

## **POLICY AND PROCEDURES**

TITLE: Waste Incidental to Reprocessing Determination

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### **1.0 POLICY**

It is the policy of the West Valley Nuclear Services Company (WVNSCO) to ensure that radioactive waste is managed in a manner that is protective of worker and public health and safety and the environment.

The purpose of this policy and procedure is to implement the process for determining if a waste is or contains a residue in a form that could be high-level radioactive waste (HLW) as defined in DOE M 435.1-1, but might be managed as other than HLW by using the Waste Incidental to Reprocessing (WIR) determination process.

All radioactive waste at the West Valley Demonstration Project (WVDP) SHALL be screened in accordance with this policy and procedure. This procedure is not intended to be retroactive: waste that has been packaged, characterized, classified for disposal as other than HLW or systems being utilized for other than HLW management on January 1, 2001 need not be re-evaluated.

This policy and procedure applies only to on-site storage and off-site disposal of radioactive wastes. This policy and procedure does not apply to on-site disposition (e.g., in-place closure) or the final HLW glass waste form.

| NOTE Minor changes and revision to this procedure do not require DOE-WVDP approval. Significant changes to this procedure (e.g., addition of a new waste category added to Attachment E) should be provided to the DOE-WVDP for approval. The DOE-WVDP should continue to be consulted on waste determined to be incidental to reprocessing through the "evaluation" process.

### **2.0 REQUIREMENTS, REFERENCES, AND FORMS**

#### **2.1 Requirements**

10 CFR 830.120, "Quality Assurance"

DOE O 414.1, "Quality Assurance"

DOE O 435.1, "Radioactive Waste Management"

DOE M 435.1-1, "Radioactive Waste Management Manual"

#### **2.2 References**

DOE Letter OH-0420-04, R. F. Warther to T. J. Jackson, "Waste Incidental to Reprocessing," dated July 27, 2004.

| Letter, WVNSCO (L.E. Rowell) to DOE (T.J. Jackson), "Revision to Waste Incidental to Reprocessing Determination Procedure (WV-929) and Citations Submitted for Approval," WD:2004:0138, dated March 16, 2004

Section 3116 of the Ronald W. Reagan National Defense Authorization Act dated October 2004 provides criteria for incidental waste determinations applicable only to South Carolina and Idaho for wastes contaminated with high level waste residues not transported out of those states. The Section 3116 criteria are similar to but not word-for-word identical with those contained in DOE's 435.1, from which the WVDP's incidental waste determination requirements in WV-929 are derived. Thus, the Section 3116 requirements and criteria are not directly applicable to the West Valley Demonstration Project; the WVDP should be consistent the intent of Section 3116 in the preparation of incidental waste determinations by evaluation to support DOE Complex-wide conformity.

10 CFR 61.55, "Waste Classification"

10 CFR 61.58, "Alternative Requirements for Waste Classification and Characteristics"  
Atomic Energy Commission, Notice of Proposed Rulemaking (34 FR 8712) for Proposed Appendix D, 10 CFR 50, Paragraphs 6 and 7, June 3, 1969.

Atomic Energy Commission, Rules and Regulations (35 FR 17530) 10 CFR 50, "Licensing of Production and Utilization Facilities, Siting of Fuel Reprocessing Plants and Related Waste Management Facilities," November 14, 1970.

"Bechtel Drawing Control Index," May 1978 (logbook).

DOE G 435.1-1, "Implementation Guide for DOE M 435.1-1."  
EP-8-001, "Equipment, Instrument, and Valve Identification Numbers."

HLW-SUP-99-0060, "Citation Determination and Evaluation of Waste Incidental to Reprocessing," Savannah River Site, April 1, 2000.

Nuclear Regulatory Commission (NRC), "Issuance of Final Branch Technical Position on Concentration Averaging and Encapsulation, Revision in Part to Waste Classification Technical Position," January 17, 1995.

SOP 300-07, "Waste Generation, Packaging, and On-Site Transportation."

West Valley Nuclear Services Company, "WVDP DOE O 435.1 Implementation Plan."

"Cognizant Responsibility List for Systems and Facilities at WVDP," Rev. 40, October 11, 2000.

WM-210, "Waste Stream Characterization."

WSRC-RP-2001-00341, "Comparison of LLW Disposal Performance Objectives 10 CFR 61 and DOE 435.1," prepared by E. Wilhite, Westinghouse Savannah River Company, Savannah River Technology Center, dated March 1, 2001.

WV-902, "Planning for Data Collection Activities."

WVDP-002, "Quality Management Manual."

WVDP-257, "WVNS Manual for the Preparation, Review, Approval, Distribution, and Revision of Controlled Documents."

WVDP-262, "WVNS Manual for Records Management and Storage."

WVDP-339, "Radioactive Waste Certification Program Plan."

WVDP-370, "WVDP Radioactive Waste Acceptance Program."

## 2.3 Forms

WV-4405, "WIR Determination Screen"

## 3.0 DEFINITIONS & ACRONYMS

### 3.1 Definitions

High-Level Waste (HLW) - High-level waste is the highly radioactive waste material resulting from the reprocessing of spent nuclear fuel, including liquid waste produced directly in reprocessing and any solid material derived from such liquid waste that contains fission products in sufficient concentrations; and other highly radioactive material that is determined, consistent with existing law, to require permanent isolation. (See DOE M 435.1-1.)

Key Radionuclides - Key radionuclides are those controlled by concentration limits in 10 CFR 61.55 and those important to satisfying the performance objectives in 10 CFR Part 61 Subpart C. (See DOE G 435.1-1.)

Low-Level Waste (LLW) - Low-level radioactive waste is radioactive waste that is not high-level radioactive waste, spent nuclear fuel, transuranic waste, byproduct material (as defined in Section 11e.(2) of the Atomic Energy Act of 1954, as amended), or naturally occurring radioactive material. (See DOE M 435.1-1.)

Transuranic (TRU) Waste - TRU waste is radioactive waste containing more than 100 nanocuries (3700 becquerels) of alpha-emitting transuranic isotopes per gram of waste, with half-lives greater than 20 years, except for: (1) high-level radioactive waste; (2) waste that the Secretary of Energy has determined, with the concurrence of the Administrator of the Environmental Protection Agency, does not need the degree of isolation required by the 40 CFR Part 191 disposal regulations; or (3) waste that the Nuclear Regulatory Commission has approved for disposal on a case-by-case basis in accordance with 10 CFR Part 61. (See DOE M 435.1-1.)

Waste Incidental to Reprocessing (WIR) - Waste resulting from reprocessing spent nuclear fuel that is determined to be incidental to reprocessing is not HLW and SHALL be managed under DOE's regulatory authority in accordance with the requirements for TRU or LLW, as appropriate. (See DOE M 435.1-1.)

