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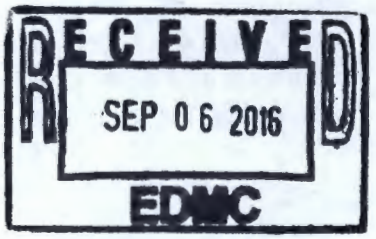
DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

U.S. Department of Energy
Environmental Restoration Disposal Facility
Hanford Site – 200 Area
Benton County, Washington
CERCLIS ID: WA1890090078



STATEMENT OF BASIS AND PURPOSE

This sixth Record of Decision (ROD) amendment to the *Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility* (EPA/ROD/R10-95/100) has been developed in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act of 1986*; and, to the extent practicable, the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 CFR 300). This ROD amendment, and supporting information, is contained in the Administrative Record for the Environmental Restoration Disposal Facility (ERDF).

The State of Washington concurs with the ROD amendment.

ASSESSMENT OF THE SITE

The response action selected in the ROD, as modified herein, is necessary to protect the public health, welfare, or the environment from actual or threatened releases of hazardous substances into the environment. Such a release, or threat of release, may present an imminent and substantial endangerment to public health, welfare, or the environment.

BACKGROUND AND DESCRIPTION OF THE ROD AMENDMENT

The ERDF ROD (EPA/ROD/R10-95/100) was signed by the U.S. Environmental Protection Agency (EPA), Washington State Department of Ecology (Ecology), and U.S. Department of Energy (DOE) (i.e., the Tri-Parties) in January 1995. An explanation of significant differences (ESD) was issued in August 1996 (EPA/ESD/R10-96/145). Five amendments to the ERDF ROD have been issued in September 1997, March 1999, January 2002, May 2007, and August 2009 (EPA/AMD/R10-97/101, EPA/AMD/R10-99/038, EPA/AMD/R10-02/030, EPA 2007, EPA 2009).

Public participation and documentation procedures for this ROD amendment have been followed, as specified in CERCLA Section 117 and 40 CFR 300.435(c)(2)(ii).

"DD" 200-DF-1

The new changes to the ROD, as amended, are summarized below.

ROD Amendment

Treatment of Waste Items in the ERDF Trench. Under this ROD amendment, the 40 CFR 268.45(a) and WAC 173-303-140(2)(a) ERDF applicable or relevant and appropriate requirement (ARAR) prohibition on placement of hazardous waste in a land disposal unit prior to completing required land disposal restriction (LDR) treatment is being waived pursuant to CERCLA Section 121(d)(4) for certain long, large, and/or heavy hazardous (LLHH) waste items because treatment prior to placement results in greater risk to human health and the environment. The waste must be treated to satisfy applicable LDR treatment requirements within a reasonable time after placement in the ERDF trench, while employing specified control measures to ensure effective treatment and to prevent releases until treatment is completed. Treatment must be conducted in accordance with a treatment plan approved by EPA, as required by the 2007 ERDF ROD Amendment. Treatment may or may not be performed in containers.

The LLHH waste items are mixed hazardous debris waste items that are eligible for ERDF disposal under the 2007 ERDF ROD Amendment and have the following characteristics:

1. Items that are too big to fit in and be treated within a standard 15.3-m^3 (20-yd^3) ERDF container (i.e., more than 6 m [19 ft] long, more than 2 m [7 ft] wide, and/or more than 1 m [3 ft] tall) and too hazardous to be safely size reduced; and are

2. Items with radiological contamination that would result in direct worker exposure during the macroencapsulation conducted prior to placement in ERDF and could result in airborne radioactivity if an industrial accident caused the waste item packaging to breach or the item to break (potentially releasing internal contamination) during treatment or transport activities; and/or are items with non-uniform weight distributions that present issues with rigging, crane lifts, and other manipulations, that contribute to the potential for industrial accidents that could increase the number of severe worker injuries.

Under *Resource Conservation and Recovery Act of 1976* and *Washington Administrative Code* LDR treatment requirements, waste that meets the definition of debris can be treated using macroencapsulation. The ERDF LDR treatment method to be used for the treatment of the LLHH items identified above within an ERDF trench consists of macroencapsulating the waste to meet 40 CFR 268.45[1], "Treatment Standards for Hazardous Debris," as the application of surface coating materials such as polymeric organics or use of a jacket of inert inorganic materials (e.g., cementitious grout) to substantially reduce surface exposure to potential leaching media. The encapsulating material must completely encapsulate debris and be resistant to degradation by the debris and its contaminants and materials into which it may come into contact after placement (leachate, other waste, microbes).

Under the waiver, macroencapsulation of the LLHH waste items identified above will be performed in the ERDF trench. By using this approach, almost none of the LLHH waste item

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[1] WAC 173-303-140, "Land Disposal Restrictions," incorporates the federal land disposal restrictions at 40 CFR 268 by reference.

handling activities and specialized equipment required for the current treatment method performed outside of the ERDF trench would be needed. Instead, standard ERDF equipment (e.g., blocks, cranes, forklifts, support facilities) and cementitious grout will be used to encapsulate the LLHH waste items requiring LDR treatment.

LLHH waste items to be macroencapsulated in the ERDF trench will be brought to ERDF from the waste site; driven into the disposal trench; and directly placed on concrete blocks, pads, or inorganic standoffs to allow the free flow of grout to completely surround and cover the waste items. This will take place at a location in the trench that has been prepared for receipt and disposal of the item. Once placed, the spread of contamination from the waste item will be prevented by protecting it from rain, snow, or wind through the use of tarps, berms, and ditches prior to encapsulation. Precautions will be taken so that if any contamination were to escape from the item's packaging, it would be trapped, collected, treated, and disposed of in accordance with applicable requirements. Encapsulation would be accomplished by flood grouting with single or multiple pours (depending on the overall size/shape of the LLHH waste items).

The in-trench treatment minimizes LLHH waste item handling to a single offloading operation during which workers can maintain a safe distance from the LLHH waste items, nearly eliminating radiological, chemical, and physical hazards. After being placed, the waste will be encapsulated with cementitious grout. This process follows the key tenets of the as low as reasonably achievable (ALARA) principle, thereby minimizing the workers' exposure to direct radiation and radiologically contaminated LLHH waste items, as well as chemical and physical hazards.

DECLARATION

The ROD, as modified herein, provides protection of human health and the environment. It complies with federal and state requirements (identified in the 1995 ROD, as amended) that are legally applicable or relevant and appropriate except as specified herein in accordance with CERCLA Section 121(d)(4), is cost effective, and utilizes permanent solutions to the maximum extent practicable.

The statutory preference for treatment as a principal element will continue to be satisfied for wastes that are required to be treated to meet the ERDF waste acceptance criteria and/or applicable LDRs under the ERDF ROD, as amended. Because hazardous substances, pollutants, or contaminants above health-based levels will be disposed in the ERDF trenches, a review will be conducted at least every 5 years after the commencement of remedial actions to ensure that the remedy continues to provide adequate protection of human health and the environment.

