste Complex
200 West Area

Item H: (N/A) Enter the receiving facility telephone number.

616 Facility	(509) 373-5013/373-5103
212-P Facility	(509) 373-3806
Central Landfill	(509) 376-6748
Central Waste Complex	(509) 373-5187

Item 10: (N/A) Enter the Hanford EPA Identification Number, "WA 789 000 8967."

Item 11: (Item 28) Enter the DOT Proper Shipping Name, Hazard Class or division number, Identification Number (UN/NA) and packaging group for each waste, as identified on the Hazardous Waste Disposal Analysis Record. For hazardous waste, an "X" is required in the HM column adjacent to the DOT description. For Hazardous Substance quantities, "RQ" (identifying Reportable Quantity) is required. Non-RCRA waste and waste not regulated by the EPA will have no marking in the HM box.

NOTE: If additional space is needed for waste descriptions, enter the additional information in Block J, page 1, or item 28, continuation sheet.

Item 12: (Item 29) Enter the number of containers for each waste and the appropriate abbreviation for the type of container(s).

DM	=	Metal drum, barrel, keg
DW	=	Wooden drum, barrel, keg
DF	=	Fiberboard or plastic drum, barrel, keg
TP	=	Tank, portable
TT	=	Cargo tank (tank truck)

TC	=	Tank car
DT	=	Dump truck
CY	=	Cylinder
CM	=	Metal box, carton, case
CW	=	Wooden box, carton, case
CF	=	Fiber or plastic box, carton, case
BA	=	Burlap, cloth, paper or plastic bag

Item 13: (Item 30) Enter the total quantity of waste described on each line. Containers and inner liners are not considered part of the waste when measuring or calculating the quantity of dangerous waste. In addition, only the weight of the residues in nonempty or nonrinsed containers or inner liners must be considered when determining waste quantities. All weights must be in kilograms.

Item 14: (Item 31) Enter the abbreviation K for kilogram. This is the only appropriate unit of measure.

Item I: (Item R) Enter the applicable waste number(s) for the waste that is described on each line. Use box J to add waste codes that do not fit in section I.

Item J: (Item S) Enter the PIN number, container type and indicate if waste is a labpack in this section. (Use box S for the continuation page.)

Item 15: (Item 32) Enter the emergency contact number (509) 373-3800 for all shipments that travel roads south of the Wye Barricade. The 911 number may be used as additional information. Shipments north of the Wye Barricade may use 911 or (509) 373-3800. If the waste being shipped contains PCBs, the out-of-service date and general waste description must be listed in this box. Generators may use this space to indicate special treatment, transportation, storage or disposal information, routine disposal analysis cross-reference number, or additional waste package information, as required.

Item 16: The generator must read, sign, and date the certification statement on behalf of the U.S. Department of Energy, Richland Operations Office (RL). This certification contains two parts. The first paragraph pertains to the transport of the shipment; the second paragraph is concerned with a generator waste minimization program.

Item K: The HMO specialist will sign and date this space following inspection to indicate generator compliance with the shipping requirements. Enter the storage cell information for waste being transported to the 616 Facility. This storage cell information will be stipulated on the Disposal Analysis Shipping Summary Table.

Item 17: (Item 33) The transporter must sign and date this block to acknowledge acceptance of the waste described on the manifest.

Item 18: (Item 34) Because Westinghouse Hanford Company (WHC) transports all hazardous waste, enter "N/A" in this block.

Item 19: (Item 35) The receiving facility operator must note in this space any significant discrepancy between the waste described on the manifest and the waste actually received at the facility.

Item 20: The receiving facility operator signs and enters the date of receipt in this space to certify receipt of hazardous materials covered by the manifest, except for discrepancies noted in Item 19.

NOTE: Do not add land ban information on the manifest.

Required Distribution

The following is a list of the required distribution for the manifest.

1. Upon completion of the preshipment inspection, the HMO Specialist will remove and retain "Transporter #2" copy of the manifest.

2. At the time of shipment, the generator will obtain the transporter's signature and remove and retain the "generator" copy of the manifest.

3. After obtaining the signature of the receiving facility operator, the transporter removes and retains the **"Transporter #1"** carbon copy of the manifest.

4. After signing the manifest, the receiving facility operator removes and retains the **"Treatment, Storage, and Disposal (TSD) Facility"** copy. The operator then forwards the original and remaining copies to Generator Services.

5. Generator Services makes a copy of the original for reference in the annual report and returns the original manifest to the generator.

NOTE: A generator who does not receive the original manifest within 35 days after shipment must contact the transporter, the receiving facility operator, and SWE to determine the status of the waste shipment.

Figure H-1 Uniform Hazardous Waste Manifest.

hrm 94

Please print or type. (Form designed for use on elite (12 pitch) typewriter.) Form Approved OMB No 2050-0039 Expires 9-30-94

UNIFORM HAZARDOUS WASTE MANIFEST	1. Generator's US EPA ID No W A 7 8 9 0 0 0 8 9 6 7	Manifest Document No 2 2 2 2 2	2. Page 1 of 1	Information in the shaded areas is not required by Federal law.

3. Generator's Name and Mailing Address
U.S. DEPARTMENT OF ENERGY, RICHLAND OPERATIONS, BLDG/AREA
P.O. BOX 550, 2355 STEVENS DR., RICHLAND, WA 99352
4. Generator's Phone (509) 376-#### ATT: GENERATOR/MSIN

A. State Manifest Document Number
B. State Generator's ID

5. Transporter 1 Company Name: WESTINGHOUSE HANFORD COMPANY — 6. US EPA ID Number: W A 7 8 9 0 0 0 8 9 6 7
C. State Transporter's ID
D. Transporter's Phone (509) 376-0971

7. Transporter 2 Company Name: N/A — 8. US EPA ID Number
E. State Transporter's ID
F. Transporter's Phone

9. Designated Facility Name and Site Address
DEPARTMENT OF ENERGY, RICHLAND OPERATIONS (616 NRDWSF)
P.O. BOX 550, 2355 STEVENS DR., RICHLAND, WA 99352
ATTN: JEFF PRATT T4-04
10. US EPA ID Number: W A 7 8 9 0 0 0 8 9 6 7
G. State Facility's ID
H. Facility's Phone (509) 373-5013

	HM	11. US DOT Description (Including Proper Shipping Name, Hazard Class and ID Number)	12. Containers No.	Type	13. Total Quantity	14. Unit Wt/Vol	I. Waste No.
a.		Non-RCRA Waste, Solid NONE NONE	1	CF	4.2	K	WT02
b.	X	Corrosive Solid, n.o.s.; 8; UN1759; PGII; (calcium hydroxide)	1	CW	2.2	K	WC01 D002
c.	RQ	Waste Flammable Liquid, n.o.s.; 3; UN1993; PG II; (D008)	1	DM	21.5	K	WT02 D001 D008
d.	X	Waste Compressed Gas, flammable, n.o.s.; 2.1; UN1954; (propane, isobutane); LTD. QTY.	1	DM	11.78	K	WT02 D001

J. Additional Descriptions for Materials Listed Above
11a.100K-92-002300 DOT 12B 65 FIBERBOARD BOX
11b.100K-92-002400 DOT 15A WOODEN BOX (D002-STATE ONLY)
11c.100K-92-002500 DOT 17H 30 GAL DRUM. LABPACK
11d.100K-92-002600 DOT 17C 5 GAL. DRUM

K. Handling Codes for Wastes Listed Above
11A.STORE IN ANY CELL
11B.STORE IN CS CELL
11C.STORE IN 1B CELL
11D.STORE IN 1A CELL

15. Special Handling Instructions and Additional Information
EMERGENCY CONTACT: (509) 373-3800

16. GENERATOR'S CERTIFICATION: I hereby declare that the contents of this consignment are fully and accurately described above by proper shipping name and are classified, packed, marked, and labeled, and are in all respects in proper condition for transport by highway according to applicable international and national government regulations.
If I am a large quantity generator, I certify that I have a program in place to reduce the volume and toxicity of waste generated to the degree I have determined to be economically practicable and that I have selected the practicable method of treatment, storage, or disposal currently available to me which minimizes the present and future threat to human health and the environment; OR, if I am a small quantity generator, I have made a good faith effort to minimize my waste generation and select the best waste management method that is available to me and that I can afford. ON BEHALF OF DOE-RO

Printed/Typed Name: GENERATOR NAME | Signature | Month Day Year

17. Transporter 1 Acknowledgement of Receipt of Materials
Printed/Typed Name | Signature | Month Day Year

18. Transporter 2 Acknowledgement of Receipt of Materials
Printed/Typed Name: N/A | Signature | Month Day Year

19. Discrepancy Indication Space

20. Facility Owner or Operator: Certification of receipt of hazardous materials covered by this manifest except as noted in Item 19.
Printed/Typed Name | Signature | Month Day Year

Style F15 REV-8 Printed by Labelmaster, An American Labelmark Co., Chicago, IL 60646 (800)621-5808 — EPA Form 8700-22 (Rev. 9-88) Previous editions are obsolete

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ORIGINAL - RETURN TO GENERATOR

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APPENDIX I

DEBRIS CHECKLIST

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Hazardous/Mixed Waste Debris Determination Checklist

NOTE. Completion of this form makes a preliminary determination of whether the waste generated is land disposal prohibited hazardous or mixed debris waste. The preliminary determination will be verified during the preparation of a Storage/Disposal Approval Record (SDAR) or Hazardous Waste Disposal Analysis Record (HWDAR). In evaluating the waste, consider the bulk of the waste stream (and not the container it is packaged in) rather than minor components. However, if minor components exist like those in Section 3.0, please note these in the comments section. When completing this checklist, use the best information available. Physical measurements or inspections are not necessarily required.

WASTE CHARACTERISTICS	Yes (Y) No (N) Unknown (UN)
1.0 Determine if the waste is dangerous or mixed waste.	
1.1 Is the waste a EPA hazardous or Washington State dangerous waste? If it is known to possess hazardous or dangerous constituents, then answer yes. If it is known to not possess hazardous or dangerous constituents, then answer no. Otherwise, answer unknown.	
If the answer is no to question 1.1, then the waste is not hazardous or mixed waste and the preparer is finished with this checklist. Go to box 4.0. If yes or unknown, then continue.	
2.0 Determine if the waste is a material that is not debris.	
2.1 Is the waste a liquid or gas? If the material requires a container to maintain its shape at room temperature, it considered a gas or liquid.	
2.2 Is the waste a process waste? Process wastes are incinerator ash, water treatment sludges, slag, vitrified material, air emission residues, and residues from the treatment of waste.	
2.3 Is the waste soil or fine-grained material? Soil, clay, absorbents, or any other fine-grained material that may be agglomerated or compacted to hold its shape.	
2.4 Is the waste cement that has been used to stabilize waste?	
2.5 Is the waste intact containers? Intact containers are defined as unruptured and able to contain at least 75 percent of original volume capacity.	
2.6 Does the waste possess a specific treatment standard? The EPA has promulgated treatment standards found in 40 CFR parts 268.41, 268.42, or 268.43. At present the only known waste-specific treatment standards that are also debris are batteries or radioactively contaminated lead metal (not salts of lead!).	

WASTE CHARACTERISTICS	Yes (Y) No (N) Unknown (UN)
2.7 Is the waste primarily smaller than 2.5 in.? At least 50 percent of the material must be smaller than 2.5 in. in all dimensions.	
If any one of the answers provided in section 2.0 is yes, then the waste is not a debris, and the preparer is finished with this checklist. Go to box 4.0. If all the answers are no or unknown, then continue.	
3.0 Determine if the waste is a debris material.	
3.1 Is the waste a manufactured object? Manufactured objects are equipment, tools, pipe, cloth, glass, plastic, rubber, concrete, etc.	
3.2 Is the waste plant or animal material? Plant or animal materials are tumble weeds, animals, wood, etc.	
3.3 Is the waste natural geologic material? Natural geologic materials are rocks, course gravel, etc.	
<u>THE WASTE IS HAZARDOUS DEBRIS</u> If the answer to any one question in section 3.0 is yes, then the waste is a hazardous or mixed debris waste. Please so indicate by placing yes in this row. If the all the answers in section 3.0 are no or unknown, then further evaluation is required. Please so indicate by placing unknown in this row.	
<u>4.0 THE WASTE IS NOT HAZARDOUS DEBRIS</u> Because conditions in section 1.0 or 2.0 were failed, the waste is not hazardous debris. Please so indicate by placing a yes in this row.	
Comments: Preparer: Name: Date: Tel. #:	

APPENDIX J

RELEASE OF NONRADIOACTIVE DANGEROUS WASTE FOR OFFSITE DISPOSAL

For Hanford Site Waste Generators Only

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DEFINITIONS

The following definitions will be used throughout the body of this text. Because several of the terms below have been abbreviated, the definitions are only applicable to this appendix.

No Radiation Added (NO-RAD Added): Any waste material that:

- Contains no measurable increase in bulk or volume radioactivity (at a 95% confidence level above background) resulting from DOE Operations except for wastes specifically exempted by EPA, DOE, or NRC regulations

- Contains no surface radioactivity above limits established in DOE Order 5400.5

No Potential For Internal Contamination (NPIC) Waste: A hazardous or TSCA waste that was generated in a listed RMMA, but, there is no potential for volume contamination. NPIC waste can be:

- In a form which could not be internally contaminated (aerosol cans, sealed containers, fluorescent light tubes, etc.).

- Through process knowledge, it is known that there is no potential for the waste to be volume contaminated.

NPIC wastes must meet the surface contamination release requirements of DOE Order 5400.5.

Naturally Occurring Radioactive Material (NORM) Waste: A NORM waste is a waste that has NORM in it's matrix. A typical example of a NORM waste is water with potassium chloride (containing a percentage of K^{40}), which is commonly used for ice melt.

Process Knowledge: Specific knowledge on the origin, storage, use, and potential exposure of a regulated waste material to radiological contamination. Process knowledge is used to determine if a regulated waste has the potential to be radioactively contaminated. Process knowledge on a regulated waste must be formally certified by the facility waste generator (FWG or generator). If a generator does not have process knowledge of a waste stream, the waste will be managed as if it is potentially both internally and externally contaminated.

Radioactive Materials Management Area (RMMA): An area in which the potential exists for contamination because of the presence of unencapsulated or unconfined radioactive material or an area that is exposed to beams or other sources of particles (neutrons, protons, etc.) capable of causing activation. A listing of RMMAs is available from Westinghouse Hanford Company Solid Waste Disposal Generator and Data Services.

__Radioactive Waste__: Any waste managed/regulated for its radioactive content.

__Regulated Waste__: A waste whose disposal is regulated under the requirements of 40 Code of Federal Regulations (CFR) Part 261 (RCRA), 40 CFR Part 761 (PCBs), and/or the *Washington Administrative Code* (WAC) 173-303.

FACILITY WASTE GENERATOR (FWG/Generator) RESPONSIBILITIES

In this section, the methods used by a Generator for determining that no radiation was added to their regulated wastes are outlined. Each step corresponds to the decision tree illustrated on Figure J-1.

1) When a regulated waste is identified which requires disposal, the FWG/generator) determines, through process knowledge, if the waste was generated or stored in an RMMA. If the waste was not generated/stored in an RMMA, the generator proceeds to Step 2. If the waste was generated or stored in an RMMA, or if the generator does not believe that his/her process knowledge is adequate, the generator proceeds to Step 4.