### 3.2 Acronyms

CFR	Code of Federal Regulations
DOE	(United States) Department of Energy
HLW	High-level (radioactive) waste
LLW	Low-level (radioactive) waste
NRC	Nuclear Regulatory Commission
QA	Quality assurance
TRU	Transuranic
WAC	Waste acceptance criteria
WIR	Waste incidental to reprocessing
WVDP	West Valley Demonstration Project
WVNSCO	West Valley Nuclear Services Co.

#### 4.0 RESPONSIBILITIES

- 4.1 Waste Generator - The waste generator is responsible for providing available radiological characterization and process history information associated with the waste to be subjected to the WIR determination process to the Facility Characterization Project.
- 4.2 Waste Shipping and Disposal Project Manager - The Waste Shipping and Disposal Project Manager has overall responsibility for ensuring that this policy and procedure is implemented. The Waste Shipping and Disposal Project Manager is responsible for ensuring a process is established to determine and document that all appropriate wastes are subjected to the waste incidental to reprocessing determination. The Waste Shipping and Disposal Project Manager SHALL be supported in the determination process by approved personnel who are deemed to be adequately trained to implement the requirements of this procedure. The Waste Shipping and Disposal Project Manager and waste generator SHALL be supported in the WIR determination by Strategic Planning Development Manager as appropriate. The Waste Shipping and Disposal Project Manager is responsible for ensuring that WIR by evaluations are submitted to the DOE/OH.
- 4.3 Records Function - The Records Function within the Finance Department is responsible for maintaining records generated when implementing this procedure.
- 4.4 Waste Shipping & Disposal (WSD) - WSD is responsible for characterizing waste, developing waste profiles, maintaining records pertaining to waste classification, characterization, and for WIR determinations. WSD may be asked to provide necessary assistance to persons assessing waste for WIR by evaluation. WSD is responsible for performing on-site certification activities for newly generated radioactive waste that will be stored in the Lag Storage Complex.
- 4.5 Department of Energy Field Element Manager (FEM) - The DOE FEM is responsible for ensuring that WIR determinations are made either by the citation or evaluation process. The DOE FEM is also responsible for consultation and coordination with the Office of Environmental Management (EM) if needed. The DOE FEM for the West Valley Demonstration Project is the DOE-WVDP Director.
- 4.6 Nuclear Regulatory Commission (NRC) - Consultation with the NRC for the review of the determination process is consistent with the requirement in the West Valley Demonstration Project Memorandum of Understanding between the U.S. Department of Energy and the U.S. Nuclear Regulatory Commission and DOE G435.1-1 states that the NRC may be consulted for review of the process for WIR evaluations.
- 4.7 WVNSCO Quality Assurance (QA) - The QA Department is responsible for maintaining the site QA program under which activities for this procedure are conducted and for overseeing and assessing the process for WIR determinations.
- 4.8 WIR Evaluation Analyst - The WIR Evaluation Analyst is responsible for performing WIR determination evaluations and WIR determination screens and is knowledgeable of waste disposition processes through a combination of experience and technical training. In addition, the WIR analyst has successfully completed the training requirements (VO430Q) on the WIR procedure and process. WIR Evaluation Analysts are approved by the Waste Shipping and Disposal Project Manager.

## 5.0 GENERAL INFORMATION

### 5.1 DOE Definition of WIR

Waste incidental to reprocessing "refers to a process for identifying waste streams that would otherwise be considered HLW due to their sources of generation or concentration but can be managed in accordance with the DOE requirements for transuranic or low-level waste if the requirements for WIR can be met. . . . The goal of the WIR determination process is to safely manage and dispose of a limited number of reprocessing waste streams that do not warrant geologic repository disposal because of their lack of long-term threats to the environment and man." (See DOE G 435.1-1, p. II-18.) In accordance with DOE M 435.1-1, Chapter II, item B, wastes may be determined not to be HLW by one of two processes, (1) the citation process or (2) the evaluation process.

#### 5.1.1 WIR by Citation

WIR by citation includes spent nuclear fuel reprocessing waste resulting from reprocessing plant operations such as (but not limited to) contaminated job wastes, including laboratory items such as clothing, tools, expended samples, sample media, and equipment.

#### 5.1.2 WIR by Evaluation

WIR by evaluation includes spent nuclear fuel reprocessing plant wastes that meet the requirements in **either** Section 5.1.2.A **or** Section 5.1.2.B:

A. Wastes that will be managed as low-level waste and meet the following criteria:

1. **(LLW Criterion 1)** Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. **(LLW Criterion 2)** Will be managed to meet safety requirements comparable to the performance objectives set out in 10 CFR Part 61, Subpart C, *Performance Objectives*; and
3. **(LLW Criterion 3)** Are to be managed, pursuant to DOE's authority under the Atomic Energy Act of 1954, as amended, and in accordance with the provisions of Chapter IV of DOE M 435.1-1, provided the waste will be incorporated in a solid physical form at a concentration that does not exceed the applicable concentration limits for Class C low-level waste as set out in 10 CFR 61.55, *Waste Classification*; or will meet alternative requirements for waste classification and characterization as DOE may authorize.

B. Wastes that will be managed as transuranic waste and meet the following criteria:

1. **(TRU Criterion 1)** Have been processed, or will be processed, to remove key radionuclides to the maximum extent that is technically and economically practical; and
2. **(TRU Criterion 2)** Will be incorporated in a solid physical form and meet alternative requirements for waste classification and characteristics, as DOE may authorize; and

3. **(TRU Criterion 3)** Are managed pursuant to DOE's authority under the *Atomic Energy Act of 1954*, as amended, in accordance with the provisions of Chapter III of DOE M 435.1-1, as appropriate.

## 5.2 WIR Determinations at the WVDP

- 5.2.1 The following waste streams are candidates for the WIR process: 1) wastes that would be considered as HLW (but have not been specifically excluded from this procedure), 2) wastes that are commingled with HLW, or 3) wastes that have been wetted by HLW.

**NOTE** *As understood in DOE G 435.1-1, Chapter II, p. II-6: DOE M 435.1-1 supports the implementation of part (2) of the 10 CFR Part 60 definition to mean that high-level wastes are wastes that are generated as a product of reprocessing of spent nuclear fuel downstream of, and including, the first step in a separations process, and the concentrated waste streams from subsequent extraction cycles or steps . . . Wastes that are produced upstream of these separations processes, from such processes as chemical or mechanical decladding, fuel dissolution, cladding separations, conditioning, or accountability measuring, are not high-level waste.*

- 5.2.2 Systems at the WVDP that have been used to process, transfer, or store HLW are listed in Attachment B. System components that may have been wetted with HLW are listed in Attachment C. A diagram of system components that have may have been wetted with HLW specific to the Main Plant is presented in Attachment D.
- 5.2.3 Wastes at the WVDP which are considered excluded by citation are listed in Attachment E.
- 5.2.4 WIR determinations may be future oriented, i.e., they may be based upon not only the current waste form but the forecast form. Basis for the WIR determinations by the evaluation process will be documented. (See Section 6.4.8.)
- 5.2.5 As part of the WIR by evaluation process in this procedure, it is assumed that if a waste is expected to meet the criteria for off-site disposal it is compliant with the performance objectives set out in DOE M 435.1-1 and 10 CFR 61, Subpart C. (WSRC-RP-2001-00341 concludes the 435.1-1 performance measures are as protective as 10 CFR 61 performance objectives for non-in situ disposal. Thus, if a waste stream and/or container meets an off-site DOE waste disposal site's WAC (e.g., Nevada Test Site), it meets the WIR LLW Criterion 2.) However, if no disposal facility is available, the WIR Evaluation Analyst will review and ensure that there is compliance with on-site interim storage requirements in WVDP-370, which documents the requirements for on-site certification.