Signature Sheet for the Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Stacy Charboneau

Stacy Charboneau, Manager
Richland Operations Office
U.S. Department of Energy

12/22/15

Date

Signature sheet for the Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Richard Albright, Director
Office of Environmental Cleanup
U.S. Environmental Protection Agency

12/22/15
Date

Signature sheet for the Amendment to the Record of Decision for the USDOE Hanford Environmental Restoration Disposal Facility between the U.S. Department of Energy and the U.S. Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Jane Hedges
Program Manager, Nuclear Waste Program
Washington State Department of Ecology

12/22/2015
Date

DECISION SUMMARY

USDOE Environmental Restoration Disposal Facility
Record of Decision Amendment

I. INTRODUCTION

This document presents an amendment to the Record of Decision (ROD) for the Environmental Restoration Disposal Facility (ERDF) at the Hanford Site.

Site Name and Location

U.S. DOE Hanford Environmental Restoration Disposal Facility
Hanford Site – 200 Area
Benton County, Washington
CERCLIS ID: WA1890090078

Lead and Support Agencies

The lead agency for this action is the U.S. Department of Energy (DOE). The lead regulatory agency is the U.S. Environmental Protection Agency (EPA). The Washington State Department of Ecology (Ecology) concurs with the ROD amendment.

ERDF ROD Background

The fundamental objective of ERDF is to support the timely removal and disposal of contaminants from various locations within the Hanford Site. Hanford Site remedial action RODs and action memoranda identify ERDF as the location for disposal of the waste resulting from those response actions. The ERDF ROD was signed by EPA, Ecology, and DOE (the Tri-Parties) in January 1995 (EPA/ROD/R10-95-100). An ESD was issued in August 1996 (EPA/ESD/R10-96/145). Five amendments to the ERDF ROD have also been issued. The first amendment was signed on September 30, 1997 (EPA/AMD/R10-97/101); the second was signed on March 23, 1999 (EPA/AMD/R10-99/038); the third was signed on January 31, 2002 (EPA/AMD/R10-02/030); the fourth was signed on May 24, 2007 (EPA 2007); and the fifth was signed on August 6, 2009 (EPA 2009). Public participation and documentation procedures have been followed as specified in *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), Section 117, and 40 CFR 300.435(c)(2)(ii).

Basis for the ROD Amendment

This ROD amendment provides the basis for an applicable or relevant and appropriate requirement (ARAR) waiver under CERCLA §121(d)(4)(B) that allows treatment of certain long, large, and/or heavy hazardous (LLHH) waste items within the ERDF landfill after implementing controls to prevent releases, and ensures protection of human health and the environment. The hazardous waste items will be treated in accordance with the method

prescribed by the regulations (macroencapsulation) and managed within the double-lined trench in a manner that provides greater protection of workers and prevents migration of hazardous constituents to the environment.

Public Involvement

A public notice was placed in the *Tri-City Herald* on September 27, 2015, announcing the availability of the proposed plan and supporting information in the Administrative Record, the start of the public comment period, and the opportunity to request a public meeting. Approximately 1,900 copies of a fact sheet describing the proposed amendment were sent by email. A public comment period was held from September 28, 2015 through October 28, 2015. No requests were received for a public meeting; therefore, no public meeting was held. The DOE received six comment letters related to the proposed plan, and the comments and DOE and EPA responses are summarized in Section IX.

The proposed amendment was discussed with the Hanford Advisory Board and the Hanford Advisory Board – River and Plateau Committee at meetings on February 11, 2014, and October 7, 2014, respectively. The Hanford Advisory Board provided advice on the proposed amendment (HAB Consensus Advice #281). The decision to amend the ROD is based on the Administrative Record for the ERDF. The locations of the Administrative Record and Public Information Repositories are listed below.

Administrative Record

This ROD amendment will become part of the Administrative Record for the ERDF, as required by 40 CFR 300.825(a)(2), and is available to the public at the following locations:

Administrative Record (contains project documents supporting this decision)

U.S. Department of Energy, Richland Operations Office
Administrative Record Center
2440 Stevens Center
Richland, Washington 99352

Information Repositories (contain limited documentation)

University of Washington
Suzzallo Library
Government Publications Division
Box 352900
Seattle, Washington 98195

Gonzaga University, Foley Center
502 East Boone Avenue
Spokane, Washington 99258

Portland State University
Branford Price Millar Library
1875 SW Park Avenue
Portland, Oregon 97207

DOE, Public Reading Room
Washington State University, Tri-Cities
Consolidated Information Center Room 101-L
2770 Crimson Way
Richland, Washington 99352

II. SITE HISTORY

The Hanford Site was added to the National Priorities List (NPL) in July 1989 as four sites: 1100 Area, 100 Area, 200 Area, and 300 Area. Each of these areas was further divided into operable units (i.e., a grouping of individual waste units based primarily on geographic area and common waste sources). These operable units contain contamination in the form of hazardous waste; radioactive/hazardous mixed waste; and other CERCLA hazardous substances, pollutants, or contaminants.

In anticipation of the NPL listing, the Tri-Parties entered into the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) (Ecology et al. 1989) in May 1989. This agreement established a framework and schedule for developing, implementing, and monitoring response actions at the Hanford Site. The Tri-Party Agreement also addresses *Resource Conservation and Recovery Act of 1976* (RCRA) compliance and permitting.

Disposal of contaminated material at the ERDF has been chosen as the preferred remedy for much of the waste excavated from numerous Hanford Site waste sites. More than 17 million tons (as of May 2015) of Hanford Site cleanup waste has been disposed at ERDF since the facility started operations in 1996. Volume estimates for future waste from CERCLA decontamination, decommissioning, demolition, and disposal projects and soil remediation projects remain unknown at this time.

III. REMEDY SELECTED IN THE ROD

The major components of the selected remedy as described in the 1995 ERDF ROD (EPA/ROD/R10-95-100) included the following:

- Construction and operation of the first two disposal cells. These cells provided an approximate waste disposal capacity of 1 million yd^3. The cells were required to be designed and constructed in accordance with RCRA minimum technology requirements (40 CFR 264, Subpart N). The decisions to expand the landfill in the future are required to be documented by amending the ERDF ROD or as part of the RODs for the Hanford Site operable units.

- The ERDF site will cover a maximum of 4.1 km^2 (1,024 acres) on the Central Plateau, which is located southeast of the 200 West Area and southwest of the 200 East Area. The initial construction of the facility required 0.65 km^2 (165 acres) of this area.

- The ERDF is a single 21.3-m (70-ft)-deep trench consisting of a series of two side-by-side cells.

- The ERDF will provide sufficient leachate storage capacity to ensure uninterrupted operations and will comply with the requirements of 40 CFR 264, Subpart N. Leachate collected at the landfill will be managed at the 200 Area Effluent Treatment Facility (located in the 200 East Area) or other approved facility.

- Surface water run-on/run-off will be controlled at the landfill and other areas of the facility that are potentially contaminated. Best management practices to control runoff shall be employed.

- During excavation, suitable soils will be stockpiled at the ERDF site to provide materials for liner systems and for daily interim and closure covers for the landfill. Materials not suitable for construction of the liner and covers will be used for other construction purposes at the Hanford Site to the extent practicable.

