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Proposed Plan for Interim Remedial Measures at the 100-HR-2 Operable Unit

United States
Department of Energy
Richland, Washington

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Date Published
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P.O. Box 550
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PROPOSED PLAN FOR INTERIM REMEDIAL MEASURES AT THE 100-HR-2 OPERABLE UNIT

Hanford Site, Richland, Washington

DOE, EPA, AND ECOLOGY ANNOUNCE PROPOSED PLAN

The preferred alternative presented in this Plan is the U.S. Department of Energy's (DOE's), U.S. Environmental Protection Agency's (EPA's), and Washington State Department of Ecology's (Ecology's) initial recommendation. The final cleanup activities will be selected only after the public comment period has ended and all of the comments have been reviewed and considered. We are seeking comments on all of the alternatives presented, not just the preferred alternative. Comments may be made in person at the {date??} meeting or may be submitted in writing. Written comments must be submitted {date??}. DOE, EPA, and Ecology are issuing this Proposed Plan as part of their public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA)[1] commonly known as the "Superfund Program," and the **National Environmental Policy Action of 1969** (NEPA). A Proposed Plan is intended to be a fact sheet that summarizes, for public review the comparison analysis of different cleanup options.

Send written comments to:
David Holland
Washington State Department of Ecology
1315 West 4th Avenue
Kennewick, Washington 99336-6018

This proposed plan identifies the preferred alternative for **interim remedial measures** (IRM) for addressing contaminated solid waste at the 100-HR-2 **Operable Unit** (OU), located at the Hanford Site (see Figure 1). The intent of an IRM is to speed up the response to soil and solid waste contamination that poses a potential threat to human health and the environment. This plan also includes a summary of other alternatives analyzed and considered for remedial action in this unit. This document is issued by Ecology, the lead agency; the EPA, support agency; and the DOE, responsible agency.

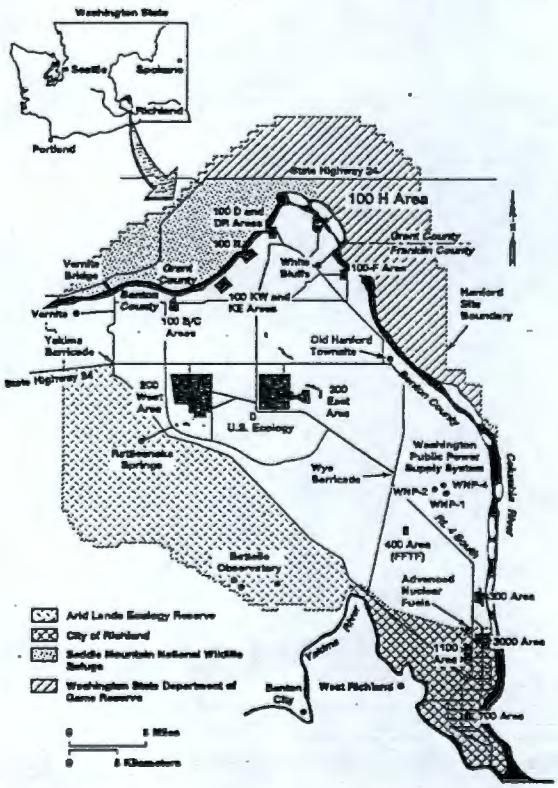

Figure 1. The Hanford Site.

[1]Technical terms and other text in **bold** face are defined in the glossary at the end of the document.

The CERCLA regulations give the EPA the authority to address issues at sites identified on the **National Priorities List** (NPL). The 100 Areas of the Hanford Site were placed on the NPL on November 3, 1989, because of soil and **groundwater** contamination resulting from the past operation of nuclear facilities.

The **Environmental Restoration Program** was started in response to placement of the 100 Areas on the NPL. The objective of the Environmental Restoration Program is the cleanup of contaminated waste sites in the Hanford Site 100 Areas in accordance with applicable regulations. The Environmental Restoration Program proposes using **past-practice cleanup strategy**, along with reactor and facility decontamination and decommissioning, to prepare the 100 Areas for removal from the NPL.

Remedial investigations (RI) and planning activities for the 100 Areas have been streamlined, with an emphasis on early action at waste sites that may pose the greatest risk to human health and the environment. These are the high-priority sites and solid waste burial grounds. The solid waste burial grounds in the 100-HR-2 OU are considered for IRMs. Due to the highly variable nature of the wastes in the solid waste burial grounds, sampling of these sites would not result in adequate characterization. Therefore, in the interest of efficiency, most solid burial grounds have not been sampled. Instead, it has been assumed that the human health and environmental risks may be of sufficient concern that all solid waste burial ground sites should be addressed with IRM.

The DOE, EPA, and Ecology are issuing this proposed plan as part of their public participation responsibilities under Section 117 (a) of the CERCLA. This proposed plan is intended to be a fact sheet that summarizes the comparative analysis of different remedial alternatives. This analysis is presented in greater detail in the *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE/RL-94-61).

