UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 10 HANFORD PROJECT OFFICE
712 SWIFT BOULEVARD, SUITE 5
RICHLAND, WASHINGTON 99352

June 14, 1995

Julie Erickson
U.S. Department of Energy
P.O. Box 550, H4-83
Richland, Washington 99352

Re: Final Draft of 100-BC-1, 100-DR-1 and 100-HR-1 Proposed Plans

Dear Ms. Erickson:

This correspondence is in regard to the final draft of the proposed plans for 100-BC-1, 100-DR-1 and 100-HR-1 submitted by the U.S. Department of Energy (DOE) to the U.S. Environmental Protection Agency (EPA) and the Washington State Department of Ecology (Ecology) for review and approval. The EPA and Ecology approve the release of the three proposed plans for public comment.

In the course of our final review, a few minor editorial corrections have been noted. An errata sheet is enclosed with this letter, along with the final submittal of the plans, to facilitate the necessary corrections prior to publishing and releasing the plans. The EPA and Ecology do not require any further review. In addition, as we discussed on June 12, 1995, the public comment period will commence on June 26, 1995 and close on August 9, 1995. A public meeting will be held in the Tri-Cities on July 25, 1995 from 7:00 P.M. to 9:00 P.M. at a location to be determined.

Should you have any questions concerning this correspondence or related matters, please contact either Kevin Oates at the EPA on (509) 376-6623 or Steve Alexander at Ecology on (509) 736-3045.

Sincerely,

Kevin J. Oates
U.S. Environmental Protection Agency

Steven M. Alexander
Washington State Department of Ecology

Enclosure

cc: w/o Attachments

K. Michael Thompson, DOE
Tom Logan, ERC
Laurie Davies, Ecology

w/Attachments

Nancy Werdel, DOE
Greg Eidam, ERC
Keith Holliday, Ecology
Wayne Soper, Ecology
Phil Staats, Ecology
Dennis Faulk, EPA

ERRATA SHEET

- For all proposed plans, the public comment period should read June 26, 1995 through August 9, 1995.

- For all proposed plans, the public meeting date should read July 25, 1995 from 7:00 P.M. to 9:00 P.M. (Note: Location needs to be finalized and stated in the text prior to release of proposed plans).

- For all proposed plans, the Ecology and DOE administrative record contacts are reversed and need to be corrected.

- For 100-DR-1, the number of sites should be 12, not 13 as presented in the text. Suggest global search and correction.

- For 100-DR-1, the footnote on Table 1 for 116-D-2A is misplaced, it should be for 116-D-9. In addition, for 116-D-9 Crib under the COPC column, Thorium-228 should be added since it was detected above the risk-based concentration (see table 3-13a and 1-13b in the 100-DR-1 QRA).

- For 100-DR-1 Table 2. The 116-D-9 Crib, Column Two. The Non Cancer Hazard Index should read " > 1 " for consistency.

- For 100-DR-1 Table 2. The 100-D and DR Buried Pipelines, the Ecorisk column should read " > 1 ".

- For 100-DR-1 Page 8, Column One, Last paragraph under Interim Remedial Action Goals, 116-D-2A Crib should read 116-D-2B Crib. In addition, the sentence should continue on to read..."where contamination begins 15 feet below the ground surface"...not..."10 feet"... as it currently reads.

- For 100-HR-1, Page 10 under compliance with ARARs, the last sentence should read..."If Land Disposal Restricted contaminants..."

- For 100-BC-1, the Ecology Unit Manager is Wayne Soper, his phone number is (509) 736-3049.

- For 100-BC-1, Table 1 for 116-B-12 Seal Pit Crib under COPC add Th-228

- For 100-BC-1, Page 8, Column 2, the first sentence after listing of three laws and draft regulation should read..."For deep sites, such as the 116-B-11 Retention Basin where contamination begins at a depth of 24 feet below the ground surface..."

- For 100-BC-1, Page 14 under P.O.C., Dennis Faulk at 509-376-8631 is the correct EPA contact and phone number.

PROPOSED PLAN FOR INTERIM REMEDIAL MEASURES AT THE 100-BC-1 OPERABLE UNIT

Hanford Site, Richland, Washington

DOE, EPA, AND ECOLOGY ANNOUNCE PROPOSED PLAN

This Proposed Plan identifies the preferred alternative for **interim remedial measures** for remedial action of radioactive liquid waste disposal sites that include contaminated soils and structures at the 100-BC-1 **Operable Unit**, located at the Hanford Site (Figure 1). It also summarizes other remedial alternatives evaluated for interim remedial measures in this Operable Unit. The intent of interim remedial measures is to speed up actions to address contaminated areas that pose potential threats to human health and the environment.

This Proposed Plan is being issued by the Washington State Department of Ecology (Ecology), the lead regulatory agency; the U.S. Environmental Protection Agency (EPA), the support regulatory agency; and the U.S. Department of Energy (DOE), the responsible agency. Ecology, EPA, and DOE 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), commonly known as the "Superfund Program." *National Environmental Policy Act* values are addressed in the *100 Area Source Operable Unit Focused Feasibility Study* (DOE/RL-94-61), which discusses the 100-BC-1 Operable Unit. This Proposed Plan is intended to be a fact sheet for public review which briefly describes the remedial alternatives analyzed, identifies a preferred alternative, and summarizes the information relied upon to recommend the preferred alternative.

