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Department of Energy
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NOV 07 2014

15-AMRP-0011

Mr. R. Albright, Director
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U.S. Environmental Protection Agency
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Ms. J. A. Hedges, Program Manager
Nuclear Waste Program
State of Washington
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Richland, Washington 99354

Addressees:

RECORD OF DECISION, HANFORD 100 AREA, SUPERFUND SITE, 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, AND 100-IU-6 OPERABLE UNITS

This letter transmits the final Record of Decision, Hanford 100 Area, Superfund Site, 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units selected by the U.S. Department of Energy and the U.S. Environmental Protection Agency on September 30, 2014. This transmittal also makes the Record of Decision available in the Administrative Record.

If you have any questions, please contact me, or your staff may contact Ray Corey, Assistant Manager for the River and Plateau, on (509) 373-9971.

Sincerely,

Doug S. Shoop
Acting Manager

AMCP:GLS

Attachment

cc: See Page 2

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cc w/attach:
G. Bohnee, NPT
R. Buck, Wanapum
D. A. Faulk, EPA
C. J. Guzzetti, EPA
S. Harris, CTUIR
S. Hudson, HAB
R. Jim, YN
N. M. Menard, Ecology
K. Niles, ODOE
J. B. Price, Ecology
D. Rowland, YN
R. E. Varljen, Ecology
Administrative Record (100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs)
Environmental Portal

cc w/o attach:
J. V. Borghese, CHPRC
R. A. Kaldor, MSA
R. E. Piippo, MSA

RECORD OF DECISION

HANFORD 100 AREA

SUPERFUND SITE

100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, AND 100-IU-6

OPERABLE UNITS

September 2014

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PART I: DECLARATION OF THE RECORD OF DECISION

1.0 Site Name and Location

USDOE Hanford 100 Area

100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units

Benton County, Washington

EPA ID: #WA3890090076

2.0 Statement of Basis and Purpose

This decision document presents the selected remedies for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units (OUs), which are part of the Hanford Site, 100 Area, in Benton County, Washington. These five OUs are referred to collectively as the 100-F/IU area.

The selected remedies were chosen 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* (SARA), and, to the extent practicable, the "National Oil and Hazardous Substances Pollution Contingency Plan" (40 *Code of Federal Regulations* [CFR] 300) (National Contingency Plan [NCP]). This decision is based on the Administrative Records for each of these operable units.

The State of Washington, through the Washington State Department of Ecology, does not concur with the selected remedies at this time.

3.0 Assessment of the Site

The response actions selected in this Record of Decision (ROD) are necessary to protect the public health or welfare or the environment from actual or threatened releases of hazardous substances, pollutants, or contaminants into the environment. Such a release or the threat of release may present an imminent and substantial endangerment to public health, welfare, or the environment.

4.0 Description of Selected Remedy

4.1 Overall Site Cleanup Strategy

The River Corridor (100 and 300 Area National Priorities List [NPL] sites) and the Central Plateau (200 Area NPL site) are the two main geographic areas for cleanup work on the Hanford Site. The River Corridor includes the former reactor operations and fuel fabrication areas adjacent to the Columbia River. The Central Plateau includes the former fuel-processing facilities and numerous waste disposal facilities. To facilitate cleanup, the River Corridor, which spans approximately 220 mi^2, was divided into six geographic areas by DOE. These six areas were selected to define manageable portions of the River Corridor that align with historical operations (e.g., uranium fuel rod preparation or reactor operations). The 100-F/IU area is the largest of the six River Corridor areas.

This ROD presents the selected final remedial actions for the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 source OUs to address soil contamination and the 100-FR-3 groundwater OU which addresses groundwater contamination from the 100-FR-1 and 100-FR-2 source OUs. Contaminated groundwater originating from the Central Plateau that has migrated to the aquifer beneath the 100-IU-2 and

100-IU-6 OUs is not part of the 100-FR-3 OU and therefore is not being addressed under this ROD. These groundwater contaminant plumes will be addressed through the CERCLA process as part of the Central Plateau groundwater OUs (200-PO-1 and 200-BP-5).

4.2 Principal Threat Wastes at the Site

Principal threat waste is defined as source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include soils containing significant concentrations of highly toxic materials and surface or subsurface soils containing high concentrations of contaminants that are, or potentially are, mobile due to wind entrainment, volatilization, surface runoff, or sub-surface transport. Contaminated groundwater is generally not considered to be source material.

Principal threat wastes associated with the OUs that are the subject of this ROD, such as fuel fragments and concentrated liquid sodium dichromate, have been removed through earlier cleanup actions. No waste sites remain in these OUs with principal threat waste.

4.3 Major Components of the Selected Remedies

The selected remedy for 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs addresses contaminated soil at waste sites exceeding soil cleanup levels. The selected remedy for the 100-FR-3 OU addresses contaminated groundwater. A brief description of the major components of each of the selected remedies is provided below.

4.3.1 Removal, Treatment, and Disposal of Contaminated Soil and Debris

Removal, Treatment (as needed) and Disposal (RTD) at waste sites in the 100-IU-2 and 100-IU-6 OUs with contaminated soil and debris exceeding soil cleanup levels protective of human health, groundwater and surface water is required. Contaminated soil and debris will be excavated using shallow and deep excavation technology, transported to the Environmental Restoration Disposal Facility (ERDF) or other EPA approved facility, and treated as necessary to meet applicable land disposal restrictions and waste acceptance criteria prior to disposal. Once remediated, the sites will be backfilled and recontoured, and then planted with native vegetation.

The sequence and timing of the remedial action to be conducted at these OUs will be specified in a work plan written by The Department of Energy (DOE) to be submitted to the U.S. Environmental Protection Agency (EPA) for approval within 6 months after ROD approval. In-progress interim action remediation for these OUs under the *1999 Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)* (EPA/ROD/R10-99/039) shall continue, except that the cleanup levels selected in this ROD shall be used immediately upon issuance of this ROD. All other aspects of the interim actions for these OUs shall continue to be performed in accordance with the existing RD/RAWP. When the new RD/RAWP for the remedies selected by this ROD is approved, that document will direct future remedial action and will replace all interim action RD/RAWP requirements.

Table 1 summarizes how the 304 waste sites in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs will be addressed. This includes RTD at 91 waste sites, and institutional controls (ICs) at 15 waste sites with radiological contamination exceeding human health direct contact cleanup levels at depths greater than 4.6 m [15 ft] below ground surface where exposure is not expected. At 198 waste sites, no additional action is needed to meet selected remedy requirements due to interim remedial actions that have been completed at those sites.

4.3.2 Monitored Natural Attenuation

Monitored Natural Attenuation (MNA) for the contaminated groundwater is required in the 100-FR-3 OU until groundwater cleanup levels are achieved. MNA relies on natural attenuation processes that include a variety of physical, chemical, or biological processes, which act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay, and chemical or biological stabilization, transformation, or destruction of contaminants.

The performance monitoring component of this remedy includes installation of new wells, periodic sampling, laboratory analysis, and data evaluation to assess and confirm the natural attenuation processes, rates of attenuation, and overall protectiveness. Operations and maintenance (O&M) activities for this remedy include inspection, maintenance, and periodic replacement of monitoring wells.

4.3.3 Institutional Controls

ICs are used to protect the integrity of a response action and/or minimize exposure to contamination in soil and groundwater until such contamination is at levels that allow for unlimited use and unrestricted exposure (UU/UE). Required ICs include ICs to prohibit irrigation at one waste site and to prevent inadvertent exposure to contamination at depth at 15 sites. ICs to restrict groundwater use are required until cleanup levels are achieved. DOE shall be responsible for implementing, maintaining, reporting on and enforcing ICs required under this ROD. Although the DOE may later transfer these procedural responsibilities to another party by contract, property transfer agreement or through other means, the DOE shall retain ultimate responsibility for remedy integrity. In the event that land is transferred out of federal ownership, deed restrictions (proprietary controls such as easements and covenants) are required that are legally enforceable against subsequent property owners.

Table 1. Waste Sites included in this ROD

Technology/Approach	Operable Unit (Number of Waste Sites)	Waste Site
No additional action needed to meet selected remedy requirements	100-FR-1 (92)	100-F-4, 100-F-7, 100-F-9, 100-F-11, 100-F-12, 100-F-16, 100-F-18, 100-F-23, 100-F-24, 100-F-25, 100-F-26:1, 100-F-26:2, 100-F-26:3, 100-F-26:4, 100-F-26:5, 100-F-26:6, 100-F-26:7, 100-F-26:8, 100-F-26:9, 100-F-26:10, 100-F-26:11, 100-F-26:12, 100-F-26:13, 100-F-26:14, 100-F-26:15, 100-F-26:16, 100-F-31, 100-F-33, 100-F-36, 100-F-37, 100-F-38, 100-F-39, 100-F-42, 100-F-43, 100-F-44:1, 100-F-44:2, 100-F-44:4, 100-F-44:5, 100-F-44:8, 100-F-44:9, 100-F-45, 100-F-46, 100-F-47, 100-F-48, 100-F-49, 100-F-51, 100-F-52, 100-F-53, 100-F-54, 100-F-55, 100-F-56:1, 100-F-56:2, 100-F-57:1, 100-F-57:2, 100-F-58, 100-F-59, 100-F-60, 100-F-61, 100-F-62, 100-F-63, 100-F-64, 100-F-65, 116-F-1, 116-F-3, 116-F-4, 116-F-5, 116-F-7:1, 116-F-7:2, 116-F-8, 116-F-10, 116-F-11, 116-F-15, 116-F-16, 118-F-8:1, 126-F-2, 128-F-2, 132-F-1, 132-F-3, 132-F-4:1, 132-F-4:2, 132-F-5, 132-F-6, 141-C, 182-F, 1607-F2, 1607-F3, 1607-F4, 1607-F5, 1607-F6, 1607-F7, UPR-100-F-2, UPR-100-F-3
	100-FR-2 (18)	100-F-2, 100-F-14, 100-F-15, 100-F-20, 100-F-35, 100-F-50, 118-F-1, 118-F-2, 118-F-3, 118-F-4, 118-F-5, 118-F-7, 120-F-1, 126-F-1, 128-F-1, 128-F-3, 1607-F1, 600-351
	100-IU-2 (45)	600-5, 600-52, 600-98, 600-99, 600-100, 600-120, 600-124, 600-125, 600-127, 600-128, 600-129, 600-131, 600-132, 600-139, 600-176, 600-181, 600-182, 600-188, 600-190, 600-191, 600-201, 600-295, 600-296, 600-297, 600-302, 600-305:1, 600-305:2, 600-305:3, 600-305:4, 600-305:5, 600-306, 600-307, 600-308, 600-309, 600-310, 600-311, 600-312, 600-341:1, 600-341:2, 600-342, 600-343, 600-344, 600-345, 600-346, 628-1