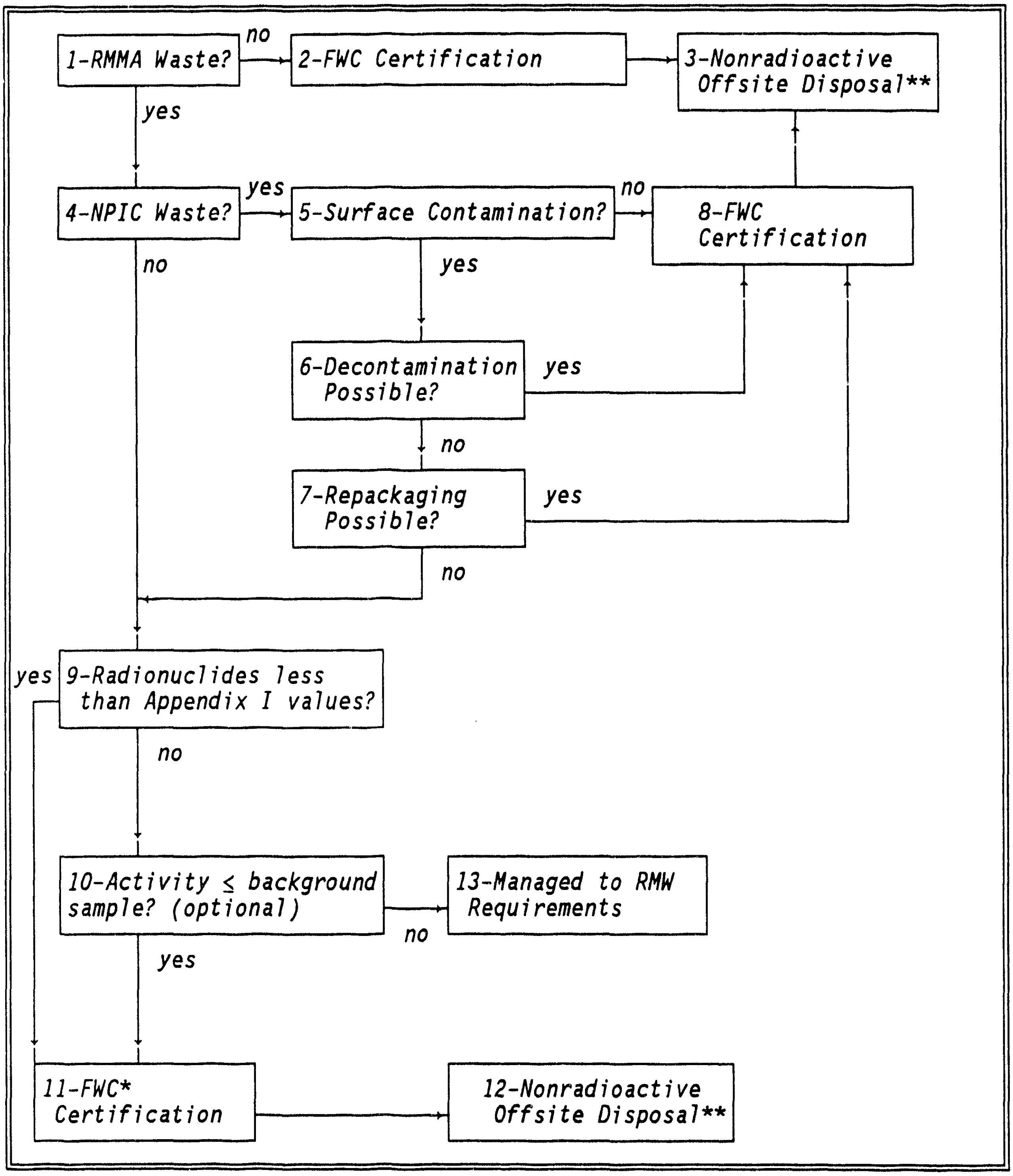
2) The generator completes the waste certification on Figure J-2a. This certification must accompany the waste shipment.

3) The waste is shipped for disposal. Before leaving the Hanford Site, all wastes are given an external survey to the requirements of DOE Order 5400.5.

4) The Generator determines if the RMMA waste has no potential for internal contamination (NPIC). An RMMA waste qualifies as NPIC if it is in a form which could not be internally contaminated (e.g. aerosol cans, sealed containers, fluorescent light tubes), or, if through process knowledge it is known that there is no potential for the waste to be volume contaminated. If the waste has no potential for internal contamination, the generator proceeds to Step 5. If the waste does not qualify as NPIC, the generator proceeds to Step 9.

5) To be released, NPIC wastes must meet the surface contamination release requirements of DOE Order 5400.5. If there is no surface contamination, the generator proceeds to Step 8. If there is surface contamination, the generator proceeds to Step 6.

FIGURE J-1 Decision Tree for Release of Hazardous and PCB Waste



* The waste's packaging must meet the surface contamination release limits of DOE Order 5400.5. If contamination is discovered on the waste package's exterior at this point, the FWC must go back to Step 5.

** Before leaving the Hanford Site, all wastes are given an external survey to the requirements of DOE Order 5400.5.

6) If the container holding an NPIC waste has surface contamination, the generator will attempt to decontaminate the containers exterior. If decontamination is possible, the generator proceeds to Step 8. If decontamination is not possible, the generator proceeds to Step 7.

7) If the NPIC waste can be transferred from the contaminated exterior container into another container, without contaminating the NPIC waste, the generator proceeds to Step 8. If it is not possible to repackage without potentially contaminating the NPIC waste, the waste is removed from its contaminated packaging and the generator proceeds to Step 9.

8) The generator completes the NPIC waste certification located in Figure J-2b. This certification must accompany the waste shipment.

9) When a potential for radioactive contamination of the waste exists, and cannot be adequately resolved by process knowledge, certification of the absence of radioactive material is based on radiological survey, sampling, and analytical data. The generator, following SW-846 Methods, obtains a representative sample of the waste. Radionuclide analysis is performed using the methods specified in Table J-1a. Measurements found to be less than the LLD quantities listed in Table J-1b for the isotopes of concern will demonstrate that no radioactivity has been added and the generator proceeds to Step 11. If the measurements are greater than the Table J-1b limits, the generator proceeds to Step 10.

10) This step, which is optional, is applicable to hazardous wastes that:

- Potentially contain or are contaminated with Naturally Occurring Radioactive Materials (NORM)
- are potentially contaminated with non-NORM radioactive materials
- are potentially activated, or
- have potentially higher concentrations of the NORM constituents than those originally present in the virgin material, from which the waste was derived.

A sample must be prepared using virgin (non-RMMA) materials in the same concentrations as the waste for a comparison sample. The criteria for determining that no radioactivity was added, or that the concentration(s) of NORM constituents were not increased by DOE operations, will be:

- If activity in the waste is less than or equal to the activity in the virgin sample. After obtaining "less than or equal to" measurements, the generator proceeds to Step 11.
- If activity in the waste is being generated by radionuclides that were not present in the RMMA as the result of DOE Operations, the generator proceeds to Step 11.

If the waste stream does not fall within the two criteria above, the generator would proceed to Steps 13 or 14.

It should be noted that because of the complexity of some waste streams, performing comparison sample analysis to release the waste will not always be possible.

11) The generator completes waste certification on Figure J-2c (for $\leq$ LLDs) or certification J-2d. The certification must accompany the waste shipment.

12) Offsite nonradioactive waste disposal. See Step 3 for additional information. Before leaving the Hanford Site, all wastes are given an external survey to the requirements of DOE Order 5400.5.

13) The generator designates the waste as "mixed" and arranges to have the waste shipped from the individual generating facility to the Central Waste Complex (CWC) interim status TSD facility for storage. The mixed waste will remain at CWC until treatment and/or disposal options are available.

14) The generator arranges to have the mixed waste shipped offsite for disposal at a NRC licensed (or an agreement state) TSD Facility for treatment. A variance from the disposal requirements of DOE order 5820.2A (e.g., ash return) would be necessary to allow the offsite TSD to dispose of the waste.

Figure J-2a. Non-RMMA Waste Certification

The undersigned certifies that, to the best of his/her knowledge, that the waste addressed on uniform hazardous waste manifest/item number____________/__________ was not generated or stored in an area where there is a potential for contamination because of the presence of unencapsulated or unconfined radioactive material, or, an area that is exposed to beams or particles capable of causing activation (neutrons, protons, etc.). The waste's container has met all of the external radiation release requirements of the WHC-CM-1-6 (WHC Radiological Control Manual) and DOE Order 5400.5.

Description of Process
Knowledge:____

Name (print)	Signature	Date
Title	Facility	Contractor

Figure J-2b. NPIC Waste Certification

The undersigned certifies that, to the best of his/her knowledge, that the waste addressed on uniform hazardous waste manifest/item number__________/__________ was generated or stored in an area where there is a potential for contamination because of the presence of unencapsulated or unconfined radioactive material.

It is additionally certified that while the waste was in the location described by the paragraph above, the waste was in a form or location which could not be internally contaminated (aerosol cans, sealed containers, fluorescent light tubes, etc.). The waste's exterior and/or container have additionally met all of the external radiation release requirements of WHC-CM-1-6 (WHC Radiological Control Manual) and DOE Order 5400.5.

Description of Process
Knowledge:____

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Name (print)	Signature	Date
Title	Facility	Contractor

Figure J-2c. RMMA Waste Certification

The undersigned certifies that, to the best of his/her knowledge, that the waste addressed on uniform hazardous waste manifest/item number________/________ was generated or stored in an area where there is a potential for contamination because of the presence of unencapsulated or unconfined radioactive material, or, an area that is exposed to beams or particles capable of causing activation (neutrons, protons, etc.).

It is additionally certified that all of the activity levels for the radionuclides of concern are either 1) less than the LLD's specified in WHC-EP-063 revision 4, Chapter 9 Table I, or; 2) that the activity levels identified in the waste did not originate from a DOE generated isotope or it's daughter products (this indicates the presence of NORM). The waste's container has met all of the external radiation release requirements of WHC-CM-1-6 (WHC Radiological Control Manual) and DOE Order 5400.5.

Description of Process
Knowledge:____

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Laboratory used for analysis (attach lab report)______________________

List all radionuclides which could have been present in the waste:

__________ __________ __________ __________

__________ __________ __________ __________

____________________	____________________	__________
Name (print)	Signature	Date
____________________	____________________	__________
Title	Facility	Contractor

Figure J-2d. Norm Waste Certification

The undersigned certifies that, to the best of his/her knowledge, that the waste addressed on uniform hazardous waste manifest/item number________/________ was generated or stored in an area where there is a potential for contamination because of the presence of unencapsulated or unconfined radioactive material, or, an area that is exposed to beams or particles capable of causing activation (neutrons, protons, etc.).

It is additionally certified that all of the activity levels for the NORM constituents in the waste were less than or equal to the activity levels in a virgin comparison sample of NORM waste. The waste's container has met all of the external radiation release requirements of WHC-CM-1-6 (WHC Radiological Control Manual) and DOE Order 5400.5.

Description of Process
Knowledge:____

Laboratory used for analysis (attach lab report)____________________

Name (print)	Signature	Date
Title	Facility	Contractor

TABLE J-1a. Radioanalysis Techniques Used for Analysis

Matrix	Analysis Group	Technique
water	gross alpha/beta activity	proportional counting
	gamma emitters	gamma energy analysis
	beta specific emitters	proportional counting* liquid scintillation* low energy photon spec. (I-129)*
	radium alpha emitters	alpha scintillation* proportional counting*
	specific actinide emitters	alpha energy analysis* laser kinetic phpos. (U chem)*
soil/other	gross alpha/beta activity**	proportional counting
	gamma emitters	gamma energy analysis
	beta specific emitters**	proportional counting* liquid scintillation* low energy photon spec. (I-129)*
	radium alpha emitters**	alpha scintillation* proportional counting*
	specific actinide emitters**	alpha energy analysis* laser kinetic phpos. (U chem)*

*Specific radionuclide analysis requiring chemical separation procedure processing.

**Soil/Other matrix samples requiring chemical dissolution prior to chemical separation/counting.

Table J-1b. Required Lower Limits of Detection for Radionuclides

ANALYSIS	LIMIT	UNITS	LIMIT	UNITS
	WATER		SOIL, OTHER	
Gross Alpha	3*	pCi/l	5*	pCi/g
Gross Beta	4**	pCi/l	10**	pCi/g
Gamma Emitters	50	pCi/l	10	pCi/g
Co-60	50		10	
Cs-137	50		10	
Eu-152	50		10	
Eu-154	50		10	
Eu-155	NA		2	
Ra-226	NA		2	
Ra-228	50		10	
Report Any Detectable Isotope				
Beta Specific Emitters				
Tritium	400	pCi/l	400	pCi/g
C-14	200	pCi/l	50	pCi/g
Ni-59	30	pCi/l	30	pCi/g
Ni-63	30	pCi/l	30	pCi/g
Se-79	TBD***	pCi/l	TBD***	pCi/g
Sr-89	5	pCi/l	10	pCi/g
Sr-90	2	pCi/l	10	pCi/g
Tc-99	30	pCi/l	30	pCi/g
I-129	25	pCi/l	25	pCi/g
Ra-228 (via Ac-228 daughter)	3	pCi/l	by GEA****	pCi/g
Radium Alpha Emitters				
Ra-226 (via Rn-222 daughter)	2	pCi/l	by GEA	pCi/g
Gross Radium	2	pCi/l	5	pCi/g
Specific Actinide Emitters				
Isotopic Thorium (Th-228, 230, 232)	2*****	pCi/l	2*****	pCi/g
Isotopic Uranium (U-234, 235, 238)	2*****	pCi/l	2*****	pCi/g
Total Uranium (Chemical Analysis)	0.2	ug/l	2	ug/g
Np-237	2	pCi/l	2	pCi/g
Pu-238	2	pCi/l	2	pCi/g
Pu-239/240 (sum)	2		2	
Pu-241	20		20	
Am-241	2	pCi/l	2	pCi/g
Cm-244	2	pCi/l	2	pCi/g

*Applies only if the absence of alpha emitting radionuclides with lower LLDs is known.
**Applies only if the absence of beta emitting radionuclides with lower LLDs is known.
***Se-79 is basically a "Hanford Reactor Specific" isotope and analytical methods have not been established. (expected to be comparable to C-14). Detection limits are to be established tentatively by January 1994.
****Gamma Energy Analysis
*****Signifies 2 pCi/l (or 2 pCi/g respectively) for each isotope. It should be noted that the analysis will not differentiate between some isotopes (ie. analysis will not differentiate between U-235 and U-236).

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APPENDIX K

RADIONUCLIDE CONTENT

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K.1 Hanford Site Practices

K.1.1 Introduction

To classify radioactive waste for disposal a generator must make two basic determinations: (1) whether the waste acceptable for near-surface disposal, and (2) if acceptable for near-surface disposal, whether the waste is classified as Category 1 or Category 3, which dictates the waste disposal handling requirements. Wastes are determined to be acceptable for near-surface disposal and placed in to one of the categories by comparison of radionuclide concentrations in the waste to concentration limits for each radionuclide. Thus, the process of determining the waste disposal requirements hinges on determining the radionuclide content of the waste.

K.1.2 Waste Analysis

The following methods, or combination of the following methods, may be used to determine the radionuclide content and concentrations in the waste.

1. Materials Accountability
2. Knowledge of Source
3. Computer Modeling
4. Direct Measurement
5. Scaling Factors

Because the optimum analysis regime is heavily dependent on waste composition and activity level, the waste generator is responsible for the specifics of the waste analysis plan. **This sample waste analysis plan for Hanford plutonium manufacturing waste has been included to serve as a reference for generators of this and other materials.**

K.1.2.1 Materials Accountability

The concentration of radionuclides in process waste may be inferred by strict accountability of radioactive materials entering and exiting the specific process. This method may also be used to determine the absence of particular nuclides. For example, a generator who uses only tritium would not need to measure the waste stream for other isotopes, such as fission products. This procedure is useful for generators who process a limited number of radionuclides in known concentrations (e.g., holders of source material).

K.1.2.2 Knowledge of Source

This method is similar to the materials accountability method and involves determining the radionuclide content and classification of waste through knowledge and control of the source of the waste. This method is useful for processes where radionuclide concentrations are relatively constant and unaffected by minor variations in the process.

This method is also useful in determining the absence of particular radionuclides from a given waste stream. Composition information for the source material should be reviewed for the presence of Table 3-1 nuclides to determine which nuclides warrant further investigation. An example knowledge-of-source analysis for plutonium manufacturing waste is included below.

^{10}Be. Beryllium-10 is not produced directly from fission. It is primarily produced from neutron activation of ^{9}Be. Although beryllium has been used as a reactor control material, it was not added to Hanford fuel rods. As a result, ^{10}Be is not normally present in plutonium manufacturing source materials.