- Air monitoring will be accomplished at ERDF by the placement of real-time air monitors for radioactive contaminants and the placement of air samplers for hazardous and radioactive constituents to detect any offsite migration of contaminants.

- Groundwater monitoring will be performed in accordance with 40 CFR 264, Subpart F.

- Appropriate measures to protect facility workers and the public will be employed during ERDF operations, including contamination control, dust mitigation, and protection of personnel from industrial hazards presented by ERDF operations. Protective measures shall comply with applicable requirements found in the *Occupational Safety and Health Act of 1970*, *Washington Industrial Safety and Health Act of 1973*, and other safety regulations or ERDF-specific safety requirements. The DOE shall also comply with the requirements of 40 CFR 300.150.

- Existing or planned site road systems will be used for waste transport.

- Waste acceptance criteria will be developed by DOE and approved by EPA in accordance with ARARs, risk/performance assessments, ERDF-specific safety documentation, and worker protection requirements. Operable unit-specific waste disposal and treatment decisions will be made as part of the remedy selection and cleanup decision process for each operable unit.

- The ERDF landfill will be closed by placing a modified RCRA-compliant closure cover over the waste. Prior to cover construction, closure cover designs will be evaluated and the most appropriate closure cover design will be selected for construction. Construction of the cover will occur on an incremental basis as the trench is expanded. The design will, at a minimum, comply with applicable RCRA requirements found in 40 CFR 264, Subpart N.

- Institutional controls shall be imposed to restrict public access to the landfill.

- Equipment will be available to transport wastes and to operate the ERDF safely.

- Hanford Site infrastructure will be expanded as necessary to support the ERDF. Infrastructure improvements or extensions may include water, sewer, electric power, roads, operations, facilities, and a chemical and fuel storage area.

- A decontamination facility will be constructed consisting of, at a minimum, an impervious pad with a sump, wash water storage, and secondary containment. Wash water used to decontaminate site equipment shall be managed in compliance with appropriate requirements.

- The detailed design will be submitted to EPA for approval (with concurrence from Ecology) prior to construction at the ERDF. At a minimum, the design will be submitted as two packages to allow for construction in phases.

- An operations plan will be submitted to EPA for approval (with concurrence from Ecology) prior to operation of the ERDF.

- Mitigation measures to reduce ecological impacts have been incorporated to satisfy the remedial action objectives identified in Sections 7(4)(i) through 7(4)(v) of the 1995 ERDF ROD. In addition, DOE commits to the development and implementation of a mitigation action plan in coordination with the Natural Resource Trustees for additional mitigation measures.

The ESD to the ERDF ROD, issued in August 1996 (EPA/ESD/R10-96/145), made the following changes:

- **Waste Origin Clarification.** Any Hanford Site environmental cleanup waste generated as a result of CERCLA or RCRA cleanup actions (e.g., investigation-derived waste, decontamination and decommissioning waste, and RCRA past-practice waste) is eligible for disposal, provided that the waste meets ERDF waste acceptance criteria and provided that the appropriate CERCLA decision documents are in place. Non-process waste (e.g., contaminated soil and debris) generated from closure of inactive RCRA treatment, storage, and disposal units may be placed in ERDF, provided that (1) the closure wastes are sufficiently similar to CERCLA or RCRA past-practice wastes placed in ERDF, (2) ERDF waste acceptance criteria are satisfied, and (3) appropriate CERCLA decision documents are in place. Revision of the RCRA Permit and closure plans may be required.

- **Use of Leachate.** The ERDF leachate may be collected and stored at the ERDF for use within the trench, as appropriate. Appropriate uses of the leachate are limited to dust suppression and waste compaction. The leachate must be sampled prior to use to ensure compliance with land disposal restrictions (LDRs), ERDF waste acceptance criteria, and other health-based limits (whichever is more restrictive). Leachate in excess of the ERDF's recycling capacity or acceptable contaminant levels will be sent to the Effluent Treatment Facility or another approved facility for management.

A ROD amendment issued in September 1997 amended the ROD as follows (EPA/AMD/R10-97/101):

- **ERDF Expansion.** The ERDF ROD specifies that expansion of the facility would be authorized on an as-needed basis through the ROD amendment process. Based on the estimated remediation waste volumes presented in the ERDF ROD, additional disposal cells

were anticipated. Two additional ERDF cells (cells 3 and 4) were authorized to be constructed for disposal of Hanford Site remediation waste. This first expansion of ERDF is also known as Phase II. Remediation volume estimates in final and planned cleanup decision documents, prepared since the issuance of the ERDF ROD, supported the need for additional disposal capacity. The Phase II construction was located entirely within the 4.1-km^2 (1.6-mi^2) area selected for ERDF, as defined in the ERDF ROD. The same RCRA design selected for the original ERDF disposal cells was used for the Phase II cells.

- **Treatment at ERDF.** The selected remedial alternative in existing 100 and 300 Area waste site remediation RODs is removal, treatment (if required), and disposal at ERDF. Treatment is required if the concentration of contaminants in the waste is above LDR standards found in the federal and state hazardous waste regulations or above the ERDF waste acceptance criteria. This ROD amendment provides the option of conducting remediation waste treatment at ERDF rather than at the operable unit prior to disposal. This option does not preclude treatment at the operable units. Treatment at ERDF is limited to stabilization and encapsulation in containers. All substantive federal and state requirements governing hazardous waste treatment in containers, such as secondary containment, must be met as part of treatment at ERDF. The decision whether to perform remediation waste treatment and a determination of the specific treatment needed must be documented as part of the remedy selection and remedial design process for the operable unit of the waste site of origination.

A second ROD amendment issued in March 1999 authorized the conditional delisting of ERDF leachate as hazardous waste as follows (EPA/AMD/R10-99/038):

- **CERCLA Leachate Delisting at ERDF.** In order to "delist" the ERDF leachate such that it may be managed at ERDF under CERCLA as nonhazardous waste, it must be demonstrated that the concentrations of hazardous contaminants found in the leachate satisfy the requirement for an exclusion under 40 CFR 260.22 and do not exceed the criteria for characteristic wastes as defined under 40 CFR 261, Subpart C, and WAC 173-303-090. In order to confirm that the concentration of hazardous constituents in the leachate continue to be below delisting levels, a sampling and analysis plan supporting the delisting was written and attached to the ROD amendment. The plan provided detailed information regarding sampling frequency and methodology and also specified analytical methods to be used. The sampling and analysis included a comparison of leachate sample results with delisting levels. Delisting levels, in general, are based on the original docket values and health-based limits. Ongoing exclusion from management as a hazardous waste is conditioned based on compliance with specified management requirements and based on the leachate meeting the limits established in the ROD amendment, as demonstrated through the verification sampling program.