Technology/Approach	Operable Unit (Number of Waste Sites)	Waste Site
	100-IU-6 (43)	600-3, 600-23, 600-107, 600-108, 600-109, 600-110, 600-111, 600-146, 600-149:1, 600-149:2, 600-178, 600-186, 600-202, 600-204, 600-205, 600-208, 600-235, 600-239, 600-257, 600-272, 600-280, 600-313, 600-314:1, 600-314:2, 600-314:3, 600-314:4, 600-314:5, 600-315, 600-317, 600-319:1, 600-319:2, 600-319:3, 600-322, 600-323, 600-324, 600-325:1, 600-325:2, 600-327, 600-334:1, 600-350, JA JONES 1, UPR-600-11, UPR-600-16
Removal, treatment, and disposal to cleanup levels in Tables 5 and 6.	100-IU-2 (39)	600-279, 600-293, 600-294, 600-298:1, 600-298:2, 600-298:3, 600-298:4, 600-298:5, 600-298:6, 600-298:7, 600-298:8, 600-299:1, 600-299:2, 600-299:3, 600-299:4, 600-299:5, 600-299:6, 600-300:1, 600-300:2, 600-300:3, 600-300:4, 600-300:5, 600-300:6, 600-300:7, 600-300:8, 600-300:9, 600-300:10, 600-300:11, 600-300:12, 600-301, 600-303, 600-316:1, 600-316:2, 600-316:3, 600-316:4, 600-316:5, 600-316:6, 600-370, 600-371, 600-372:1, 600-372:2, 600-373, 600-374, 600-375:1, 600-375:2, 600-375:3, 600-375:4, 600-375:5, 600-376:1, 600-376:2
	100-IU-6 (52)	600-20, 600-318:1, 600-318:2, 600-318:3, 600-318:4, 600-318:5, 600-320:1, 600-320:2, 600-320:3, 600-320:4, 600-320:5, 600-320:6, 600-320:7, 600-320:8, 600-320:9, 600-321:1, 600-321:2, 600-321:3, 600-321:4, 600-326:1, 600-326:2, 600-328, 600-329, 600-331, 600-332, 600-334:2, 600-349, 600-356, 600-358, 600-368, 600-369:1, 600-369:2, 600-369:3, 600-369:4, 600-369:5, 600-369:6, 600-369:7, 600-369:8, 600-370, 600-371, 600-372:1, 600-372:2, 600-373, 600-374, 600-375:1, 600-375:2, 600-375:3, 600-375:4, 600-375:5, 600-377, 600-378, 600-379
Institutional controls		
Prohibit irrigation - waste site with groundwater/surface water protection risk if irrigation were applied	100-FR-1 (1)	116-F-14
Excavation restrictions - waste sites with deep (greater than 4.6 m [15 ft]) below ground surface] radiological contamination exceeding human health direct contact cleanup levels	100-FR-1 (14)	100-F-10, 100-F-19:1, 100-F-19:2, 100-F-19:3, 100-F-29, 100-F-34, 116-F-2, 116-F-6, 116-F-9, 116-F-12, 116-F-14, 118-F-8:3, 118-F-8:4, UPR-100-F-1
	100-FR-2 (1)	118-F-6

5.0 Statutory Determinations

Under CERLCA Section 121 and the NCP Section 300.430(f)(5)(ii), the remedy must be protective of human health and the environment and comply with applicable or relevant and appropriate requirements (ARARs) (unless a statutory waiver is justified), are cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element, and a bias against off-site disposal of untreated wastes.

The selected remedies for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs are protective of human health and the environment, comply with Federal and State requirements that are legally applicable or relevant and appropriate to the remedial action, and are cost-effective. The selected remedies also utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. The remedy for the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs satisfy the statutory preference for treatment as a principal element of the remedy (i.e., reduces the toxicity, mobility or volume of hazardous substances, pollutants or contaminants as a principal element through treatment) in part as treatment is required where it is needed to meet applicable land disposal restriction requirements.

The remedy for the 100-FR-3 OU does not satisfy the statutory preference for treatment as a principal element of the remedy. It relies on natural attenuation processes instead of active engineered remedies and therefore, is considered a passive, rather than an active treatment technology. DOE and EPA have determined that the selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at these OUs as the selected remedies provide the best balance of trade-offs in terms of the five balancing remedy selection criteria while also considering the statutory preference for treatment as a principal element.

Because the selected remedies will result in hazardous substances, pollutants or contaminants remaining on-site above levels that allow for unlimited use and unrestricted exposure, a statutory review will be conducted within five years after initiation of remedial action to ensure that the remedies are, or will be, protective of human health and the environment. Five-year reviews will continue until hazardous substances, pollutants or contaminants no longer remain present above levels that allow for unlimited use and unrestricted exposure.

The preamble to the NCP states that when noncontiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA § 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. The 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs and the ERDF are reasonably close to one another, and the wastes in these OUs are compatible for the selected disposal approach. Therefore, the sites are considered to be a single site for response purposes.

6.0 ROD Data Certification Checklist

The information outlined in Table 2 is included in the Decision Summary (Part II) of this ROD. Additional information can be found in the Administrative Records for each of these OUs.

Table 2. 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs ROD Data Certification Checklist

Information	Location in ROD
Contaminants of Concern (COCs) and their respective concentrations	Section 7
Baseline risk represented by the COCs	Section 7
Cleanup levels established for COCs and the basis for these levels	Tables 5, 6, 7
How source materials constituting principal threat wastes are addressed	Section 11
Current and reasonably anticipated future land use and current and potential future beneficial uses of groundwater	Section 6
Potential land and groundwater use that will be available at the site as a result of the selected remedy	Section 6
Estimated capital, annual operations and maintenance, and total present value costs, discount rate, and the number of years over which the remedy cost estimates are projected	Section 12.3
Key factors that led to selecting the remedy	Section 12.1

7.0 Authorizing Signatures

USDOE Signature for the Record of Decision for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units within the USDOE Hanford 100 Area NPL Site. The Record of Decision is selected by the U.S. Department of Energy and the U.S. Environmental Protection Agency

Doug Shoop
Acting Manager, Richland Operations Office
U.S. Department of Energy

9/30/14
Date

USEPA Signature for the Record of Decision for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units within the USDOE Hanford 100 Area NPL Site as selected by the U.S. Department of Energy and the U.S. Environmental Protection Agency

Richard Albright
Director, Office of Environmental Cleanup
U.S. Environmental Protection Agency, Region 10

9/30/14
Date

PART II: DECISION SUMMARY

This Decision Summary provides a summary of the site characteristics, alternatives evaluated, and the analysis of those alternatives for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs at the Hanford Site. It also identifies the selected remedy for these OUs and explains how the remedy fulfills statutory and regulatory requirements. Although some of the information in the Decision Summary is similar to that in the Declaration, this section discusses the topics in more detail and provides the rationale for the "summary declarations." This section is based on the information that is available in the Administrative Records for each of these OUs.

1.0 Site Name, Location, and Brief Description

The Hanford site is federally-owned property located in south eastern Washington State, which is managed by the DOE. Hanford currently contains three listed NPL sites. One of the NPL sites is the 100 Area (EPA ID#: WA3890090076) commonly referred to as the River Corridor portion of the Hanford Site. To facilitate cleanup, the River Corridor, which spans approximately 220 mi^2, was divided into six geographic areas by DOE. These six areas were selected to help define manageable portions of the River Corridor that align with historical operations (e.g., uranium fuel rod preparation or reactor operations). The 100-F/IU area is the largest of the six River Corridor areas.

The 100-F/IU area can be divided into two primary areas of use: the 100-F Reactor Area, and the 100-IU-2/IU-6 Area. The 100-F Reactor area encompasses approximately 2.8 km^2 (1.1 mi^2) in the northeast portion of the Hanford Site, adjacent to the Columbia River. The reactor's primary mission was plutonium production. The waste sites within the F Reactor area are included in either the 100-FR-1 or 100-FR-2 OUs. Groundwater contamination from these source OUs is part of the 100-FR-3 OU. The 100-IU-2 and 100-IU-6 OUs include the waste sites within an area between and outside the reactor and production areas within the River Corridor (Figure 1). These two OUs include the pre-Hanford, agriculture-based town of White Bluffs (100-IU-2) and the Hanford town site (100-IU-6).

Buildings (including the F Reactor) are not part of the operable units. Contaminated buildings are being removed in accord with CERCLA Removal Action Memoranda. This ROD addresses all five operable units. DOE is the lead agency responsible to perform the remedial actions, and the EPA is the lead regulatory agency.