^{36}Cl. Chlorine-36 is not produced directly from fission. It is primarily produced from neutron activation of ^{35}Cl, however this source term is negligible because chlorine is not normally present in Hanford reactor fuel and cladding materials.

^{40}K. Potassium-40 is not produced directly from fission. It is primarily produced from neutron activation of ^{39}K, however this source term is negligible because potassium is not normally present in Hanford reactor fuel and cladding materials.

^{59}Ni. Nickel-59 is not produced directly from fission. It is primarily produced from neutron activation of ^{58}Ni, however this source term is negligible because nickel is only found in trace amounts in Hanford reactor fuel and cladding materials.

^{63}Ni. Nickel-63 is not produced directly from fission. It is primarily produced from neutron activation of ^{62}Ni, however this source term is negligible because nickel is only found in trace amounts in Hanford reactor fuel and cladding materials.

^{93}Mo. Molybdenum-93 is not produced directly from fission. It is primarily produced from neutron activation of ^{92}Mo, however this source term is negligible because molybdenum is only found in trace amounts in Hanford reactor fuel and cladding materials.

^{133}Ba. Barium-133 is not produced directly from fission. It is also shielded by stable ^{133}Cs so that decay of mass number 133 fission products does not produce ^{133}Ba. Barium-133 is primarily produced from neutron activation of ^{132}Ba, however this source term is negligible because barium is not normally present in Hanford reactor fuel materials. In addition, ^{132}Ba comprises only 0.101 % of natural barium.

^{150}Eu. Europium-150 is not produced directly from fission. It is also shielded by stable ^{150}Sm so that decay of mass number 150 fission products does not produce ^{150}Eu. It is not appreciably produced from neutron activation because the target material (^{149}Eu) does not have a measurable absorption cross-section. ^{150}Eu is primarily produced by proton irradiation of ^{150}Sm, and as a result should not appear in plutonium manufacturing waste.

^{152}Gd. Gadolinium-152 is not produced directly from fission. It is also shielded by stable ^{152}Sm so that decay of mass number 152 fission products do not produce ^{152}Gd. It is not appreciably produced from neutron activation because the target material (^{151}Gd) does not have a measurable absorption cross-section. Gadolinium-152 is primarily produced by proton irradiation of ^{151}Eu, and as a result should not appear in plutonium manufacturing waste.

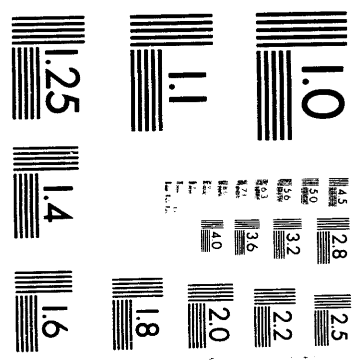
^{187}Re. Although natural Re has been considered for use as a nuclear control or poison material, it is too costly for general use. Re is not routinely used in reactor core materials and is unlikely to appear in most waste streams.

^{209}Po. Polonium occurs in trace amounts (approx. 100 μg/ton) in uranium ores, with ^{209}Po a small fraction of that total. Polonium-209 is also not produced by neutron activation or fission product decay. Polonium-209 is not routinely used in reactor core materials and is unlikely to appear in plutonium manufacturing waste.

^{210}Pb. Lead-210 is not produced from fission or neutron activation. It is primarily produced as a decay product of ^{226}Ra. Radium occurs naturally in trace amounts (approx 140 mg/ton) in uranium ore, thus the production of ^{210}Pb is negligible except for concentrated radium waste.

^{226}Ra. Radon-226 is created by the decay of ^{234}U and ^{238}U, and as a result is found in natural uranium ores in equilibrium with the uranium activity. Processing techniques to prepare uranium for use as a nuclear fuel generally strip the majority of the radium, so the activity of radium will be much less than uranium. Ingrowth of radium into processed uranium begins immediately, however this process takes in excess of 1 x 10^6 years to reach equilibrium and does not materially contribute to the radium inventory during the time period of waste generation and disposal. For the maximum enrichment used at Hanford, radium ingrowth at 20 years generates 4.95 x 10^{-7} Ci/MT of radium activity.

Comparison of ^{226}Ra activity with that of major activity sources in nuclear fuels clearly demonstrates that ^{226}Ra activity may be safely ignored. For example, at the absolute worst-case of ^{226}Ra activity in equilibrium, ^{226}Ra activity is only 1/10,000 of the



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^{90}Sr activity. Comparing these relative activity levels to their respective Table 4-1 limits shows that.

$$\frac{A^{Ra-226}/Ra\text{-}226\,limit}{A^{Sr-90}/Sr\text{-}90\,limit} = \left(\frac{1}{10{,}000}\right)\times\left(\frac{4.3\times10^{-03}}{1.4\times10^{-04}}\right) = 0.003$$

Thus, even at worst-case the ^{226}Ra contribution to the sum of fractions is negligible in comparison to the more significant radionuclides.

^{228}**Ra.** Radon-228 is produced by decay of ^{232}Th. Radon-228 reaches secular equilibrium in approximately 50 years, thus ^{228}Ra ingrowth is significant during the waste generation and disposal cycle. As a result, at worst case the ^{228}Ra activity will be equal to the ^{232}Th activity. However, because the half-life of ^{228}Ra is significantly lower than ^{232}Th, (5.76 years versus 1.41 x 10^{10} years) the allowable limit for radium is orders of magnitude larger than ^{232}Th. Comparison of activity levels and limits shows that.

$$\frac{A^{Ra-228}/Ra\text{-}228\,limit}{A^{Th-232}/Th\text{-}232\,limit} = \left(\frac{1}{1}\right)\times\left(\frac{1.2\times10^{-04}}{1.9\times10^{+01}}\right) = 6.32\times10^{-06}$$

Thus, even at worst-case the ^{228}Ra contribution to the sum of fractions is negligible in comparison ^{232}Th.

K.1.2.3 Computer Modeling

Certain nuclear processes may be accurately modeled by computer code. If available, validated computer code may be used to supplement knowledge-of-source analysis by showing that certain radionuclides are insignificant in the source material. Computer models may also be used to develop scaling factors (see section K.1.2.5). Two examples of computer modeling for plutonium manufacturing waste are included below.

Simulation of fission processes may be used to determine the significance of many nuclides of interest in plutonium manufacturing source material. Validated ORIGEN 2 code available from Battelle Pacific Northwest Laboratories was used to develop radionuclide activities for a representative sample of weapons-grade plutonium source material. The weapons-grade ORIGEN 2 run was based on.

1. Hanford N Reactor Mark IV fuel, 0.947 % enrichment, zirconium cladding.
2. Operation to a burnup of 1000 MWD/MT to simulate weapons-grade production (6% by wt. nominal ^{240}Pu content). Duration of operation was approximately 100 days.
3. Power density of 10 MW/MTU, representative of N Reactor.
4. Activities at reactor shutdown and after decay periods of 1 year, 20 years and 40 years were calculated.

Maximum calculated activities for each radionuclide from the above ORIGEN 2 model have been included in Table K-1. An ORIGEN 2 run for fuels-grade plutonium was also used to evaluate the effects of longer operation on transuranic nuclide activities. The fuels-grade ORIGEN 2 run was based on.

1. Hanford N Reactor Mark IA fuel, 0.947 % and 1.25 % concentric enrichments, zirconium cladding.
2. Operation to a burnup of 3000 MWD/MT to simulate fuels-grade production (12% by wt. nominal ^{240}Pu content).
3. Power density of 10 MW/MTU, representative of N Reactor.
4. Activities were calculated at 180 days after reactor shutdown.

This simulation produced much more conservative plutonium and transuranic activities, and was therefore used for plutonium and transuranic scaling factors. Calculated activities for the fuels-grade ORIGEN 2 run have been included in Table K-2.

Absolute activities are not as useful for disposal analysis as the limit fraction (nuclide activity divided by the Table 3-1 limit). A large limit fraction indicates that the nuclide in question is close to its limit and will contribute significantly to the disposal category determination. Conversely, a low limit fraction indicates that the nuclide activity is negligible from a disposal perspective.

Comparison of the limit fractions for the activities in Table K-1 shows that the following nuclides are negligible in plutonium manufacturing waste. ^{3}H, ^{14}C, ^{79}Se, ^{93}Zr, ^{107}Pd, ^{113m}Cd, ^{121m}Sn, ^{129}I, ^{135}Cs, ^{147}Sm, ^{151}Sm, ^{152}Eu, ^{154}Eu, ^{229}Th, ^{230}Th, ^{232}Th and ^{231}Pa. Comparison of the ^{239}Pu limit fraction to the other plutonium limit fractions shows that ^{244}Pu is also negligible. Similarly, comparison of the ^{244}Cm limit fraction to other curium limit fractions shows that ^{245}Cm, ^{246}Cm, ^{247}Cm and ^{248}Cm are negligible.

K.1.2.4 Direct Measurement

The concentrations of all radionuclides in the waste may be directly measured by laboratory analytical techniques. This method is useful to generators who process a limited number of radionuclides, and may also be used to generate scaling factors to simplify future analysis (see section K.1.2.5). The measurement techniques chosen depend on the radionuclides of interest and the activity level of the material, however the lower limit of detection for the technique selected should not exceed 0.01 times the Category 1 limit in Table 3-1. Table 3-1 radionuclides and their respective direct measurement techniques are listed below.

Measurement Techniques

Analysis Group	Nuclides from Table 3-1	Technique
Gamma Emitters	^{40}K, ^{60}Co, ^{137}Cs, ^{152}Eu, ^{154}Eu, ^{210}Pb, ^{226}Ra, ^{235}U, ^{239}Pu, ^{241}Pu, ^{241}Am, ^{243}Am	Gamma Energy Analysis (Short List)
Beta Specific Emitters	^{3}H, ^{14}C, ^{59}Ni, ^{63}Ni, ^{79}Se, ^{90}Sr, ^{99}Tc, ^{129}I	Proportional Counting[1] Liquid Scintillation[1] Low Energy Photon Spec. (^{129}I)[1]
Radium Alpha Emitters	^{226}Ra, ^{228}Ra	Alpha Scintillation[1] Proportional Counting[1]
Uranium	^{232}U, ^{233}U, ^{234}U, ^{235}U, ^{236}U, ^{238}U	Laser Kinetic Phosphorescence (U Chem)[1,2]
Specific Actinide Emitters	^{237}Np, $^{239/240}Pu$, ^{241}Am, ^{242}Cm, $^{243/244}Cm$	Alpha Energy Analysis1

1 Requires chemical separation procedures.
2 Measures only total uranium, no isotopic information generated.

For many waste streams, obtaining a representative sample for laboratory use may be difficult or impossible, and some judgement will be necessary to determine sampling adequacy (e.g., a pump or valve which has been contaminated with radioactive tank waste). In such cases smear samples may be used for laboratory analysis, or the contaminant material (tank waste) may be directly sampled to obtain a representative radionuclide distribution.

It may also be impossible to directly measure how much contaminant material is present on the waste item. In such cases, indirect calculation of radioactive content may be performed using radiation measurements, waste composition information and the waste geometry. The most accurate methods available should be used to indirectly calculate the amount of contaminant materials.

K.1.2.5 Scaling Factors

Radionuclides may be roughly organized into two groups. (1) those which are amenable to direct measurement by the generator (e.g., gamma energy analysis or assay equipment) and (2) those which require more costly and time consuming analysis which is generally beyond the capability of the generator (e.g., chemical separation and alpha/beta analysis). To simplify the determination of group 2 isotope activities, activity ratios may be established for a given waste stream which relate the concentration of readily-measured group 1 radionuclides to group 2 radionuclides. These activity ratios are known as scaling factors.

Laboratory analysis should be used whenever possible to initially determine the scaling factors for all radionuclides of interest. Because validated laboratory techniques do not exist for all Table 3-1 radionuclides, computer-generated scaling factors may be used to supplement laboratory scaling factors when necessary. Scaling factors should be sufficiently conservative to ensure calculated activities are worst-case.

Scaling factors may be generated which correlate radionuclide content to gross radioactivity measurements (e.g., gamma survey) or to group 1 radionuclide activities from direct measurement techniques (e.g., ^{137}Cs activity by gamma energy analysis). Scaling factors for Category 3 waste should be correlated to direct measurement techniques.

Detailed laboratory analysis for all group 1 and group 2 nuclides and computer modeling of waste processes should be re-performed whenever there is reason to believe that the radionuclide content of the waste stream may have been altered. Facility changes, process changes and/or variations in routine waste sampling all indicate that scaling factors may need to be updated.

Examples of plutonium manufacturing scaling factors are included below.

K.1.2.5.1 Fission Product Scaling Factors

Knowledge-of-source and computer-modeling analysis were used in section K. 1.2.2 and K.1.2.3 to show that the significant fission products in plutonium manufacturing source material are ^{90}Sr, ^{99}Tc, ^{126}Sn, and ^{137}Cs. Because ^{137}Cs is the only easily measured isotope, scaling factors which relate ^{137}Cs activity to ^{90}Sr, ^{99}Tc and ^{126}Sn would greatly simplify the categorization process.

To generate fission product scaling factors, the ^{90}Sr, ^{99}Tc, and ^{126}Sn activities from Table K-1 were divided by the ^{137}Cs activity, then the results were compared against laboratory data to ensure that the scaling factors were conservative. The final scaling factors were then incorporated into Table K-3 to simplify the calculation of fission product activities. Fission product activities should be calculated as follows.

1. Determine ^{137}Cs activity by GEA.

2. ^{90}Sr, ^{99}Tc and ^{126}Sn activities shall be calculated from the ^{137}Cs activity using Table K-3 as follows.

a. Enter the ^{137}Cs activity by GEA in column 2.

b. Calculate the decay correction factor for the age of the waste and enter in column 3. The age (in years) of the oldest material in the waste stream should be used to calculate the decay correction factor. A quick reference chart of decay corrections is provided below. Hanford tank waste generators should use 50 years for conservatism.

Decay Correction

Age of Waste (years)	Decay Correction $e^{\lambda t}$	Age of Waste (years)	Decay Correction $e^{\lambda t}$
1	1.02	20	1.58
2	1.04	30	1.99
5	1.12	40	2.51
10	1.20	50	3.16

c. Multiply the ^{137}Cs activity in column 2 by the decay correction in column 3 and enter the result in column 4. This is the ^{137}Cs activity at the end of the fission process.

d. Multiply the decay-corrected ^{137}Cs activity in column 4 by the ratios in column 5 and enter the results in column 6. Column 6 activities should be used for characterization.

K.1.2.5.2 Uranium

Total uranium content in waste may be measured by a variety of routine methods, however determination of uranium isotopic distribution requires difficult mass spectroscopy. As a result, scaling factors which relate the mass of uranium present to uranium isotopic distribution would greatly simplify the characterization process.

To generate uranium isotopic scaling factors, the activity of each uranium isotope in Table K-1 was converted to μg using specific activity values. The μg of each uranium isotope were then summed to produce a total μg uranium. Each uranium nuclide mass was then divided by the total μg uranium to develop a mass fraction. Finally the mass fractions were converted back to activity fractions using specific activity values. The final scaling factors were then incorporated into Table K-4 to simplify the calculation of uranium isotopic activities. The activity of each uranium isotope should be calculated as follows.

1. Enter the total uranium value in μg U/g sample from laser fluorescence or other laboratory analysis in column 2 of Table K-4.

2. Multiply the total uranium value by the ratios in column 3 and record the results in column 4. Column 4 activities should be used for characterization.

K.1.2.5.3 Plutonium Isotopic Scaling Factors

Plutonium-239 activity may be easily measured by gamma energy analysis, however determination of the plutonium isotopic distribution requires difficult mass spectroscopy. As a result, scaling factors which relate the activity of ^{239}Pu to the plutonium isotopic distribution would greatly simplify the characterization process.

To generate the plutonium isotopic scaling factors, the activities of the plutonium isotopes in Table K-2 were divided by both the ^{239}Pu activity and the sum of the ^{239}Pu and ^{240}Pu activities. The final scaling factors were then incorporated into Table K-5 and K-6 to simplify the calculation of plutonium isotopic activities. The activity of each plutonium isotope should be calculated as follows.