The preferred alternative presented in this Proposed Plan is to remove, treat (as appropriate or required), and dispose of the contaminated soil and associated structures from nine source areas within the 100-BC-1 Operable Unit (Table 1). Treatment would be conducted as necessary or appropriate for cost effective operations (e.g., to meet land disposal restrictions, to reduce the size of the **Environmental Restoration Disposal Facility**, or to reduce overall costs). The preferred alternative will reduce potential threats to human health and the environment at 100-BC-1 Operable Unit radioactive liquid waste disposal sites. The remedial actions described are intended to reduce potential human health and ecological risks and to ensure that contaminants present at these waste sites will not adversely impact **groundwater** beneath the sites or the Columbia River.

Send written comments to:
Kevin Oates
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, WA 99352

The preferred alternative is the initial recommendation of Ecology, EPA, and DOE. The cleanup alternative will be selected only after the public has had the opportunity to comment on this recommendation and all comments have been reviewed and considered. The agencies are seeking comments on each alternative presented, not just the preferred alternative. Comments may be made in person at the public meeting or may be submitted in writing. Written comments must be submitted by August 2, 1995. Response to comments will be presented in a responsiveness summary that will be part of the **record of decision** (ROD), which is the legal decision document that selects the cleanup remedy. The public is encouraged to review Appendix F of the *100 Area Source Operable Unit Focused Feasibility Study* (DOE/RL-94-61), which discusses the 100-BC-1 Operable Unit. This and other documents listed at the end of this Proposed Plan provide greater detail about this Operable Unit. The Proposed Plan can be read at the information repositories listed at the end of this Proposed Plan.

Technical terms and other text in bold are defined in the glossary at the end of this document.

Figure 1. 100-BC-1, 100-BC-2, and 100-BC-5 Operable Units.

Table 1. Description of 100-BC-1 Operable Unit High-Priority Radioactive Liquid Waste Disposal Sites.

Waste Site	Physical Description of Waste Site	Former Waste Site Use	[1]Contaminants of Potential Concern
116-B-11 Retention Basin	Reinforced concrete retention basin. 143 m long x 70 m wide x 2 m deep.	Held cooling water effluent from 105-B Reactor for cooling/decay before release to the Columbia River. Large leaks of effluent to soil.	Am-241, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Pu-238, Pu-239, Ra-226, Sr-90, Th-228, U-238, antimony, chromium, lead, mercury
116-C-5 Retention Basin	Two circular steel tanks. 101 m diameter x 5 m deep.	Held cooling water effluent from 105-B and C Reactors for cooling/decay before release to the Columbia River. Large leaks of effluent to soil.	Am-241, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Ni-63, Pu-238, Pu-239, Ra-226, Sr-90, Th-228, U-238, antimony, chromium, lead, mercury
116-B-1 Process Effluent Trench	Unlined trench. 108 m long x 9 m wide x 5 m deep.	Received high activity effluent produced by failed fuel elements, disposed effluent to the soil.	Cs-137, Co-60, Eu-152, Eu-154, Pu-239, K-40, Sr-90, U-238, chromium
116-C-1 Process Effluent Trench	Unlined trench. 175 m long x 38 m wide x 7 m deep.	Received high activity effluent produced by failed fuel elements, disposed effluent to the soil.	Am-241, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Pu-238, Pu-239, Ra-226, Sr-90, Th-228, U-238, antimony, chromium, lead, mercury
116-B-13 and 116-B-14 Sludge Trenches	116-B-13, unlined trench, 15 m long x 15 m wide x 3 m deep. 116-B-14, unlined trench, 37 m long x 3 m wide x 3 m deep.	Received sludge from retention basins: sludge disposed to soil then trench backfilled.	Am-241, Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Pu-238, Pu-239, Ra-226, Sr-90, U-238, antimony, chromium, lead, mercury
116-B-4 French Drain	Gravel filled pipe. 1 m diameter x 6 m deep.	Received contaminated spent acid from dummy decontamination facility; disposed effluent to soil.	Co-60, Cs-137, Eu-152, Eu-154, Eu-155, Pu-239, K-40, Th-228, barium.
116-B-12 Seal Pit Crib[2]	Timber reinforced excavation filled with gravel, soil covered. 3 m long x 3 m wide x 3 m deep.	Received drainage from confinement seal system in 117-B building seal pits; disposed effluent to soil.	arsenic, chromium
116-B-5 Crib	Concrete covered unlined crib containing boiler ash and gravel fill. 26 m long x 5 m wide x 4 m deep.	Received low-level effluent from contaminated maintenance shop and decontamination pad in 108-B building including tritium waste; disposed effluent to soil.	Cs-137, Co-60, Eu-152, Eu-154, H-3, barium, mercury
100-B/C Buried Process Effluent Pipelines	Buried process effluent pipelines. Total length ≈ 6533 m pipe diameter - varies; leaks have occurred with known soil contamination.	Transported reactor cooling water from reactors to retention basins, outfall structures, and disposal trenches, contains contaminated sludge and scale.	Cs-134, Cs-137, Co-60, Eu-152, Eu-154, Eu-155, Ni-63, Pu-238, Pu-239, Sr-90, U-238

Am-241	= ^{241}americium	K-40	= ^{40}potassium
Cs-134	= ^{134}cesium	Ni-63	= ^{63}nickel
Cs-137	= ^{137}cesium	Pu-238	= ^{238}plutonium
Co-60	= ^{60}cobalt	Pu-239/240	= $^{239/240}$plutonium
Eu-152	= ^{152}europium	Ra-226	= ^{226}radium
Eu-154	= ^{154}europium	Sr-90	= ^{90}strontium
Eu-155	= ^{155}europium	Th-228	= ^{228}thorium
H-3	= tritium	U-238	= ^{238}uranium

[1] The **contaminants of potential concern** were identified from the Qualitative Risk Assessment.
[2] Data not available for this site. Contaminants of potential concern identified based on analogous site 116-D-9 Crib.