2.0 Site History and Enforcement Activities

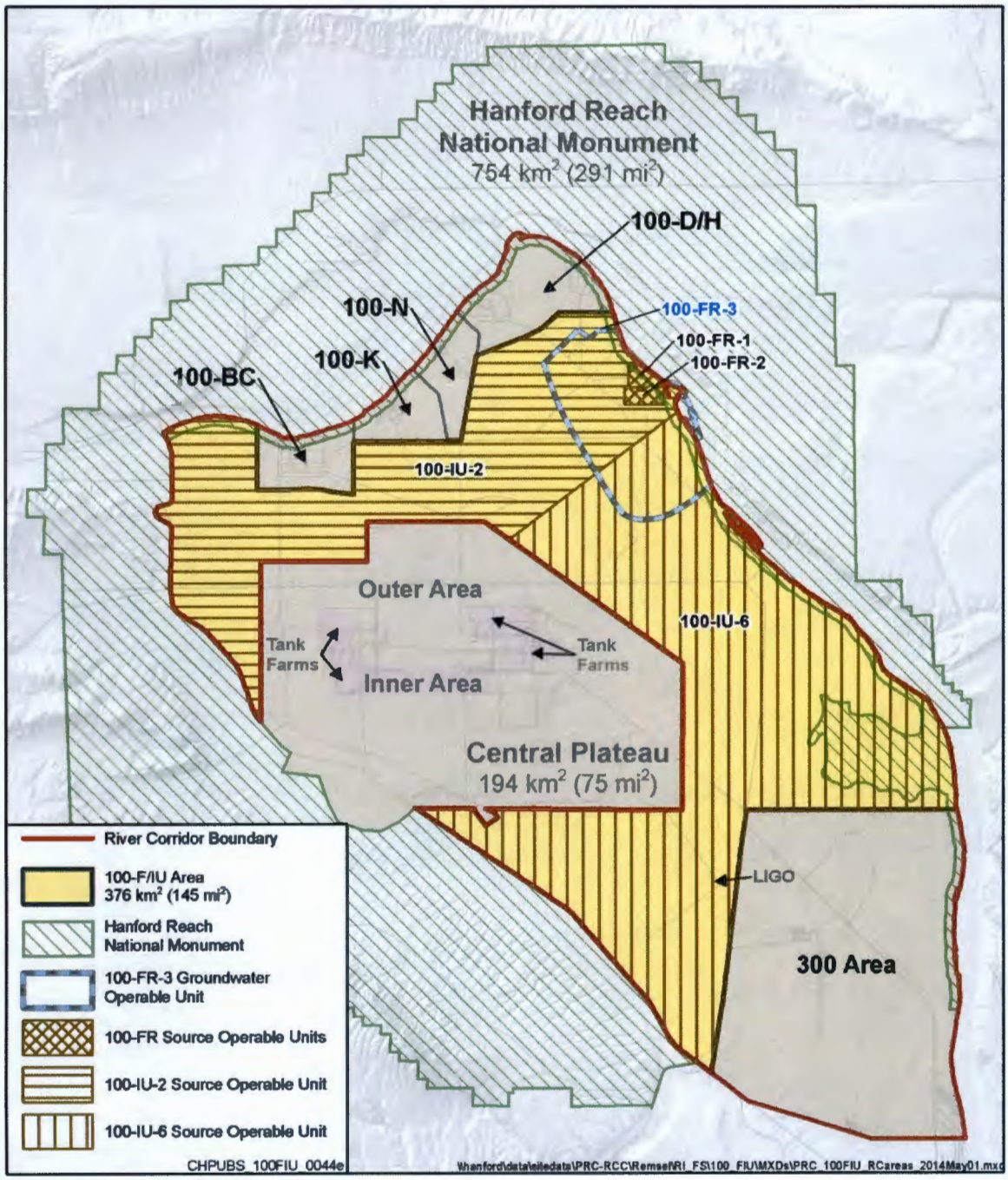
This section provides background information on past activities at the Hanford Site that have led to the current contamination at the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs. In addition, this section contains information on how CERCLA has been applied to the investigation and cleanup of these OUs.

2.1 Site Operational History

From 1943 to 1990, the primary mission of the Hanford site was the production of nuclear materials for national defense. Operations at the Hanford Site included nuclear fuel manufacturing, reactor operations, fuel reprocessing, chemical separation, plutonium and uranium recovery, processing of fission products, and waste partitioning. The 100-F Reactor's primary mission was plutonium production. The water-cooled nuclear reactor, associated structures, and processes that generated solid and liquid wastes were the primary sources of contamination. Solid waste was placed in unlined burial grounds. Liquid contaminants were released to the environment via retention basins, trenches, cribs, ditches, and through outfall piping to the Columbia River. The secondary mission of the 100-F Reactor Area was the

Experimental Animal Farm, a biological laboratory used to examine the effects of radiation and radioactive contamination on plants, animals, and fish.

Figure 1. Hanford Site River Corridor



The 100-IU-2 and 100-IU-6 OUs include the waste sites within an area between and outside the reactor and production areas within the 100 Area. These two OUs include the pre-Hanford, agriculture-based town of White Bluffs (100-IU-2) and the Hanford town site (100-IU-6). During development of the Hanford Site, portions of the 100-IU-2 and 100-IU-6 OUs were used for housing and staging equipment and materials. Waste sites generally originated from industrial chemical use and include landfills, dump sites, surface debris, and unplanned releases.

2.2 Previous Investigations and Interim Actions

In the early 1990s, two limited field investigations were conducted for the 100-FR-1 and 100-FR-3 OUs. These previous investigations were an initial step in characterizing the nature and extent of contamination in the soil and groundwater, as well as assessing the threat that the contaminants posed to human health and the environment. As a result of the limited field investigations, substantial work to remove contaminated soil and facilities has been completed under the interim action RODs currently in place. Beginning in 2010, DOE performed a Remedial Investigation/Feasibility Study (RI/FS) to further characterize the nature and extent of contamination in the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs.

Waste site remedial actions began in the late 1990s. Radioactive liquid effluent waste sites were remediated first because they were the primary contributors to contamination at the 100-F Area. Most of the high-priority liquid waste sites in the 100-F Area were remediated by 2002, followed by the remediation of burial grounds and other remaining site types. Waste site remediation has been conducted in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs under the following interim remedial actions:

- 1995 – *Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA/ROD/R10-95/126)
- 1997 – *Amendment to the Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA/AMD/R10-97/044) (Note: This amendment added the 100-FR-1 and 100-FR-2 waste sites to the interim remedial action ROD for the 100-BC-1, 100-DR-1, and 100-HR-1 OUs [EPA/ROD/R10-95/126].)
- 1999 – *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)* (EPA/ROD/R10-99/039)
- 2000 – *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington* (EPA/ROD/R10-00/121)
    - 2000 – *Explanation of Significant Differences for the 100 Area Remaining Sites Record of Decision: 100-IU-6 Operable Unit* (EPA/ESD/R10-00/045)
    - 2004 – *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision* (EPA et al., 2004)
    - 2009 – *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision: Hanford Site, Benton County, Washington* (EPA et al., 2009)

- 2011 – *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010* (EPA et al., 2011)

- 2012 – *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2011* (EPA et al., 2012)

2.3 CERCLA Regulatory and Enforcement Activities

In July 1989, the EPA placed the 100, 200, 300, and 1100 Areas of the Hanford Site on the NPL pursuant to CERCLA. In anticipation of the NPL listing, DOE, EPA, and Ecology entered into the *Hanford Federal Facility Agreement and Consent* Order, also known as the Tri-Party Agreement, in May 1989. This agreement established a procedural framework and schedule for developing, implementing, and monitoring CERCLA response actions on the Hanford Site.

3.0 Community Participation

This section describes how the public participation requirements of CERCLA and the NCP were met in the remedy selection process.

The Tri-Parties developed a Community Relations Plan in April 1990 as part of the overall Hanford Site restoration process. It was designed to promote public awareness of the investigations and public involvement in the decision-making process.

A single RI/FS Report and single Proposed Plan for 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs were made available to the public on June 9, 2014. The public comment period extended from June 9 through August 11, 2014, since early stakeholder input had requested a 30-day extension. The notice of the public comment period and availability of these two documents and the administrative records was published in the *Tri-City Herald* on June 9, 2014 and June 16, 2014. Electronic listserve messages were sent to about 1,300 e-mail addresses, and about 2,000 US Postal Service cards were sent with a notice of the public comment period and availability of the documents. This information was also included in Hanford's public involvement calendar available on the internet.

A public meeting and webinar was held on July 23, 2014 in Hood River, Oregon. The public meeting was held to present the Proposed Plan to a broader community audience than those that had already been involved at the site. At this meeting, representatives from DOE and EPA answered questions about problems at the operable units and the remedial alternatives. DOE and EPA also used this meeting to solicit a wider cross-section of community input, including on the 100-F/IU area reasonably anticipated future land use and potential beneficial ground-water uses.

The administrative records for each of the five OUs are available at http://pdw.hanford.gov/arpir/ under "Predefined Searches," "Select by Operable Unit." Information is also accessible at both the Administrative Record Center and the Public Information Repositories at the locations and as specified below:

ADMINISTRATIVE RECORDS
U.S. Department of Energy
Administrative Record Center
2440 Stevens Center Place, Room 1101
Richland, WA

PUBLIC INFORMATION REPOSITORIES
(Contains limited documentation, but provides access to the online Administrative Records)

USDOE Public Reading Room
Washington State University, Tri-Cities
Consolidated Information Center, Room 101-L
2770 University Drive
Richland, WA 99352

University of Washington
Suzzallo Library
Government Publications Division
P.O. Box 352900
Seattle, WA 98195

Portland State University
Branford P. Millar Library
1875 SW Park Avenue
Portland, OR 97207

Gonzaga University
Foley Center Library
East 502 Boone Avenue
Spokane, WA 99258

Responses to the comments received during the Proposed Plan public comment period are included in the Responsiveness Summary, which is Part III of this ROD.