A third ROD amendment was issued in January 2002 that authorized the expansion of the ERDF cells and construction of a waste staging area at ERDF as follows (EPA/AMD/R10-02/030):

- **ERDF Phase III Construction.** The ERDF ROD specifies that expansion of the facility would be authorized as needed through the ROD amendment process. Based on estimated remediation waste volumes presented in the ERDF ROD, additional disposal cells were

anticipated. This amendment authorized four additional ERDF cells to be constructed and operated for disposal of Hanford Site remediation waste. The second expansion of ERDF is also known as Phase III. The Phase III construction was to be located entirely within the 4.1-km^2 (1.6-mi^2) area selected for ERDF. The approved design of ERDF is a single 21-m (70-ft)-deep trench consisting of pairs of side-by-side cells with final dimensions of 433 m (1,420 ft) long by 219 m (720 ft) wide at the top of the trench. The facility is equipped with a RCRA double-liner and leachate collection and recovery system. The same RCRA design selected for the existing ERDF disposal cells was to be used for the Phase III cells. The detailed design was to be submitted to the EPA for approval prior to construction of the ERDF expansion. The Phase III cells will be closed in the same manner as the existing ERDF cells.

- **Remediation Waste Staging at ERDF**. The selected remedial alternative in existing 100 and 300 Area RODs is typically removal, treatment (if required), and disposal at ERDF. Treatment is required if the waste does not meet the ERDF waste acceptance criteria, including LDR standards found in federal and state hazardous waste regulations. This ROD amendment authorized the option of conducting remediation waste staging at the ERDF rather than at the operable unit prior to treatment and disposal. This ROD amendment allowed the staging of remediation waste at ERDF while awaiting treatment to satisfy the ERDF waste acceptance criteria and comply with LDRs. The decision whether to perform remediation waste treatment and the specific treatment needed will be documented as part of the remedy selection and remedial design process for the waste site operable unit or waste site of origination. The staging area at ERDF is to be designed, constructed, operated, and closed in accordance with RCRA regulations for storage at corrective action management units, as amended by the final rule published in the *Federal Register* on January 22, 2002. The ERDF staging area is to be used to hold waste with low-level radionuclide, dangerous waste, and polychlorinated biphenyl (PCB) contaminants. Staging of these wastes requires compliance with the substantive requirements of PCB storage requirements of 40 CFR 761.65, "Storage for Disposal," and corrective action management unit standards for hazardous waste storage. Low-level radioactive waste management standards, including DOE O 435.1, *Radioactive Waste Management*, will be addressed as to-be-considered provisions for staging of radioactive waste.

A fourth ROD amendment issued in May 2007 authorized the disposal of certain Hanford Site waste in storage at ERDF as follows (EPA 2007):

- **Acceptance of Other Hanford Waste.** This ROD amendment authorized the disposal at ERDF of Hanford Site-only-generated waste in storage as listed in Table 1 of that amendment. The use of a plug-in approach for the disposal at the ERDF of other similar wastes that originate at the Hanford Site and are placed in storage, which present a substantial threat of a release of hazardous substances to the environment, was also authorized in the document. This "plug-in" process allows such other wastes in storage to be authorized for ERDF disposal without an ESD or ROD amendment, upon written EPA approval. DOE is required to issue annual fact sheets on such wastes approved for disposal at ERDF. The primary eligibility requirements for disposal at the ERDF under the "plug-in" approach are that the waste is in storage and similar to a waste identified in Table 1, meets

ERDF waste acceptance criteria, complies with applicable LDR requirements, is generated on the Hanford Site or directly derived from a Hanford Site-generated waste in support of RCRA and CERCLA cleanup actions, is compatible for disposal at ERDF, and is not already being addressed by a CERCLA decision document. EPA approval must be granted for each individual waste.

A fifth ROD amendment and ESD issued in August 2009 authorized the ERDF expansion with the construction of super cells 9 and 10; authorized the change in design to a single "super" cell that has the capacity of two previously constructed disposal cells; and authorized additional ERDF cells as follows (EPA 2009):

- **ERDF Expansion.** Under this ROD amendment, an area equal to four additional ERDF cells or two "super" cells was authorized for disposal of Hanford Site remediation waste (Phase IV). This cell construction was to be located entirely within the 4.1-km^2 (1.6-mi^2) area selected for the ERDF, as defined in the ERDF ROD. The cells were to be designed, constructed, and operated to meet ROD requirements, including RCRA; minimum technical requirements in 40 CFR 264, Subpart N; and requirements to provide sufficient leachate storage capacity to ensure uninterrupted operations.

- **Updated ERDF Cell Design.** The ERDF ROD states that the ERDF is designed as a single 21.3-m (70-ft)-deep trench consisting of a series of two side-by-side cells, each measuring 152 by 152 m (500 by 500 ft) at the base with the final dimensions of the two cells measuring 432.8 m (1,420 ft) long by 152.4 m (500 ft) wide at the top of the trench. This ROD amendment modified the ROD cell design to allow a single "super cell" to be used in place of the double cell side-by-side configuration described in the ROD. A "super cell" is equivalent in size to what has been called two cells in the past. The term "cell" refers to the disposal area, leachate collection sump, and associated piping and crest pad building. By incorporating the advancements in landfill design that have occurred since ERDF's inception, ERDF "super cells" are able to accomplish the leachate collection with one sump and one crest pad building that heretofore required two. The "super cells" are to continue to be equipped with a double liner and a leachate collection and recovery system that meets the requirements for hazardous waste landfills under RCRA (40 CFR 264, Subpart N), as required in the ERDF ROD. The detailed design for such "super cells" is to be approved by the EPA prior to construction.

- **Authorization of Additional ERDF Cells.** An additional significant change addressed how additional ERDF cells will be authorized. The ERDF ROD specified that expansion of the facility would be authorized by ROD amendments. This requirement was changed to allow ERDF cells to be authorized for construction and operation upon EPA approval through the issuance of a fact sheet by DOE. The fact sheet is to be placed in the Administrative Record and Information Repositories. This change allowed additional ERDF cells to be constructed as needed to support the disposal of Hanford Site remediation waste. The additional cells will be located entirely within the 4.1-km^2 (1.6-mi^2) area selected for ERDF, as defined in the ERDF ROD, and must comply with all ROD requirements for design, construction, and operation. The detailed design for additional ERDF cells shall be submitted to the EPA for approval prior to construction.

IV. DESCRIPTION OF THE ROD AMENDMENT

Treatment of Waste Items in the ERDF Trench. Under this ROD amendment, the 40 CFR 268.45(a) and WAC 173-303-140(2)(a) prohibitions on placement of hazardous waste in a land disposal unit prior to completing required LDR treatment, which are ARARs for ERDF, are being waived pursuant to CERCLA Section 121(d)(4) for certain hazardous debris that are LLHH waste items identified below because treatment prior to placement results in greater risk to human health and the environment. The waste must be treated to satisfy applicable LDR treatment requirements within a reasonable time after placement in the ERDF trench, while employing control measures specified below to ensure effective treatment and to prevent releases until treatment is completed. Treatment must be conducted in accordance with a treatment plan approved by EPA, as required by the 2007 ERDF ROD Amendment. Treatment may or may not be performed in containers.