The public is encouraged to review the following documents to gain a more comprehensive understanding of the 100-HR-2 OU:

- *RCRA Facility Investigation/Corrective Measures Study Work Plan for the 100-HR-2 Operable Unit* (DOE/RL-93-20)
- *100-HR-2 Limited Field Investigation Report* (DOE/RL-94-53)
- *100-HR-2 Focused Feasibility Study Report* (DOE/RL-94-65)
- *100 Areas Feasibility Study, Phases 1 and 2* (DOE/RL-92-11)
- *100 Area Source Operable Unit Focused Feasibility Study* (DOE/RL-94-61)

These documents are available for review as part of the administrative record for the Hanford Site at the following locations:

- U.S. Department of Energy
  Richland Operations Office
  Administrative Record Center
  2440 Stevens Center Place
  Richland, Washington 99352
- EPA Region 10
  Superfund Record Center
  1200 Sixth Avenue
  Park Place Building, 7th Floor
  Mail Stop: HW-074
  Seattle, Washington 98101
- Washington State Dept. of Ecology
  Administrative Record
  719 Sleater-Kinney Road Southeast
  Capital Finance Building, Suite 200
  Lacey, Washington 98503

SITE BACKGROUND

The H Reactor is a former DOE plutonium production nuclear reactor that was in operation between 1949 and 1965. The operation of the reactor resulted in contamination of many support facilities, adjacent soil, and groundwater. The contaminated areas at the 100-H reactor were subdivided into three OUs: 100-HR-1, 100-HR-2, and 100-HR-3.

The 100-HR-2 OU, shown in Figure 2, encompasses an area of approximately 100 acres (40.5 hectares). The 100-HR-2 OU consists of solid waste burial grounds, burn pits, an ash pit, septic systems, and support facilities. Groundwater underlying the H Area is addressed in the 100-HR-3 OU.

WASTE SITE HISTORIES

Descriptions of each solid waste burial ground in 100-HR-2 are presented in Table 1. The table summarizes information on the former use of each site, provides information on approximate waste site dimensions, and presents the **contaminants of potential concern**. Solid waste burial ground locations are shown on Figure 2.

Table 1. Description and History of 100-HR-2 Operable Unit Solid Waste Burial Grounds.

Waste Site Name/Number	Physical Description	Date of Use	Former Use	Contaminants of Potential Concern
118-H-1 Burial Ground	213 m x 107 m x 6 m deep; estimated volume and area of contaminated soil are 15,381 m^3 and 22,752 m^3, respectively.	1949-65	Contains irradiated and contaminated reactor safety equipment and various pieces of hardware as well as non-radioactive solid waste. All trenches and pits have been backfilled and stabilized with clean soil to prevent exposure to surface radiation.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, cadmium, lead, mercury
118-H-2 Burial Ground	30.5 m x 42.7 m x 3 m deep; estimated volume and area of contaminated soil are 2,904 m^3 and 656 m^3, respectively.	1955-65	Contains irradiated and contaminated hardware associated with an experimental reactor test facility. It consists of two concrete vaults that received radioactive solid waste. Both vaults have been back-filled and stabilized with clean soil to prevent exposure to surface radiation.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, cadmium, lead, mercury
118-H-3 Burial Ground	30.5 m x 114.4 m x 95.5 m x 122 m x 6 m deep; estimated volume and area of contaminated soil are 3,159 m^3 and 8,210 m^3, respectively.	1953-57	Contains components and hardware from reactor modification programs. All trenches have been backfilled and stabilized with clean soil to prevent exposure to surface radiation.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, cadmium, lead, mercury
118-H-4 Burial Ground	45.7 m x 9.2 m x 3 m deep; estimated volume and area of contaminated soil are 802 m^3 and 418 m^3, respectively.	1953	Contains irradiated reactor safety equipment and hardware associated with its removal from the reactor. The trench has been backfilled and stabilized with clean soil to prevent exposure to surface radiation.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, cadmium, lead, mercury
118-H-5 Burial Ground	9.2 m x 0.6 m x 1.5 m deep; estimated volume and area of contaminated soil are 8.47 m^3 and 5.57 m^3, respectively.	1953 and 1960	Contains irradiated experimental reactor safety equipment. It also contains soil from the 116-H-4 Pluto Crib. The Pluto Crib was an earthen pit that received an estimated 260 gallons of radioactive liquid waste. The liquid waste consisted of contaminated cooling water from reactor process tubes. The burial ground has been backfilled and stabilized with clean soil to prevent exposure to surface radiation.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, Ra-226, cadmium, lead, mercury
Buried Thimble Site	12.2 m x 2.1 m x 1.4 m deep; estimated volume and area of contaminated soil are 11.33 m^3 and 7.4 m^3, respectively.	Unknown	Suspected to contain a component of the reactor safety system. The area has been covered with clean soil. There is a radio-active surface contamination barricade around a small portion of the area.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, cadmium, lead, mercury
105-H Rod Cave	(12.2 m) x 0.6 m x 1.5 m deep; estimated volume and area of contaminated soil are 35.7 m^3 and 26 m^3, respectively.	Unknown (appears in aerial photographs as early as 1950).	Used for temporary storage of irradiated reactor safety equipment. These pieces of hardware were usually contaminated. Lead bricks have been stacked to form one wall, and the roof is covered with gravel and is not visible.	C-14, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, H-3, Ni-63, Sr-90, cadmium, lead, mercury