4.0 Scope and Role of the Response Action

The process for characterization and remediation of waste sites at the Hanford Site is addressed by the Tri-Party Agreement. The River Corridor (100 and 300 Area NPL sites) and the Central Plateau (200 Area NPL site) are the two main geographic areas for cleanup work on the Hanford Site. The River Corridor includes the former reactor operations and fuel fabrication areas adjacent to the Columbia River. The Central Plateau includes the former fuel-processing facilities and numerous waste disposal facilities. To facilitate cleanup, the River Corridor was divided into six geographic areas by DOE. These six areas were selected to define manageable portions of the River Corridor that align with historical operations (e.g., uranium fuel rod preparation or reactor operations). The 100-F/IU is the largest of the six River Corridor areas.

The Hanford cleanup strategy includes (1) removing contamination that is close to the Columbia River to support reasonably anticipated future uses, protect the environment, restore groundwater to beneficial use and ensure the aquatic life in the Columbia River is protected; and (2) moving the contaminated material to the Central Plateau or other EPA-approved disposal facility in accordance with CERCLA remedy requirements. This involves addressing contamination in soils, restoration of groundwater beneath the Hanford Site to drinking water standards and ensuring that aquatic life in the Columbia River is protected by achieving Ambient Water Quality Standards in areas where groundwater discharges to surface water.

Contaminated groundwater originating from the Central Plateau that has migrated to the aquifer beneath the 100-IU-2 and 100-IU-6 OUs is not being addressed under this ROD. These groundwater contaminant plumes will be addressed through the CERCLA process as part of Central Plateau groundwater OUs (200-PO-1 and 200-BP-5).

This ROD addresses the risk from releases and potential releases in the following OUs:

- 100-FR-1 waste sites
- 100-FR-2 waste sites
- 100-IU-2 waste sites
- 100-IU-6 waste sites
- 100-FR-3 groundwater

Portions of the 100-F/IU area shown in Figure 2 not included in these OUs are the following:

- All buildings, including 105-F Reactor Building – inactive facility, and
- Laser Interferometer Gravitational-Wave Observatory (LIGO) – active facility

All of the remediation activities conducted in the 100-F/IU area have been the result of CERCLA decisions, as listed below. There are no RCRA Treatment, Storage and Disposal (TSD) units in the 100-F/IU area. Interim actions under CERCLA were initiated in the 100-F/IU area in 1997 for contaminated waste sites in 100-FR-1 and 100-FR-2 and in 1999 for contaminated waste sites in 100-IU-2 and 100-IU-6. There were no interim actions for contaminated groundwater in 100-FR-3. The following are the RODs and associated Explanations of Significant Differences for these operable units:

- 1995 – *Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA/ROD/R10-95/126)
- 1997 – *Amendment to the Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington* (EPA/AMD/R10-97/044) (Note: This amendment added the 100-FR-1 and 100-FR-2 waste sites to the interim remedial action ROD for the 100-BC-1, 100-DR-1, and 100-HR-1 OUs [EPA/ROD/R10-95/126].)
- 1999 – *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)* (EPA/ROD/R10-99/039)
- 2000 – *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington* (EPA/ROD/R10-00/121)
    - 2000 – *Explanation of Significant Differences for the 100 Area Remaining Sites Record of Decision:100-IU-6 Operable Unit* (EPA/ESD/R10-00/045)
    - 2004 – *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision* (EPA et al., 2004)
    - 2009 – *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision: Hanford Site, Benton County, Washington* (EPA et al., 2009)
    - 2011 – *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010* (EPA et al., 2011)
    - 2012 – *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2011* (EPA et al., 2012)

Two action memoranda that apply to building deactivation, decommission, decontamination and demolition in the 100-F/IU area are:

- 1997 – *Action Memorandum: 100 B/C Area Ancillary Facilities and the 108-F Building Removal Action, U.S. Department of Energy Hanford Site, Richland, WA* (EPA and DOE, 1997)
- 1998 – *Action Memorandum 105-F and 105-DR Reactor Buildings and Ancillary Facilities* (Ecology et al., 1998)

Three five-year review reports have been issued. CERCLA and the NCP (40 CFR 300) require that remedial actions that result in hazardous substances, pollutants or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure be reviewed at least every 5 years after initiation of the selected remedial action to ensure that human health and the environment are being protected by the remedial action being implemented. Three five-year reviews have been completed for the Hanford Site:

- 2001 – Hanford Site First CERCLA Five Year Review Report
- 2006 – Hanford Site Second CERCLA Five Year Review Report (DOE/RL-2006-20)
- 2012 – Hanford Site Third CERCLA Five Year Review Report (DOE/RL-2011-56)

5.0 Site Characteristics

The following sections provide information on the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OU site features, current land and groundwater uses, the nature and extent of contamination (including groundwater plumes), and the conceptual site model (CSM) on contaminant migration and the potential contaminant receptors.

5.1 Site Features and Land and Groundwater Use

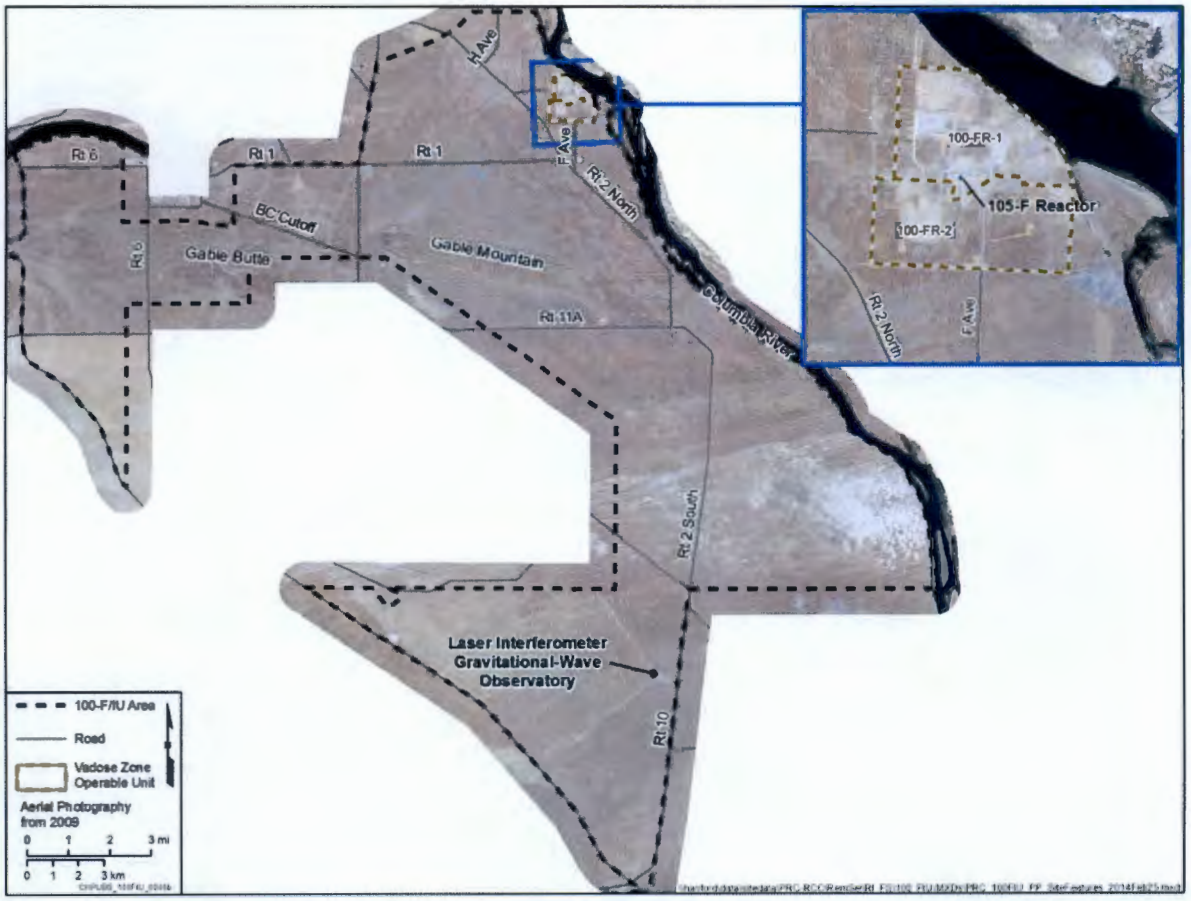
The 100-F/IU area is mostly comprised of undeveloped land (Figure 2). The F Reactor remains in interim safe storage. The Hanford school and White Bluffs bank are two historic structures preserved in the 100-IU-6 and 100-IU-2 OUs, respectively.

The 100-F/IU area is being used for waste management, environmental monitoring, waste site remediation, and conservation and restoration activities. The segment of the Columbia River adjacent to the 100-F/IU area is used for a variety of recreational activities.

The raw water supply for the 100 and 200 Areas is provided from the Columbia River through a series of pump houses, reservoirs, and pipelines. This water distribution system is known as the export water system. A large part of this system intersects the 100-F/IU area of the River Corridor.

Many communities downstream of the Hanford Site draw water from the Columbia River for all or part of their domestic water supply. The City of Richland's water uptake is the closest to the Hanford Site. No alternate water sources have been required for the City of Richland because of contamination resulting from Hanford operations.

Figure 2. Features of the 100-F/IU Area



5.1.1 Physical Features Impacting Remedy Selection

The topography of the reactor area in the 100-F Area is relatively flat, with elevations generally between 120 and 128 m (394 and 420 ft) above mean sea level inland from the Columbia River. The area has been disturbed and graded extensively since reactor construction began in 1943 and continues through present-day waste site remediation activities that restore natural contours and native vegetation.

The topography within the 100-IU-2 and IU-6 OUs varies widely. Portions of this region are relatively flat, but it includes Gable Butte and Gable Mountain, which rise approximately 60 m (200 ft) and 180 m (590 ft), respectively, above surrounding land.