**NOTE** *DOE O 435.1-1 cites DOE M 435.1-1, which includes by reference performance objectives in 10 CFR 61, Subpart C. These performance objectives include 1) protection of the general population from releases of radioactivity, 2) protection of individuals from inadvertent intrusion, 3) protection of individuals during operations, and 4) stability of the disposal site after closure.*

- 5.2.6 If additional data are required, data may be collected in accordance with WV-902, "Planning for Data Collection Activities."
- 5.2.7 WIR determinations will be implemented in accordance with requirements of the WVDP Quality Assurance Program.

5.3 Training/Approval of Individuals Who Document WIR Determinations

- 5.3.1 Individuals who review and document WIR evaluations SHALL have been approved to perform this function by the Waste Shipping and Disposal Project Manager through completion of training requirements outlined by training activity number VO430Q.

6.0 PROCEDURE

The WIR process is summarized on the flow chart in Attachment A. Wastes may be excluded from the WIR process in accordance with Sections 6.1 and 6.2. If the waste does not meet criteria for exclusion as a result of these sections, trained personnel will be assigned to complete the WIR process, as summarized in Sections 6.3 through 6.5.

WIR determinations are performed on each waste characterization profile. If the waste profile is new, or is being revised, a new WIR Determination Screen (Form WV-4405) SHALL be completed and filed with the waste characterization profile. WIR determinations MAY be performed on a container by container basis.

6.1 Identify the Waste for the WIR Determination

If wastes are being evaluated on a waste profile basis, determine if a waste profile has been previously generated and the WIR process has been performed on the waste profile. If not, proceed to Step 6.1.1. If wastes are being evaluated on a container basis, proceed to Step 6.1.1.

- 6.1.1 Determine if a waste is radiologically contaminated. If not, the waste is excluded from any further WIR screening process. Document the screening results on Form WV-4405 (i.e., answer "No" at Gate 0 on Form WV-4405), check that the waste is not HLW and print/sign name underneath the first section of Form WV-4405. A peer review is required, with a signature and date. Forward completed form to WSD to be incorporated into the waste characterization profile file or with the individual file for the container. Otherwise, answer the gate "Yes" and continue with the screening process.

**NOTE** *The scope of a WIR determination may be narrowly or broadly defined, ranging from a single item or small group of items to an entire facility. For efficiency it is recommended that, whenever possible, wastes resulting from the same processes be combined into a single WIR determination (DOE G 435.1-1, p. II-18).*

6.2 Determine if the Waste is From a HLW System or Could Have Been "Wetted With" HLW

- 6.2.1 Determine if the waste originated from (or may have been contaminated with spills from) one of the systems that was "wetted" with HLW, as listed in Attachment B. If so, it is subject to this procedure. If not, it is excluded. Document the screening results on Form WV-4405 (i.e., answer "No" at Gate 1 on Form WV-4405), check that the waste is not HLW and print/sign name underneath this section of Form WV-4405. A peer review is required, with a signature and date. Forward completed form to WSD to be incorporated into the waste characterization profile file or with the individual file for the container. Otherwise, answer the gate "Yes" and continue with the screening process.

- 6.2.2 Determine if the waste is from a system component with the potential to have been "wetted" by HLW, as listed in Attachment C (for instance, tanks, pumps, and piping). If the waste is not from one of the system components that may have come into contact with HLW, it is excluded from this procedure. The component is also excluded if it is known never to have been "wetted" with HLW. Also determine if the waste is from the Main Plant and is not associated with the components on the figure in Attachment D. Document the screening results on Form WV-4405 (i.e., answer "No" at Gate 2 on Form WV-4405), check that the waste is not HLW and print/sign name underneath this section of Form WV-4405. A peer review is required, with a signature and date. Forward completed form to WSD to be incorporated into the waste characterization profile file or with the individual file for the container. Otherwise, answer the gate "Yes" and continue with the screening process.

**NOTE1** *For example, a tank that was part of System 7 but was used only to hold evaporator condensate would be excluded from this process.*

**NOTE2** *Further evaluation requires completion by a WIR Evaluation Analyst.*

6.3 Determine if the Waste is not HLW by the Citation Process

**NOTE** *The individual performing the WIR determination may perform a WIR evaluation for any item listed in Attachment E if they feel it is necessary.*

If the waste does not consist of only items from the list in Attachment E, document the screening results on Form WV-4405 (i.e., answer "No" at Gate 3 on Form WV-4405 and skip to Section 6.4 of this procedure). Otherwise, the waste is determined to be not HLW by citation and can be managed as other than HLW. Waste will be classified, characterized, and managed in accordance with Waste Management Procedures.

- 6.3.1 Document the screening results on Form WV-4405 (i.e., answer "Yes" at Gate 3 on Form WV-4405 and complete the corresponding citation number from Attachment E), check that the waste is not HLW and print/sign name underneath this section of Form WV-4405. A peer review is required, with a signature and date.

- 6.3.2 Forward completed form to WSD to be incorporated into the waste characterization profile file or with the individual file for the container.

6.4 Determine if the Waste is Excluded by the Evaluation Process

**NOTE** *Consideration may be given to both the current and future waste forms when completing WIR evaluations.*

If process knowledge suggests that the waste could be managed as TRU waste, complete Section 6.4.1 to assess compliance with **TRU Criterion 1** and Section 6.4.6 in order to assess compliance with **TRU Criteria 2 and 3**.

If process knowledge suggests that the waste could be managed as LLW, complete Section 6.4.1 to assess compliance with **LLW Criterion 1** and Section 6.4.7 in order to assess compliance with **LLW Criteria 2 and 3**.



#### 6.4.1 Evaluate the Waste for Removal of Key Radionuclides

In this section, the waste is evaluated for compliance with **TRU Criterion 1** and **LLW Criterion 1** as cited in Sections 5.1.2.A.1 and B.1 in order to determine if major radionuclides have been removed to the maximum extent technically and economically practical. A suggested tabular format for the evaluation is given in Section 6.4.2.