MARK YOUR CALENDAR

A 45-day public comment period for the 100-BC-1 proposed plan will be from June 19, 1995, to August 2, 1995.

A public meeting on this proposed plan will be held as follows:

Date: ???
Time: ???
Place: ???

You will have an opportunity at the meeting to direct questions to EPA, Ecology, and DOE

SITE BACKGROUND

The Hanford Site is located in southeastern Washington (Figure 1). The 100 Area of the Hanford Site is located along the Columbia River and includes nine DOE nuclear reactors previously used for plutonium production, two of which are the 105-B and 105-C Reactors. In November 1989, the EPA placed the 100 Area on the **National Priority List** because of soil and groundwater contamination resulting from the past operation of nuclear facilities.

The 105-B Reactor operated between 1944 and 1968, and the 105-C Reactor operated from 1952 to 1969. Reactor operations and former waste handling practices have caused contamination around the 105-B and 105-C reactors and support facilities, adjacent soil, and groundwater. To organize cleanup efforts under the Superfund Program, contaminated areas at the 105-B and 105-C Reactors were subdivided into three geographic areas called "operable units." The three 100-BC Operable Units are designated as 100-BC-1, 100-BC-2, and 100-BC-5 (Figure 1).

The 100-BC-1 Operable Unit (Figure 2) encompasses an area of approximately 180 hectares (450 acres). It includes former radioactive liquid waste disposal sites and buried debris resulting from demolition of some reactor support facilities. Sites fall into two general categories; shallow sites where both soil exposure and groundwater impacts may be a concern; and deep sites where groundwater impact is the primary concern. The 100-BC-2 Operable Unit includes former radioactive liquid waste disposal sites and buried debris from 105-C Reactor operations. Groundwater beneath the 100-BC-1 and 100-BC-2 Operable Units and vicinity is being addressed in the 100-BC-5 Operable Unit.

The 100-BC-1 Operable Unit includes twenty-six waste sites that have been designated by Ecology, EPA, and DOE as *high priority* for interim remedial measures. *High priority* waste sites are distinguished from *low priority* sites based on the results of remedial investigation activities, assessment of potential impacts to human health and the environment, and local community concerns. Twelve of the twenty-six high priority sites are radioactive liquid waste disposal sites within the 100-BC-1 Operable Unit. This Proposed Plan presents interim cleanup actions for nine of those sites. No interim action is recommended for the 116-B-12 crib because there are no known significant contaminants in the top 15 feet. The two sites not addressed include the 116-B-9 French Drain and the 116-B-10 Drywell, which were not fully evaluated as candidates for interim action. Table 1 summarizes information on the former use, waste site dimensions, and **contaminants of potential concern**, and is based on historical process knowledge, previous investigations, and the limited field investigation undertaken by DOE. The waste site locations are shown in Figure 2.

SUMMARY OF SITE RISK

Potential risks to human health and ecological receptors was evaluated in the *Qualitative Risk Assessment Report*. The results of the **qualitative risk assessment** are summarized in Table 2 and described in the following sections. These results indicate that interim remedial measures are warranted at these nine high priority sites.

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 current 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

Figure 2. Location of 100-BC-1 Waste Sites.

Table 2. [1]Qualitative Risk Assessment Summary for 100-BC-1 Interim Remedial Measure Sites.

Waste Site	[2]Human Health Risk Estimates				[2]Ecological Risk Estimates (Environmental Hazard Quotient)
	[3]Residential Land Use		[4]Recreational Land Use		
	Increased Cancer Risks	Noncancer Hazard Index	Increased Cancer Risks	Noncancer Hazard Index	
116-B-11 Retention Basin	$>1 \times 10^{-2}$	2.5	$>1 \times 10^{-2}$	<1	>1
116-C-5 Retention Basin	$>1 \times 10^{-2}$	2.5	$>1 \times 10^{-2}$	<1	>1
Pipeline sludges	$>1 \times 10^{-2}$	NA[5]	$>1 \times 10^{-2}$	NA[5]	>1
Pipeline soils	3×10^{-3}	<1	2×10^{-5}	<1	<1
116-B-1 Process Effluent Trench	$>1 \times 10^{-2}$	<1	1×10^{-4}	<1	<1
116-C-1 Process Effluent Trench	$>1 \times 10^{-2}$	2.5	2×10^{-3}	<1	>1
116-B-13 and 116-B-14 Sludge Trenches	$>1 \times 10^{-2}$	2.5	$>1 \times 10^{-2}$	<1	>1
116-B-4 French Drain	$>1 \times 10^{-2}$	<1	3×10^{-4}	<1	>1
116-B-12 Crib[6]	5×10^{-4}	2.5	3×10^{-6}	<1	<1
116-B-5 Crib	2×10^{-3}	<1	1×10^{-5}	<1	<1

1. The Qualitative Risk Assessment provides an evaluation of the need for interim remedial measures at 100-BC-1 sites.

2. Human health and ecological risks estimated in the QRA are based on conservative assumptions that may overstate the level of potential risks. Actual risks associated with the 100-BC-1 sites are likely to be lower than those presented here.