1. Plutonium-239 activity should be determined by GEA if possible. However, if other gamma emitters interfere with ^{239}Pu detection, determine $^{239/240}Pu$ activity by chemical separation and alpha spectroscopy (alpha spectroscopy cannot discriminate between ^{239}Pu and ^{240}Pu because the alpha energies are very close).

2. If the ^{239}Pu activity was determined by GEA, the individual plutonium isotope activities should be calculated using Table K-5 as follows.

   a. Enter the ^{239}Pu activity by GEA in column 2.

   b. Multiply the ^{239}Pu activity by the ratios in column 3 and record the results in column 4. Column 4 activities should be used for characterization.

3. If the $^{239/240}Pu$ activity was determined by alpha spectroscopy, the individual plutonium isotope activities should be calculated from Table K-6 as follows.

   a. Enter the $^{239/240}Pu$ activity from alpha spectroscopy in column 2.

   b. Multiply the $^{239/240}Pu$ activity by the ratios in column 3 and record the results in column 4. Column 4 activities should be used for characterization.

K.1.2.5.4 Transuranic Isotopic Scaling Factors

Americium 241 activity may be easily measured by gamma energy analysis, however determination of the transuranic isotopic distribution requires difficult mass spectroscopy. As a result, scaling factors which relate the activity of ^{241}Am to the transuranic isotopic distribution would greatly simplify the characterization process.

To generate the transuranic isotopic scaling factors, the activities of the transuranic isotopes in Table K-2 were divided by the ^{241}Am activity. The final scaling factors were then incorporated into Table K-7 to simplify the calculation of transuranic isotopic activities. The activity of each transuranic isotope should be calculated as follows.

1. Americium-241 activity should be determined by GEA if possible. However, if other gamma emitters interfere with ^{241}Am detection, determine ^{241}Am activity by chemical separation and alpha spectroscopy.

2. The individual transuranic isotope activities should be calculated from the ^{241}Am activity using Table K-7 as follows.

    a. Enter the ^{241}Am activity from GEA or alpha spectroscopy in column 2.

    b. Multiply the ^{241}Am activity by the ratios in column 3 and record the results in column 4. Column 4 activities should be used for characterization.

K.1.3 Waste Matrix Calculations

Category 1, Category 3 and Class C disposal limits are stated in terms of curies per cubic meter of waste matrix volume. The total activity of each Table 3-1 radionuclide in the waste package should be divided by the internal package volume to obtain the waste matrix concentrations.

Transuranic waste limits are stated in terms of nanocuries per gram of waste matrix. The total activity of each Table 3-1 transuranic radionuclide in the waste package should be divided by the waste matrix weight to obtain the waste matrix concentrations. The waste matrix weight is defined as the weight of all waste items in the container plus the weight of any radioactive contaminant materials or hazardous materials enclosed. Shipping container, void space filler, shielding or other package weights should not be included in the waste matrix weight value.

For the purposes of characterization, the radionuclide inventory may be assumed to be evenly distributed over the waste matrix.

K.1.4 Disposal Category Determination

Once the radionuclide composition is accurately known, the limits of Table 3-1 are used to determine the disposal handling category.

K.1.4.1 Category 1 Determination

Classification of waste as Category 1 or greater than Category 1 is accomplished by comparing radionuclide activities for the waste matrix to the limits in Table 3-1. If any radionuclide activity exceeds the Category 1 limit in Table 3-1 then the waste is Category 3 or Greater Than Category 3.

For waste which contains a mixture of radionuclides, a sum of fractions approach should be used to make the category determination. The activity of each radionuclide is divided by its Category 1 limit and the resulting fractions are added. If the sum of fractions is $\leq$ 1.0 the waste is classified Category 1. If the sum of fractions is > 1.0 the waste is Category 3 or Greater Than Category 3.

Table K-8 may be used to simplify the Category 1 determination procedure. Table K-8 should be used as follows.

1. Determine the waste matrix radionuclide activities in accordance with section K.1.2 and section K.1.3 Enter the radionuclide activities in column 2.

2. Divide the activities in column 2 by the Category 1 limits in column 3. Enter the resulting fraction in column 4.

3. Add all the fractions in column 4 and enter the total at the bottom of Table K-8. If the total is $\leq$ 1.0 the waste is Category 1. If the total is > 1.0 the waste is at a minimum Category 3.

K.1.4.2 Category 3 Determination

Category 3 determination is made by the same general method as the Category 1 determination. Table K-9 may be used to simplify the Category 3 determination procedure. Table K-9 should be used as follows.

1. Determine the waste matrix radionuclide activities in accordance with section K.1.2 and K.1.3. Enter the radionuclide activities in column 2.

2. Divide the activities in column 2 by the Category 3 limits in column 3. Enter the resulting fraction in column 4.

3. Add all the fractions in column 4 and enter the total at the bottom of Table K-9. If the total is $\leq$ 1.0 the waste is Category 3. If the total is > 1.0 the waste is Greater Than Category 3.

K.1.4.3 TRU Determination

TRU determination is made by summing the activities of all the alpha-emitting transuranic nuclides with half-lives greater than 20 years and comparing the result to the limit of 100 nCi/g waste matrix. If the total transuranic activity exceeds 100 nCi/g waste matrix the waste is classified as TRU and is also classified Category 3.

Table K-10 may be used to simplify the transuranic determination procedure. Table K-10 should be used as follows.

1. Calculate the transuranic nuclide activities for the waste matrix in accordance with section K.1.2 and K.1.3. Convert activities to nCi/g.

2. Enter transuranic nuclide activities in column 2.

3. Add the activities in column 2 and compare to the limit. If the total activity exceeds 100 nCi/g the waste is transuranic.

Total alpha activity may also be used for TRU determination.

K.1.4.4 Class C Determination

If the waste item is found to be Category 3 or Greater Than Category 3, the NRC classification of the waste should be determined in accordance with the Code of Federal Regulations, Title 10, Part 61.

K.1.5 Acceptability for Near-Surface Burial

If the waste item is classified Greater Than Class C or TRU it is restricted from near-surface disposal and must be stored for future processing. Waste which is Category 1 or Category 3 is acceptable for near-surface disposal.

K.2 Background

K.2.1 NRC Comparison

There are several significant differences between WHC-EP-0063 and 10 CFR 61, which serves as the waste acceptance document for civilian sector radioactive waste. This section provides a discussion of the reasons behind the differences.

K.2.1.1 Table 3-1

Table 3-1 contains 60 nuclides while 10 CFR 61.55 contains only 15. The reason for the difference lies in the way the PA (which generated Table 3-1) was conducted. The PA only addresses disposal safety. Practical concerns such as small fission yield, shielding isotopes or other effects which may make it functionally impossible to accumulate appreciable concentrations of certain nuclides were not considered at all. As a result, most nuclides with half-lives over 5 years have limits established in Table 3-1.

Appendix K is the result of a study by SWD to apply process knowledge and practical concerns to eliminate nuclides which do not warrant consideration in

Hanford wastes. Analysis of this type should help minimize the impact of Table 3-1 and serve as an example for characterization of other waste streams.

K.2.1.1.1 Radionuclide Concentration Limits

Comparison of the concentration limits in Table 3-1 and 10 CFR 61.55 points out several instances where Table 3-1 is more conservative. The reason these limits are more conservative again involves the PA. Both the NRC and the PA use intruder scenarios and water table infiltration studies, but the NRC limits were based on a superseded internal dose calculation algorithm (ICRP-2). The WHC PA used state-of-the-art models (ICRP-30 and ICRP-48) to calculate doses. These new computer routines generally calculate higher doses for given radionuclide introduction amounts, which created correspondingly lower limits. This results in Category 1 limits which are generally lower than 10 CFR 61.55.

For Category 3 limits, however,the specified Hanford burial depth eliminates all plausible intruder scenarios except well-drilling, which exposes the intruder to a much smaller quantity of waste. This small exposure overrides the effects of the more conservative dose calculation algorithm and results in Category 3 limits which are larger than 10 CFR 61.55.

K.2.1.1.2 Sum of Fractions Rule

Given that Table 3-1 includes more nuclides than 10 CFR 61.55, the sum of fractions will be effectively more conservative because more small fractions are summed. To help reduce the effect of the larger nuclide table, generators have been allowed to use an activity value of zero for nuclides determined to be insignificant to characterization or nuclide activities below the minimum detectable activity of the appropriate analysis method.

WHC-EP-0063 also sums all nuclides in one table while 10 CFR 61.55 sums short and long-lived nuclides separately. This would, on first analysis, indicate that WHC-EP-0063 had added an unnecessary layer of conservatism beyond the NRC. However, consider an example of a waste which contains 22 Ci/m3 of ^{59}Ni and 1 Ci/m3 of ^{137}Cs. Using the classification method of 10 CFR 61.55, the long-lived limit fraction would be 0.1, meaning the classification would be determined solely by the short-lived activity. The short-lived limit fraction would be 1.0, meaning the waste would be Class A.

A potential problem exists with this method. Because both ^{59}Ni and ^{137}Cs are present at 100% of their respective Class A limits, a potential intruder could receive 200% of his exposure limit from this waste item if it were handled as Class A waste. This potential problem is easily avoided by summing the short and long-lived nuclide ratios together. Because short-lived nuclides decay considerably during the 100 year institutional control period the limits are very high, however exposure from all radionuclide sources are considered cumulatively.

Table K-1. ORIGEN 2 Simulation Results for Weapons-Grade Plutonium

Nuclide	Maximum Activity (Ci/MT)	Nuclide	Maximum Activity (Ci/MT)
^{3}H	1.598 E+01	^{229}Th	2.393 E-09
^{10}Be	8.907 E-08	^{230}Th	1.428 E-07
^{14}C	3.592 E-06	^{232}Th	2.335 E-11
^{79}Se	1.330 E-02	^{231}Pa	1.553 E-05
^{90}Sr	2.802 E+03	^{232}U	3.056 E-05
^{93}Zr	6.255 E-02	^{233}U	1.140 E-06
^{94}Nb	1.923 E-06	^{234}U	5.758 E-04
^{99}Tc	4.487 E-01	^{235}U	1.823 E-02
^{107}Pd	1.455 E-03	^{236}U	1.180 E-02
^{113m}Cd	1.123 E+00	^{238}U	3.328 E-01
^{121m}Sn	3.939 E-03	^{237}Np	5.874 E-03
^{126}Sn	2.002 E-02	^{238}Pu	3.253 E+00
^{129}I	8.691 E-04	^{239}Pu	5.119 E+01
^{133}Ba	0	^{240}Pu	1.229 E+01
^{135}Cs	1.267 E-02	^{241}Pu	6.478 E+02
^{137}Cs	3.217 E+03	^{242}Pu	6.552 E-04
^{147}Sm	8.083 E-09	^{244}Pu	3.659 E-12
^{150}Eu	7.160 E-08	^{241}Am	1.775 E+01
^{151}Sm	5.429 E+01	^{242m}Am	1.275 E-03
^{152}Eu	1.123 E-01	^{243}Am	2.381 E-04
^{152}Gd	4.126 E-15	^{243}Cm	6.121 E-05
^{154}Eu	2.192 E+01	^{244}Cm	2.633 E-02
^{210}Pb	1.653 E-14	^{245}Cm	1.490 E-07
^{226}Ra	1.308 E-09	^{246}Cm	1.344 E-09
^{227}Ac	6.780 E-06	^{247}Cm	1.795 E-16
^{228}Ra	1.782 E-11	^{248}Cm	1.859 E-17

Table K-2. ORIGEN 2 Simulation Results for Fuels-Grade Plutonium

Nuclide	Maximum Activity (Ci/MT)	Nuclide	Maximum Activity (Ci/MT)
^{237}Np	2.651 E-02	^{241}Am	8.159 E+00
^{238}Pu	4.422 E+01	^{242m}Am	1.593 E-02
^{239}Pu	1.131 E+02	^{243}Am	5.986 E-02
^{240}Pu	6.712 E+01	^{243}Cm	8.438 E-03
^{241}Pu	7.383 E+03	^{244}Cm	1.140 E+00
^{242}Pu	2.985 E-02		

Table K-3. Fission Product Activity Worksheet

Nuclide	^{137}Cs Activity by GEA	Decay Correction	Corrected ^{137}Cs Activity	^{137}Cs Activity Ratio	Nuclide Activity
$Y^{90}Sr$		1		8.710 E-01	
^{99}Tc		$e\lambda t$ =		1.335 E-04	
^{126}Sn				6.223 E-06	

$\lambda = \ln 2/t_{½}{}^{137}Cs = 2.298 \times 10^{-2}\ y^{-1}$
t = age of waste in years

Table K-4. Uranium Activity Worksheet

Nuclide	Total U (μg U/g sample)	Isotope Activity Ratio (Ci/μg)	Nuclide Activity (Ci/g sample)
^{232}U		3.061 E-17	
^{233}U		1.142 E-18	
^{234}U		5.768 E-16	
^{235}U		1.826 E-14	
^{236}U		1.181 E-14	
^{238}U		3.334 E-13	

Table K-5. Plutonium Activity from ^{239}Pu Worksheet

Nuclide	^{239}Pu Activity	^{239}Pu Activity Ratio	Nuclide Activity
^{238}Pu		3.253 E-01	
^{240}Pu		5.935 E-01	
^{241}Pu		6.528 E+01	
^{242}Pu		2.639 E-04	

Table K-6. Plutonium Activity from $^{239/240}Pu$ Worksheet

Nuclide	$^{239/240}Pu$ Activity	$^{239/240}Pu$ Activity Ratio	Nuclide Activity
^{238}Pu		2.454 E-01	
^{239}Pu		6.278 E-01	
^{240}Pu		3.724 E-01	
^{241}Pu		4.097 E+01	
^{242}Pu		1.656 E-04	

Table K-7. Transuranic Activity Worksheet

Nuclide	^{241}Am Activity	^{241}Am Activity Ratio	Nuclide Activity
^{237}Np		3.249 E-03	
^{242m}Am		1.952 E-03	
^{243}Am		7.337 E-03	
^{243}Cm		1.034 E-03	
^{244}Cm		1.397 E-01	

Table K-8. Category 1 Determination Worksheet

Nuclide	Activity (Ci/m^3)		Fraction
	Waste Matrix	Cat 1 Limit	
^{3}H		5.0 E+06	
^{10}Be		1.0 E+00	
^{14}C		4.0 E-02	
$^{14}C^{o}$		4.0 E-01	
^{36}Cl		4.0 E-04	
^{40}K		1.7 E-03	
^{60}Co		7.7 E+01	
^{59}Ni		4.0 E+00	
$^{59}Ni^{o}$		4.0 E+01	
^{63}Ni		4.8 E+00	
$^{63}Ni^{o}$		4.8 E+01	
^{79}Se		3.8 E-01	
^{90}Sr		4.3 E-03	
^{93}Zr		2.7 E+00	
^{94}Nb		2.6 E-04	
$^{94}Nb^{o}$		2.6 E-03	
^{93}Mo		3.0 E-01	
^{99}Tc		5.6 E-03	
^{107}Pd		4.8 E+00	
^{113m}Cd		2.0 E-01	
^{121m}Sn		6.3 E+00	
^{126}Sn		1.8 E-04	
129		2.9 E-03	
^{133}Ba		7.7 E-01	
^{135}Cs		1.9 E-01	
^{137}Cs		6.3 E-03	
^{147}Sm		1.6 E-02	
^{151}Sm		3.8 E+01	
^{150}Eu		1.6 E-03	
^{152}Eu		5.3 E-02	
^{154}Eu		8.3 E-01	
^{152}Gd		6.3 E-03	