C-14 = ^{14}Carbon
Cs-137 = ^{137}Cesium
Co-60 = ^{60}Cobalt
Eu-152 = ^{152}Europium
Eu-154 = ^{154}Europium
Eu-155 = ^{155}Europium
H-3 = Tritium
Ni-63 = ^{63}Nickel
Ra-226 = ^{226}Radium
Sr-90 = ^{90}Strontium

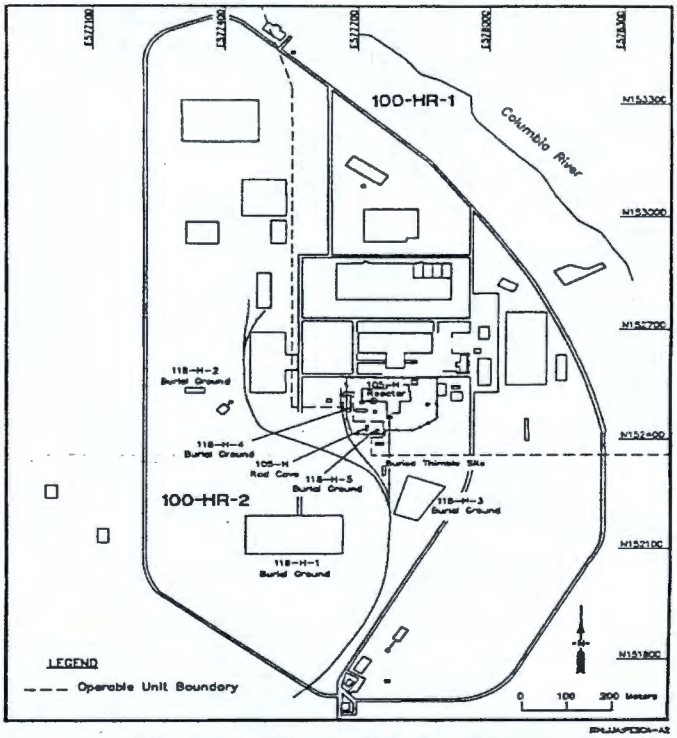

Figure 2. Waste Site Locations.

Dates to Remember

Mark your calendar

_____ to _____

Public comment period on the proposed plan for 100-HR-2.

Date for Public Meeting
Time for Meeting
Public Meeting at:
Place
Complete Address
City, State Zip

SUMMARY OF SITE RISK

In the superfund process, potential risks to human health and the environment are evaluated to determine whether significant risks exist due to site contaminants. Two types of potential human health effects due to contact with site contaminants are evaluated at Superfund sites. The first is the potential increase in cancer risks. This potential increase is expressed exponentially as 1×10^{-4}, 1×10^{-5}, 1×10^{-6} (one in ten thousand, one in one hundred thousand, one in a million, respectively). This means that for a 1×10^{-4} risk, if 10,000 people were exposed to a contaminant of concern for some period of time, one additional person could be expected to be diagnosed with cancer in his/her lifetime. Based on urgent national cancer rates, 2,500 people out of 10,000 are expected to be diagnosed with cancer. Under a 1×10^{-4} risk, 2,501 cancer diagnoses could be expected. Remedial actions generally are not required at risk levels below 1×10^{-4} unless there are other considerations such as adverse environmental impacts, potential for future migration, or uncertainty regarding future land use. For the second, noncarcinogenic health impacts, a **Hazard Index** (HI) is calculated. An HI greater than or equal to one may pose a potential adverse human health risk.

A **qualitative risk assessment** (QRA) was conducted to estimate the human health and environmental risks that could result if 100-HR-2 solid waste contaminants were not cleaned up. The human health risk assessment examined the potential for cancer and other health effects from the contaminants. Because cancer is of concern for animals but not a concern for plants, only noncancer-causing effects were assessed for ecological risk.

Human Health Risk - Human health risk assessments can be conducted using a variety of exposure scenarios. Different scenarios assume different levels of use. For example, one scenario might assume people will live in a home on the site (residential scenario). Another possibility is that people only occasionally visit the site (recreational scenario). The occasional-use (recreational) scen-

ario was used because this scenario represents the most probable human exposure to contaminants.

Three exposure pathways were evaluated as the most likely ways people would be exposed to contamination in the soil. These are eating soil (for example, campers eating food dropped in the dirt), breathing dust, and being directly exposed to the radiation from radionuclides in soil. The human health risk for the 100-HR-2 OU is mostly from direct exposure to radionuclides in soils.