3. Corresponds to a frequent-use scenario.

4. Corresponds to an occasional-use scenario.

5. NA = Not applicable. Noncarcinogenic contaminants not detected at this site. No hazard index was calculated for this site.

6. Risk estimates were based on analogous site 116-D-9 Crib.

adverse environmental impacts, potential for future migration, or uncertainty regarding future land use. For the second type of potential human health effect, non-carcinogenic health impacts, a **Hazard Index** (HI) is calculated. An HI greater than or equal to 1 may pose a potential adverse human health risk.

Human Health Risk - Human health risks were evaluated for 100-BC-1 sites in order to select sites that should be addressed by interim remedial measures. Human health risks were evaluated using a qualitative risk assessment. The qualitative risk assessment used a limited set of exposure assumptions and pathways to estimate health risks. Contaminants detected in soils at the 100-BC-1 Operable Unit high priority radioactive liquid waste disposal sites pose a potential increased health risk to future users of the site. The level of potential health risk posed by these contaminants differs depending upon the future site use. Two scenarios were evaluated; an occasional use scenario which corresponds to a recreational use, and a frequent use scenario which corresponds to a residential use. In either case, future users could be exposed to contaminants in soil through ingestion of soil, inhalation of wind-blown dust, or external exposure to radiation.

Based on the qualitative risk assessment, the contaminants in soil providing the highest contribution to potential increased cancer risks included the radionuclides cesium-137, cobalt-60, europium-152, and europium-154. Chromium in soil provided the highest contribution to noncancer hazard indices at 100-BC-1 Operable Unit sites. The risk estimates presented in Table 2 represent potential future risks if the area were to be used for recreational or residential purposes. These risks are outside of EPA's acceptable risk range and show that remedial actions should be taken at these sites.

Past disposal of radioactive liquid wastes to the soils at the 100-BC-1 Operable Unit has resulted in potential impacts to the underlying groundwater. Should groundwater under the site be used, future users could be exposed to contaminants by drinking the groundwater. The existing groundwater contamination that resulted from these source operable units is part of the 100-BC-5 Operable Unit, and will be addressed in a future proposed plan for groundwater.

Ecological Risk - Ecological risks for the waste sites within the 100-BC-1 Operable Unit were estimated by evaluating potential impacts to the Great Basin pocket mouse. Risks to the mouse were estimated assuming the food pathway was the primary route of exposure to both radionuclides and inorganic/organic contaminants. An **Environmental Hazard Quotient** (EHQ) equal to or greater than 1.0 was considered to indicate that individual mice were at risk.

Nearly all of the radiological risk (EHQ $>$ 1.0) to the mouse at this Operable Unit was attributable to strontium-90. The inorganic contaminants that exceed an EHQ of 1.0 include antimony, chromium, and mercury. Table 2 summarizes the risk estimates to the Great Basin pocket mouse due to exposure to contaminants at the 100-BC-1 Operable Unit waste sites.

SCOPE AND ROLE OF ACTION

This proposed plan presents interim remedial measures at nine high priority radioactive liquid waste disposal sites and associated contaminated soil and structures at the 100-BC-1 Operable Unit. The objective of the proposed interim remedial measures is to reduce potential future threats to human health and the environment from these waste sites. It is expected that no additional remedial measures will be required at these sites. A limited number of additional waste sites may be remediated during the interim remedial measures if they are adjacent to or within the excavation area for the high priority radioactive liquid waste disposal sites. The 116-B-3 Pluto Crib is such a site.

The public has provided input to the DOE on the future use of the 100 Area through various forums, including the **Hanford Future Site Uses Working Group**. However, the final land use for the 100 Area of the Hanford Site has not been established. Remedial action objectives and cleanup goals may be revisited if land use and groundwater use determinations are inconsistent with the goals presented in this plan. For the purposes of this Proposed Plan, Ecology, EPA, and DOE have agreed to cleanup goals that, to the extent practicable, would support a goal to not limit future uses of the 100 Area land due to contaminants resulting from Hanford operations. This would be accomplished through remediation of the sites to address the potential direct effects of exposure, potential releases to air and groundwater, and would minimize ecological and cultural impacts. The development of mitigation plans to address site-specific ecological and cultural resources will occur during the remedial design phase that follows after the ROD is signed.