##### A. Assess Technical Practicality

1. Identify the technical decontamination methods that are applicable to the waste being evaluated. Technical treatment options may include the following:
  - chemical treatment processes (e.g., acid bath)
  - physical removal processes (e.g., spraying, scraping)
  - separation technologies (e.g., ion exchange)

Include all treatment methods that were considered.
2. Identify the key radionuclides requiring removal.
3. Evaluate the radionuclide removal efficiencies for each technology listed. Document the evaluation.
4. Document the assessment of factors such as technical risk, physical or chemical factors incompatible with the waste, and potential effects on the public, the worker, and the environment.
5. For each treatment method, list the bases of the determination for those methods that were practical and those that were impractical. (Such bases may include the status of the technologies, such as the technical maturity or the results from applying the technology at other sites.)

#### 6.4.2 Assess Economic Practicality

**NOTE** *If wastes could meet WAC of off-site disposal facilities or if wastes could meet 10 CFR 61.55 Class C LLW criteria without additional treatment, it may be determined that further removal of radionuclides is not economically practical.*

- A. For each of the technical processes determined technically practical, include:
  - total life cycle costs for an alternative or
  - unit costs (e.g., cost per curie removed, cost per piece of equipment decontaminated, or cost per person-rem)
- B. Determine, if possible, a relationship between costs and removal of the key radionuclides and identify the point in the relationship at which removal costs increase and become impractical.
- C. An economic assessment may not be necessary if a treatment option is not considered to be technically practical.

Example Worksheet for Technical and Economical Practicality				
Technical Removal Process	Estimated Removal Efficiency (%)	Cost Per Tank	Technology Status	Comments
1) Spray Washing	99%	\$1.2M	Demonstrated technology	Dependent upon properties of residual waste
2) Chemical Dissolution	99.9%	>\$20M	Demonstrated technology	Possible equipment corrosion

- 6.4.3 On the basis of the technical and economic evaluation in this section as well as on the basis of the results from Sections 6.4.6 (TRU) and 6.4.7 (LLW), select the optimum treatment method and document the basis for the selection. An example text format for the evaluation is given in Attachment F.
- 6.4.4 If it is determined that radionuclides have been removed to the maximum extent technically and economically practical, then the waste is compliant with either **TRU Criterion 1** or **LLW Criterion 1**, whichever is being evaluated.
- 6.4.5 If it is determined that radionuclides have not been removed to the maximum extent technically and economically practical, then the waste may be processed further and re-evaluated. Otherwise, the waste must be managed as HLW. (See Section 7.5.)
- 6.4.6 Evaluate the Waste as Transuranic (TRU) Waste

In this section, waste is evaluated for compliance with **TRU Criteria 2 and 3** as cited in Sections 5.1.2.B.2 and B.3.

**NOTE** *The following procedural steps for WIR determinations do not require that formal waste profiles, container characterization files, and/or other documentation be generated in accordance with Waste Management procedures. The following steps are predictive and are intended to be used only for WIR determinations. Checklists and criteria in Waste Management documents or in WVDP controlled documents pertaining to waste storage are to be used for guidance only.*

- A. Estimate the concentration (in nCi/g) of TRU in the waste being assessed and document the estimate.
  1. Documentation should include calculations summarizing the technical basis for the concentration estimate including: the mass of the final waste form, analytical data used to estimate the activity of each TRU and any other supporting information. (See Section 6.4.8.)
  2. Isotopes for TRU determinations include: neptunium-237, plutonium-238, plutonium-239, plutonium-240, plutonium-242, plutonium-244, americium-241, americium-242, americium-243, curium-243, curium-245, curium-246, curium-247, curium-248, curium-250, berkelium-247, californium-249, and californium-251. (Listing is from WVDP-370, item 4.2.1.)
- B. Determine if the estimated concentration is more than 100 nCi/g (3700 Bq/g).

If the estimated concentration is less than or equal to 100 nCi/g, the waste cannot be classified as TRU and must be evaluated via the LLW option. (See Section 6.4.7.)

- C. Using guidance from criteria in WM-210, "Waste Stream Characterization," determine if the waste has the potential to be disposed off-site.
  - 1. If it is determined that the waste could meet the WAC of a disposal facility that can accept TRU waste (e.g., WIPP - in the event that this disposal facility may be used by the WVDP), the waste will be considered as compliant with **TRU Criteria 2 and 3**.
  - 2. If the waste can not meet WAC criteria for an off-site disposal facility, then the waste **SHALL** be managed as HLW in accordance with Section 6.5.

**NOTE** *Conditions for on-site storage include restrictions on free liquids, hazardous constituents, pressurization, pathogens, chelating agents, polychlorinated biphenyls, reactivity, fissile material, contamination, and contact exposure rate.*

- D. If the waste has potential for on-site storage as TRU waste, it must be demonstrated to meet a TRU WAC for the anticipated final waste form.
- E. If waste could not meet WAC criteria for an off-site disposal facility, then the waste **SHALL** be managed as HLW in accordance with Section 6.5.

#### 6.4.7 Evaluate the Waste as Low-level Waste (LLW)

In this section, waste is evaluated for compliance with **LLW Criteria 2 and 3** as cited in Sections 5.1.2.A.2 and A.3.

**NOTE** *The following procedural steps for WIR determinations do not require that formal waste profiles, container characterization files, and/or other documentation be generated in accordance with Waste Management procedures. The following steps are predictive and are intended to be used only for WIR determinations. Checklists and criteria in Waste Management documents or in WVDP controlled documents pertaining to waste storage are to be used for guidance only.*

- A. Estimate the concentration (in nCi/g or Bq/m<sup>3</sup>, as appropriate) of key radionuclides in the waste being assessed and document the assessment.
  - 1. Include all 10 CFR 61.55 Table 1 and Table 2 radionuclides applicable to the WVDP: hydrogen-3, carbon-14, cobalt-60, nickel-63, strontium-90, technetium-99, iodine-129, cesium-137, plutonium-241, curium-242, and alpha-emitting TRU nuclides (all of the TRU nuclides listed in Section 7.4.6.A.1, above, plus curium-244). Radionuclides in activated metals and those with half-lives less than five years were not included in the listing since these do not apply to WVDP waste.
  - 2. Documentation should include calculations summarizing the technical basis for the concentration estimate, including: the mass of the material, analytical or measurement data used to estimate the activity of each key radionuclide, and any other supporting information, as appropriate. (See Section 6.4.8.)