The LLHH waste items (see Table A) are mixed hazardous debris waste items that are eligible for ERDF disposal under the 2007 ERDF ROD Amendment and have the following characteristics:

1. Items that are too big to fit in and be treated within a standard 15.3-m^3 (20-yd^3) ERDF container (i.e., more than 6 m [19 ft] long, more than 2 m [7 ft] wide, and/or more than 1 m [3 ft] tall) and too hazardous to be safely size reduced; and are

2. Items with radiological contamination that would result in direct worker exposure during macroencapsulation conducted prior to placement in ERDF and could cause airborne radioactivity if an industrial accident caused the waste item packaging to breach or the item to break (potentially releasing internal contamination) during treatment or transport activities; and/or are items with non-uniform weight distributions that present issues with rigging, crane lifts, and manipulation that contribute to the potential for industrial accidents that could increase the number of severe worker injuries.

Under federal and state LDR regulations, hazardous or dangerous waste that meets the definition of debris can be treated using macroencapsulation. Macroencapsulation is described in 40 CFR 268.45[2], "Treatment Standards for Hazardous Debris," as the application of surface coating materials such as polymeric organics (e.g., resins and plastics) or use of a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media.

The macroencapsulation method to be used for treatment of the LLHH waste items identified above would be performed in the ERDF trench by flood grouting. By using this approach, almost none of the LLHH waste item handling activities and specialized equipment required for the current out of trench treatment would be needed. Instead, standard ERDF equipment (e.g., blocks, cranes, forklifts, support facilities) will be used, with minimal handling of the waste. Cementitious grout equipment will be used to encapsulate the LLHH waste items requiring LDR treatment with grout in a manner that satisfies the 40 CFR 268.45 treatment standards.

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[2] WAC 173-303-140, "Land Disposal Restrictions," incorporates the federal land disposal restrictions at 40 CFR 268 by reference.

The untreated LLHH waste items will be brought to ERDF from the waste site; driven into the disposal trench; and directly placed on concrete blocks, pads, or inorganic standoffs to allow the free flow of grout to completely surround and cover the waste items. This will take place at a location in the trench that has been prepared for receipt, treatment, and disposal of the item. Once placed, the spread of contamination from the waste item will be prevented by protecting it from rain, snow, or wind (e.g., through the use of tarps, berms, ditches, or other methods) prior to encapsulation. Precautions will be taken so that if any contamination were to escape from the item's packaging, it will be trapped, collected, treated, and disposed of in accordance with applicable requirements. Macroencapsulation would be accomplished by flood grouting with single or multiple pours (depending on the overall size/shape of the LLHH waste items). The macroencapsulated waste debris is allowed to cure for at least 1 week before it is covered with soil.

The in-trench treatment minimizes LLHH waste item handling to a single offloading operation during which workers can maintain a safe distance from the LLHH waste items, nearly eliminating radiological, chemical, and physical hazards. After being placed, the waste will be encapsulated with cementitious grout. This process will follow the key tenets of the as low as reasonably achievable (ALARA) principle, thereby minimizing the workers' exposure to direct radiation and radiologically contaminated LLHH waste items, as well as chemical and physical hazards while meeting the treatment requirements of ERDF's RCRA ARARs.

V. CERCLA GREATER RISK ARAR WAIVER

CERCLA Section 121(d)(4)(B) allows ARARs to be waived in situations where compliance with the requirement poses greater risk to human health and the environment than alternative options. In promulgating the CERCLA "National Oil and Hazardous Substances Pollution Contingency Plan" (NCP) (40 CFR 300), EPA identified three criteria to be considered in evaluating application of this waiver:

a. Magnitude of adverse impacts. The risk posed or the likelihood of present or future risks from the remedy using the waiver should be significantly less than that posed by the compliant remedy posing the risk.

b. Duration of adverse impacts. The more long lasting the risks from the compliant remedy, the more this waiver becomes appropriate.

c. Reversibility of adverse impacts. This waiver is especially appropriate if the risks posed by meeting the ARAR could cause irreparable damage

(55 FR 8748, March 8, 1990; 53 FR 51439, December 21, 1988).

As EPA explained in the NCP proposed rule, this "greater risk" waiver could be used in situations where compliance with an ARAR resulted in greater risk to workers as follows:

Meeting an ARAR could pose greater risks to workers or residents. For example, excavation of a particularly toxic, volatile, or explosive waste to meet an ARAR could pose high, short-term risks. If protective measures were not practicable for such an excavation, use of this waiver might be appropriate (53 FR 51439).

Evaluation of Compliant and Alternative Options

The key elements of the compliant and alternative options that were evaluated are described below along with the associated risk factors.

Treatment Prior to Placement in Compliance with the LDR Treatment Requirements

The out-of-trench method currently used to treat LLHH waste items prior to placement complies with LDR treatment requirements by completely encapsulating the LLHH waste items through the application of a surface coating using a polymer coating technology. The application of a polymer coating to an LLHH waste item outside the ERDF trench requires at least nine operations that result in increased worker exposure to radiological and industrial hazards when compared to the in trench treatment alternative:

1. Transporting the item to the ERDF LLHH waste item staging area;
2. Performing close-up radiological surveys;
3. Performing 4 to 10 crane lifts and manipulation of the item during the polymer application to ensure complete encapsulation;
4. Spraying four or more coats of the polymer necessary to complete macroencapsulation;
5. Inspecting the coatings and touching up the coating after each application as needed to encapsulate the LLHH waste item;
6. Reloading the item onto a truck for transport into the trench;
7. Inspecting the coating and touching up the coating;
8. Performing one last crane lift to offload the encapsulated LLHH waste item in the trench;
9. Inspecting the final coating (Note: This inspection can lead to additional coating touch-up).

Risk Factors: The ARAR-compliant treatment process requires 3 times more workers and 4 to 10 times more crane lifts (including rotational manipulation of the LLHH waste items) than the in-trench waiver. Although practicable preventive measures (proper crane selection for the job, operator and support personnel training, machinery and gear inspections, rigging inspections, etc.) are followed during crane lifts, an industrial accident involving a suspended LLHH waste item could result in irreparable impacts to ERDF workers, including serious injuries or death. Also, ERDF workers accumulate more radioactive dose during the current out-of-trench treatment process of each LLHH waste item with radioactive contamination, which amounts to a 200 times increase in excess cancer risk.

Cementitious Flood-Grouting Treatment in the ERDF Trench Subsequent to an ARAR Waiver

With the ARAR waiver, an untreated LLHH waste item arrives at ERDF; is placed on a concrete pad, blocks, or inorganic standoffs in a prepared area in the trench; is flood-grout macroencapsulated; and, after the grout has cured long enough to reach the required strength, is

covered with waste or clean soil. This treatment is superior to polymer coating macroencapsulation because the waste items will not be moved post-treatment (thus preventing damage to the encapsulating media), and because of the higher ultimate strength of the cured grout. Contingent on seasonal local weather conditions prior to encapsulation, temporary protection from rain, snow, or wind is provided (e.g., through the use of tarps, berms, ditches, or other methods) until the flood-grouting treatment is complete. In-place LLHH waste item cementitious flood grouting involves a single pour or multiple pours (depending on the overall size/shape of the item). Implementation of this alternative requires a waiver from the requirement to treat LLHH waste items to meet LDR treatment requirements prior to placement in the ERDF trench. The in-trench cementitious flood-grouting treatment requires only five operations:

1. Preparing a location (stand-off and berm) to receive the LLHH waste item;
2. Transporting the LLHH waste item directly into the ERDF trench;
3. Performing one crane lift to unload and set the LLHH waste item in the prepared location;
4. Pouring cementitious grout from a truck or grout pump to encapsulate the LLHH waste item and allow it to cure;
5. A visual survey to verify complete encapsulation prior to burial.