Other Sites in the
100-BC-1 Operable Unit

(not addressed in this proposed plan)

- Fuel Storage Basin Trench (116-B-2)*
- Pluto Crib (116-B-3)*
- Crib (116-B-6A)*
- Crib (116-B-6B)*
- Outfall Structure (116-B-7)*
- French Drain (116-B-9)*
- Dry Well/Quench Tank (116-B-10)*
- Fuel Storage Basin Cleanup Pond (116-B-15)
- Storage Tank (116-B-16)
- Ball 3X Burial Ground (118-B-5)*
- Solid Waste Burial Ground (118-B-7)*
- Reactor (118-B-8)
- Storage Facility (118-B-9)
- Pit--Burial Ground (118-B-10)*
- Battery Acid Sump ((120-B-1)
- Ash Pit (126-B-1)
- Clearwells (126-B-2)*
- 184-B Coal Pit Demolition and Inert Waste Landfill (126-B-3)
- Brine and Salt Dilution Pits (126-B-4)
- Burning Pit (128-B-1)
- Sand Blast Disposal Site (128-B-2)
- Dump Site (128-B-3)*
- Demolished Tritium Separations Facility (132-B-1)
- Stack, Reactor Exhaust (132-B-2)
- Stack, 108-B (132-B-3)
- Demolished Filter Building (132-B-4)*
- Demolished Gas Recirculation Building (132-B-5)*
- Demolished Outfall Structure (132-B-6)*
- Demolished Outfall Structure (132-C-2)*
- Dumping Area (600-34)
- Septic System (1607-B1)
- Septic System (1607-B2)
- Septic System (1607-B3)
- Septic System (1607-B4)
- Septic System (1607-B5)
- Septic System (1607-B6)
- Septic System (1607-B7)

*High priority waste sites not addressed in this proposed plan.

INTERIM REMEDIAL ACTION GOALS

Interim remedial action goals represent contaminant concentrations in soils that are considered protective of human health and the environment. Cleanup goals for the proposed actions are based on the three laws and the draft regulation listed below.

- State of Washington *Model Toxics Control Act* for organic and inorganic chemical constituents in soil to support unrestricted (residential) use.
- Draft EPA and Nuclear Regulatory Commission proposed standard of 15 mrem/yr in soils above background for radionuclides for human health.
- Protection of groundwater such that contaminants remaining in the soil after remediation do not result in an impact to groundwater that could exceed **Maximum Contaminant Levels** under the *Safe Drinking Water Act*. This applies to waste sites where groundwater has not been impacted.
- Protection of the Columbia River such that contaminants remaining in the soil after remediation do not result in an impact to groundwater and, therefore, the Columbia River that could exceed the Ambient Water Quality Criteria under the *Clean Water Act* for protection of fish. This applies to sites where groundwater has already been impacted.

For deep sites, such as the 116-B-1 Process Effluent Trench where contamination begins at a depth of 15 feet below the ground surface, the extent of remediation may be balanced against several factors including reduction of risk by decay of radionuclides, protection of human health and the environment, costs, sizing of the Environmental Restoration Disposal Facility, worker safety, presence of ecological and cultural resources, the use of institutional controls, and long term monitoring costs. In the event that contaminated soil above cleanup goals are left in place, additional public comment may be requested.

SUMMARY OF ALTERNATIVES CONSIDERED

The *100 Area Source Operable Unit Focused Feasibility Study (DOE/RL-94-61)* identified six general response actions that could be applied to waste sites in the 100 Areas, including the 100-BC-1 Operable Unit. The alternatives evaluated for interim remediation are as follows:

- No action
- Institutional Controls
- Containment
- Remove/Dispose
- In Situ Treatment
- Remove/Treat/Dispose.

NOTE: The No Action, Institutional Controls, Containment and In Situ Treatment alternatives would limit the future uses of the 100 Area. A summary of alternatives considered is provided below.

No Action - The "no action" alternative was evaluated to provide a baseline for comparison to the other alternatives. It represents a hypothetical scenario where no additional restrictions, controls, or active remedial measures other than those currently existing are applied to a site.

Institutional Controls - This alternative involves the following:

- deed and/or access restrictions
- groundwater monitoring.

Deed restrictions would consist of limitations on certain types of land-uses (e.g., prohibiting drilling or excavation) at an individual waste site. Access restrictions would include fences or signs. Groundwater monitoring would include sampling for potential changes in groundwater contaminant concentrations underlying the waste sites. These institutional controls would limit exposure to humans and would monitor changes in groundwater quality until a final response action could be evaluated and implemented.

Containment - This alternative includes the following elements:

- institutional controls
- groundwater monitoring
- surface water controls
- installation of a surface barrier at the surface.

As described under the institutional control alternative, deed restrictions and/or access restrictions, combined with groundwater monitoring, would be implemented along with surface water controls during and after installation of a surface barrier, such as the Hanford Barrier.

Remove/Dispose - This alternative applies to contaminated soils and structures and includes the following:

- remove contaminated media
- dispose media at an approved disposal facility
- backfill of excavated areas and revegetation.

Under this alternative, contaminated media would be excavated, transported, and disposed at an appropriate facility (e.g., the Environmental Restoration Disposal Facility or 218-W-5 Burial Ground, Trench 31 [W025]), in accordance with waste acceptance criteria established for the disposal facility. Any material that exceeds the disposal facility acceptance criteria would be stored onsite consistent with requirements until treated to meet acceptance criteria or a treatability variance is approved. As the contaminated material is excavated, it would be characterized and segregated prior to transportation. Excavation would continue until all contaminated material exceeding the cleanup goal is removed. The site would then be backfilled and the area would be revegetated. Site specific revegetation plans will be developed during remedial design with input from affected stakeholders such as Natural Resource Trustees and Native American Tribes.