- B. Determine if the estimated concentrations are consistent with 10 CFR 61.55 criteria for Class C LLW.
  - 1. If estimated concentrations are not within the Class C criteria, the waste may not have the potential to be classified as LLW but must either be processed further to remove additional radionuclides (Section 6.4.1) and re-evaluated or (if not already done) be assessed via the TRU option (Section 6.4.6) or pursue alternative classification.
  - 2. If estimated concentrations are within Class C criteria, the waste has the potential to be classified as LLW.
  - 3. The waste may also be considered LLW if it meets the alternative requirements for waste classification and characterization as DOE may authorize (DOE M 435.1-1, Section II, B(2)(a)3). Such alternative requirements for waste classification and characterization are not addressed in WV-929.
- C. If the waste could meet the WAC of a disposal facility that can accept LLW (e.g., a DOE facility such as the Nevada Test Site (NTS) or Hanford or a commercial facility such as Envirocare), it is considered compliant with **LLW Criteria 2 and 3**. Document per Section 6.4.8.
- D. If the waste could not meet WAC criteria for an off-site disposal facility or if no disposal facility is currently available, the waste must be evaluated for on-site storage.

**NOTE** *Conditions for on-site storage include restrictions on free liquids, hazardous constituents, pressurization, pathogens, chelating agents, polychlorinated biphenyls, reactivity, fissile material, contamination, and contact exposure rate.*

- E. If the waste could meet criteria in WVDP-370 for on-site storage as LLW, the waste is considered compliant with **LLW Criteria 2 and 3**. Document per Section 6.4.8.
- F. If the waste does not meet criteria of LLW it must either be processed further (Section 6.4.1) and re-evaluated or managed as HLW (Section 6.5).

#### 6.4.8 Document Results of the WIR Evaluation

- A. Document the screening results on Form WV-4405 (i.e., answer "Yes" or "No" at Gate 4 on Form WV-4405), check that the waste is or is not HLW and print/sign name underneath this section of Form WV-4405. A peer review is required, with a signature and date. Another WIR Evaluation Analyst or the Strategic Planning Development Manager can serve as a peer reviewer.
- B. Transmit the completed form per WV-107 to DOE for review and consultation.
- C. Once DOE has performed their review and consultation, forward completed form to WSD (as well as documentation from DOE) to be incorporated into the waste characterization profile file or with the individual file for the container.
- D. A suggested format for documenting WIR evaluation determinations is provided in Attachment F. Supporting documentation for WIR evaluation determinations SHALL include the following at minimum:

- Calculations for radionuclide concentrations (e.g., analytical data, volume estimates, density estimates, dose estimates, dose-to-curie conversion factors);
- Comparison of nuclide concentrations with applicable limits (e.g., TRU limit in DOE M 435.1, Class C LLW limits in 10 CFR 61.55);
- Documentation of potential for compliance with off-site WAC criteria;
- Calculations for cost estimates;
- Bases for selection of preferred treatment methods; and
- Bases for ultimate WIR determination.

- E. WIR evaluations SHALL be attached to the WIR Determination Screen (WV-4405) and maintained as part of characterization profile documentation or with the individual file for the container.

#### 6.5 Disposition of Materials Determined to be HLW

Materials that have not been excluded and have not met the WIR criteria (e.g., are HLW) are to be stored or managed as appropriate, for instance, in HLW interim storage, until such time as disposition is defined.

6.5.1 Document the results of the WIR evaluation in accordance with Section 6.4.8.

6.5.2 Wastes may be processed further to reduce radionuclide concentrations and may then be re-evaluated.

6.5.3 Alternate options for classification or disposal may be considered.

#### 7.0 RECORDS

The following forms, data sheets, logs, reports, or any other form of documentation considered to be a record and generated in response to this procedure shall be prepared, maintained, and transferred to the MRC in accordance with WVDP-262. Refer to RIDS for further information.

7.1 Documentation supporting WIR determination by the evaluation process. (See Section 6.4.8.)

7.2 WIR Determination Screen (Form WV-4405).

#### 8.0 ATTACHMENTS

Attachment A - Flow Chart for WIR Determinations

Attachment B - List of System Numbers and HLW Status of Each

Attachment C - Equipment Type Designators at the WVDP

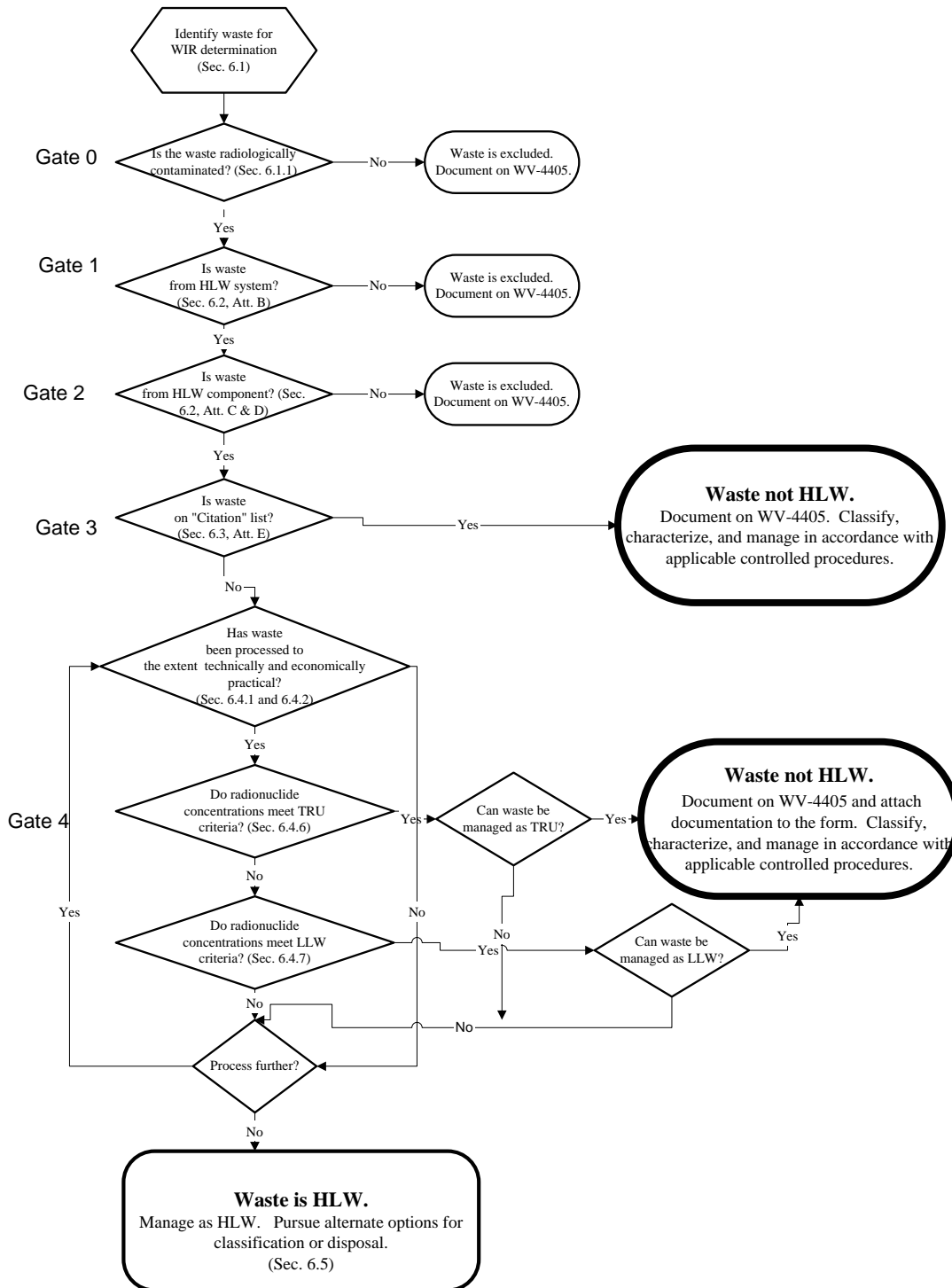
Attachment D - Diagram of Main Plant System Components that May Contain HLW