Nuclide	Activity (Ci/m^3)		Fraction
	Waste Matrix	Cat 1 Limit	
^{187}Re		5.3 E+00	
^{209}Po		2.9 E-02	
^{210}Pb		1.0 E-02	
^{226}Ra		1.4 E-04	
^{228}Ra		1.9 E+01	
^{227}Ac		4.5 E-03	
^{229}Th		4.8 E-04	
^{230}Th		2.1 E-03	
^{232}Th		1.2 E-04	
^{231}Pa		1.6 E-04	
^{232}U		5.3 E-04	
^{233}U		7.7 E-03	
^{234}U		9.1 E-03	
^{235}U		3.2 E-03	
^{236}U		1.0 E-02	
^{238}U		6.3 E-03	
^{237}Np		1.9 E-04	
^{238}Pu		9.1 E-03	
^{239}Pu		3.6 E-03	
^{240}Pu		3.6 E-03	
^{241}Pu		7.7 E-02	
^{242}Pu		3.8 E-03	
^{244}Pu		8.3 E-04	
^{241}Am		2.6 E-03	
^{242m}Am		2.6 E-03	
^{243}Am		1.3 E-03	
^{243}Cm		2.5 E-02	
^{244}Cm		2.3 E-01	
^{245}Cm		2.1 E-03	
^{246}Cm		3.3 E-03	
^{247}Cm		7.1 E-04	
^{248}Cm		9.1 E-04	
Total		< 1.0	

o Limit for isotope in activated metal

Table K-9. Category 3 Determination Worksheet

Nuclide	Activity (Ci/m^3)		Fraction
	Waste Matrix	Cat 3 Limit	
^{3}H	NA	NA	NA
^{10}Be		2.2 E+02	
^{14}C		9.1 E+00	
$^{14}C^{o}$		9.1 E+01	
^{36}Cl		8.3 E-02	
^{40}K		3.4 E-01	
^{60}Co	NA	NA	NA
^{59}Ni		8.3 E+02	
$^{59}Ni^{o}$		8.3 E+03	
^{63}Ni		1.7 E+04	
$^{63}Ni^{o}$		1.7 E+05	
^{79}Se		8.3 E+01	
^{90}Sr		1.5 E+04	
^{93}Zr		5.9 E+02	
^{94}Nb		5.6 E-02	
$^{94}Nb^{o}$		5.6 E-01	
^{93}Mo		7.1 E+01	
^{99}Tc		1.2 E+00	
^{107}Pd		1.0 E+03	
^{113m}Cd	NA	NA	NA
^{121m}Sn		2.0 E+05	
^{126}Sn		3.8 E-02	
^{129}I		5.9 E-01	
^{133}Ba	NA	NA	NA
^{135}Cs		4.2 E+01	
^{137}Cs		1.3 E+04	
^{147}Sm		3.4 E+00	
^{151}Sm		1.8 E+05	
^{150}Eu		7.7 E+02	
^{152}Eu	NA	NA	NA
^{154}Eu	NA	NA	NA
^{152}Gd		1.3 E+00	

Nuclide	Activity (Ci/m^3)		Fraction
	Waste Matrix	Cat 3 Limit	
^{187}Re		1.1 E+03	
^{209}Po		7.7 E+01	
^{210}Pb		5.6 E+05	
^{226}Ra		3.6 E-02	
^{228}Ra	NA	NA	NA
^{227}Ac		3.2 E+05	
^{229}Th		1.1 E-01	
^{230}Th		1.3 E-01	
^{232}Th		2.2 E-02	
^{231}Pa		3.3 E-02	
^{232}U		4.0 E+00	
$^{233}U^{*}$		1.1 E+00	
^{234}U		2.1 E+00	
^{235}U		5.9 E-01	
^{236}U		2.2 E+00	
^{238}U		1.4 E+00	
$^{237}Np^{*}$		4.0 E-02	
$^{238}Pu^{*}$		4.5 E+01	
$^{239}Pu^{*}$		7.7 E-01	
$^{240}Pu^{*}$		7.7 E-01	
$^{241}Pu^{*}$		3.1 E+01	
$^{242}Pu^{*}$		8.3 E-01	
$^{244}Pu^{*}$		1.7 E-01	
$^{241}Am^{*}$		1.1 E+00	
$^{242m}Am^{*}$		2.4 E+00	
$^{243}Am^{*}$		2.8 E-01	
$^{243}Cm^{*}$		6.3 E+02	
$^{244}Cm^{*}$		2.9 E+02	
$^{245}Cm^{*}$		3.3 E-01	
$^{246}Cm^{*}$		7.7 E-01	
$^{247}Cm^{*}$		1.5 E-01	
$^{248}Cm^{*}$		2.0 E-01	
Total		< 1.0	

o Limit for isotope in activated metal.
* Category 3 limit is the lower of this value and 100 nCi/g.

Table K-10. TRU Determination Worksheet.

Nuclide	Nuclide Activity (nCi/g)	Limit1 (nCi/g)
^{237}Np		
^{238}Pu		
^{239}Pu		
^{240}Pu		
^{242}Pu		
^{244}Pu		
^{241}Am		
^{242m}Am		
^{243}Am		
^{243}Cm		
^{245}Cm		
^{246}Cm		
^{247}Cm		
^{248}Cm		
Total α 2		
Total		< 100

1 Individual isotopes do not have limits.
2 Use nuclide activities OR total α.

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APPENDIX L

CENTRAL WASTE COMPLEX DOSE EQUIVALENT CURIE FACTORS

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Table L-1. Central Waste Complex Packaging Requirements (Central Waste Complex FSAR ECN 173274, Section 2.13 b)(4 sheets)

Isotope	Type-A (A_2) Package Limits (Ci/Package)	CWC Package Limits (Ci/Package)[1]	CWC LFMW Package Limits (Ci/Package)[2]	Dose Equivalency Curie Factor CWC DE-Ci/Ci
^{3}H	1.0e+03	2.1e+02		1.1e-03
^{7}Be	3.0e+02			1.2e-07
^{10}Be	--	2.1e+02	1.9e+01	1.1e-03
^{14}C	6.0e+01			6.5e-06
^{22}Na	8.0e+00			5.4e-04
^{31}Si	2.0e+01			7.4e-07
^{32}P	3.0e+01			4.9e-05
^{35}S	6.0e+01			7.8e-06
^{36}Cl	1.0e+01			6.0e-04
^{40}K	--	1.2e+03	1.1e+02	1.9e-04
^{41}Ca	--	3.0e+03	2.7e+02	7.8e-05
^{45}Ca	2.5e+01			2.1e-05
^{46}Sc	8.0e+00			9.4e-05
^{51}Cr	6.0e+02			1.1e-06
^{54}Mn	2.0e+01			2.2e-05
^{55}Fe	1.0e+03			8.5e-06
^{57}Co	9.0e+01			2.7e-05
^{58}Co	2.0e+01			3.6e-05
^{59}Fe	1.0e+01			4.9e-05
^{59}Ni 59	9.0e+02			4.0e-06
^{60}Co	7.0e+00			6.3e-04
^{63}Ni	1.0e+02			9.4e-06
^{65}Zn	3.0e+01			6.7e-05
^{75}Se	4.0e+01			2.7e-05
^{79}Se	--	2.6e+02	2.3e+01	9.0e-04
$^{85}Kr(1)$	5.0e+00			2.1e-05
$^{85}Kr(2)$	1.0e+03			
^{85}Sr	3.0e+01			5.8e-06
^{86}Rb	3.0e+01/			2.1e-05
^{87m}Sr	5.0e+01			7.2e-07
^{89}Sr	1.0e+01			1.7e-05

Table L-1. Central Waste Complex Packaging Requirements (Central Waste Complex FSAR ECN 173274, Section 2.13 b)(4 sheets)

Isotope	Type-A (A_2) Package Limits (Ci/Package)	CWC Package Limits (Ci/Package)[1]	CWC LFMW Package Limits (Ci/Package)[2]	Dose Equivalency Curie Factor CWC DE-Ci/Ci
^{90}Sr	4.0e-01			4.3e-03
^{90}Y	1.0e+01			2.7e-05
^{93}Mo	--	2.6e+03	2.3e+02	9.0e-05
^{93m}Nb	2.0e+02			9.4e-05
^{93}Zr	2.0e+02	9.4e+01	8.3e+00	2.5e-03
^{94}Nb	--	1.9e+02	1.7e+01	1.2e-03
^{95}Nb	2.0e+01			1.9e-05
^{95m}Nb	--	3.0e+04	2.7e+03	7.8e-06
^{95}Zr	2.0e+01			1.2e-04
^{99}Tc	2.5e+01			1.3e-04
^{99m}Tc	1.0e+02			3.1e-07
^{103}Ru	2.5e+01			2.9e-05
^{106}Ru	7.0e+00			1.5e-03
^{107}Pd	--	5.9e+03	5.2e+02	4.0e-05
^{109}Cd	7.0e+01			4.5e-04
^{110m}Ag	7.0e+00			1.2e-03
^{113m}Cd	--	3.7e+01	3.3e+00	6.3e-03
^{113m}In	6.0e+01			6.3e-07
^{113}Sn	6.0e+01			3.4e-05
^{119m}Sn	1.0e+02			1.9e-05
^{121m}Sn	--	6.5e+03	5.8e+02	3.6e-05
^{122}Sb	3.0e+01			1.8e-05
^{124}Sb	5.0e+00			8.3e-05
^{125}I	7.0e+01	2.7e-01		8.5e-01
^{125}Sb	2.5e+01			4.0e-05
^{126}Sb	--	5.4e+03	4.8e+02	4.3e-05
^{126m}Sb	--	6.9e+04	6.1e+03	3.4e-06
^{126}Sn	--	7.6e+02	6.7e+01	3.1e-04
^{127}Te	2.0e+01			1.1e-06
^{127m}Te	2.0e+01			6.7e-05
^{129}I	2.0e+00	2.3e-02		1.0e+01

Table L-1. Central Waste Complex Packaging Requirements (Central Waste Complex FSAR ECN 173274, Section 2.13 b)(4 sheets)

Isotope	Type-A (A_2) Package Limits (Ci/Package)	CWC Package Limits (Ci/Package)[1]	CWC LFMW Package Limits (Ci/Package)[2]	Dose Equivalency Curie Factor CWC DE-Ci/Ci
^{129}Te	2.0e+01			3.6e-07
^{129m}Te	1.0e+01			7.4e-05
^{131}I	1.0e+01	1.9e-01		1.2e+00
$^{131m}Xe(1)$	1.0e+01			6.1e-05
$^{131m}Xe(2)$	1.0e+02			
$^{133}Xe(1)$	5.0e+00			1.9e-04
$^{133}Xe(2)$	1.0e+03			
^{134}Cs	1.0e+01			1.4e-04
^{134m}Cs	1.0e+01			1.9e-07
^{135}Cs	2.5e+01			1.4e-05
^{137}Cs	1.0e+01			9.6e-05
^{140}Ba	2.0e+01			1.0e-05
^{140}La	3.0e+01			2.0e-05
^{141}Ce	2.5e+01			2.7e-05
^{144}Ce	7.0e+00			1.2e-03
^{144}Pr	--	8.7e+05	7.7e+04	2.7e-07
^{144m}Pr	--	5.5e+06	4.8e+05	4.3e-08
^{147}Nd	2.0e+01			2.1e-05
^{147}Pm	2.5e+01			1.2e-04
^{147}Sm	unlimited	5.9e-01	5.2e-02	4.0e-01
^{151}Sm	9.0e+01			1.6e-04
^{152}Eu	1.0e+01			6.5e-04
^{153}Gd	1.0e+02			1.1e-04
^{154}Eu	5.0e+00			8.5e-04
^{155}Eu	6.0e+01			1.7e-04
^{182}Ta	2.0e+01			1.4e-04
^{187}Re	unlimited	1.3e+06	1.2e+05	1.8e-07
^{203}Hg	2.5e+01			2.2e-05
^{210}Po	2.0e-01			3.1e-02
^{212}Pb	5.0e+00			5.6e-04
^{224}Ra	5.0e-01			9.4e-03

Table L-1. Central Waste Complex Packaging Requirements (Central Waste Complex FSAR ECN 173274, Section 2.13 b)(4 sheets)

Isotope	Type-A (A_2) Package Limits (Ci/Package)	CWC Package Limits (Ci/Package)[1]	CWC LFMW Package Limits (Ci/Package)[2]	Dose Equivalency Curie Factor CWC DE-Ci/Ci
^{226}Ra	5.0e-02			2.5e-02
^{227}Ac	3.0e-03			3.8e+01
^{228}Ac	4.0e+00			1.7e-03
^{228}Ra	5.0e-02			1.3e-02
^{228}Th	8.0e-03			1.6e+00
^{230}Th	3.0e-03			2.5e+00
^{231}Pa	2.0e-03			1.0e+01
^{231}Th	2.5e+01			2.7e-06
^{232}Th	unlimited	1.8e-02		1.3e+01
^{232}U	3.0e-02		1.6e-03	2.1e+00
^{233}U	--			4.3e-01
^{234}Th	1.0e+01			1.1e-04
^{234}U	1.0e-01			4.3e-01
^{235}U	2.0e-01			3.8e-01
^{236}U	--			4.1e-01
^{237}Np	--			4.5e+00
^{238}Pu	--			2.2e+00
^{238}U	unlimited	6.2e-01	5.5e-01	3.8e-01
^{239}Pu	--			1.0e+00
^{240}Pu	--			2.5e+00
^{241}Am	--			2.5e+00
^{241}Pu	--			4.9e-02
^{242}Am	--	1.2e+03	1.1e+02	1.9e-04
^{242}Cm	--			5.6e-02
^{242}Pu	--			2.2e+00
^{243}Am	--			2.5e+00
^{243}Cm	9.0e-03			1.7e+00
^{244}Cm	--			1.3e+00
^{245}Cm	6.0e-03			2.5e+00
^{246}Cm	6.0e-03			2.7e+00
^{252}Cf	9.0e-03			7.8e-01

1. The CWC package limits must be used in place of the Type A package limits.

2. Applicable for acceptance of packages into the Low Flashpoint Modules

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APPENDIX M

DECISION TREE FOR NONRADIOACTIVE DANGEROUS WASTE SHIPMENTS

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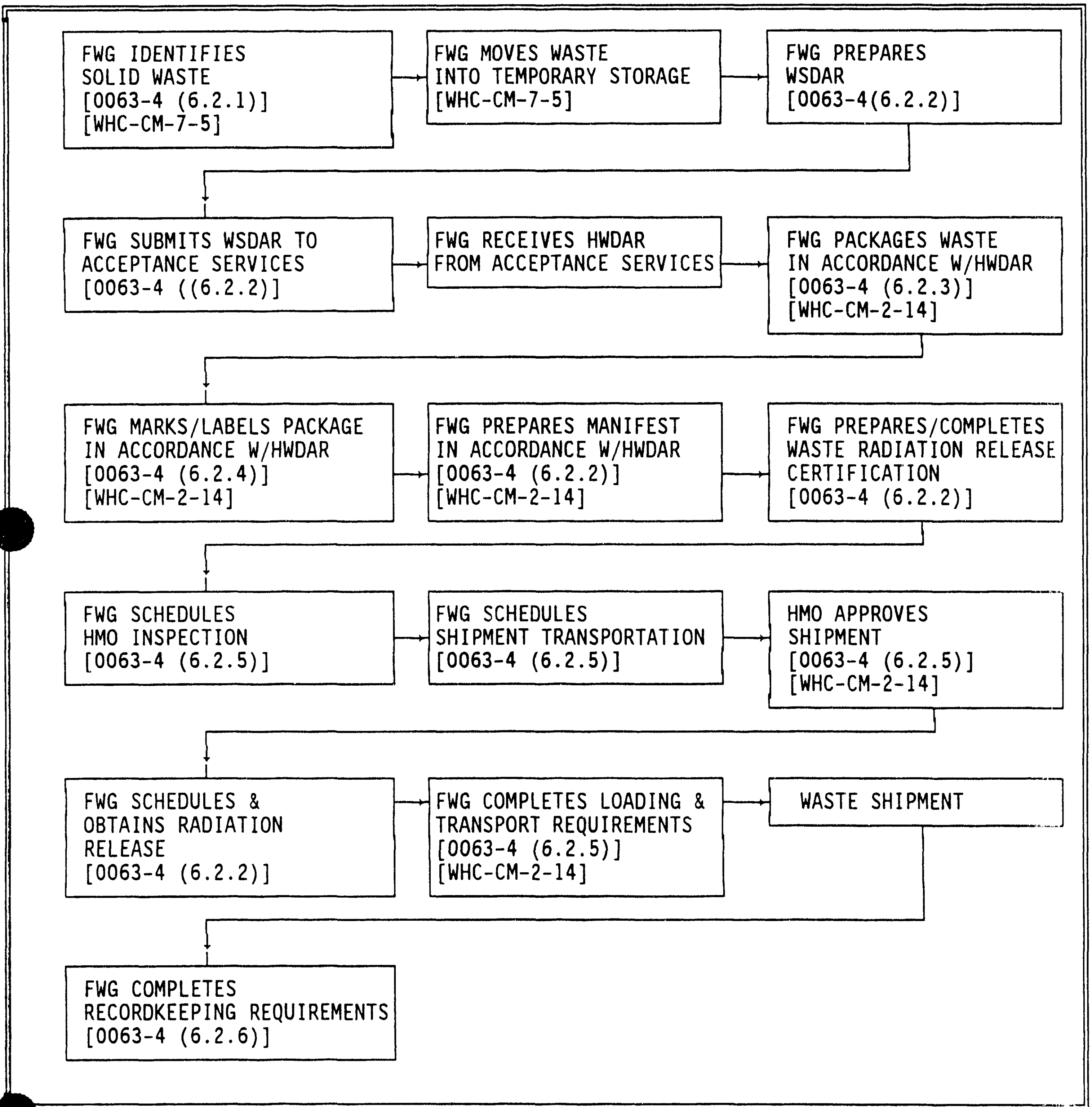
Decision Tree for Nonradioactive Dangerous Waste Shipments