In Situ Treatment (for soil) - This alternative applies to contaminated soil and includes the following elements:

- institutional controls
- groundwater monitoring
- surface water controls
- **in situ vitrification.**

Institutional controls such as deed restrictions and/or access restrictions, groundwater monitoring, and surface water controls would be implemented as discussed under the institutional control and containment alternatives after completion of the in situ vitrification process. Under this alternative, the contaminated soil would be vitrified in place and covered with a minimum of one meter of soil. The disturbed area would then be revegetated.

In Situ Treatment (for Buried Process Effluent Pipelines) - This alternative applies to buried process effluent pipelines and contaminated soils. It includes the following elements:

- institutional controls
- groundwater monitoring
- void grouting
- installation of a surface barrier, if needed.

Under this alternative, deed and/or access restrictions, groundwater monitoring, and surface water controls would be implemented as previously described. The buried process effluent pipelines would be pressure injected in place with grout that would immobilize contamination in the pipeline (i.e., the contaminated metal, scale, and sediments in the pipe) through encapsulation. A surface barrier would be installed (as described in the containment alternative) over soils and buried pipelines if needed to reduce infiltration of rainwater.

Remove/Treat/Dispose - This alternative applies to sites with contaminated soil and structures, and includes the following elements:

- remove contaminated media
- **thermal desorption**, if required, for soil
- **soil washing**, as appropriate
- disposal at an approved facility
- backfill of excavated areas and revegetation.

Under this alternative, the contaminated soils would be excavated as described under the remove/dispose alternative. Soils contaminated with organic chemicals at levels exceeding waste disposal acceptance criteria would be treated by thermal desorption, then recombined with the remaining contaminated soils prior to soil washing.

Soil washing could reduce the volume of contaminated soil for disposal. The application of soil washing to a waste site will depend on several factors including soil conditions, contaminant specific cleanup goals and the level of contaminants present. Soil washing is a desirable treatment only when significant volume reduction can be achieved. It would only be performed when such volume reduction could be achieved in a cost-effective manner. The greatest cost benefit would be achieved at large volume sites with low levels of contaminants. Treatability studies are currently in progress to evaluate the applicability of soil washing in the 100 Areas.

Following removal and treatment, contaminated soil and/or contaminated products resulting from treatment technologies would be disposed of in the same manner as the remove/dispose alternative. The excavation would be backfilled with washed soils and other soils as needed and revegetated.

PREFERRED INTERIM REMEDIAL MEASURES

The preferred alternative proposed for the waste sites, except the 116-B-12 Seal Pit Crib, is remove, treat (where appropriate or required) and dispose. The preferred alternatives meet the remedial action objectives under the future land use assumptions, provide long-term effectiveness and permanence, and overall protectiveness. It is implementable, utilizes proven technologies and equipment to complete the action, and is cost effective.

EVALUATION OF ALTERNATIVES

The preferred alternatives are believed to provide the best balance of tradeoffs among the alternatives with respect to the nine evaluation criteria used to evaluate remedies. A description of those criteria is presented below. The criteria fall into three categories: The first two (Overall Protection of Human Health and the Environment, and Compliance with **Applicable or Relevant and Appropriate Requirements [ARARs]**) are considered *threshold* criteria and, in general, must be met. ARARs may be waived in accordance with CERCLA Section 121. The next five are considered *balancing* criteria and are used to compare techni[illegible] and cost aspects of the alternatives. The final two criteria (State and Community Acceptance) are considered *modifying* criteria. Modifications to remedial actions may be made based upon state and local comments and concerns. These will be evaluated after all public comments have been received. The following paragraphs discuss how the alternatives address the criteria for the 116-B-11 and 116-C-5 Retention Basins, 100-B/C Buried Process Effluent Pipelines, 116-B-1 and 116-C-1 Process Effluent Trenches, 116-B-13 and 116-B-14 Sludge Trenches, 116-B-4 French Drain and 116-B-5 Crib.

OVERALL PROTECTION

The no action alternative does not meet this criteria. Institutional controls alone cannot be relied on to indefinitely provide protection, and therefore do not meet this criteria. The containment alternative would provide protection by encapsulating wastes for the 116-B-5 Crib, 116-B-4 French Drain, and buried process effluent pipelines, but would not provide adequate protection for the other waste sites. The in situ alternative would provide overall protection for all waste sites except the retention basins. The remove/dispose and remove/treat/dispose alternatives would provide overall protection of human health and the environment.

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 treatability variance 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 capital, operation and maintenance costs for each alternative by performing present worth cost analyses.

8. *State Acceptance*, based on review of the remedial investigation and focused feasibility study reports, and the 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.

COMPLIANCE WITH APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

The no action, institutional controls, containment and in-situ treatment alternatives would not meet all of the principal ARARs identified for all of the sites. The remove/dispose and the remove/treat/dispose alternatives would meet the ARARs, with the potential exception of Land Disposal Restrictions under the *Resource Conservation and Recovery Act*. If Land Disposal Restricted contaminants are encountered, contaminated soil would be treated or a treatability variance could be requested.

LONG TERM EFFECTIVENESS

The no action and institutional controls alternatives would not meet cleanup goals and, therefore, would not provide for long-term effectiveness. Containment and in-situ treatment would provide a greater degree of long term effectiveness by stabilizing and isolating the wastes in place. The remove/dispose and remove/treat/dispose alternatives would provide the greatest long-term effectiveness and permanence.