The results indicate a medium human health risk for the 118-H-5 solid waste burial ground. This means a person who visits the site 7 days each year for 30 years increases his/her lifetime chance of getting cancer greater than one chance in ten thousand compared to a person who does not visit the site. The 118-H-1 solid waste burial ground and the buried thimble site have a low human health risk. This means a person who visits the site 7 days each year for 30 years increases his/her lifetime chance of getting cancer by greater than one chance in one million compared to a person who does not visit the site. Conservative assumptions were used to complete the risk assessment, meaning the results are probably the maximum potential risk.

Risk could not be evaluated at the 118-H-2, 118-H-3, and 118-H-4 burial grounds or the 105-H Rod Cave because of a lack of necessary information. The burial grounds may pose a significant risk to human health and the environment. This risk is difficult to evaluate, due to the highly variable nature of the burial ground contents. For this reason, it has been agreed that the burial ground contents would be evaluated during actual remediation.

Ecological Risk - Ecological evaluations estimate risk to plants and animals from site contaminants. The great basin pocket mouse was used to assess ecological site risks for the 100-HR-2 OU. The mouse is used to evaluate ecological risk because the size of its home range is similar to the size of most waste sites. Therefore, the pocket mouse could spend most or all of its life (eating, nesting, breeding) exposed to a single waste site.

The significant ecological risk at the 118-H-5 solid waste burial ground was attributable to the radionuclide strontium-90. There was not a significant ecological risk at the 118-H-1 solid waste burial ground and the buried thimble site. Ecological risk could not be evaluated at 118-H-2, 118-H-3, and 118-H-4 solid waste burial grounds, or the 105-H Rod Cave because of a lack of necessary information.

SCOPE AND ROLE OF ACTION

Contamination present in solid waste of the 100-HR-2 OU represents a potential threat to future occasional users and the current ecology of the 100 H Area. The contamination in the waste sites described in this proposed plan has been designated as appropriate for IRMs. The **interim action** would take place after the **Interim Record of Decision** (IROD) is issued and would generally continue at some level until a final **Record of Decision** (ROD). The final ROD will address remedy selection for solid waste burial grounds to determine what additional actions (if any) are required to release the site for future use.

The intent of an IRM is to expedite the response to soil and solid waste contamination that poses a potential threat to human health and/or the environment. The selected IRM could possibly serve as the final remedy: however, this determination cannot be made without additional analysis to assess the effectiveness of the interim measure. Like the IROD, the final site remedies for the entire 100 Area would be selected only after taking public comment into consideration.

The cleanup goals selected for the IRM assume that the 100-H Area will be used for recreational purposes in the future. They also assume that the groundwater may serve as a full-time (residential) drinking water source. These goals were, in part, based on previous public input.

Contaminants may be present in the solid waste at the IRM waste sites in concentrations that represent a threat to future occasional users of the 100-HR-2 OU. Contaminants may also represent an ongoing threat for contamination of groundwater. Based on the comparative analysis of the alternatives, DOE, Ecology, and EPA have selected removal, treatment (as appropriate), and disposal for the solid waste burial grounds. This alternative includes the following actions that are described in greater detail in the Summary of Considered Alternatives section of this proposed plan:

- Removal of contaminated solid waste from the burial grounds.
- Treatment of solid waste from the burial grounds, if appropriate, using technologies such as **thermal desorption** and compaction. The purpose of treatment is primarily to reduce the volume of contaminated solid waste destined for disposal and to a lesser extent, reduce long-term risk to human health and the environment.

- Disposal of contaminated solid waste at the proposed **Environmental Restoration Disposal Facility** (ERDF), or other appropriate onsite facilities.

These measures are consistent with remedial action objectives because their implementation would reduce potential risks to future site users and ecological receptors. Remediation of these sites would minimize further contaminant migration from the sites to the groundwater. The measures are also in compliance with **applicable or relevant and appropriate requirements** (ARAR). Costs for these alternatives represent the most effective remedies for the least expenditures.

The following are waste sites that are also within the 100-HR-2 OU that are not addressed with proposed IRMs but are planned to be addressed in the final ROD:

- 126-H-1 Ash Pit
- 128-H-1 Burn Pit
- 128-H-2 Burn Pit
- 128-H-3 Burn Pit
- 151-H Electrical Facility
- 1607-H1 Septic System
- 1607-H3 Septic System
- 1701-H Gate House
- 1709-H Fire Headquarters
- 1713-H Warehouse
- 1720-H Patrol Headquarters
- 1720-HA Arsenal
- 184 Power House

SUMMARY OF ALTERNATIVES

The *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE/RL-94-61) identified six soil and solid waste cleanup alternatives that could be applied to contaminated solid waste burial grounds in the 100 Areas. Four of these cleanup alternatives indicated are applicable for the contaminated solid waste at the 100-HR-2 sites. The cleanup alternatives for solid waste include:

- Containment
- Removal/Disposal
- **In Situ** Treatment
- Removal/Treatment/Disposal

Table 2 presents the estimated cost, in place waste volume, and implementation schedules for each cleanup alternative. A summary of the applicable alternatives is provided below. More detailed descriptions of these alternatives can be found in the *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE/RL-94-61).