The vadose zone at the 100-F Area comprises up to 15 m (49 ft) of unconsolidated gravel and sand of the Hanford formation. The unconfined upper aquifer ranges from a saturated thickness of 1 m (3 ft) in the southwestern 100-F Area to 8 m (25 ft) in the eastern portion of 100-F. The low-permeability Ringold Formation upper mud unit forms a continuous base of the aquifer at the 100-F Area (Figure 3).

Groundwater flows toward the east-northeast in the northern portion of the 100-F Area, toward the east in the southwestern portion, and approximately parallel to the river in the southeastern 100-F Area. Groundwater flow is not always directed toward the river, as the hydraulic gradients change direction in response to river stage. This interaction with the river not only affects groundwater flow patterns but also contaminant transport rates, groundwater geochemistry, contaminant concentrations, and attenuation rates.

The thickness of the vadose zone in the 100-IU-2 and IU-6 OUs ranges from near zero adjacent to the Columbia River to greater than 107 m (350 ft). The uppermost aquifer is unconfined and is within the Ringold Formation unit E, the Hanford formation, or the Cold Creek unit. The base of the unconfined aquifer is one of several low-permeability units in the Ringold Formation. Groundwater flows west to east beneath the southern portion of the 100-IU-2 and IU-6 OUs, discharging to the Columbia River at the eastern edge of the Hanford Site (Figure 3).

Groundwater in the unconfined aquifer discharges to the Columbia River via upwelling through the riverbed (hyporheic zone) and riverbank seeps. The rate of discharge from the Hanford Site aquifer is very low compared to the flow of the river. Because the river stage regularly fluctuates up and down, flow beneath the shoreline is back and forth, with river water intruding into the unconfined aquifer and mixing with groundwater at times. When the river stage drops to a low elevation, riverbank seeps appear (Figure 4).

Figure 3. Stratigraphy and Hydrogeologic Units of 100-F/IU

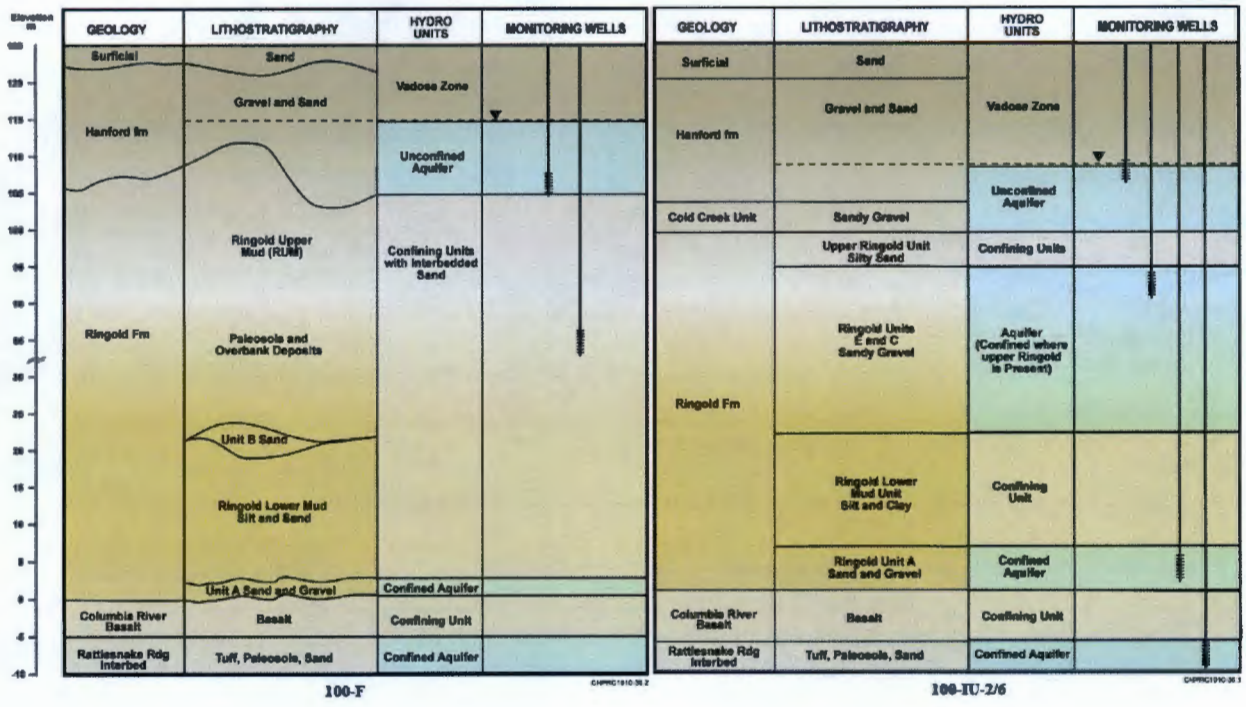
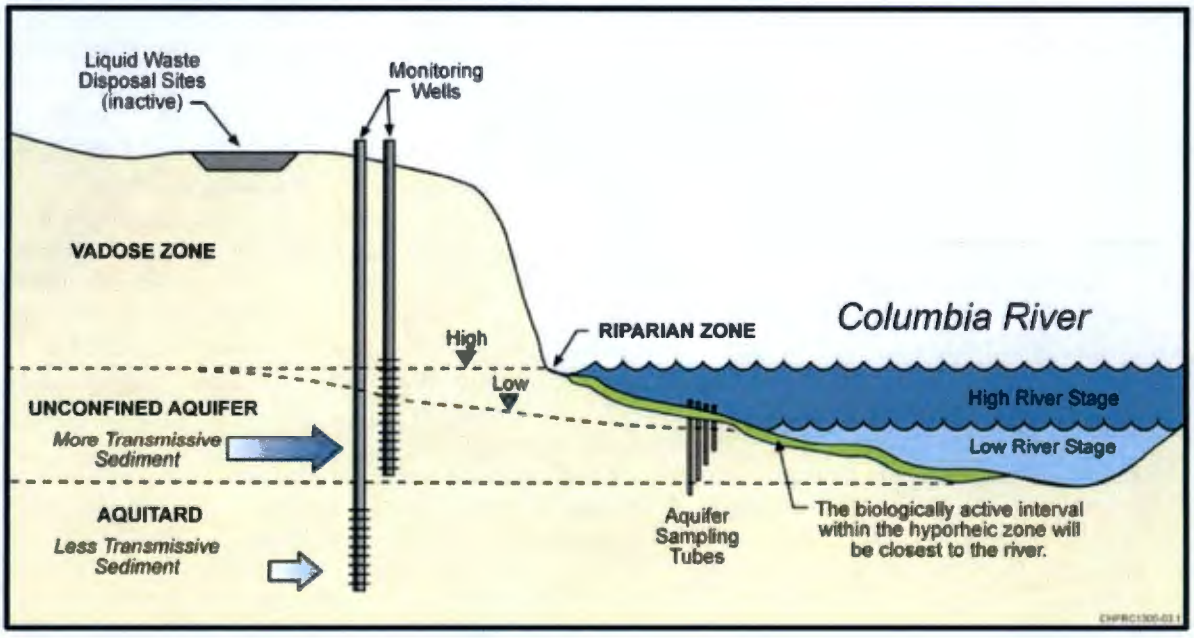


Figure 4. Conceptual Site Model of River and Groundwater Mixing Zone



5.2 Nature and Extent of Contamination

The following subsections discuss the nature and extent of contamination in the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 OUs.

5.2.1 Sources of Contamination

The identified sources of contamination in the 100-F/IU area are categorized as primary and secondary sources. Primary sources are from the historical operation of the water-cooled nuclear reactor (F Reactor) and its support infrastructure, as well as the Experimental Animal Farm. The primary source waste was the liquid waste generated during reactor operation (i.e., reactor cooling water, Fuel Storage Basin water, and decontamination solutions). Reactor cooling water, obtained from the Columbia River, was conditioned before passing through the reactor. The conditioning process included solids removal and addition of sodium dichromate for corrosion protection. Contaminants potentially introduced into the cooling water as it passed through the reactor consisted of fuel materials, fission and activation products, and residual Cr(VI).

Secondary sources consist of environmental media (e.g., soil, surface water, and groundwater) that were impacted by releases from primary sources. These media can retain sufficient levels of contaminants that can act as a reservoir for continuing releases to adjacent soil, surface water, groundwater, or air.

Historical releases of various liquid and solid waste resulted in contamination of the vadose zone and underlying groundwater. Contaminated groundwater migrated downgradient toward the Columbia River and entered the river through surface springs. Direct interaction of groundwater with surface water in the river's hyporheic zone also has occurred.

5.2.2 Waste Site (Soil) Contamination

Contaminants in solid waste disposed in burial grounds at the 100-FR-1 and 100-FR-2 OUs included radionuclides from facility operations and nitrate from Experimental Animal Farm waste. The solid wastes were buried up to 8 m (25 ft) below ground surface (bgs). The liquid waste discharged to the waste sites in the 100-FR-1 and 100-FR-2 OUs contained nitrate, radionuclides, metals, anions, and organic

chemicals. Liquid effluent was also discharged through outfalls to the Columbia River. During the operational period, large groundwater mounds formed beneath reactor effluent disposal areas. These mounds accelerated the radial spreading of mobile contaminants, such as hexavalent chromium (Cr[VI]) and nitrate in the aquifer, enabling them to move inland.

Low-mobility contaminants, including many metals and radionuclides, sorbed to fine textured sediments in the vadose zone. These contaminants were found at the greatest concentrations within and near the areas of discharge. When little or no liquid effluent was discharged to a waste site, soil contamination remained in the shallow sediment. Most of this shallow contamination has been removed during interim remedial actions. Strontium-90 is a slightly mobile contaminant in the subsurface and was observed in several 100-FR-1 and 100-FR-2 waste sites, including the 118-F-1 and 118-F-6 burial grounds, and 116-F-9 and 116-F-2 trenches. This contaminant migrated a limited distance vertically and horizontally in groundwater during the operational period; the residual contamination is mostly sorbed to fine textured sediment in the vadose zone and aquifer.