Attachment E - Listing of Items that are Excluded by Citation

Attachment F - Suggested Format for Documenting WIR by Evaluation

## Attachment A

### Flow Chart for WIR Determinations



**Attachment B**

List of system numbers and a description of systems that have been (or will be) used to process, transfer, or store HLW. Sources: EP-8-001 (and cited lists) and logbook "Bechtel Drawing Control Index," dated 5/78.

<b>System #</b>	<b>Description</b>
4	Solvent Extraction and Waste Separation
7	Process Waste Handling
8	High-Level Liquid Waste Storage (Waste Tank Farm)
50	Supernatant Treatment System
55	Sludge Mobilization and Transfer System
63	Vitrification Facility System
68	High-Level Waste Interim Storage
69	Vitrification Facility Sampling
90	Analytical Laboratory
313	Remote-Handled Waste Facility

### Attachment C

Equipment type designators at the WVDP. Equipment used to process, transfer, or store HLW are in **bold**. Designators formerly used by NFS are listed. Sources: EP-8-001 (and cited lists) and logbook "Bechtel Drawing Control Index," dated May 1978.

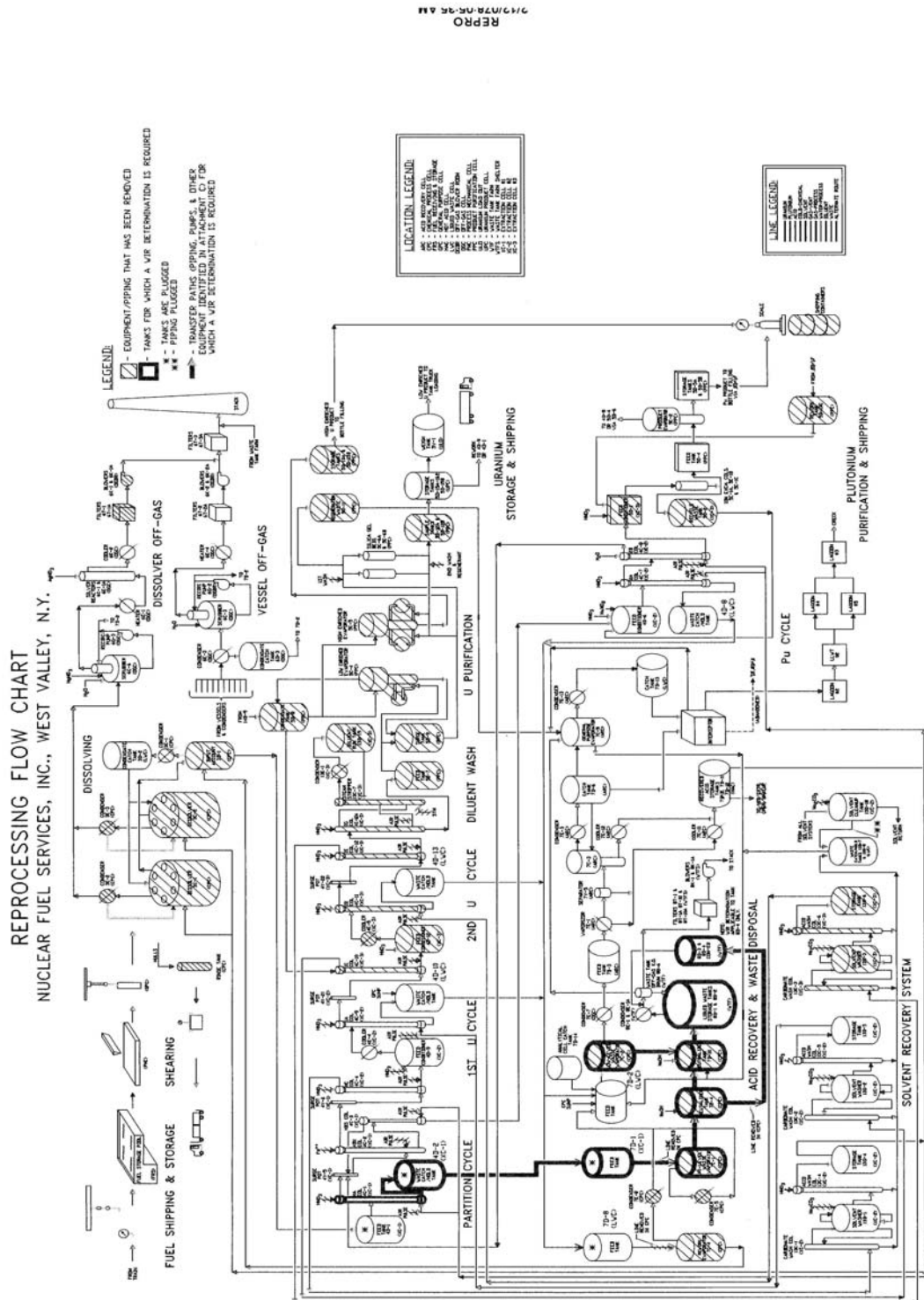
Designator	Type	Designator	Type
<b>A (NFS)</b>	<b>General</b>	M	Shielding doors and windows
AAD	Air aspirating detector	MCC	Motor control center
ANN	Annunciator	MCP	Motor control panel
ANS	Annex distribution center	MPS	Manual pull station
AP	All-page, plant-page	MS	Motor starter
ARP	Agent release panel	MSM	Master/slave manipulator
ASD	Adjustable speed drive	MSS	Main switching station
B	Control panels (general)	N (NFS)	Insulation
<b>B (NFS)</b>	<b>Process</b>	OCB	Oil circuit breaker
BD	Beam detector	P	Generators (or "Electrical" as formerly used by NFS)
<b>C</b>	<b>Columns, pressure vessels, and scrubber</b>	PB	Pull box (wire pull box)
CAS	Clean agent system	PC	Pump controller
CB	Electrical circuit breaker	PDB	Power distribution box
CE	Communications panel	PLC	Programmable logic controller
CP	Control panel (electrical)	PP	Power panel
<b>D</b>	<b>Tanks</b>	Q (NFS)	Foundations
DC	Dry chemical	R (NFS)	Buildings
DGP	Data gathering panel	RDR	Radiation detection relay
DS	Disconnect switch	RE	Rad monitor skid
<b>E</b>	<b>Exchangers</b>	RP	Relay panel
EHT	Electrical heat trace box	RUD	Roll-up door
EJB	Electrical termination box	S (NFS)	Site improvements
F	Fired heaters	SA	Security alarm
FAP	Fire alarm panel	SD	Smoke detector