Table 2. 100-HR-2 Site-Specific Alternative Costs.

Site (In Place Waste Volume in cubic meters)	Containment				Removal/Disposal				In Situ Treatment				Removal/Treatment/Disposal			
	Capital ($)	O&M ($)	Present* Worth ($)	Yrs	Capital ($)	O&M ($)	Present* Worth ($)	Yrs	Capital ($)	O&M ($)	Present* Worth ($)	Yrs	Capital ($)	O&M ($)	Present* Worth ($)	Yrs
100-HR-2 OPERABLE UNIT																
118-H-1 (15,381)	9.39E+06	4.44E+06	1.14E+07	0.5	2.49E+07	0.00E+00	2.31E+07	2.0	1.12E+07	5.18E+06	1.36E+07	0.7	2.32E+07	7.45E+05	2.22E+07	2.0
118-H-2 (2,904)	1.00E+06	4.10E+05	1.19E+06	0.1	1.70E+06	0.00E+00	1.62E+06	0.1	1.18E+06	4.56E+05	1.38E+06	0.1	1.90E+06	9.28E+04	9.28E+04	0.1
118-H-3 (3,159)	4.24E+06	1.96E+06	5.14E+06	0.2	6.72E+06	0.00E+00	6.41E+06	0.5	5.03E+06	2.26E+06	6.06E+06	0.3	6.76E+06	1.86E+05	6.63E+06	0.6
118-H-4 (802)	8.46E+05	3.36E+05	9.95E+05	0.1	7.17E+05	0.00E+00	6.85E+05	0.1	9.93E+05	3.74E+05	1.16E+06	0.1	1.15E+06	3.08E+04	1.14E+06	0.1
118-H-5 (9)	N/A	N/A	N/A	N/A	2.04E+05	0.00E+00	1.97E+05	0.1	N/A	N/A	N/A	N/A	7.32E+05	1.35E+04	7.23E+05	0.1
105-H Rod Cave (36)	4.77E+05	1.60E+05	5.45E+05	0.1	2.07E+05	0.00E+00	1.99E+05	0.1	5.51E+05	1.73E+05	6.24E+05	0.1	7.32E+05	1.41E+04	7.24E+05	0.1
Buried Thimble Site (1,133)	8.02E+05	3.15E+05	9.42E+05	0.1	4.10E+05	0.00E+00	3.93E+05	0.1	9.40E+05	3.50E+06	1.09E+06	0.1	9.32E+05	1.64E+04	9.16E+05	0.1

*Present worth calculated using a 5% discount rate. Present worth accounts for the time value of money. This adjustment allows for a cost comparison on an equal basis.

N/A = Not applicable.
Capital = The cost of large equipment and other major purchases necessary to implement the alternative.
O&M = The cost of operation and maintenance activities required to implement the alternative.
Yrs = Estimated duration for completion of remedial alternative in years.

The DOE, EPA, and Ecology believe that a combination of removal, treatment, and disposal technologies, where appropriate, would significantly reduce the potential threats to human health and the environment at the 100-HR-2 OU solid waste burial grounds. Also these actions are intended to ensure that additional contaminants are not transported to the groundwater.

Containment (Alternative A) - This alternative includes institutional controls, groundwater monitoring, surface water controls, and a water infiltration barrier. Institutional controls involve limitations of certain land-uses (e.g., prohibiting drilling). Groundwater monitoring involves the long-term collection and analysis of groundwater under waste sites to evaluate contaminant movement or concentrations that could affect human health or the environment. Surface water controls (e.g., drainage channels and culverts) would be implemented at the site. The infiltration barrier would consist of layers of clean soil and native grasses underlain by layers of sand, gravel, and asphalt. The surface water controls and infiltration barrier would minimize contact with contaminated solid waste and would protect groundwater by minimizing contamination movement due to erosion and infiltration.

This alternative would reduce risks to human health and the environment by (1) restricting exposure pathways through the construction of a physical barrier that would inhibit contact with the contaminants and (2) minimizing the spread of contamination by erosion and infiltration.

Removal/Disposal (Alternative B) - This alternative includes the removal of contaminated solid waste and disposal at an approved facility. Under this alternative, contaminated solid waste would be excavated and disposed at the proposed ERDF or other appropriate onsite facilities. Excavation would continue until all contaminated material exceeding an established clean-up level, is removed. Clean soil would be backfilled at the site and the site would be contoured to its original condition. Site risks to human health and the environment would be reduced by the removal and appropriate disposal of contaminated soils.

In Situ Treatment (Alternative C) - This alternative applies to solid waste burial grounds and is similar to Alternative A with the addition of in situ treatment. It includes groundwater monitoring, surface water controls, and **in situ vitrification.** Groundwater monitoring, and surface water controls would be implemented (as described under the Containment alternative) after completion of the in situ vitrification process. Under this alternative, the contaminated solid waste would be left in place and dynamically compacted. This would reduce the pore spaces, minimize groundwater contact, and minimize potential for settlement of the water infiltration barrier (as described under the Containment alternative). This alternative would reduce risks to human health and the environment by (1) eliminating exposure pathways through the construction of a physical barrier that would inhibit contact with the contaminants, (2) minimizing the spread of contamination by erosion and infiltration, and (3) lowering the potential for contaminants to reach groundwater and reducing the potential for settlement and subsequent failure of the barrier.