REDUCTION OF TOXICITY, MOBILITY, OR VOLUME THROUGH TREATMENT

The no action and institutional controls alternatives do not reduce the mobility, toxicity, or volume of the contaminants. The containment and institutional controls alternatives do not include treatment. The containment, in-situ treatment, and remove/dispose alternatives would reduce the mobility of contaminants but not the toxicity or volume. The remove/treat/dispose alternative provides the most significant level of treatment and would reduce volume and mobility.

SHORT-TERM EFFECTIVENESS

The no action and institutional controls alternatives require minimal effort to implement. The containment and in situ treatment options require technology that is readily available. The remove/dispose alternative would provide a greater degree of short-term protectiveness than the remove/treat/dispose alternative because it requires less time to implement, utilizes standard technologies, and presents less short-term risk to workers and the environment.

IMPLEMENTABILITY

The institutional controls alternative would require administrative actions such as deed restrictions. The containment and in situ treatment alternatives are implementable with existing technologies. The remove/dispose alternative is easier to implement than the remove/treat/dispose alternative.

COSTS

Table 3 provides a summary of costs for the alternatives for the nine waste sites. Costs were not developed for containment at the 116-B-11 Retention Basin, 116-C-5 Retention Basin, 116-B-13 Sludge Trench, 116-B-14 Sludge Trench, 116-B-1 and 116-C-1 Process Effluent Trenches, and for in situ treatment at 116-B-11 and 116-C-5 Retention Basins, since the alternative would not adequately meet the threshold evaluation criteria as discussed above.

No contaminants of concern have been identified within the top 15 feet at the 116-B-12 Seal Pit Crib; therefore, the no interim action alternative was the only alternative considered.

> EPA, Ecology, and DOE believe the assumptions relied upon in developing the preliminary cost estimates for the cleanups has resulted in estimates that are too high. The Tri-Parties are working together to implement a demonstration project this summer in the 100-BC Area to address a number of concerns related to cleanup, including the incorporation of actual cost into the cost models. It is expected that contaminated materials from those actions will be disposed of at the 218-W-5 Burial Ground, Trench 31 (W025) in the 200 Area, or stored for future disposal at the Environmental Restoration Disposal Facility.

EVALUATION OF POTENTIAL ENVIRONMENTAL IMPACTS

In addition to evaluating whether the alternatives pose a risk to human and ecological receptors, the different remedial alternatives were compared relative to the potential impacts the action might have on cultural and natural resources, transportation, and regional socioeconomics. The evaluation of alternatives also considered avoidance and mitigation of the above impacts, what commitment of resources may be necessary, and how the actions at this operable unit relate to actions being planned or executed at other operable units (cumulative impacts). The development of avoidance and mitigation measures will be initiated as soon as the remedial alternative is selected. The waste sites to be remediated occur within areas previously disturbed by reactor operations and agricultural activities, so remediation and revegetation actions will likely result in improving rather than degrading ecological conditions in the area.

The levels of impact from the alternatives will vary depending on requirements (such as equipment and services), the need for borrow materials, and people that are needed to support each alternative. Significant impacts are expected to be limited to potential exposure of remediation workers to hazardous or radioactive substances, short term indirect impact to wildlife from construction noise and the commitment of land area used for disposal. The extent of physical disturbance caused by the action was also evaluated because this has a direct relationship to the potential for impacting cultural and natural resources.

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Table 3. 100-BC-1 Site-Specific Alternative Costs

Site	Containment			Removal/Disposal			In Situ Treatment			Removal/Treatment/Disposal		
	Capital	O&M	Present Worth	Capital	O&M	Present Worth	Capital	O&M	Present Worth	Capital	O&M	Present Worth
100-BC-1 OPERABLE UNIT												
116-B-11 Retention Basin	NA	NA	NA	$50.9	$0.00	$48.1	NA	NA	NA	$51.6	$7.69	$55.5
116-C-5 Retention Basin	NA	NA	NA	$59.0	$0.00	$56.2	NA	NA	NA	$68.7	$11.9	$75.2
116-B-13 Sludge Trench	NA	NA	NA	$.87	$0.00	$.83	$1.77	$.94	$2.58	$1.29	$.11	$1.35
116-B-14 Sludge Trench	NA	NA	NA	$.75	$0.00	$.72	$1.39	$.61	$1.91	$1.18	$.08	$1.20
116-B-1 Process Effluent Trench	NA	NA	NA	$3.13	$0.00	$2.99	$6.59	$4.33	$10.4	$3.43	$.59	$3.83
116-C-1 Process Effluent Trench	NA	NA	NA	$16.5	$0.00	$15.7	$33.9	$27.7	$54.8	$17.3	$1.45	$17.9
116-B-5 Crib	$.71	$.27	$.82	$1.13	$0.00	$1.08	$2.19	$1.24	$3.28	$1.50	$.17	$1.60
116-B-4 French Drain	$.40	$.13	$.45	$.30	$0.00	$2.83	$.63	$.11	$.72	$.72	$.011	$.71
116-B-12 Seal Pit Crib	No action proposed at site.											
100 B/C Pipelines	$47.0	$21.8	$54.6	$36.1	$0.00	$32.9	$7.04	$3.88	$8.87	$38.1	$5.78	$40.0

NOTES:

- Costs are in millions of dollars
- O&M - Operation and Maintenance
- NA - Not Applicable to the Waste Site (see FFS Report)
- Costs presented are based on a different exposure scenario than the selected scenario, but the relative differences between alternatives is similar (see FFS Report for detailed cost analysis).
- Costs presented are preliminary, and are presented for comparison purposes only. It is expected that actual costs will be significantly lower.