After reactor operations and liquid effluent disposal ceased, there was a significant decrease in water infiltrating the vadose zone. The artificially elevated groundwater mounds largely dissipated within 3 to 5 years. Natural rainfall and snowmelt infiltration transported some additional contamination to groundwater.

Waste sites and facilities in the 100-IU-2 and 100-IU-6 OUs were mainly associated with housing and staging equipment and material for the Manhattan Project; most of the area was previously occupied by homesteads and farms. The area includes roads, railroads, a fire station, fuel stations, storage facilities, an old concrete batch plant site, storage vaults in the east end of Gable Mountain, and pre-Hanford Site farm sites and landfills (e.g., pre-1943 municipal and farm waste sites). Contamination in this area generally originated from light industrial chemical use and agriculture, rather than nuclear material production and chemical processing.

5.2.3 Groundwater Contamination

Groundwater contaminants at levels that exceed federal and state standards in the 100-FR-3 OU are nitrate, Cr(VI), trichloroethene (TCE), and strontium-90. Waste sites in the 100-FR-1 and 100-FR-2 OUs that were the source of groundwater contaminants have been removed. Natural processes, including degradation, radioactive decay, and dispersion, are causing contaminant concentrations to decline in groundwater. The locations of the groundwater contaminant plumes that are within the 100-FR-3 OU are shown on Figure 5.

Nitrate contamination of groundwater in the 100-FR-3 OU is greater than the 45 mg/L drinking water standard (DWS) over an area of approximately 1,060 ha (2,620 ac). The Experimental Animal Farm was a source of this contamination because nitrate is a component of animal waste. The nitrate contamination was likely transported inland during operations when reactor effluent discharge resulted in groundwater mounding and changes in hydraulic gradients. Based on spatial and temporal groundwater data analyzed for the 100-F/IU RI/FS from 2007-2011, concentrations of nitrate ranged from 0.91 to 139 mg/L.

Cr(VI) in the 100-FR-3 OU exceeds the 10 µg/L Washington State surface water quality standard over an area of approximately 16 ha (41 ac). DOE used the surface water quality standard of 10 µg/L as a screening level to identify contamination that might pose a risk of reaching the Columbia River at levels above the surface water quality standard. Based on spatial and temporal groundwater data analyzed for the 100-F/IU RI/FS from 2007-2011, concentrations of Cr(VI) ranged from 2.2 to 93 µg/L. Cr(VI) concentrations are generally below the Model Toxics Control Act (MTCA) (*Washington Administrative Code* [WAC] 173-340, "Model Toxics Control Act—Cleanup") Method B groundwater cleanup level of 48 µg/L in the relatively small plume near the river. While the plume exceeds the 10 µg/L water quality

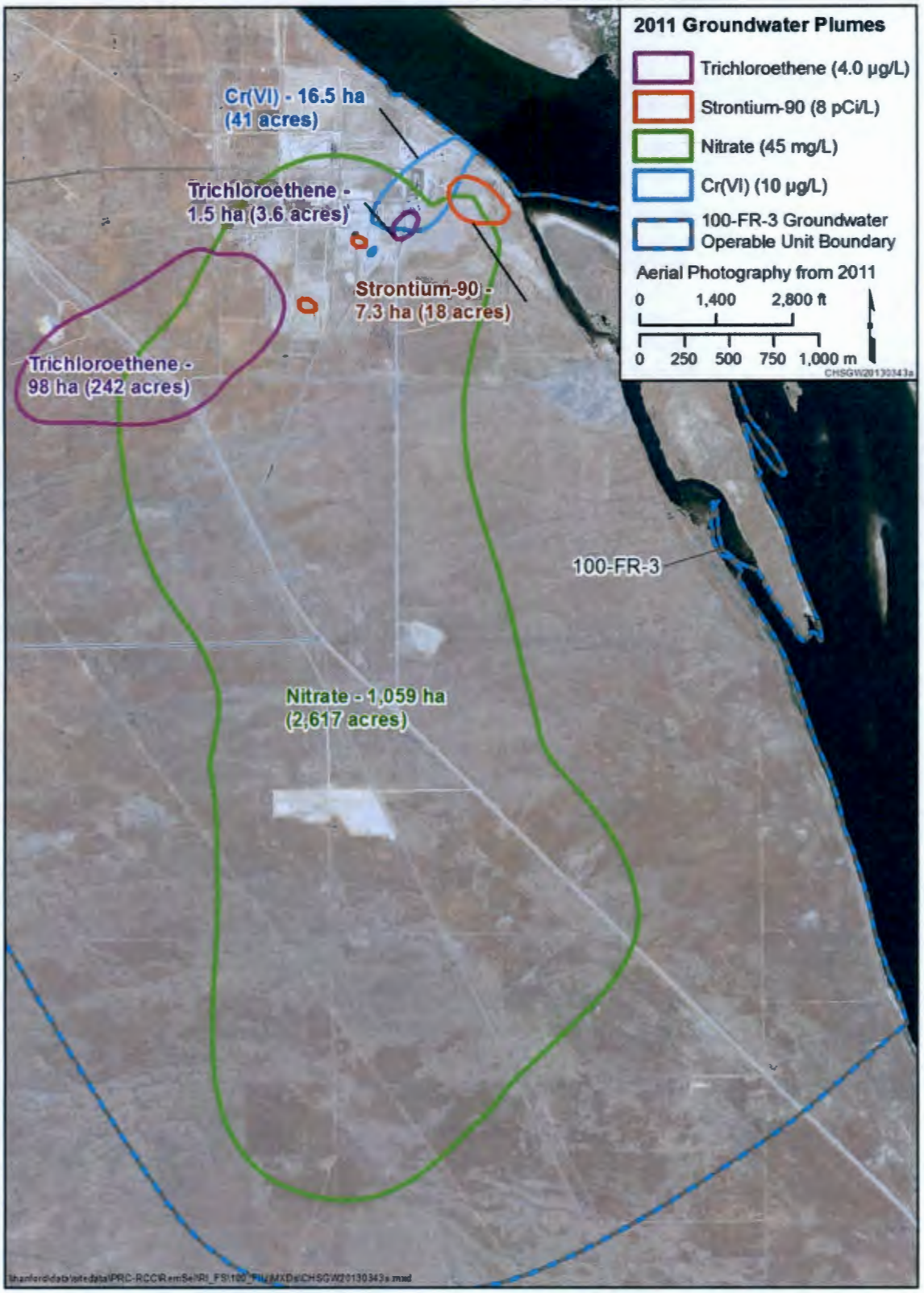
standard in the groundwater, aquifer tubes and pore water samples indicate infrequent exceedances of this level near the surface water interface.

The source of TCE contamination in the 100-FR-3 OU is believed to have been from a number of waste sites, including a group of waste sites west of the 100-F Area that have been remediated. The area of groundwater with TCE concentrations greater than the 4.0 µg/L MTCA risk-based (WAC 173-340) cleanup level is approximately 99 ha (246 ac). Based on spatial and temporal groundwater data analyzed for the 100-F/IU RI/FS from 2007-2011, concentrations of TCE ranged from 0.25 to 20 µg/L.

Facilities producing biological waste materials contaminated with strontium-90 included the Experimental Animal Farm and the radioecology laboratory. Strontium-90 was also present in discharges to the 116-F-14 and 116-F-2 liquid disposal sites, and in solid waste disposed of at various burial grounds, including the 118-F-6 site. Concentrations of strontium-90 in groundwater above the 8 picocuries per liter (pCi/L) DWS are present in an area of 7.3 ha (18 ac). Based on spatial and temporal groundwater data analyzed for the 100-F/IU RI/FS from 2007-2011, concentrations of strontium-90 ranged from 0.36 to 26 pCi/L.

Contaminated groundwater originating from Central Plateau source OUs extends to the unconfined aquifer beneath the 100-IU-2 and 100-IU-6 OUs. Contaminant plumes under the 100-IU-2 and 100-IU-6 OUs include iodine-129, nitrate, and tritium. These groundwater contaminant plumes will be addressed through the CERCLA process as part of the Central Plateau groundwater OUs (200-PO-1 and 200-BP-5).

Figure 5. Groundwater Contaminant Plumes in the 100-FR-3 OU



6.0 Current and Potential Future Land and Water Uses

This section discusses the current and reasonably anticipated future land uses at the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs, as well as the current use and future beneficial groundwater use of the groundwater located beneath these OUs. Land use forms part of the basis for exposure assessment assumptions and risk characterization conclusions.

6.1 Current On-Site and Surrounding Land Use

Land use in the 100-F/IU area is currently controlled by DOE, with the U.S. Fish and Wildlife Service (USFWS) managing the Hanford Reach National Monument (HRNM). DOE and the USFWS manage this federally owned land to protect natural and cultural resources while cleanup activities are being conducted. The 100-F/IU area is mostly comprised of undeveloped land. The F Reactor remains in interim safe storage (ISS). The Hanford school and White Bluffs bank are two historic structures preserved in the 100-IU-6 and 100-IU-2 OUs, respectively. The 100-F/IU area is being used for waste management, environmental monitoring, waste site remediation, and conservation and restoration activities. The land use farther away, beyond the Hanford boundaries includes irrigated agriculture and to the south and east are the cities of Richland, West Richland, Kennewick, and Pasco.