Removal/Treatment/Disposal (Alternative D) - This alternative includes removal of the contaminated solid waste, thermal desorption (as required), compaction (as appropriate), and disposal at an approved facility. Under this alternative, contaminated solid waste would be excavated as described under the removal/disposal alternative. Solid waste, such as scrap metal, will be compacted, as appropriate. Solid waste that has been contaminated with organics, such as solvents and petroleum products, would be treated by thermal desorption. Clean soil would be used to fill the excavation to its original contours. Contaminated solid waste would be disposed at the ERDF or another appropriate onsite facility. The risk to human health or the environment would be reduced by the physical removal treatment, and proper disposal of contaminated solid waste.

PREFERRED INTERIM REMEDIAL ALTERNATIVES

The preferred alternative described below was selected based on an evaluation of criteria presented in the *100 Area Source Operable Unit Focused Feasibility Study Report* (DOE/RL-94-63). This alternative is protective of human health and the environment in both the short- and long-term. All applicable or relevant and appropriate requirements are met. Table 2 presents the estimated cost and in place waste volume for each cleanup alternative.

Solid Waste Burial Grounds - The preferred alternative for the solid waste burial grounds is excavation and removal of contaminated solid waste, treatment of contaminated solid waste to reduce volume or toxicity (as appropriate), and disposal of the remaining contaminated fraction in the proposed ERDF or another appropriate onsite facility. The preferred alternative would provide the most protection of human health and the environment from solid waste and may be the most cost-effective. Though the removal/disposal alternative has the lowest cost according the current assumptions, the actual disposal

costs may be much more expensive. If the actual disposal cost are more expensive, treating the waste to reduce volume before disposal may make the removal/treat/dispose alternative the cheapest.

Treatment at individual waste sites will include compaction, as appropriate, to reduce the volume of material. If organics are present, thermal desorption would be used to remove organic contaminants. Organic contaminants are not in the general conceptual models for the waste site groups but may be present at some individual waste sites. The applicability of each treatment will be determined on a waste-site by waste-site basis.

Compaction of solid waste is a well established technology for the processing and disposal of solid waste. The method that achieves the highest degree of compaction is baling. A baler consists of a series of hydraulic rams that compresses solid waste into a confined space. The resulting material can be bound with wires into dense bricks. This waste generally will not support combustion or produce concentrated leachate. Depending on the type of baler, the volume of material can be reduced to 10% of the original volume.

Organic compounds are not generally present in the 100-HR-2 waste sites. However, if organic compounds (solvents, petroleum products) are found, thermal desorption would be used to reduce toxicity and meet ERDF waste acceptance criteria. Thermal desorption involves heating soils and solid waste to evaporate volatile contaminants. Thermal desorption would be used as part of the specific waste site remedy if samples confirm the presence of organic compounds and the disposal facilities cannot accommodate them.

EVALUATION OF ALTERNATIVES

Each of the 100-HR-2 OU remedial alternatives was evaluated in detail to determine the preferred remedy for each of the waste site groups. The first seven of the nine criteria established by CERCLA were used to evaluate the remedial alternatives in the detailed and comparative analyses process. The last two criteria, state acceptance and community acceptance, will be evaluated following comment on this proposed plan and IROD. The nine criteria encompass mandatory legal requirements and include other technical, economic, and practical factors that assist in gauging the overall feasibility and acceptability of the cleanup alternatives. A summary of the comparative analysis of the alternatives presented in the *100-HR-2 Focused Feasibility Study Report* (DOE/RL-94-65) is presented in Table 3. This table presents the alternatives that are applicable to the solid waste burial grounds. It presents a graphic comparison of the relative differences between each alternative for the first seven CERCLA criteria.

Overall Protection of Human Health and the Environment - The preferred alternative would provide the most protection of human health and the environment from soil and solid waste contamination.

The preferred alternative would physically remove waste from the site to the extent practical, thereby minimizing risk.

Compliance with Applicable or Relevant and Appropriate Requirements - All the remedial alternatives would comply with applicable or relevant and appropriate requirements in federal and state environmental statutes.

Long-Term Effectiveness and Permanence - The preferred alternative would be effective and permanent in the long term. Contaminated material would be removed, treated (if necessary), and disposed of. These actions would minimize risk.

Reduction of Toxicity, Mobility, or Volume Through Treatment - The in situ vitrification alternative would be the most effective in reducing mobility and, to some extent, volume. The preferred alternative would not control mobility, but would reduce volume.

Short-Term Effectiveness - The containment and in situ vitrification alternatives would be the most effective in the short term. The preferred alternative treatment processes may create adverse impacts during construction and operation.