SUPPORTING DOCUMENTS

The public is encouraged to review the following documents to gain a better understanding of the 100-BC-1 Operable Unit:

- *Remedial Investigation/Feasibility Study Work Plan for the 100-BC-1 Operable Unit* (DOE/RL-97-07)
- *Limited Field Investigation for the 100-BC-1 Operable Unit* (DOE/RL-93-06)
- *Qualitative Risk Assessment for the 100-BC-1 Operable Unit Report* (WHC-SD-EN-RA-003)
- *100-Area Source Operable Unit Focused Feasibility Study Report (DOE/RL-94-61)*, Appendix F
- *100 Areas Feasibility Study, Phases 1 and 2* (DOE/RL-92-11)

ADMINISTRATIVE RECORD

The Administrative Record can be reviewed at the following locations:

U. S. Department of Energy - Richland Operations
Administrative Record
2440 Stevens Center Place; Room 1101
Richland, Washington 99352
509/376-2530
ATTN: Marilyn Smith

EPA Region 10
Lobat-Anderson Inc.
c/o U.S. Environmental Protection Agency
1200 Sixth Avenue
Seattle, Washington 98101
206/553-4494
ATTN: Karen Prater

Washington State Department of Ecology
Nuclear Waste Library
300 Desmond Drive S.E.
Lacey, Washington 98503
206/407-7097
ATTN: Debbi Isom

POINTS OF CONTACT

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Nancy Werdel
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U.S. Environmental Protection Agency Representative
EPA (Region 10)
Kevin Oates
509/376-6623

Washington State Department of Ecology Representative
Ted Wooley
Unit Manager
509/736-3027

INFORMATION REPOSITORIES

Proposed plans are available for review at the following repositories:

University of Washington, Suzzallo Library
Government Publications Room
Seattle, Washington 98195
206/543-4664
ATTN: Eleanor Chase

Gonzaga University, Foley Center
E. 502 Boone
Spokane, Washington 99258
509/328-4220 Ext. 3844
ATTN: Tim Fuhrman

Portland State University, Branford Price Millar Library
934 S.W. Harrison
Portland, Oregon 97207-1151
503/725-3690
ATTN: Michael Bowman/Susan Thomas

U.S. Department of Energy Richland Public Reading Room
Washington State University, Tri-Cities
100 Sprout Road, Room 130 West
Richland, Washington 99352
509/376-8583
ATTN: Terri Traub

GLOSSARY

Applicable or Relevant and Appropriate Requirements (ARARs) - These are federal and state requirements that apply to cleanup actions under CERCLA.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) - This is a federal law that establishes a program that enables the Environmental Protection Agency to identify hazardous waste sites, ensure that they are cleaned up, and allow other government entities to evaluate damages to natural resources. CERCLA is also known as the "Superfund law." CERCLA applies to the 100-BC-1 Operable Unit.

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

Environmental Hazard Quotient - The ratio of exposure toxicity for ecological receptors of contaminants. When the Environmental Hazard Quotient exceeds 1.0, a possible ecological risk is assumed to exist.

Environmental Restoration Disposal Facility - A disposal facility for contaminated soils and solid waste that will be available in October 1996 at the Hanford Site to support interim remedial measures.

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.

Hanford Future Site Uses Working Group - A working group made up of representatives of interested parties concerned with the cleanup and possible future uses of the Hanford Site. The group was active in 1992 and produced a report identifying possible future site uses and an examination of the cleanup necessary to make those uses possible.

Hazard Index - The ratio of exposure to toxicity for receptors of contaminants. When the Hazard Index exceeds 1.0, a possible human health risk is assumed to exist.

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

Interim Remedial Measure - 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/Focused Feasibility Study, and is selected in a record of decision.

Maximum Contaminant Level (MCL) - The maximum concentration of a particular contaminant allowable in drinking water under the *Safe Drinking Water Act* of 1974, as amended.

National Priority List - A list of top-priority hazardous waste sites in the United States that are eligible for investigation and cleanup under the Superfund law.

Operable Unit - This is a subset of a larger Superfund CERCLA site; it is typically the subject of Operable Unit-specific investigations and remedial actions.

Qualitative Risk Assessment - An evaluation of risk for a predefined set of human and environmental exposure scenarios that assists Tri-Party signatories in making decisions on the necessity of interim remedial measures.

Record of Decision - The formal document in which the lead regulatory agency sets forth the selected remedial measure and the reasons for its selection.

Soil Washing - Soil washing is a means to reduce contaminated soil waste volume by concentrating contaminants in the fine (i.e., clay, silt, and sand) soil fractions. Only the contaminated fines, rather than the entire range of particle sizes, are disposed of at an approved waste disposal facility, thereby conserving space at the disposal facility. The uncontaminated gravel and cobble fractions can then be returned to the waste site excavation.

Thermal Desorption - A process that uses indirect low temperatures to thermally remove volatile and semi-volatile organic compounds from contaminated soil, sediment, or sludge.