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APPENDIX N

FACILITIES WHERE UNCONDITIONAL RELEASE SURVEY IS NOT REQUIRED

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FACILITIES WHERE UNCONDITIONAL RELEASE SURVEY IS NOT REQUIRED

100 Area Facilities

151B
151D
181B
181D
182B
182D
183D
1707N
A21K Switchyard
B3S4/351 Substation

200 AREA FACILITIES

222SA
243G4
243G5
243G6
272E
272W
273E
273EA
273W
274E
274W
275E
275W
277W
282E
282W
283E
283W
284E
284W
2244B
2245B
2246B
2247B
2400E
2403EA
2701A
2701EA
2701EC
2701ED
2701EF
2701WA
2701WC
2703E
2704S
2704W
2709W
2710E
2711E
2713E
2715E
2715EA
2715ED
2715W
2716E
2716S
2719E
2719EA
2719WA
2720W
2721E
2721EA
2722E
2722W
2727E
2727S
2727W
2728W
2750E
2751E
2752E
2753E

<u>Trailers</u>
M0011
M0012
M0015
M0016
M0017
M0019
M0021
M0027
M0028
M0029
M0031
M0032
M0037
M0039
M0040
M0041
M0042
M0043
M0047
M0048
M0056
M0104
M0107
M0201
M0203
M0204
M0206
M0211
M0215
M0221
M0223
M0232
M0234
M0235
M0240
M0244
M0246
Complex
M0249
M0250
M0251
M0252
M0253
M0256
M0257
M0266
M0267
M0268
M0273
M0306
M0346
M0347
M0351
M0354
M0355
M0377
M0384
M0392
M0393
M0400
M0405
M0407
M0408
M0410
M0413
M0414
M0419
M0705
M0720
M0721
M0863
M0922
M0924
M0927
M0931
M0934
M0936
M0939
M0946
M0947
M0995
M0996

<u>Kaiser Trailers</u>
Includes entire Kaiser Trailer complex at 4th & Baltimore in 200 East Areas

<u>LERF Project</u>
Includes Trailer/Office outside 200 Fast, near the 810 Gate

300 AREA Facilities

305
315
328
335/336
337 High Bay
338
339A
382
384
3621B
3621C
3621D
3701
3701A
3701D
3701L
3701R
3701S
3701T
3701U
3702
3703
3705
3707A
3707B
3707C
3707D
3707H
3709
3711
3713
3715
3717
3717B
3717C
3718
3718N
3763
3764
3765
3766
3767
3768
3769
3770
3790

Trailers

323-2
335-1
340-1
335-1
M0046
M0052
M0105
M0258
M0259
M0260
M0261
M0262
M0263
M0264
M0265
M0394
M0395
M0903
M0904
M0926
M0933

Substations

352C
352E
352F
C354
C351

400 Area Facilities

427
427A
481A
483B
4701C
4702
4704 N/S
4706
4707
4710
4713B
4719
4721
4722B
4722C
4726
4727
4732A
4732B
4732C
4734B
4734C
4734D
4760
4790
4802
4862

M0353
M0908
400 Area
Laydown Yard

Substations
51 & 52

600 Area facilities

251
2752 Substation
2752W Substation
622G Complex
622R Complex
(Includes 622F)
Patrol Training Academy Facilities
M0012
M0245
M0246
M0247
M0248
M0254
M0255
TR57A/WNP1
6652P
6652R
6652S
616 - Non-radioactive/Dangerous Waste Storage Facility

Yakima Barricade 6290
Wye Barricade:
604F
604G
604H
Battelle Observatory
609 & 609A Fire Station
McGee Ranch Site
699-48-9, Deepening
Project Wellsite
North Slope Area
LIGO (Laser Interferometer
Gravitational-Wave
Observatory)
White Bluffs:
Bank, School,
Irrigation Pump House

700 and 300 Areas (RCHN/RCHC/RCHS

All 700 Area Facilities
All 3000 Area Facilities: except PSL, LSL-2, EDL and RTL.
M0905
3220 (Communication Bldg.)

1100 Area Facilities (RCHN/RCHC/RCHS/KENN)

HAPO	1100 Jadwin 1135 Jadwin	Finance Center (Kenn)
PSL- 1120		
Sky Park (Tech Trng Ctr), except for Bay 1816	1155 Jadwin (712 Swift3) 1163 Jadwin 1167 Jadwin	
Stevens Center	1170 Jadwin 1171 Offices	
TCPC	1201 Jadwin	
Vitro		

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APPENDIX O

HANFORD ONLY DIFFICULT WASTE MANAGEMENT

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1.0 INTRODUCTION

Occasionally, it may not be possible to process small volumes of mixed waste (MW) through the waste management system as previously described in this manual. These wastes include those where process knowledge is not adequate for waste characterization, and sampling and analysis cannot occur within the 90-day generator accumulation period.

These wastes will be referenced as Difficult Waste (DFW) in this appendix. Waste of this type has the potential of being generated at all major facilities on the Hanford Site.

Difficult Waste shall be defined as MW or suspect MW that cannot receive a Storage/Disposal Approval Record (SDAR), but must be shipped to an interim storage facility within 90-days of the waste being generated. Waste must be properly certified, documented, and packaged after waste determination per this manual, and Hazardous Material Packaging and Shipping (WHC-CM-2-14) to be accepted for storage at the interim storage facility.

This appendix was developed to implement a plan to allow DFW to be designated and transferred to a permitted, interim holding area at the appropriate storage facility within the 90-day generator accumulation limit that is imposed by Chapter 173-303 WAC. Once all information necessary to fully characterize the waste is received, they will be formally accepted by a treatment, storage, or disposal (TSD) facility and transferred for final disposition.

1.1 SCOPE

The scope of this appendix is to ensure conservative waste designation of DFW, and provide for the safe and effective movement of DFW from the point of generation to an appropriate interim storage facility. This procedure will allow the safe and effective handling of DFW until detailed waste analysis and characterization is completed. Compliance with all federal and state regulations, and DOE Orders shall be maintained for all DFW managed under this program. Movement of waste shall be accomplished using methods equivalent to the Uniform Hazardous Waste Manifest (UHWM) system. All appropriate and applicable health, safety and environmental criteria will be followed at all times.

The management of waste while at the generating facility is not addressed in this appendix. Management of waste at the generator's facility is the sole responsibility of the generator. The generator shall comply with the requirements found in this manual, the WHC Environmental Compliance Manual (WHC-CM-7-5), DOE Order 5820.2A, and Chapter 173-303 WAC.

Waste generated from Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) and Resource Conservation and

Recovery Act (RCRA) past practice unit investigations shall be managed pursuant to the Environmental Investigation Instruction (EII) 4.3. This EII allows management of such waste within the associated operable unit. This instruction has been agreed upon by the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology).

1.2 RESPONSIBILITIES AND AUTHORITIES

WHC is responsible for managing DFW in conformance with all applicable federal, state, and local regulations, DOE Orders, and WHC rules and regulations. The DOE, Richland Operations Office (RL) also has programmatic responsibilities in this area. Chapters 1.0 and 2.0 of this manual describe the approvals necessary in order to deviate from the normal waste handling procedures described in this manual.

1.2.1 Generating Facility Responsibility

Each generating facility is responsible for the management of waste while it is being accumulated at the generator's site. At a minimum, a generator is responsible for complying with WAC 173-303-200 and WHC-CM-7-5 Section 7.8.

The generator is responsible for supplying a charge code, proper waste identification, and packaging in compliance with requirements generated by Package Safety Engineering (PSE) for transport and storage of DFW at an interim storage facility. The generator will remain responsible for providing information to Solid Waste Disposal (SWD) to allow for final acceptance of DFW into the appropriate interim storage facility for storage. This responsibility includes, but is not limited to, the cost of waste analysis, repackaging, storage, movement within the interim storage facility, formal acceptance certifications, Difficult Waste Information Sheet (DFWIS), compaction/void filling (if required), appropriate documentation and labeling, and other regulatory requirements applied to all waste generating facilities for proper waste disposition. The generator is primarily responsible to ensure the waste meets minimum sampling, characterization and packaging requirements outlined in this appendix. Waste characterization analysis must have been completed and awaiting laboratory results prior to being considered and/or accepted for interim storage, and Generator and Waste Acceptance Services (GWAS) named as the organization to receive lab results.

The generator is responsible for arranging transport of the DFW in accordance with the process described in this appendix. A DFWIS shall be used by the generator to document proper waste designation, and to document and control the waste movement process.

1.2.2 Solid Waste Disposal Responsibilities

The SWD shall be responsible for implementation and administration of the DFW program. The SWD can assess a surcharge on each generating facility utilizing the DFW program on a case-by-case basis. The surcharge assessed will be double the standard charges for management of the waste. Restoration and Upgrade Programs will be responsible for determining if additional surcharges are billed to the generator(s).

1.2.2.1 Generator and Waste Acceptance Services Responsibilities

GWAS is responsible for reviewing, accepting and/or rejecting each submitted DFWIS within two working days from receiving the DFWIS. If the waste information is complete and meets GWAS criteria as specified in this appendix, the disposition of the waste will be determined based upon segregation criteria for each DFW package. GWAS acceptance of each waste package will be documented in writing (cover letter), acknowledging acceptance for interim storage in accordance with this procedure. GWAS shall send the original DFWIS back to the generator along with the acceptance cover letter. Copies of the letter shall be sent to Hazardous Materials Operations (HMO) and Solid Waste Management (SWM).

GWAS will assist the generator with waste designation when requested. The Solid Waste Acceptance Team (SWAT) will verify the contents of each waste package prior to shipment to the interim storage facility to confirm that the interim storage facility can safely and effectively handle the waste package.

1.2.2.2 Solid Waste Management Responsibilities

The SWM shall receive approved DFW for interim storage. In order to facilitate receipt, a representative from SWM shall verify that each proposed DFW shipment meets the acceptance criteria for the intended interim storage facility.

Safety documentation (e.g., Operating Specification Requirements (OSRs), Operational Safety Limits (OSLs), Safety Analysis Reports (SARs)) shall form the basis for establishing a safety envelope for interim storage of DFW.

The SWM shall unload and stage approved shipments of DFW per Plant Operating Procedures (POPs). The SWM shall perform all required waste management activities (e.g., inspections of the stored waste per WAC 173-303-340, POP requirements) while the wastes are in interim storage.

1.2.3 Transportation and Packaging Responsibilities

See Chapters 2.0 and 4.0 of this manual for transportation and packaging requirements.

2.0 ACCEPTANCE PROCESS

2.1 PROCEDURE

2.1.1 The generator identifies waste that may qualify as DFW because the waste is in danger of exceeding the 90-day accumulation limit due to difficulties such as, not being able to receive laboratory analysis information before the 90-day accumulation limit would be exceeded.

2.1.2 The generator prepares and submits both a Waste Storage/Disposal Request (WSDR) according to this manual, and a DFWIS according to Attachment A of this appendix. Along with the DFWIS, the responsible generator's Level III manager or higher must issue an Internal Memo to GWAS that justifies the need for management of the waste under the DFW program. At a minimum, the justification must provide the following:

- All the contributing factors that will prevent the SDAR from being issued and the waste from being shipped to an interim storage facility within 90-days of the date of generation;
- Actions taken to facilitate the issuance of an SDAR;
- Actions being taken to prevent a recurrence of this situation, and the frequency with which the DFW program has been used in the past; and
- Why the waste pre-planning process failed to prevent this situation from occurring.

The generator must interface with GWAS if they are unable to complete the DFWIS. GWAS can assist the generator in completing the DFWIS properly. GWAS has the authority to reject any DFWIS if the waste does not meet the criteria specified in this appendix.

2.1.3 GWAS reviews the WSDR, the DFWIS, and the Internal Memo. If GWAS determines that an SDAR can be issued within 90-days of the initial waste accumulation date, GWAS issues an Internal Memo to the responsible generator's Level III manager or higher describing the specific actions (if any) that are required to gain an SDAR. At this point the generator is no longer able to qualify for the DFW program and must follow the requirements of the normal waste management process described in this manual.

2.1.4 If any deficiencies are identified on the DFWIS, the DFWIS will be rejected and referred to the generator for resolution. If accepted, a DFW Package Identification Number (PIN) is assigned and the interim storage location of the DFW package is determined.

2.1.5 If the DFWIS is complete and approved, GWAS returns a signed DFWIS and issues a cover letter. The cover letter shall state:

- That the DFWIS has been approved;
- A listing of each DFW package PIN that is included;
- That the shipment of waste can be scheduled; and
- The points of contact to schedule a visual field verification and confirmation of the waste package(s).

GWAS will send the original cover letter to the generating facility along with the completed DFWIS forms with the approval signature of GWAS. GWAS will send copies of the cover letter to HMO and SWM operations. GWAS retains and files the supporting documents for future reference or inspection (if required). The generator shall perform the following:

- Complete the Radioactive Shipping Record (RSR) with assistance from HMO;
- Contact the individuals identified in the cover letter to schedule a visual field DFW package verification and confirmation;
- Arrange for DFW package inspection and shipment; and
- Obtain a sample of the waste and transmit this sample for detailed analysis.

A joint HMO and SWM inspection team shall visually verify the contents of each waste package according to the criteria in the DFWIS. If the package meets the DFWIS criteria, an HMO representative and an SWM representative shall sign the DFWIS in the appropriate section. If the package does not meet the DFWIS criteria defined in this appendix, it will be the generator's responsibility to resolve any and all deficiencies prior to DFW shipment in accordance with this appendix.

DFW package(s) shall be ready for verification at the time they reach the generator's staging area (or other appropriate area). The individual DFW package(s) will then be loaded onto the waste transport vehicle for movement to the interim storage facility for interim storage after verification by SWM and inspection by HMO. The DFWIS for each DFW package shall be retained by the vehicle operator during shipment.

2.1.6 Solid Waste Operations shall:

- Ensure a DFWIS is present for each DFW package prior to unloading the transport vehicle;

- Move the DFW package(s) to the appropriate interim storage facility as stated in the DFWIS. A designated SWM operations representative shall sign the DFWIS when the package(s) have reached their designated storage location; and

- Provide verification of DFW package arrival and interim storage at the interim storage facility to the generator by sending a copy of the completed DFWIS to the generator.

3.0 ACCEPTANCE CRITERIA AND DFWIS INSTRUCTIONS

The DFWIS (Attachment A) is completed by the generator to ensure the DFW is conservatively designated and the interim storage facility has adequate information to safely and effectively manage the DFW. Each block of the DFWIS contains a question regarding some aspect of the DFW. All questions on the DFWIS must be completed by indicating YES, NO, or UNKNOWN, as appropriate. The PIN number assigned to the waste package by the generator should be written on the top of each sheet of the DFWIS. GWAS will assign the DFW PIN number upon approval of the DFWIS. The DFWIS must be signed and dated by a designated DFW generator representative.