Designator	Type	Designator	Type
FD	Fire damper	SG	Switch gear
FU	Fuses	SPS	Spray process systems
<b>G</b>	<b>Pumps and drivers</b>	SRP	Sequence relay panel
GB	Glove box	SS	Selector switch
GE	Engine drive pump's engine	STR	Storage rack
GM	Motor-driven pump's motor	<b>T</b>	<b>Filters ("Special Equipment" as used by NFS)</b>
GT	Turbine-driven pump's turbine	TC	Temperature controller
<b>H</b>	<b>Vacuum equipment</b>	TE	Resistance temperature detector (RID)
HD	Heat detector	TM	Electrical thermostat
HJB	Heater junction box	TPB	Telecommunications pull box
HTD	Heat trace power distribution panel	<b>TRS</b>	<b>Transfer system</b>
HTR	Electric heater	TS	Electrical transfer switch
HTT	Heat trace tee connection box	TTB	Telecommunications termination box
ID	Isolation damper	U (NFS)	Expendables
IM	Interface module	UPS	Uninterruptable power supply
J (NFS)	Instruments	US	Unit substation
JB	Junction box	<b>V</b>	<b>Package units</b>
<b>K</b>	<b>Fans, compressors, and mixers</b>	VC	Video camera
KM	Fan, compressor, mixer drive motor	VFD	Variable frequency drive
<b>L</b>	<b>Piping (NFS designator)</b>	W	Cranes, lifting equipment, and conveyors ("material processing" by NFS)
LC	Load center	WI	Weigh scale
LDR	Line driver	WT	Work table
LP	Lighting panel	X (NFS)	Painting
LS	Limit switch / level switch	XFR	Transformer
LT	Lighting transformer	<b>XX</b>	<b>Miscellaneous</b>
<b>M (NFS)</b>	<b>Structures</b>	Y	Ventilation, HVAC equipment

## Attachment D

**Diagram of Main Plant System Components that may Contain HLW and Justification why these Components Require a WIR Determination**



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#### Attachment D

Based on historical reprocessing operations conducted between 1965 and 1972 by Nuclear Fuel Services (NFS), and applying the definition of high-level waste\* (HLW), the following components are subject to the Waste Incidental to Reprocessing (WIR) determination methodology in DOE Order 435.1. The following components were used to route and store liquid wastes from the first cycle solvent extraction system. It should be noted that connecting piping of these components also are subject to this WIR determination process.

1. The first Extraction Column in the process, 4C-1
2. Waste Catch/Hold Tank 4D-2
3. Feed Tank 7D-1
4. High-Level Waste Evaporator 7C-1 (removed)
5. Neutralizer Tank 7D-4 (removed)
6. Neutralizer Tank 7D-10 (removed)
7. Tanks 8D-1, 8D-2, and 8D-4 (storage of HLW)

One more component which was used to concentrate wastes from subsequent extraction cycles is also applicable. That component is Tank 7C-2, which has also been removed.

**\*Note:** In addition to the definition of HLW found in this procedure, additional guidance has been given by NRC to define what is meant by the phrase "liquid wastes which are produced directly in reprocessing." Further definition can be found in 10 CFR 50, Appendix F. Appendix F to Part 50 only applies to NRC-licensed fuel reprocessing facilities and this original definition of HLW was promulgated in 1970 with the West Valley Facility in mind. Appendix F defines high-level liquid radioactive wastes as:

"...those aqueous wastes resulting from the operation of the first cycle solvent extraction system, or equivalent, and the concentrated wastes from subsequent extraction cycles."

## Attachment E

### Listing of Items that are Excluded by Citation

The proposed addition of new waste categories to this listing should be forwarded to the DOE-WVDP for approval.

#### **Contaminated Job Wastes**

<b>Citation Number</b>	<b>Waste</b>
A1	hand tools (e.g., screwdrivers, wrenches, hammers)
A2	electrical tools (e.g., drills, grinders)
A3	job control wastes (e.g., paper, plastic, rubber, metal, wood, cloth items, tape, survey media, postings, signs, step-off pads, ropes, barricades, herculite)
A4	temporary containment materials (e.g., huts, windbreaks, glove bags, drip containment)
A5	ventilation system HEPA filters, ventilation systems, off-gas systems, and associated components
A6	personnel protective equipment (e.g., clothing, respiratory equipment)
A7	hoses and electrical cords
A8	radiological monitoring equipment (e.g., wipes, smears, filters, probes)
A9	portable tools (e.g., hydraulically-operated shears, cut-off saws, flame torches)
A10	emptied waste boxes, reusable insert containers (RIC)
A11	general debris (trash) removed during manual housekeeping
A12	material handling equipment (e.g., gantry crane)
A13	consumables (e.g., weld rod)
A14	portable fire extinguishers
A15	hoisting and rigging
A16	Replaced, worn and failed parts (e.g., wires, cables, motors, gears, brackets, plates, bearings, belts, gaskets, flanges, pipe, and valves)

#### **Sample Media**

<b>Citation Number</b>	<b>Waste</b>
B1	lab ware (e.g., funnels, beakers, cylinders, stir bars, flasks, sample bombs)
B2	thermometers
B3	sample vials, vessels, and bottles
B4	sample carriers
B5	tongs and forceps
B6	syringes and needles
B7	planchets, crucibles, and crucible lids
B8	expended samples

### **Measuring and Monitoring Equipment**

<b>Citation Number</b>	<b>Waste</b>
C1	tapes (e.g., reel, steel)
C2	instruments and gauges
C3	indicators (e.g., level, pressure, density, specific gravity)
C4	temperature indicators and thermocouples in wells
C5	conductivity probes
C6	in-line monitors

### **Laboratory Clothing, Tools, and Equipment**

<b>Citation Number</b>	<b>Waste</b>
D1	lab coats, gloves, tape, hoods, shoe covers, coveralls
D2	wipes, swabs, absorbent materials, towels
D3	weighing equipment (e.g., laboratory balances and scales)
D4	centrifuges
D5	sampling and analytical evaporators and condensers
D6	grinding equipment and lab ware for solid samples
D7	electronic measuring equipment and probes or detectors for chemical and radioactive constituents
D8	cables and cords
D9	heating equipment (e.g., hot plates, ovens, furnaces, microwave ovens)
D10	laboratory instrumentation with associated wiring, plumbing, and tubing
D11	laboratory quantities of contaminated resins, reagents, sample aliquots
D12	empty laboratory containers (e.g., leach buckets, mixing containers, digestion vessels)
D13	DELETED
D14	glove boxes, hoods, and associated equipment
D15	remote cameras and support equipment
D16	shield windows and other shielding (temporary or permanent)
D17	laboratory-associated operations equipment and media (e.g., HEPA and HEME filters)