Risk Factors: This simpler and safer in-trench treatment process uses fewer ERDF workers for a shorter period, and the workers are positioned at a greater distance from the LLHH waste items during treatment. These factors lead to less exposure to radioactive waste and lower accumulated dose (dose increases as distance decreases and time increases). This approach also decreases the likelihood of an industrial accident and injury because handling of LLHH waste items is reduced to a single crane lift and workers are not required to spend time in close proximity to them. The in-trench treatment results in a reduction of the risk of irreparable impacts to ERDF workers while resulting in the same or better treatment result, and employs control measures identified above to ensure the approach remains protective of human health and the environment.

Justification of the ARAR Waiver

As indicated above, EPA identified three criteria for consideration in evaluating whether compliance with an ARAR will result in greater risk to worker health than alternative actions. A summary of DOE's and EPA's assessment of how those criteria apply to the treatment of the LLHH waste items follows.

Magnitude of adverse impacts

The waiver of the ARAR as described above affords a much safer and simpler method of treatment and yields the equivalent, or better, macroencapsulation of the LLHH waste items than the current out-of-trench method which complies with the requirement to complete treatment before the waste is placed in the trench.

- A comparison of radiological exposure factors between treatment before placement and the in-trench method (treating in the trench pursant to an ARAR waiver) demonstrates that out-of-trench treatment of each of the radioactive LLHH items that the waiver will apply to exposes ERDF workers to 200 times more excess cancer risk than the in-trench alternative.

- Data collected from treating 17 LLHH items prior to placement in ERDF were used to determine the following exposure factors: the number of workers, distance, and time for out-of-trench treatment. The LLHH waste items with radioactive contamination that the waiver will apply to have similar radiological exposure risk characteristics when compared to the 17 LLHH waste items treated outside ERDF.

- The out-of-trench treatment puts 3 times more ERDF workers in much closer proximity to LLHH waste items that require 4 to 10 times more crane lifts than in-trench treatment. More workers, closer proximity to the waste item, and more crane lifts increase the possibility of an industrial accident during out-of-trench treatment compared to in-trench treatment, particularly for LLHH items with non-uniform weight distributions that present issues with rigging and crane lifts. An industrial accident involving a suspended waste item during the treatment process could result in serious injuries or death to ERDF workers in the vicinity.

- The physical danger related to LLHH waste items such as the heel pit, which is 1.8 m (6 ft) wide, 2.7 m (9 ft) tall, and weighs 78,000 lb, with an uncertain center of gravity, is much greater due to their increased mass and their unknown and difficult-to-determine centers of gravity, making multiple out-of-trench manipulation for treatment more hazardous, even accounting for the practicable safety measures previously stated, than the single, in-trench lift.

- The potential for encapsulation damage while moving the treated LLHH waste items into the ERDF trench, resulting in polymer coating rework, would be reduced to zero because waste items are not moved after treatment. Also, in-trench cementitious flood grouting is a more reliable and durable treatment option than the polymer coating method. The added reliability and durability of cementitious flood grouting would increase confidence in LLHH waste item macroencapsulation compared to the polymer coating method.

In summary, the risks posed using the waiver would be significantly less than that posed by the compliant alternative considering the increased possibility of a severe industrial accident from 4 to 10 times more crane lifts and/or 200 times more excess cancer risk (for LLHH waste items with radioactive contamination). Also, the increased number of workers that would be in close proximity to LLHH waste items (three times more), the increased duration of the work process (four times longer), and the potential long-lasting and irreparable impacts associated with performing the treatment out of trench support approval of the waiver. Finally, cementitious flood grouting is a more reliable and durable treatment option than the polymer coating method.

Duration of adverse impacts

The more long lasting the worker risks from compliant treatment prior to placement, compared to the in-trench approach, the more appropriate the LDR treatment waiver becomes.

Compliant, out-of-trench macroencapsulation processing of the LLHH items increases the potential for serious worker injury over the next 20 years it is expected to take to treat the LLHH waste items. An industrial accident involving a waste item suspended from a crane during the treatment process could result in serious irreversible injuries to ERDF workers in the vicinity. In addition, the dose from exposure to radioactive waste is a function of the distance and time spent

near the item (dose increases as distance decreases). The potential for serious physical injuries, combined with increased potential for cancer due to greater dose absorbed by ERDF workers, represents long-lasting potential impacts.

Approximately 1,000 LLHH waste items are expected for treatment over the next 20 years, and the in-trench treatment alternative will greatly reduce the potential risk for adverse impacts associated with the outside-the-trench treatment process over that time. The significant reduction of worker risk expected with in-trench treatment at ERDF supports the waiver when considering the risks associated with an industrial accident with potential for serious injury or death and exposure to radiation over the next 20 years.

Reversibility of adverse impacts

The greater risk ARAR waiver is especially appropriate if the risks posed by meeting the ARAR could cause irreparable damage (55 FR 8748, March 8, 1990, and 53 FR 51439, December 21, 1988).

To date, more than 17 LLHH waste items have been treated outside the trench using the polymer coating macroencapsulation alternative. However, approximately 1,000 LLHH waste items are expected for treatment at ERDF over the next 20 years. In-trench treatment of the LLHH waste items with radioactive contamination will reduce worker exposure and excess cancer risk by 200 times compared to the outside-the-trench treatment (1.2×10^{-3} out-of-trench versus 6.0×10^{-6} in-trench). Also, for in-trench treatment, fewer workers are required to manipulate the LLHH waste items and fewer crane lifts are required, so the possibility of an industrial accident causing severe irreversible injuries is reduced. Due to the improved conditions during in-trench treatment, the risk of irreparable damages to workers would be reduced for the following reasons:

- The reduced number of workers exposed to the LLHH waste items with radioactive contamination and the reduced duration of the workers' exposure will lower their risk for developing cancer.

- The reduced number of workers required to manipulate the LLHH waste items will reduce their risk for irreversible physical injuries during rigging, crane operation, and LLHH waste item placement.

VI. STATUTORY DETERMINATIONS

The ROD, as amended and modified herein, satisfies CERCLA Section 121. As indicated in the ROD and in this and prior ROD amendments, the selected remedy is protective of human health and the environment, will comply with federal and state requirements (identified in the 1995 ROD and subsequent ROD amendments) that are legally applicable or relevant and appropriate except as specified herein in accordance with CERCLA Section 121(d)(4), is cost effective, and will use permanent solutions to the maximum extent practicable.