Implementability - The containment alternative would be the most implementable for the solid waste sites. The removal/disposal alternative would be the most implementable for the soil sites. The preferred alternative would be implementable for either soil or solid waste sites.

Cost - The removal/disposal alternative has the lowest cost according the current assumptions. However, the actual disposal costs may be much more expensive then the current assumption. If that happens, treating the waste to reduce volume before disposal may make the removal/treat/dispose alternative the cheapest.

Table 3. Comparative Analysis Summary[a] 100-HR-2 Operable Unit.

Evaluation Criteria	Waste Site Groups	Burial Ground 118-H-1				Burial Ground 118-H-2				Burial Ground 118-H-3				Burial Ground 118-H-4				105-HR Red Cave				Buried Thimble[c] Site				Burial Ground 118-H-5	
	Alternatives[b]	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	A	B	C	D	B	D
Overall Protection of Human Health and Environment		Fair	Better	Good	Best	Fair	Better	Good	Best	Fair	Better	Good	Best	Fair	Better	Good	Best	Fair	Better	Good	Best	Fair	Better	Good	Best	Better	Best
Compliance with ARAR		Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best	Best
Long-Term Effectiveness and Permanence		Fair	Better	Good	Better	Fair	Better	Good	Better	Fair	Better	Good	Better	Fair	Better	Good	Better	Fair	Better	Good	Better	Fair	Better	Good	Better	Better	Better
Reduction of Toxicity, Mobility, and Volume		Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Good	Better
Short-Term Effectiveness		Best	Good	Better	Fair	Best	Good	Better	Fair	Best	Good	Better	Fair	Best	Good	Better	Fair	Best	Good	Better	Fair	Best	Good	Better	Fair	Good	Fair
Implementability		Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Best	Better	Fair	Good	Better	Good
Present Worth ($ millions)		11.4	23.1	13.6	22.2	1.19	1.62	1.38	0.928	5.14	6.41	4.06	6.63	0.995	0.685	1.14	1.15	0.543	0.399	0.634	0.724	0.942	0.393	1.09	0.916	0.197	0.723

Notes:

ARAR = applicable or relevant and appropriate requirement.

[a]Comparative Analysis Summary is based on Tables 6-1 and 6-2 in the *100-HR-2 Focused Feasibility Study Report*. Comparisons are made between relevant alternatives for each individual waste site group only.

[b]Alternatives are summarized
- A Containment
- B Removal and disposal
- C In situ treatment of solid waste
- D Removal, treatment and disposal of solid waste

[c]Considered Burial Grounds.

Key:
- Best
- Better
- Good
- Fair
- Poor

EXPLANATION OF CERCLA EVALUATION CRITERIA

1. *Overall Protection of Human Health and the Environment* addresses whether or not a remedial action provides adequate protection and describes how potential risks posed through each exposure route are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

2. *Compliance with Applicable or Relevant and Appropriate Requirements* addresses whether or not a remedial action will meet all of the applicable or relevant and appropriate requirements and other federal and state environmental statutes or provide grounds for invoking a waiver of the requirements.

3. *Long-Term Effectiveness and Permanence* refers to the magnitude of residual risk and the ability of a remedial action to maintain reliable protection of human health and the environment after remedial goals have been met.

4. *Reduction of Toxicity, Mobility, or Volume Through Treatment* evaluates the anticipated performance of the treatment technologies that may be employed in a remedy.

5. *Short-Term Effectiveness* refers to the speed with which the remedial action achieves protection, as well as the remedy's potential to create adverse impacts on human health and the environment that may result during the construction and implementation period.

6. *Implementability* refers to the technical and administrative feasibility of a remedial action, including the availability of materials and services needed to implement the selected solution.

7. *Cost* evaluates operation and maintenance and capital costs for each alternative by performing present worth cost analyses.

8. *State Acceptance*, based on its review of the remedial investigation and focused feasibility study reports and proposed plan, indicates whether the state concurs with, opposes, or has no comment on the preferred interim alternative.

9. *Community Acceptance* is an assessment of the general public response to the proposed plan following a review of the public comments received on the remedial investigation, focused feasibility study, and proposed plan during the public comment period and open community meetings.

INFORMATION REPOSITORIES	POINTS OF CONTACT
Final Reports U.S. Department of Energy, Richland Operations Office Public Reading Room 2440 Stevens Center Place Richland, Washington 99352 (509) 376-7411 Hrs: Mon-Fri 8-12 am and 1-4:30 pm	U.S. Department of Energy, Richland Operation Office Representative Nancy Werdel 100 Area Manager (509) 376-5500
Final Reports EPA Region 10 Superfund Record Center 1200 Sixth Avenue Park Place Building, 7th Floor Mail Stop: HW-074 Seattle, Washington 98101 (206) 553-4493 Hrs: Mon-Fri 8 am - 4:30 pm	U.S. Environmental Protection Agency Representative EPA Region 10 Kevin Oates Unit Manager, Environmental Engineering (509) 376-8665
Final Reports Washington State Department of Ecology Nuclear Waste Library 719 Sleater-Kinney Road Southeast Capital Financial Building, Suite 200 Lacey, Washington 98503 (206) 407-7097 Hrs: Mon-Fri 8 am - 5 pm	Washington State Department of Ecology Representative David Holland Unit Manager (509) 736-3027

OPPORTUNITIES FOR COMMUNITY INVOLVEMENT

Community Meeting Announcement

You are invited to attend an upcoming meeting regarding the *Ecology's Proposed Plan for Interim Remedial Measures at the 100-HR-2 Operable Unit* at the Hanford Site. The DOE, EPA, and Ecology representatives will report on the remedial alternatives, including the preferred alternative, and will answer your questions.