6.2 Anticipated Future Land Use

In June 2000, the HRNM was established within the boundaries of the Hanford Site. *Establishment of the Hanford Reach National Monument* (Clinton, 2000) mandates preservation of the natural and cultural resources within the HRNM and specifically included the possibility of adding lands to the HRNM as they are remediated. DOE's reasonably anticipated future use of the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs is conservation and preservation. EPA and the Washington State Department of Ecology believe that other uses, including residential use, are reasonably anticipated future land use for these areas. The residential based cleanup levels, identified in this ROD, also allow for conservation and preservation uses.

6.3 Current Ground and Surface Water Uses

Groundwater from the 100-FR-3 OU is currently contaminated above DWSs, and withdrawal for uses other than research purposes and monitoring is prohibited by DOE's self-imposed site controls. Under current site use conditions and controls, the only complete human exposure pathway to groundwater in 100-FR-3 is the potential for limited exposure to groundwater from intermittent seeps along the Columbia River or during remediation, research and monitoring activities. 100-FR-3 groundwater is not being used for drinking water.

The Columbia River is the second largest river in the contiguous United States in terms of total flow and is the dominant surface-water body on the Hanford Site. The Columbia River is the principal source of drinking water for the Tri-Cities and the Hanford Site. In addition, the river is used regionally for irrigation and recreation, which includes fishing, hunting, boating, water skiing, diving, and swimming.

6.4 Potential Future Groundwater Beneficial Uses

The NCP (40 CFR 300) establishes an expectation to "return useable ground waters to their beneficial uses wherever practicable, within a timeframe that is reasonable given the particular circumstances of the site" ("Remedial Investigation/Feasibility Study and Selection of Remedy"
[40 CFR 300.430(a)(1)(iii)(F)]). Washington state regulations contain a similar expectation.

Given the nature of the groundwater in 100-FR-3, potential beneficial groundwater uses include drinking water, irrigation and industrial uses. Drinking water use includes other domestic uses such as bathing and cooking. The Tri-Party agencies' goal for Hanford groundwater is consistent with the NCP.

6.5 Expected Timeframes for Beneficial Groundwater Use

The raw water supply for the 100 and 200 Areas is provided from the Columbia River through a series of pump houses, reservoirs, and pipelines. This water distribution system is known as the export water system. There are no plans to start using 100-FR-3 groundwater as drinking water when standards are met. The expected timeframes to attain the cleanup levels in 100-FR-3 groundwater are 20 years for Cr(VI), 80 years for nitrate, 50 years for TCE, and 150 years for strontium-90. The expected timeframe to attain the Washington state surface water quality standard for Cr(VI) is 35 years.

6.6 Location of Anticipated Groundwater Use in Relation to Contamination

Groundwater monitoring for contamination is ongoing via many wells located throughout the 100-FR-3 OU and that use is anticipated to continue in the future. Use of raw water from the export water system is the current and anticipated water use in the 100-F/IU area.

7.0 Summary of Site Risks

This section of the ROD summarizes the site risks associated with the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs, as identified in the baseline risk assessment. This section of the ROD includes information on the human health risk assessment and ecological risk assessment and states the basis for taking action at these OUs.

7.1 Summary of Human Health Risk Assessment

The baseline risk assessment estimates what risks the contamination at the 100-F/IU area poses if no action were taken. It provides the basis for taking action and identifies the contaminants and exposure pathways that need to be addressed by the remedial action. This section of the ROD summarizes the results of the human health risk assessment.

7.1.1 Identification of Contaminants of Concern

Contaminants of potential concern were initially identified by evaluating the history of operations in the 100-F/IU area and analysis of soil and groundwater samples over time. The initial contaminants of potential concern were refined to COCs during site characterization and risk assessment. The COCs in the soil (Table 3) are identified based on review of available characterization data, waste site history and processes, and characterization of analogous waste sites. As a result of this comprehensive review, the COCs are radionuclides, metals, organics (including polycyclic aromatic hydrocarbons and polychlorinated biphenyls), and inorganic anions. The human health risk assessment identified Cr(VI), nitrate, TCE, and strontium-90 as COCs in 100-FR-3 groundwater based on a quantitative evaluation of groundwater data. The COCs in groundwater are listed in Table 4.

Table 3. COCs for 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6

Exposure Medium: Soil in 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6			
Radionuclides	**Metals**	**Organics**	**Inorganic Anion**
Cesium-137	Arsenic	Benzo(a)pyrene (PAH)	Nitrate
Cobalt-60	Lead	Trichloroethene	
Europium-152	Mercury	Aroclor-1254 (PCB)	
Europium-154	Hexavalent Chromium	Aroclor-1260 (PCB)	
Nickel-63		Total petroleum hydrocarbons	
Strontium-90			
COC = Contaminant of Concern PCB = Polychlorinated Biphenyl PAH = Polycyclic Aromatic Hydrocarbons			

Table 4. COCs for 100-FR-3

Exposure Medium: Groundwater in 100-FR-3			
Radionuclides	**Metals**	**Organics**	**Inorganic Anion**
Strontium-90	Hexavalent Chromium	Trichloroethene	Nitrate
COC = Contaminant of Concern COCs were detected at concentrations in groundwater higher than DWSs, Washington state surface water quality standard, or risk thresholds.			

7.1.2 Human Health Exposure Assessment

Exposure to contamination in the 100-F/IU area is controlled by the interim action RODs currently in place and DOE's site controls to prevent unacceptable human exposure. Risks to current workers are managed through use restrictions and health and safety programs.

For purposes of establishing a basis for action and developing cleanup levels, EPA and DOE have agreed to use the residential scenario. Residential human exposure scenarios were evaluated in the River Corridor Baseline Risk Assessment (RCBRA), the Columbia River Component (CRC) risk assessment and the baseline human health risk assessment in the 100-F/IU RI/FS Report (DOE/RL-2010-98). The residential and groundwater scenarios are described in this ROD because they are the basis for action and for the selected cleanup levels. In addition to the residential exposure scenario, the 100-F/IU RI/FS Report also includes human health risk estimates based on a National Monument worker, casual recreational user and Tribal exposure scenarios.

The residential scenario for exposure to chemicals assessment used Washington State's MTCA cleanup levels (WAC 173-340) for unrestricted use. For assessing risks from chemicals in soil, MTCA Method B (WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards") levels were used. MTCA provides chemical-specific standards that define acceptable risk levels based on reasonable maximum exposure scenarios. For direct contact, these MTCA-based cleanup levels are based on a six-year exposure of a child through incidental soil ingestion, but does not include consumption of site-derived food. For the inhalation pathway, the MTCA (WAC 173-340) Standard Method B air cleanup levels are based on exposure of adults and children from inhalation of vapors and dust in ambient air. The residential scenario used to assess risk described above are based on potential exposure to the top 4.6 m (15 ft) of soil as part of the reasonable maximum exposure scenario.

For assessing residential risk from radionuclides in soil, the residential scenario is based on exposure to soil within the top 4.6 m (15 ft) which occurs over a 30-year period. The scenario evaluated is as follows. A residence is established on the waste site and the resident receives exposure from direct contact with the soil from the waste site and through the food chain. This includes potential exposure through external radiation, incidental soil ingestion and inhalation of ambient dust particulates. The food chain pathway includes exposure from consumption of fruits and vegetables grown in a backyard garden and consumption of meat (beef and poultry) and milk from livestock raised in a pasture. Uptake of contamination into crops and livestock is assumed to occur from contamination present in soil. Contaminants in soil are transported through the soil column, into the underlying groundwater, and to a hypothetical down gradient well located at the waste site boundary that is used for drinking water consumption, irrigation of crops and watering livestock and consumption of fish raised in a pond of water from the down gradient well. An additional evaluation was performed for groundwater if the only exposure was through use of groundwater as a drinking water source (which includes other domestic uses such as bathing and cooking).

The exposure pathways and duration in the MTCA unrestricted scenario used to evaluate risk and develop cleanup levels for chemical soil contaminants are less conservative than the default residential scenario in EPA guidance. However, EPA guidance allows the use of site-specific scenarios for assessing risk and setting cleanup levels. The MTCA unrestricted scenario is single pathway, the lower of the ingestion or inhalation. The EPA default residential scenario uses multiple pathways, which is the sum of ingestion, inhalation and dermal pathways. The MTCA duration is six years for ingestion and is thirty years for inhalation. The EPA duration is thirty years for all pathways. The cancer risk limit for soil individual chemical cleanup levels were set at the $1x10^{-6}$ limit in MTCA. Soil chemical cleanup levels must also meet the multi-contaminant total cancer risk limit in MTCA of $1x10^{-5}$. Although MTCA is less conservative with respect to the risk scenarios, the acceptable MTCA risk limits are at the conservative end of the NCP cancer risk range, which is $1x10^{-4}$ to $1x10^{-6}$. MTCA uses the same hazard index of one limit as EPA for non-cancer toxic effects. The cancer risk limit for soil radionuclide cleanup levels were set at $1x10^{-4}$ risk limit or 15 mrem/year for isotopes where that is more conservative. Soil radionuclide cleanup levels must also meet the multi-contaminant total cancer risk limit of $1x10^{-4}$.

Human health risk from exposure to groundwater was evaluated through risk calculations and comparison to federal and state drinking water or cleanup standards. For assessing human health risks from radionuclides and chemicals in groundwater, the methodology identified in EPA's tap water scenario was used (residential drinking water source in EPA's "Regional Screening Levels for Chemical Contaminants at Superfund Sites"). The approach used assumes that the groundwater is used as a tap water source for a 30 year period. Potential routes of exposure include ingestion, dermal contact and inhalation of volatiles during household activities. Groundwater concentrations were also compared to existing federal and state drinking water or cleanup standards.