The statutory preference for the treatment as a principal element will continue to be satisfied for wastes that are required to be treated to meet the ERDF waste acceptance criteria and/or LDRs

under the ERDF ROD, as amended. Because hazardous substances, pollutants, or contaminants will remain on site above levels that allow for unlimited use and unrestricted exposure, a review will be conducted at least every 5 years after the commencement of remedial actions to ensure that the remedy continues to be protective of human health and the environment.

VII. PUBLIC PARTICIPATION COMPLIANCE

Public participation requirements for a ROD amendment specified in CERCLA Section 117 and 40 CFR 300.435(c)(2)(ii) have been met as described previously in Section I. The DOE and EPA reviewed all written comments submitted during the public comment period and prepared a responsiveness summary, included below as Section IX.

VIII. REFERENCES

40 CFR 260, "Hazardous Waste Management System: General," *Code of Federal Regulations*, as amended.

40 CFR 261, "Identification and Listing of Hazardous Waste," *Code of Federal Regulations*, as amended.

40 CFR 264, "Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities," *Code of Federal Regulations*, as amended.

40 CFR 268, "Land Disposal Restrictions," *Code of Federal Regulations*, as amended.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*, as amended.

40 CFR 761, "Storage for Disposal," *Code of Federal Regulations*, as amended.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 U.S.C. 9601, et seq.

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Ecology, EPA, and DOE, 1989, *Hanford Federal Facility Agreement and Consent Order*, 2 vols., as amended, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington.

EPA/AMD/R10-97/101, 1997, *Record of Decision Amendment: U.S. Department of Energy Environmental Restoration Disposal Facility Hanford Site – 200 Area Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Seattle, Washington.

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EPA, 2007, *U.S. Department of Energy Environmental Restoration Disposal Facility, Hanford Site – 200 Area, Benton County, Washington, Amended Record of Decision, Decision Summary and Responsiveness Summary,* U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

EPA, 2009, *Amended Record of Decision Authorizing Supercells 9&10*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington.

Occupational Safety and Health Act of 1970, 29 U.S.C. 15, et seq.

Resource Conservation and Recovery Act of 1976, 42 U.S.C. 6901, et seq.

Superfund Amendments and Reauthorization Act of 1986, Public Law 99-499, as amended.

WAC 173-303-140, "Land Disposal Restrictions," *Washington Administrative Code*, as amended.

Washington Industrial Safety and Health Act of 1973, RCW 49.17, as amended.

WCH, 2015, *ERDF Risk Reduction ARAR Waiver Proposal*, WCH-611, Rev. 1, Washington Closure Hanford, Richland, Washington.

IX. RESPONSIVENESS SUMMARY

U.S. Department of Energy
Environmental Restoration Disposal Facility
Hanford Site
Benton County, Washington
Amended Record of Decision

Introduction

This responsiveness summary was prepared in accordance with the requirements of Section 117 of CERCLA, as amended. The purpose of this responsiveness summary is to summarize and respond to significant public comments on the Proposed Plan for an Amendment to the January 1995 ERDF ROD. The Proposed Plan for an Amendment, issued on September 28, 2015, identified proposed changes to components of the remedy set forth in the January 1995 ERDF ROD, as amended.

The Tri-Parties announced the issuance of the proposed plan and availability of the supporting information in the Administrative Record in the community newspaper, the *Tri-City Herald.* A 30-day comment period was provided for the public to read the proposed plan, review the documents in the Administrative Record, request a meeting, and submit written comments.

Community Involvement

A newspaper notice placed in the *Tri-City Herald* on September 27, 2015, provided a brief analysis of the proposed plan and announced the availability of the proposed plan and the start of the public comment period. Approximately 1,900 copies of the fact sheet describing the proposed plan were sent by mail. A public comment period was held from September 28, 2015 through October 28, 2015. No requests were received for a public meeting; therefore, no public meeting was held.

Comments and Responses

The DOE received letters from four separate people associated with the polyurethane/polyurea coating industry, and one letter each from the Yakama Nation and the Oregon State Department of Energy. The comment letters are available in the Administrative Record. The comments, along with responses, are summarized below.

The comments from people associated with the polyurethane/polyurea coating industry dealt with similar issues and are responded to here as a group.

A. **Grout Macroencapsulation Compliance with 40 CFR 268.45:** These comments questioned whether grout macroencapsulation was compliant with regulations.

   RESPONSE: Polyurea and cementitious grout encapsulation both meet the alternative treatment standard for hazardous debris specified under 40 CFR 268.45. Cementitious

macroencapsulation is one of the most widely used techniques for the treatment and disposal of hazardous waste and low-level radioactive waste. Grout-based macroencapsulation has been approved at other RCRA disposal facilities. The regulatory definition of macroencapsulation calls for use of polymeric organic coatings or a jacket of inert inorganic materials to substantially reduce surface exposure to potential leaching media. DOE complies with this requirement by completely surrounding waste items with an inorganic (cementitious) barrier.

B. **Concrete Macroencapsulation Durability:** These comments questioned the strength and durability of grout macroencapsulation.

RESPONSE: Cementitious grout macroencapsulation that is protected from aggressive environments (e.g., freeze/thaw cycles, immersion in water, temperature variations) provides long-term durability without the need of primers or other surface coatings. Grout macroencapsulation is conducted by providing a firm, well-compacted subgrade for in trench treatment to prevent differential settlement; using flowable grout to fill all voids and cavities present in the waste debris; providing substantial grout encapsulation thickness to distribute loads; entombing and insulating the grout macroencapsulated waste item with soil to minimize temperature variations and freeze/thaw conditions; and installing forms to contain and support the grout during curing. Application of the cementitious grout jacket is accomplished by flowable grout and is not critically dependent upon the skill of the personnel applying the material.

Significant cracking of grout and concrete can occur when placed in tension (stretching/bending/differential settlement forces). Treatment of the debris on a compacted base and subsequent burial isolates the treated debris from the environs and ensures that it will not be subject to tensile forces. As additional layers of waste are placed over grouted waste debris, the depth of burial increases, further insulating it. The buried treated waste will reach a constant temperature and not be subject to freeze/thaw cycles or other thermal stresses. The waste soils surrounding the grouted waste debris are well compacted. Tests performed at ERDF have demonstrated that the compaction requirements at ERDF ensure that very little settling of the soil will occur. In this state of burial, the grouted waste is subject to compressive stress, which grout and concrete are well suited to withstand.

C. **In-Trench Grout macroencapsulation techniques**: Several comments give the impression that waste debris will be placed directly on the floor and covered with grout.

RESPONSE: As stated in the proposed plan and in this ROD amendment, waste debris will be placed on supports (e.g., concrete pads, blocks, or other inorganic standoffs) to elevate the waste debris above the ground in order to allow cementitious grout to freely flow around and under the waste debris, ensuring complete macroencapsulation. In-trench grout macroencapsulation does not require personnel to be close to the waste debris, reducing radiation exposure. The method consists of four steps: (1) building an earthen berm or other formwork and preparing supports to elevate the waste item above the ground (e.g., concrete pads or other inorganic standoffs), which is done before the waste debris arrives and does not contribute to dose received; (2) transporting the LLHH waste item directly into the ERDF

trench; (3) placing the waste debris on the supports, which is done using a crane and two personnel using taglines or a forklift and does not require close approach to the waste items (taglines are attached before the item is shipped to ERDF); and (4) placing grout using either chutes or a grout pump depending on the radioactive dose of the item. Again, workers are not required to work in close proximity to the waste item, significantly limiting the potential to accumulate radioactive dose. The macroencapsulated waste debris is allowed to cure for at least 1 week before it is covered with soil. The treated waste debris is not moved post-treatment and is not subjected to the stresses that would be generated by moving it. All treatment operations can be performed relatively quickly at a distance from the waste item, which minimizes the potential for the few workers involved to receive radioactive dose.