Acceptance cannot take place until the DFWIS is complete. Corrective actions by the generator must be taken if deficiencies are found with the DFW package(s) and/or documentation. All DFW must meet the minimum requirements for acceptance as outlined in this appendix and the DFWIS. The following sections describe the waste acceptance criteria and DFWIS instructions in greater detail.

3.1 GENERAL ACCEPTANCE CRITERIA

PORTIONS OF THE FOLLOWING INFORMATION HAVE BEEN ADAPTED FROM THIS MANUAL AND ARE RESTATED BELOW FOR CLARITY

3.1.1 Prohibited Material

Prohibited materials include (see Section 3.1 of this manual for further information):

- Etiologic Agents;

- Chemically incompatible materials in any waste container;

- Explosives;

- Pyrophorics; and

- Gas cylinders that are not permanently vented including aerosol cans.

These materials cannot be accepted for interim storage. They must be removed from the DFW package(s) before the package can be accepted.

3.1.2 DFW Package

DFW packages shall:

- Be in good condition with no visible signs of cracks, holes, bulges, severe corrosion or other damage that could in any way compromise container integrity during shipment or storage. Containers with any of the above signs shall not be used. DFW containers not meeting the criteria specified in this section, shall be repackaged or overpacked prior to acceptance;
- Containers shall not be used for shipment or storage if the DFW has potential to react with or degrade the container or liner by physical, chemical, or radiological mechanisms; and
- Package(s) shall be DOT approved, and shall be non-combustible/non-flammable.

If these conditions cannot be met, the DFW must be either repackaged, overpacked or returned to the generator.

Identify the specific shipping container and the gross weight of the package on the DFWIS.

3.1.3 External Radiological Dose Rate

The following shall apply:

- The maximum radiological dose rate on any accessible surface of the package cannot exceed 100 mr/hr on contact, one inch;
- If the dose rate exceeds the established 100 mr/hr limit, the package shall be shielded to meet the established radiological criteria established in this section, and this manual; and
- Include the dose rate in mrem per hour and if the waste is Type A or greater include the Transport Index (TI) dose rate on the DFWIS.

3.1.4 Liquids

The following shall apply:

- Double containment shall be required for all packages containing liquids. In the event a drum is overpacked in another package, the annulus of the outer package shall be filled with an approved absorbent;

- Proper package orientation for free liquids shall be maintained at all times. Containers with liquids, shall be marked "THIS END UP" or with direction arrows in legible form on opposite sides of the package and near the top; and
- A "LIQUID ORGANIC WASTE" marking shall be placed on the side of each package containing free organic liquids.

3.1.5 Description of Radiological/Mixed Constituents of the DFW Package

Provide the following information:

- The radionuclides;
- Total curie content;
- Whether the DFW is greater than Type A;
- Point of origin; and
- Vented aerosol containers if applicable.

Also include contents inventory/waste stream documentation, whether any samples have been taken, and process knowledge.

3.2 RADIOLOGICAL CHARACTERISTICS CRITERIA

PORTIONS OF THE FOLLOWING INFORMATION HAVE BEEN ADAPTED FROM THIS MANUAL AND ARE RESTATED BELOW FOR CLARITY

3.2.1 Smearable Surface Contamination

Smearable contamination on the exterior surfaces of all DFW packages shall not exceed the following limits:

- <220 disintegrations per minute (dpm) per square centimeter (cm^2) for Alpha contamination; and
- <2200 dpm/100 cm^2 for Beta/Gamma contamination.

Any packages with smearable contamination exceeding the limits must either be decontaminated to levels below the limits or shall be overpacked.

3.2.2 Nuclear Criticality Limits

The total fissile content of any one package shall not exceed 15 grams. If this limit is exceeded contact GWAS for further instructions.

3.2.3 Transuranic Waste

If the transuranic isotope curie content is not known or cannot be determined from dose rate surveys of the package, contact GWAS for further instructions.

3.2.4 Gas Generation

If the potential exists for gas generation that will cause the package to exceed 1.5 atmospheres, either a catalyst pack, vent clip, or a carbon filter shall be used.

3.3 CHEMICAL CHARACTERIZATION

This section of the DFWIS must be completed for all waste. Initial field characterization or documented process knowledge shall be required before the waste can be accepted for storage (i.e., pH, flammability, reactivity, etc.).

3.3.1 Flashpoint

If the flashpoint is <100 °F, answer the question YES, and mark the flashpoint or flashpoint range ("Flashpoint <100 °F" or "Flashpoint >100 °F and <140 °F") on the package and D001 waste code on the Hazardous Waste Sticker.

If the flashpoint is >140 °F, answer the question NO, and no marking or labeling is required.

Indicate the flashpoint (if known) on the DFWIS.

3.3.2 Corrosive Waste

If the DFW is corrosive (a liquid with a pH $\leq$ 2 or $\geq$ 12.5 or corrodes SAE 1020 steel greater than 0.250 inch per year at 55 degrees C or if a solid when mixed with an equal amount of water causes the water to be outside of the corrosion limits above), or it is unknown, answer the question YES or UNKNOWN as appropriate. Label the package with a DOT Corrosive label, "pH <2" marking (if applicable - GWAS can help determine if this marking applies), or "pH>12.5" marking (if applicable - GWAS can help determine if this marking applies), and a D002 waste code on the Hazardous Waste Sticker.

If the waste is not corrosive, answer the question NO, and no corrosive marking or labeling is required.

3.3.3 Listed Waste

If the DFW is U/P/K-Listed, F-Listed, or potentially F-Listed, answer the question YES, list the code(s) on the DFWIS, and label the appropriate waste code(s) on the Hazardous Waste Sticker.

If the DFW is not potentially listed, answer the question NO, and no -Listed marking or labeling is required.

3.3.4 Polychlorinated Biphenyls Waste

If Polychlorinated Biphenyls (PCBs) are present or unknown, answer the question YES or UNKNOWN as appropriate, label the package with the appropriate "PCB" sticker and apply the appropriate waste code (as determined by a certified designator).

Mark the PCB concentration or range of concentrations on the DFWIS and on the package. If the range is unknown, contact GWAS or SWM for resolution. Field sampling may be required.

If PCBs are not present in the DFW, answer the question NO, and no PCB marking or labeling is required.

3.3.5 Oxidizers and Ignitable Waste

If the DFW is ignitable or oxidizers are present, label the package "Oxidizer", mark the Hazardous Waste Sticker with the D001 code and answer the question YES. If it is unknown, label the DFW "Oxidizer" and apply the D001 code to the Hazardous Waste Sticker and answer the question UNKNOWN, or contact GWAS. If the DFW is not potentially an oxidizer or ignitable, answer the question NO, and no oxidizer marking or labeling is required.

3.3.6 Characteristic, Toxic, Persistent, or Carcinogenic Waste

If the DFW is Toxic, Persistent, or Carcinogenic as defined in Chapter 173-303 WAC, apply the appropriate waste code(s) (e.g., WT01 - WT02, WP01 - WP02 - WP03, WC01 - WC02) respectively. If the DFW contains any dangerous characteristic wastes, apply the appropriate "D" codes (i.e., D001, D002, D003) to the Hazardous Waste Sticker, label the package, and answer the question YES. If the DFW does not contain any Characteristic, Toxic, Persistent, or Carcinogenic materials, answer the question NO, and no Characteristic, Toxic, Persistent, or Carcinogenic marking or labeling is required. If the answer is UNKNOWN, contact GWAS for assistance.

3.3.7 Toxicity Characteristics

If any of the Toxicity Characteristic waste codes (D004-D043) are known, include the appropriate waste codes on the DFWIS on the Hazardous Waste Sticker, and answer the question YES. If the DFW does not contain any of these waste types, answer the question NO, and no Toxicity Characteristic marking or labeling is required. If the answer is UNKNOWN, contact GWAS for assistance.

3.3.8 Extremely Hazardous Waste

If the DFW is determined to be "Extremely Hazardous Waste" (EHW), or if the waste class is unknown, label the container with a "MW-EHW" marking and answer the question YES or UNKNOWN as appropriate. If the DFW is known to be "Dangerous Waste" (DW), label the container with a "MW-DW" marking and answer the question NO.

3.4 LABELING AND MARKING

Reference Section 4.6 of this manual for additional instructions. The package(s) shall be labeled or marked with the following:

- Point of origin;
- Generator DFW PIN# assigned by GWAS;
- Department of Transportation (DOT) Radioactive Label as specified;
- Gross weight in pounds or kilograms;
- "THIS END UP" (liquids only);
- "BOTTOM TIER ONLY" (for drums weighing 1,000 pounds or greater);
- Hazardous Waste Sticker with the appropriate waste codes (if applicable); and
- DOT Hazard Class(es) and Proper Shipping Name.

3.5 SUMMARY

Attach the chemical characterization sample numbers, dates and analysis reports if known. State the primary hazards of the DFW along with the proper shipping name. Identify any placarding requirements. Ensure all required labels and/or markings are present and all waste codes are indicated on the Hazardous Waste Sticker. Attach all documentation on known hazards (Material Safety Data Sheet(s) (MSDS), container inventory sheets, etc.). List any GWAS variance Control Numbers.

3.6 GENERATING FACILITY CERTIFICATION

Each DFW must have the printed name, signature of a designated representative and the date under the following certification.

I HEREBY DECLARE THAT THE CONTENTS ARE FULLY AND ACCURATELY DESCRIBED ABOVE BY PROPER SHIPPING NAME AND ARE CLASSIFIED, PACKED, AND LABELED (PER WAC 173-303-070), AND ARE IN ALL RESPECTS IN PROPER CONDITION FOR TRANSPORT ACCORDING TO FEDERAL AND STATE REGULATIONS TO THE BEST OF MY KNOWLEDGE.

4.0 RECEIPT AND STAGING

The DFW shall be received for interim storage at the interim storage facility in the appropriate DFW staging area through the use of detailed procedures.

The DFW shall be staged at the interim storage facility until full laboratory characterization documentation is provided by the generator. After receipt of this characterization information, the generator shall request an SDAR as indicated below. When the approved SDAR is received, SWM may move the package(s) to another location within the TSD facility.

4.1 FINAL WASTE CHARACTERIZATION

After the generator has determined the final waste characterization, the generator shall provide GWAS with all characterization documentation and a revised WSDR with the corrected information. Based on this information, GWAS will either issue an SDAR, or require the generator to provide additional information. If an SDAR is issued, a copy will be sent to SWM Operations which will relabel the package(s) if required.

DIFFICULT WASTE INFORMATION SHEET (DFWIS)REV1

GENERATOR PIN #____________________ DIFFICULT WASTE (DFW) PIN#____________________

Generator must answer the following questions to the best of their knowledge. A "Y" or "?" answer to any of the questions will require action by the generator, see the fine print below each question to determine the action. A DFWIS must be completed for each DFW package which is to be shipped to interim storage. If any questions are encountered during this process, please contact Generator and Waste Acceptance Services (GWAS) Send the completed DFWIS forms with CC:Mail form variances provided by the GWAS to D. L. Allen, T3-05.

WASTE CHARACTERISTICS	YES(Y), NO(N), UNKNOWN(?)	INITIAL
1. Does the waste contain any prohibited material? Prohibited materials include. • Etiologic Agents (49 CFR 173 386) • Chemically incompatible materials in any waste container (40 CFR 265.313) • Explosives (10 CFR 61.56) • Pyrophorics (10 CFR 61 56) • Gas cylinders that are not permanently vented		
2. Does the container violate any of the following requirements? Shipping Container ________________ Gross Weight ________ lbs or kg • Containers MUST be in good condition with no visible cracks, holes, bulges, severe corrosion, or other damage that could compromise integrity. Any containers that are bulged, severely corroded, or otherwise damaged shall not be used and the waste must be repackaged or overpacked in a container meeting the criteria in this section. • Containers shall not be used for shipment or storage of wastes that could react with or degrade the container or liner by physical, chemical, or radiological mechanisms. • All containers shall be either metal, composite, or wood and shall be fire retardant. • If Container does not meet DOT shipping requirements, contact GWAS.		
3. Is dose rate of package > 100 mrem/hr at any point? Dose Rate ____________ mrem/hr TI Dose Rate(For Type A and Greater only)____________ The maximum surface-radiation dose rate shall not exceed 100 mrem/hr at any point. If the dose rate exceeds the limit, the package shall have to be shielded down to the acceptable limit.		
4. Are any liquids present in the waste? Is the container properly labeled for these liquids? Double containment is required for all containers containing liquids. If the container does not have double containment, overpack the container (contact GWAS for assistance), absorbent shall be placed in the annulus. "This end up," or directional arrows will be marked on the sides and near the top to indicate proper package orientation for packages containing inner containers of liquids. "LIQUID ORGANIC WASTE" shall be marked on the side of each drum containing free organic liquids in inner containers		
5. Give as complete of a description as possible of the contents of the waste package. (Check One)LLW______ LLMW______ TRU______ TRU-Mixed______, Does this waste contain aerosol containers? ______ Physical Description:____________________ Radionuclides:____________________ Total Curies:__________ Is the waste greater than Type A__________ Point of origin:__________ Have samples been taken, if so when?		
6. Does the waste exceed these surface contamination limits? Removable contamination on the exterior surfaces of all waste packages shall not exceed the following limits: • 220 dpm/100 cm^2 for alpha contamination • 2,200 dpm/100 cm^2 for beta-gamma contamination.		
7. Does the waste package exceed the nuclear criticality limits? • The total fissile content of any one container will not exceed 15 grams. • If this limit is exceeded, contact GWAS for further instructions.		

DIFFICULT WASTE INFORMATION SHEET (DFWIS)REV1

GENERATOR PIN #____________________ DIFFICULT WASTE (DFW) PIN#____________________

WASTE CHARACTERISTICS	YES(Y), NO(N), UNKNOWN(?)	INITIAL
8. Is this waste TRU, If so what is the PE-Ci content? PE-Ci Content _______ _____________ If the curie content is not known or cannot be determined from the dose rate, contact GWAS for further instructions.		
9. Does a potential exist for gas generation? If the potential exists for gas generation, contact GWAS for assistance.		
10. Is the flashpoint of the waste ≤ 140 °F? Flashpoint ________ °F If the flashpoint is less than 100 °F, the container shall be labeled with a DOT Flammable Liquid label. If the flashpoint is unknown, the container will be labeled with a "Flashpoint < 100 °F" marking and DOT Flammable label and D001 waste code on the Hazardous Waste Sticker. If the flashpoint is ≤ 140°F, mark flashpoint or flashpoint range ("Flashpoint < 100°F" or "Flashpoint > 100°F and < 140°F") on container and D001 waste code on the Hazardous Waste Sticker.		
11. Is the waste corrosive? If the waste is corrosive, or it is unknown if the waste is corrosive, label the container with a DOT Corrosive label, "pH < 2" marking, or "pH > 12.5" marking (only if known), and a D002 waste code on the Hazardous Waste Sticker.		
12. Is the waste potentially Listed? If the waste is U/P-Listed, F-Listed or potentially F-Listed, label the appropriate code(s) on the Hazardous Waste Sticker.		
13. Are PCB's present in the waste? If PCB's are present, label the drum with the appropriate "PCB" sticker, mark the PCB concentration or concentration range on the container, and apply the applicable waste codes. Indicate PCB concentration or concentration range ____________ ppm If concentration or range is unknown and PCBs are suspected, contact GWAS.		
14. Are any of the following present in the waste? (check one, if applicable) ____OXIDIZER ____POISON ____FLAMMABLE SOLID ____PIH If the waste contains Poisons, flammable solids, or oxidizers, label the drum		
15. Does the waste exhibit any of the Washington State characteristics of toxicity, persistence, or carcinogenicity? If any of these waste codes are known, include these waste codes on the Hazardous Waste Sticker and label container as required by CHAPTER 173-303 WAC.		
16. Is the waste Extremely Hazardous Waste (EHW)? If the waste is EHW or if the waste class is unknown, label the container with a "MW-EHW" marking.		
17. Is the waste reactive? If the waste is reactive or it is unknown if the waste is reactive, contact GWAS for further instructions.		
18. Does the package require additional labeling and marking? The packages shall be labeled or marked with the following: • Point of origin • DFW PIN # assigned by GWAS • DOT Radioactive Label as specified by PSN • Gross weight in pounds or kilograms • "Bottom Tier Only" (for drums weighing 1,000 lb or greater) • Hazardous Waste marking with PSN and waste codes (If applicable) • Other hazard marking and labels as applicable		

DIFFICULT WASTE INFORMATION SHEET (DFWIS)REV1

GENERATOR PIN #________________ DIFFICULT WASTE (DFW) PIN#________________

WASTE CHARACTERISTICS	YES(Y), NO(N), UNKNOWN(?)	INITIAL

19. CHEMICAL INFORMATION

Chemical Constituents(if known)________________________

Proper Shipping Name(RQ?) ________________ Hazard Class________ UN/NA#________

Waste Codes(if known)________________________

List GWAS attachment Control Numbers ________________________

Placards Required

GENERATOR CERTIFICATION

I hereby declare that the contents are fully and accurately described above by proper shipping name and are classified, packed, and labeled (per WAC 173-303-070), and are in all respects in proper condition for transport according to state and federal regulations to the best of my knowledge.