**Decontamination Media and Decontamination Solutions**

Citation Number	Waste
E1	swabs, mops, masslin clothes, buckets, rollers, brushes
E2	kraft paper, surface coverings, wrappings
E3	strippable coatings and application equipment
E4	CO <sub>2</sub> decontamination equipment (tanks, hoses, nozzles)
E5	acids, bases, and cleaning solutions
E6	liquid, chemical, and steam spray nozzles, hoses, and piping
E7	scabbling equipment
E8	canister decontamination chambers and support equipment
E9	herculite and tape
E10	portable vacuum cleaners
E11	spray wands, spray manifolds
E12	piping, tanks and vessels used to collect cleaning solutions (e.g., contaminated water)

## **Attachment F**

### **Suggested Format for Documenting WIR by Evaluation**

- Introduction and Summary
- Background
- Approach
  - Technical and Economic Practicality
  - Concentration and Physical Form
  - Performance Objectives
- Technical and Economic Practicality
  - Technical Practicality
    - Characteristics and Waste Properties
    - Methodology
    - Discussion
  - Economic Practicality
  - Conclusion
- Concentration Limits and Physical Form
- Performance Assessment
- References

# WVNSCO RECORD OF REVISION

Rev. No.	Description of Changes	Revision On Page(s)	Dated
2	<p>Changed the following in response to DOE Assessment Letter JJM:085 - 79315 - 435.5.1, T. J. Jackson to J. L. Little, "Technical Review Team Comments on WV-929, 'Waste Incidental to Reprocessing Determination'," dated September 13, 2001:</p> <p>Section 1.0: Replaced the paragraph with "The purpose of this policy and procedure is to implement the process for determining if a waste is or contains a residue in a form that could be high-level radioactive waste (HLW) as defined in DOE M 435.1-1, but might be managed as other than HLW by using the Waste Incidental to Reprocessing (WIR) determination process."</p> <p>Section 2.0 More clearly defined what waste is applicable to this procedure by changing, ". . . waste being stored on-site and managed in a controlled manner. . ." to ". . . waste that has been packaged, characterized, classified for disposal. . .".</p> <p>Section 2.0 Rewrote to say, "This policy and procedure applies only to on-site storage and off-site disposal of radioactive wastes. This policy and procedure does not apply to on-site disposition (e.g., in-place closure) or the final HLW glass waste form."</p> <p>Section 3.1 The first four requirements were moved to the reference section since they are not requirements.</p> <p>Section 3.2 Deleted "Technical Basis for Waste Incidental to Reprocessing Determination for Tanks 8D-1 and 8D-2: Revision 1, September 29, 2000 WD:2000:0733</p> <p>Section 5.0 Deleted Responsibility 5.4 based upon recommended changes to Responsibility 5.9.</p> <p>Section 5.9 Changed "(FM)" to "(FEM)" to be consistent with DOE M 435.1-1.</p>	All	11/01/01
	Added expended samples and sample media to Section 5.1.1.	4	
	Attachment E - Added Citation Number B8, Expended Samples.	20	



WVNSCO RECORD OF REVISION CONTINUATION FORM

Rev. No.	Description of Changes	Revision On Page(s)	Dated
	Deleted D13 from Citation List (Attachment E).	21	
	Attachment G - Physically removed Form WV-4405 from document and made minor formatting changes to it.	24	
	Changed references in text from Attachment G to Form WV-4405.	7, 8, 12, 13	
	Changed references throughout document from Waste Management Services (WMS) to Waste Shipping and Services (WSS) due to department title change.	3, 4, 7, 8, 12	
	Departments affected by this revision are Facility Characterization Project and Waste Shipping & Services.		
6	Revision is a minor change. Doe approval is not required.		08/02/04
	Added note that incorporates the direction given in DOE letter OH-0420-04, R. F. Warther to T. J. Jackson, "Waste Incidental to Reprocessing," dated July 27, 2004.	1	
	Made provisions for WIR determinations to be made on a container-by-container basis.	6, 7, 8, 10-13	
	Deleted the requirement to submit to DOE WIR screens that are excluded by citation per letter OH-0420-04.	8	
	Added how WIR evaluations are to be transmitted to DOE for consultation per DOE letter OH-0240-04.	12	
	Added note to Attachment E per DOE letter OH-0420-04.	20	
	Added "herculite" to the Citation List, duplicating it in both Citation number A-3 and E-9.	20	
	Changed references to Waste Shipping & Services (WSS) to Waste Shipping & Disposal to reflect current organization.	All	
	Departments affected by this revision are Facility Characterization Project and Waste Shipping & Disposal, Records & Configuration/Document Control		

WVNSCO RECORD OF REVISION CONTINUATION FORM

Rev. No.	Description of Changes	Revision On Page(s)	Dated
7	<p>Third paragraph removed from Att. D as incorrect and inconsistent with other provisions of WV-929 based on the following: Tank 7D-14 in the Liquid Waste Cell receives waste by gravity flow from the Analytical and Process Chemical Laboratory drain. Potential high level waste material in the Analytical and Process Chemistry Laboratories is considered to have always been a sample. (No high level liquid waste material from reprocessing came into the Analytical and Process Chemistry laboratories directly.) At the singular moment it was decided to put any sample material into the drain that led to Tank 7D-14, the sample is considered to be expended. At this moment, this material was non-HLW by citation (see Att. E, Citation Item B8, "expended samples.") Thus, tanks 7D-14, 3D-2, and 7D-2 in the Liquid Waste Cell were contaminated with non-HLW materials by definition. Thus, these vessels are not subject to any subsequent WIR determination.</p> <p>Changed approval authority from DOE-OH to DOE-WVDP. Waste Shipping and Disposal Project Manager assigned overall responsibility with support from Strategic Planning Development Manager.</p> <p>Added reference to WD:2004:0138 and Section 3116 of NDAA A5 added "...ventilation systems, off-gas systems and associated Components..."</p> <p>E12 added "...and vessels..."</p> <p>A3 added "...wood..."</p> <p>A10 added "...reusable insert containers (RIC)..."</p> <p>A16 revised to be "...replaced, worn and failed parts (e.g., Wires, cables, motors, gears, brackets, plates, bearings, belts, Gaskets, flanges, pipe, valves)..."</p> <p>Waste Shipping &amp; Disposal is affected by this change.</p>	<p>18, 19</p> <p>1,4,20 3,4,6,12</p> <p>1,2 20 20 20 20 20</p>	03/27/07