D. **Radiation exposure and risk analysis**: As one of the comments notes, there is a "danger of exposure to high dose pieces…"

The purpose of this ROD amendment is to waive the RCRA LDR ARAR requirement to treat the waste before placement, based on greater risk to human health and the environment. The comments only focus on exposure of the one or two workers applying the polymeric macroencapsulation coating. As documented in the *ERDF Risk Reduction ARAR Waiver Proposal* (WCH-611), which was made available in the Administrative Record, the entire out-of-trench polymeric macroencapsulation coating process (i.e., from waste arrival to burial) includes several additional activities, both before and after the poly application, that expose workers to industrial and radiological risks. Before the polymeric coating application can begin, substantial work (e.g., stabilizing waste debris on supports; cinching up and securing plastic packaging; applying polyurethane foam to provide a firm, smooth base to support the polymeric coating) is required to prepare the waste debris to provide an acceptable base for the successful application of the polymeric macroencapsulation coating. Table 1 in the proposed plan provides a comparison of the risks for the entire existing and proposed processes (i.e., from waste arrival to burial), not just the polymeric coating application. This amendment will improve worker safety by reducing the workers' exposure to radiological and industrial risks. The current polymeric coating methodology requires manipulation of the waste debris in multiple increments with at least four crane lifts to position and rotate the waste items to ensure complete coating. Every time workers approach the waste item to apply coatings, manipulate (hoist and rotate) the waste item, (radiologically) survey the item, and inspect the treated waste item, personnel are required to operate in close proximity to it. All of the workers involved, in addition to the one or two applying the polymers, receive radioactive dose during these operations. The multiple manipulations required to completely coat the waste debris causes repeated exposures for the involved workers. The risk analysis in WCH-611 assessed these additional exposures.

Following is the response to the Oregon State Department of Energy comment.

Appling Polymeric Macroencapsulation Coatings In-Trench:

The Oregon State Department of Energy encouraged in situ treatment of the waste with polymer coatings followed by grouting.

RESPONSE: Although applying polymer coatings in situ would eliminate one of the shortcomings of the polymer method (i.e., the potential for damage to the coatings due to transport and offloading into the trench), it would not substantially reduce worker exposure. The process of applying polymer coatings, regardless of where it is performed, puts more workers in closer proximity to radiological sources for longer periods of time compared to in situ grout. A very slight reduction of worker exposure (approximately 2% reduction) would be achieved by not transporting/offloading the treated waste debris, but it would be an insubstantial reduction to workers' total radiological exposure as well as exposure to industrial hazards associated with multiple crane lifts and manipulation required to rotate the item to meet the LDR requirement for 100% encapsulation.

The confidence expressed in the in situ cementitious grout treatment method is due to the fact that at ERDF many objects have been grouted in the trench for void fill, and well-developed procedures and practices are in place to do so reliably. In situ grout treatment methods will be very similar to void fill operations.

Responses to Yakama Nation Comments follow.

Macroencapsulation of Hot Cells and Gloveboxes: The Yakama Nation raised a concern that these waste streams were not previously discussed and macroencapsulation of them would result in limited characterization efforts; void areas remaining; and, unanticipated stress or failure of ERDF cell liners. The Yakama Nation also stated that these items are being effectively and safely remediated using the current approach.

RESPONSE: While hot cells and gloveboxes were not specifically called out in presentations to the public, the presentation to the River and Plateau Committee on October 7, 2014, did identify large or complex waste items as waste items to which the waiver might apply and large gloveboxes from the Hanford Plutonium Finishing Plant were discussed. Highly contaminated hot cells and gloveboxes fall within this category.

The mode and method of treatment does not impact the characterization efforts for different wastes.

Void filling is an integral part of in-trench grout macroencapsulation. At ERDF, pipes, boxes, and other vessels are regularly filled with grout for the purpose ensuring containers are at least 90% full before disposal, in accordance with 40 CFR 264.315 requirements for landfill disposal of hazardous waste containers. The methods developed for grout void fill will be applied to grout macroencapsulation operations.

There will be no unanticipated stresses or failure of ERDF cell liners as a result of the treatment process. The ERDF Operations Plan requires that large or heavy waste items be placed in a manner to protect the liner system and final cover. This practice will not change for in-trench macroencapsulation of hot cells, gloveboxes, or other heavy hazardous waste items.

While work controls have been implemented to mitigate risk associated with the current treatment methods, the provisions of this amendment will further reduce worker exposure and risk.

Reliability of Grout Macroencapsulation:

The Yakama Nation expressed concerns about the reliability of grout/cement to serve as containment, and requested that some type of surface coating be applied to these items prior to application of the slurry-grout to help serve as a preventative water barrier.

RESPONSE: Please see Response B to the polyurethane industry comments regarding the reliability of grout. Macroencapsulation with a jacket of grout constitutes a compliant and effective water barrier.

Inventory Tracking:

The Yakama Nation suggested that DOE create an inventory tracking and planning tool for assessing all site wastes that are intended to be macroencapsulated in ERDF and those key contaminants (e.g., technetium-99, carbon-14, iodine-129, and uranium) which may limit the contaminant inventory allowable in ERDF. This tool would provide a running summary of how much ERDF's capacity has been consumed and how much remains available for all waste and for each key contaminant.

RESPONSE: The DOE agrees with this comment. The ERDF Operations Plan requires such an inventory tracking system, which is in place and has been used throughout ERDF's history.

Table A

Typical Long, Large, and/or Heavy Hazardous (LLHH) Waste Items to be Macroencapsulated in ERDF Sorted by Waste Category

Category 1: Long-Length Tank-Waste-Contacted Equipment	**Category 2: Large Tank-Waste-Contacted Debris**	**Category 3: Large Hot Cells (Including Large Gloveboxes)**
Dip tubes	C-105 Heel pit	324 Building hot cells (300 Area)
Thermocouples	Various pits (e.g., valve, jumper, leak detection, pump, and transfer)	Plutonium Finishing Plant hot cells and gloveboxes
Thermocouple risers	Cover blocks/plates	
Salt well screens and pumps	Rigid jumpers	
Slurry pumps	Top hats	
Salt well pump risers	Tank lids	
Slurry distributors	Equipment skids	
Supernate pumps		
Cone penetrometers		
Sluicers		
Mars units		
Various in-tank pumps		
Slurry distributors		
Water lances		
Surface level probes		
Liquid observation wells		
Solids level detectors		
Risers for Instrumentation		
Radiation hardened cameras		
Equipment trees		
Corrosion probes		