PRINTED/TYPED NAME________________ SIGNATURE________________ DATE________

GENERATOR AND WASTE ACCEPTANCE SERVICES

This container shall be placed in ________________ DE-Ci Content ________________

Generator and Waste Acceptance Services (signature/date) ________________ Charge Code ________

PRE-SHIPMENT INSPECTION CERTIFICATION

I hereby confirm that this Difficult Waste package meets the Difficult Waste acceptance criteria based upon the information provided above by the generator.

Hazardous Materials Operations (signature) ________________ Date ________

Solid Waste Management (signature) ________________ Date ________

RECEIPT AND STORAGE VERIFICATION

The Difficult Waste package has been received at interim storage by Solid Waste Management and placed in the appropriate facility as specified in the Generator and Waste Acceptance Services section of this document

(signature/date) ________________ Location ________________

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APPENDIX P

ALTERNATE RADIONUCLIDE CLASSIFICATION CALCULATION

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In cases where the radionuclide concentration of a given waste package exceeds the Category 1 limit by a small amount the following alternative method for determining waste radionuclide category may be used. WHC will ensure that the intruder 100 mrem/year limit specified in DOE Order 5820.2A is maintained by establishing curie limits for the burial trenches.

Classification of mixtures of radioisotopes may be accomplished by the following sum of the fractions method. The curie concentration of each isotope in table 3-1 shall be divided by its Category 1 limit. If the sum of these fractions for the radionuclides in the waste is $\leq$ 1.0 then the waste is Category 1. If the sum of the fractions is > 1.0 by a small amount then the radionuclide category of the waste should be determined as follows: The sum of the fractions shall be calculated separately for short lived (half life $\leq$ 100 years) radionuclides and for long lived (half life > 100 years) radionuclides. If the sum of the fractions for the long lived radionuclides does not exceed the Category 1 limit, use the sum of the fractions of the short lived radionuclides to calculate the waste radionuclide category. If the sum of the fractions of the long lived radionuclides exceeds the Category 1 limit but not the Category 3 limit and the sum of the fractions of the short lived radionuclides does not exceed the Category 3 limit the waste is Category 3.

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DISTRIBUTION SHEET

To: Distribution   From: N. P. Willis   Date: 10/27/93

Project Title/Work Order:

WHC-EP-0063-4, "Hanford Site Solid Waste Acceptance Criteria"

EDT No.: 114443   ECN No.: N/A

Name	MSIN	With Attachment	EDT/ECN & Comment	EDT/ECN Only
Please Note: An * prior to a name signifies those listed on the "short list" distribution.				
* Central Files (2)	L8-04	X		
* EDMC	H4-22	X		
* Information Release Administration (3)	L8-07	X		
* M. R. Adams	H6-01	X		
M. D. Aichele	T4-04	X		
S. E. Albin (7)	T1-06	X		
L. K. Aldrich	L8-16	X		
* D. L. Allen	T3-05	X		
R. R. Ames	N3-13	X		
S. J. Amir	T3-04	X		
J. D. Anderson	T3-04	X		
J. L. Aranda	T5-08	X		
K. F. Armatis	S6-12	X		
D. L. Armstrong	B5-20	X		
E. G. Backlund	T5-54	X		
D. F. Baker	S6-19	X		
R. L. Baker	S2-34	X		
* D. L. Barron	S2-12	X		
W. B. Barton	L4-75	X		
W. F. Baxter	L4-73	X		
K. L. Beebe	S5-51	X		
J. E. Beiler	S6-70	X		
M. W. Benecke	L4-30	X		
* G. L. Bennett	X3-68	X		
T. L. Bennington (3)	H4-16	X		
H. L. Benny	L7-09	X		
J. B. Benton	R3-45	X		
H. R. Benzel	T4-03	X		
D. W. Bergmann	T7-11	X		
P. C. Berlin	N3-13	X		
* J. C. Biagine	S6-30	X		
J. W. Biglin	L5-31	X		
* J. M. Bishop	L6-26	X		
V. L. Blanchard	T3-04	X		
K. W. Bledsoe	R4-03	X		
R. E. Bolls	T3-04	X		
R. J. Boom	T1-30	X		
R. J. Bottenus	T3-28	X		
* W. W. Bowen	S6-65	X		
* H. C. Boynton	T3-04	X		
R. W. Brown	L6-79	X		
J. P. Buescher	S5-65	X		
J. A. Bultena	N3-06	X		

*	M. E. Burnside	G2-02	X
	A. B. Carlson	H5-33	X
*	G. B. Carlson	G2-06	X
	J. R. Carver	X5-52	X
	F. J. Carvo	N1-41	X
	P. Castille	T4-04	X
	S. A. Chastain	L5-01	X
*	M. S. Cochrane	S1-52	X
*	L. L. Cole	G2-02	X
	R. L. Collins	B2-16	X
	F. M. Coony	H6-07	X
*	P. J. Crane	T3-28	X
	N. R. Dahl	N2-04	X
	T. F. Dale	S5-51	X
	C. R. Davis	T4-04	X
*	C. B. Dean	L6-40	X
	J. D. Dederick	B2-16	X
	T. A. Demitruk	H5-36	X
	E. E. Dick	T4-10	X
	L. P. Diediker	T1-30	X
*	J. E. Dreher	T4-05	X
	V. T. Dunnett	T3-04	X
	R. R. Durfee	T4-04	X
*	D. S. Dutt	L6-39	X
*	D. K. DuVon	R2-77	X
*	J. J. Ehlis	G2-02	X
	R. W. Eisele	T4-06	X
	J. D. Elliott	T4-06	X
	M. W. Ellis	S6-19	X
*	N. P. Emerson	T4-03	X
	B. B. Emory	X3-70	X
	D. B. Encke	R2-77	X
*	L. J. Estey	T5-04	X
	J. P. Estrellado	H4-70	X
	G. C. Evans	H6-23	X
	J. Y. Fannin	L4-69	X
	D. G. Farwick	H4-16	X
*	D. J. Farquahar	A1-05	X
	G. W. Faulk	T3-28	X
	J. G. Field	G2-02	X
	A. L. Fishback	S5-51	X
	B. R. Fitzpatrick	T4-40	X
	D. L. Flyckt	R3-45	X
	P. J. Fortin	T6-12	X
	J. M. Frain	H6-04	X
*	R. W. France	S2-40	X
	J. G. Francik	G6-57	X
	S. K. Fritts	T4-05	X
	M. J. Galbraith	H6-02	X
	J. E. Gamin	G6-57	X
	R. G. Gant	X0-41	X
*	C. J. Geier	R2-50	X
	R. P. Genoni	G2-02	X
	S. K. Genoni	B5-25	X
	W. P. Gilles	B5-25	X

*	R. J. Giroir	T4-05	X
	C. K. Girres	T3-04	X
	S. D. Godfrey	R1-51	X
	D. D. Goeckner	T1-34	X
	W. H. Grams	L0-17	X
	M. D. Graves	T6-20	X
*	E. F. Gray	R3-50	X
	G. L. Greene	T4-19	X
	W. O. Greenhalgh	L5-31	X
	R. E. Gregory	T5-08	X
*	W. T. Gretsinger	R4-01	X
	D. D. Griffin	N3-06	X
*	P. R. Gunter	R1-62	X
	F. W. Gustafson	H6-04	X
	D. L. Hagel	N3-11	X
*	D. L. Halgren	S6-70	X
*	T. W. Halverson	B5-21	X
	J. B. Hall	G6-57	X
*	D. W. Hamilton	T6-02	X
*	W. H. Hamilton Jr	N3-10	X
	R. B. Hamrick	T4-04	X
	G. R. Hanson	T4-03	X
*	P. L. Hapke	T4-05	X
	E. A. Harding	S2-15	X
	E. M. Harding	N3-06	X
	M. R. Harker	H4-68	X
	J. A. Harris	S3-31	X
	W. M. Harty, Jr.	G6-02	X
	A. R. Hawkins	L4-85	X
	M. L. Hayward	H5-33	X
	P. L. Hemsworth	T4-06	X
*	D. R. Herman	S2-12	X
	I. Henderson	T3-28	X
*	J. R. Hilliard (2)	S6-19	X
	N. O. Hinojosa	X8-20	X
	T. R. Hipschman	S5-03	X
	D. R. Hirzel	T5-54	X
*	K. L. Hladek	N3-13	X
	B. J. Hobbs	N3-06	X
	J. E. Hodgson	X7-02	X
	R. D. Hodgson	H5-71	X
	G. G. Hopkins	N3-06	X
	D. A. Hoover	N3-13	X
	C. H. Huang	H4-68	X
	P. K. Huff	X8-20	X
	M. C. Hughes	R2-81	X
	M. R. Ibatuan	N3-13	X
	R. W. Jackson	N3-06	X
	P. H. Jacobsen	N3-13	X
	W. G. Jasen	S5-59	X
	R. M. Jochen	X0-35	X
	D. J. Johnson	N1-58	X
	D. M. Johnson	H5-33	X
	H. E. Johnson	H4-68	X
	K. D. Johnson	H5-33	X

	M. C. Jones		T4-01	X
	R. J. Jones Jr.		S4-65	X
	J. P. Joyce		H4-68	X
	M. E. Juguilon		L4-94	X
	W. J. Karwoski		H4-14	X
	R. S. Kelley		H5-33	X
	J. H. Kessner		H4-23	X
	J. Khojandi		G2-02	X
	D. R. Kibbe		L4-86	X
	P. F. Kison		S6-12	X
	J. A. Koerner		T6-12	X
	E. H. Kohlman		H5-09	X
	C. M. Kronvall		T5-53	X
	O. L. Kruger		H5-33	X
	M. J. La Barge		H6-30	X
*	E. L. Lamm		G4-10	X
	J. S. Layman		B5-32	X
*	R. J. Landon		H6-21	X
	M. J. Lauterbach		H6-01	X
*	R. L. Law		B1-61	X
*	G. J. LeBaron		S6-19	X
	M. D. Leclair		H1-60	X
	J. S. Lee		T4-01	X
	H. Leigh		N1-40	X
	J. B. Levine		R3-54	X
	R. M. Lipinski		T3-04	X
	C. D. Lucas		X0-35	X
	W. C. Mallory		R3-12	X
	E. J. Manthos (4)		T5-54	X
*	C. E. Marple		S2-34	X
*	M. L. Martin		T6-20	X
*	R. L. Martin		T3-03	X
	B. A. Mayancsik		H5-33	X
*	D. J. McBride		T5-54	X
	D. C. McCann		B5-25	X
*	M. M. McCarthy		N3-13	X
	J. P. McGrogan		G2-02	X
	D. W. McNally		X0-51	X
	M. A. Medsker		H4-68	X
	B. C. Meese		T5-04	X
	M. A. Mihalic		R2-77	X
	G. E. Miller		B5-32	X
*	P. C. Miller		N2-04	X
	E. C. Mincey		T5-08	X
*	A. G. Miskho		H6-30	X
	G. J. Miskho		R2-50	X
	L. J. Mitchell		G6-57	X
	T. E. Mitchell		S6-22	X
	D. J. Moak		N3-05	X
*	R. D. Moerman		B5-20	X
*	J. A. Morrison		T3-01	X
	J. A. Mortensen		T3-28	X
*	M. R. Morton		R2-77	X
*	K. J. Moss		X0-21	X

	D. E. Nester	H5-33	X
	J. M. Nielsen	T4-05	X
	R. R. Nielson	T6-12	X
	T. W. Noland	L4-85	X
*	E. M. Nordquist	R3-27	X
*	F. J. Nunamaker	L6-36	X
	H. E. Oens	T5-02	X
	R. W. Ohrt	H5-25	X
	A. R. Olander	L4-96	X
	B. K. Olson	S3-31	X
	M. A. Ortega	T3-28	X
*	R. A. Otte	G5-03	X
	R. K. P'Pool	T1-30	X
*	I. Palfrey	S4-43	X
	R. B. Pan	H5-53	X
	R. Pedraza	T4-06	X
	J. E. Perham	T4-08	X
*	R. D. Pierce	T3-04	X
	A. G. Pines	T4-10	X
	B. G. Place	H5-33	X
*	A. D. Poor	G4-10	X
	B. E. Poremba	T4-03	X
	D. R. Porten	H4-68	X
	E. A. Porter	R2-88	X
	J. H. Portsmouth	G2-03	X
*	R. W. Powell	H4-14	X
	D. B. Powell, Jr.	T4-03	X
	L. L. Powers	L4-96	X
	D. A. Pratt	T4-03	X
	J. W. Pratt	T4-04	X
*	W. H. Price	N3-05	X
*	G. R. Priddy	R3-12	X
	D. R. Pyzel (2)	T4-04	X
*	D. E. Rasmussen	L4-30	X
*	R. E. Raymond	R2-54	X
	R. D. Redekopp	T5-50	X
	J. F. Relyea	L4-69	X
*	J. A. Remaize	L6-18	X
*	W. L. Reseck	L6-53	X
*	D. C. Richardson	R2-50	X
*	J. G. Riddelle	T3-28	X
*	R. A. Riggers	N2-04	X
*	J. A. Rivera	B2-16	X
	R. G. Robbins	T4-06	X
*	R. J. Roberts	N3-13	X
	F. V. Roeck	H6-01	X
*	L. E. Rogers	N3-05	X
	J. C. Sabin	H5-71	X
	M. A. Sams	G2-02	X
*	B. I. Sanner	B1-61	X
	A. E. Schilling, Jr.	T5-51	X
*	B. D. Schilperoort	X8-20	X
	J. P. Schmidt	X0-41	X
	J. T. Schorzman	T4-04	X
	J. J. Schumacher	L6-26	X

	E. F. Serabia	T4-19	X
*	M. M. Serkowski	S6-70	X
*	L. K. Severud	H5-60	X
	J. B. Shannon	T3-11	X
	R. L. Shaver	H4-23	X
	J. S. Sheehan	T3-05	X
	M. L. Sheriff	H5-33	X
	N. M. Shoemaker	T4-04	X
	W. A. Skelly	H6-03	X
	J. P. Sloughter	T6-07	X
	B. L. Smith	T6-10	X
	E. R. Smith	G2-02	X
	K. R. Smith	G2-02	X
*	R. A. Smith	G6-02	X
*	W. L. Smoot	B2-18	X
	T. W. Spicer	N3-06	X
	M. T. Stankovich	H6-02	X
*	J. C. Stevens	B1-03	X
	R. G. Stickney	L0-17	X
*	D. E. Stocker	L8-10	X
	C. A. Strand	L4-30	X
	K. E. Strickler	S6-60	X
*	K. D. Strong	S6-60	X
	C. R. Stroup	B2-23	X
*	S. C. Sutton	S2-34	X
	L. D. Swenson	G6-06	X
	T. C. Synoground	T3-28	X
*	R. W. Szelmeczka	T4-06	X
*	J. D. Thomson	R1-30	X
	M. E. Thurman	G2-02	X
	J. C. Titus	S0-02	X
	W. E. Toebe (2)	H6-22	X
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