DATE: ?
TIME: ?
PLACE: ?

You will have an opportunity at the meeting to direct questions to Ecology and the regulatory representatives and comment on the remedial alternatives. If you have any questions regarding the meeting, you should contact David Holland at (509) 736-3027.

Public Comment Period Announcement

A 30-day public comment period will begin on ?. The DOE, EPA, and Ecology request your written comments on the *Proposed Plan for Interim Remedial Measures at the 100-HR-2 Operable Unit*. Written comments should be postmarked not later than ?, and sent to: David Holland at the Washington Department of Ecology.

GLOSSARY

Applicable or Relevant and Appropriate Requirements (ARAR) - These ensure compliance with all substantive elements of federal laws and more stringent state laws that apply or are determined to be relevant and appropriate.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - A federal law that establishes a program that enables the Environmental Protection Agency to identify abandoned hazardous waste sites, ensure that they are cleaned up, and allow other government entities to evaluate damages to natural resources. It is also known as the "Superfund Law." CERCLA applies to the 100-HR-2 OU.

Contaminants of Potential Concern - These are chemical and radioactive constituents that must be addressed by remedial action.

Environmental Restoration Disposal Facility (ERDF) - A proposed disposal facility for contaminated soils and solid waste, which is assumed to be available at the Hanford Site to support IRMs.

Environmental Restoration Program - DOE's plan, in conjunction with EPA and Ecology, for cleanup of environmental contamination at the Hanford Site that resulted from former practices.

Focused Feasibility Study (FFS) - An engineering study on a waste site that evaluates a limited number of remedial alternatives for cleaning up environmental contaminants.

Groundwater - Underground water that fills the spaces between particles of soil, sand, gravel, or fractures in rocks.

Hazard Index - This is used to evaluate risk from noncarcinogenic substances. The daily intake over a specified time period is compared to a reference dose.

In Situ - This refers to an activity or action that is being conducted in place.

In Situ Vitrification - A thermal treatment process that converts soil and other material into stable glass or glass-like crystalline substances, which stabilizes the contaminants in-place.

Interim Action - The implementation of the selected interim remedy for an OU or site.

Interim Record of Decision (IROD) - The formal document in which the lead regulatory agency sets forth the selected IRM and the reasons for its selection.

Interim Remedial Measure (IRM) - A remedial action that is taken at a site to address one or more of the contamination problems, but not necessarily all of the contamination problems. The remedial action is based on a **Limited Field Investigation** (LFI)/**Focused Feasibility Study** (FFS) and is selected in an IROD.

Limited Field Investigation (LFI) - Part of the IRM process that assesses the applicability of IRMs for reducing human health and environmental risks.

National Environmental Policy Action of 1969 (NEPA) - Declares a national environmental policy and promotes consideration of environmental concerns by federal agencies.

National Priorities List (NPL) - A list of top-priority hazardous waste sites in the United States that are eligible for investigation and cleanup under the Superfund program.

Operable Unit (OU) - This is a subset of a larger Superfund CERCLA site, typically the subject of OU-specific investigations and remedial actions.

Past-Practice Cleanup Strategy - The strategy is a process to meet statutory requirements and appropriate CERCLA/ **Resource Conservation and Recovery Act** (RCRA) guidance and ensure the protection of human health and welfare and the environment at the Hanford Site through effective cleanup actions (effective both in terms of protection and cost). The strategy has a bias-for-action through optimizing the use of interim remedial actions, culminating with decisions on final remedies on the OU and aggregate area scale.

Qualitative Risk Assessment (QRA) - An evaluation of risk for a predefined set of human and environmental exposure scenarios that assists Tri-Party signatories in making defensible decisions on the necessity of IRMs.

Record of Decision (ROD) - The formal document in which the lead regulatory agency sets forth the selected final remedy and the reasons for its selection.

Remedial Investigation (RI) - An in-depth study to gather data necessary to determine the nature and extent of contamination. The purpose of an RI is to provide sufficient information to identify feasible engineering solutions and evaluate potential human health and environmental risks.

Resource Conservation and Recovery Act - The first comprehensive federal effort to deal with the problems of solid waste and hazardous waste. The law was enacted in the fall of 1976.

Thermal Desorption - A treatment process that increases soil temperature to promote the vaporization (remove in a gas state) of unwanted contaminants.