7.1.3 Human Health Toxicity and Risk Characterization

All of the previously remediated waste sites in the 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 source OUs (see Table 1) with closeout verification data from the shallow vadose zone from 0 to 4.6 m (0 to 15 ft) bgs were evaluated in the RI risk assessment. One site (118-F-6) had residual strontium-90 contamination that resulted in excess lifetime cancer risk (ELCR) greater than $1x10^{-4}$ based on the residential exposure scenario. The 118-F-6 waste site reported a total ELCR of 1.8×10^{-4}. The exposure point concentration (EPC) of strontium-90 is 4.1 pCi/g, based on maximum result observed during post-remediation sampling. The EPC, which is greater than the residential direct contact cleanup level of 2.3 pCi/g, did not exceed the interim action cleanup level of 4.5 pCi/g. The residual strontium-90 is at a depth of 2 to 4 m (6.6 to 13.1 ft) bgs and will decay to a total ELCR of less than 1.0×10^{-4} by year 2033. All other previously remediated waste sites report a total excess lifetime cancer risk less than the MTCA ("Human Health Risk Assessment Procedures" [WAC 173-340-708(5)]) total risk threshold of $1x10^{-5}$ and

have a hazard index of less than one for the residential exposure scenario. This scenario and risk limits were used in setting preliminary remediation goals (PRGs) in the risk assessment.

The residential risk assessment scenario considered direct exposure to contamination within the upper vadose zone 4.6 m (0 to 15 ft) bgs as part of the reasonable maximum exposure (RME). In the risk assessment, closeout verification data from all previously remediated waste sites excavated into the deep vadose zone were evaluated to identify where exposure to residual contamination could present a potential risk if contamination was brought to the surface and then exposure occurred through the residential exposure scenario. Activity that would result in exposure to contamination deeper than 4.6 m (0 to 15 ft) bgs was not considered part of reasonably anticipated future land use. However, residential PRGs were used to identify where unacceptable risk could occur under unrestricted exposure. Fifteen remediated waste sites in the 100-FR-1 and 100-FR-2 OUs (100-F-10, 100-F-19:1, 100-F-19:2, 100-F-19:3, 100-F-29, 100-F-34, 116-F-12, 116-F-14, 116-F-2, 116-F-6, 116-F-9, 118-F-6, 118-F-8:3, 118-F-8:4, and UPR-100-F-1) contained residual radioisotope concentrations at depths greater than 4.6 m (0 to 15 ft) bgs that would result in an excess lifetime cancer risk greater than $1x10^{-4}$ based on the residential exposure scenario. Radionuclides associated with historical waste disposal contribute a majority of the excess lifetime cancer risk and include cesium-137, cobalt-60, europium-152, europium-154, nickel-63, and strontium-90.

For waste sites that had not been previously remediated, a review of available characterization data, waste site history or processes, and contamination and risk information for analogous waste in remediated sites was used to establish a basis for action and support remedy selection. Although only some of the sites not previously remediated had sample data, this comprehensive review of information was used for remedy selection.

All of the previously remediated waste sites in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs were also evaluated as potential sources for groundwater and surface water contamination using closeout verification data. One site (116-F-14) contains residual Cr(VI) contamination exceeding the soil cleanup level (2.0 mg/kg) necessary for protection of surface water subject to groundwater discharge. The Cr(VI) surface water standard (10 µg/L) applies where groundwater discharges to the Columbia River. No other waste sites were identified to have soil contaminants that exceeded chemical or radionuclide soil PRGs which would cause an unacceptable risk to groundwater or the Columbia River.

Groundwater was evaluated as a potential drinking water source through a comparison of the exposure point concentration for each contaminant against the lowest applicable standard or MTCA risk-based concentration, including federal and state DWSs and MTCA-based groundwater cleanup levels.

A total of 20 monitoring wells were completed in the unconfined aquifer within the 100-FR-3 groundwater OU, and data and information obtained from these wells was evaluated in the risk assessment. Of these, 19 wells were specifically sampled during the RI to reduce the uncertainty in determining the nature and the spatial and temporal distribution of groundwater contamination.
The groundwater within 100-FR-3 contains nitrate at concentrations greater than the DWS of 45 mg/L and TCE at concentrations greater than the risk-based MTCA cleanup level of 4.0 µg/L.
Strontium-90 has also been detected in 100-FR-3 at concentrations above the DWS of 8 pCi/L.
Contaminant concentrations in the groundwater were also compared to surface water standards for protection of aquatic organisms because groundwater discharges to the Columbia River. This comparison included state surface water quality standards for fresh water and federal ambient water quality criteria. The groundwater within the 100-FR-3 Groundwater OU contains Cr(VI) concentrations greater than the state surface water quality standard of 10 µg/L.

The risk assessment included evaluation of groundwater contamination using the EPA tap water scenario. Both cancer and non-cancer risk were calculated for ingestion and dermal contact as well as inhalation of volatile contaminants during household activities. Based on the results of the groundwater risk evaluation, concentrations of strontium-90, Cr(VI), TCE, and nitrate exceeded risk thresholds and were identified as COCs.

7.1.4 Uncertainties

Uncertainties in the risk assessment arise due to multiple factors. Uncertainty reflects limitations in knowledge, and simplifying assumptions must be made to quantify health risks. Uncertainties are associated with sampling and analysis, sampling design, calculated exposure point concentrations, actual exposure verses exposure scenarios, toxicity assumptions and risk characterization.

A significant uncertainty in the risk assessment is related to backfill. The risk assessment for waste sites in the 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 source OUs that had completed interim remediation did not consider the risk reduction resulting from backfill placed over residual contamination. Post excavation confirmatory sample data collected from the bottom and sides of the excavation hole to depths as great as 4.6 m (15 ft) was used in the risk assessment as if ground surface contained contamination at that concentration. Clean backfill reduces actual risk.

For many waste sites, characterization data has been collected using both a statistical sampling design and a focused sampling design which uses samples that have been taken in areas anticipated to be the most contaminated. When both statistical and focused samples exist for an analyte at a waste site, risk could be overestimated due to sample bias. Focused samples tend to have higher contamination than statistical samples. During interim action remediation, statistical samples were used in a comparison to cleanup levels, and for some sites focused samples were collected and compared with cleanup levels. These uncertainties apply to both the human health and the ecological risk assessments.

7.2 Summary of Ecological Risk Assessment

The RCBRA and the 100-F/IU RI/FS report evaluated ecological risks at the 100-F/IU area interim remediated waste sites with upland habitat for potential ecological risks. The 100-F/IU RI/FS used information from the RCBRA and other sources to evaluate the risk to populations and communities of ecological receptors, and it was concluded that there was no ecological risk at remediated waste sites within the 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 source OUs. The ecological risk evaluations have concluded that 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 interim remedial actions that have achieved interim action ROD cleanup levels to protect human health will also protect ecological receptors. For 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 waste sites that have not been interim remediated, once human health cleanup levels are achieved, residual contamination would not be sufficient to adversely impact populations and communities of ecological receptors as demonstrated by the interim remediated sites.

The RCBRA and the CRC evaluated potential ecological risks present in the riparian, near-shore, and river areas in the100-F/IU area. The 100-F/IU RI/FS used information from these risk assessments and from other sources to evaluate risk to populations and communities of ecological receptors. The 100-F/IU RI/FS evaluated contaminants present in these environments and pathways where Hanford Site operations have or may have released contaminants to the riparian, near-shore, and river environments. The evaluation included releases or potential releases of radionuclides, metals, and nitrate into the Columbia River from groundwater. The 100-F/IU RI/FS concluded that there were no contaminants of ecological concern or ecological risk to populations and communities due to the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs in riparian, near shore and river environments.

The Hanford Reach contains three species listed as threatened or endangered under the federal Endangered Species Act of 1973. These are the upper Columbia River spring-run Chinook salmon, steelhead, and bull trout. The spring-run Chinook salmon do not spawn in the Hanford Reach but use it as a migration corridor. Steelhead spawning has been observed in the Hanford Reach. The bull trout is not considered a resident species and is rarely observed in the Hanford Reach. The 100-FR-3 OU contains four groundwater COCs which are the contaminants present that could pose a risk to these species: Cr(VI), strontium-90, nitrate, and TCE. The Columbia River rapidly dilutes groundwater contaminants to low concentrations, so the primary concern for ecological risk to aquatic biota is from exposure to groundwater via upwelling through the riverbed gravels, cobbles, and sand. The 100-F/IU RI/FS concluded that contaminated groundwater from the 100-FR-3 OU will have no effect on these fish species. This conclusion of no effect is because current and predicted concentrations of COCs in groundwater do not exceed toxicity thresholds for steelhead.

7.3 Basis for Action

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

Waste sites that have not been remediated were evaluated based on process history, sample data and analogous experience from sites already interim remediated. These waste sites were determined to pose an unacceptable risk to human health and the environment from direct exposure, providing the basis for remediation action. COCs for these sites are presented in Table 3.

Based on the results of the groundwater risk evaluation, concentrations of nitrate and strontium-90 are present at levels that exceed DWSs. TCE is present at levels that exceed the human health risk-based concentration, and it is identified as a COC. Cr(VI) is present at levels that exceed the state surface water quality standard and human health risk-based concentration, and it is also identified as a COC.

8.0 Remedial Action Objectives

The remedial action objectives (RAOs) provide a general description of cleanup goals. These goals typically provide the basis for development of the remedial alternatives, provide a basis for evaluating the cleanup options, and provide an understanding of how the identified risks will be addressed by the response action. RAOs also facilitate the five-year review determination of protectiveness.

8.1 Specific Remedial Action Objectives

The RAOs describe what a proposed remedial action is expected to accomplish. RAOs generally include information on the media, COCs, potential exposure pathways, and remediation goals, taking into account the current and reasonably anticipated future land use. The RAOs for the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs are based on a residential use scenario. The RAOs for the 100-FR-3 OU reflect the potential use of groundwater as a drinking water source. The RAOs for the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 ROD are RAOs 3 through 6. The RAOs for the 100-FR-3 ROD are RAOs 1, 2, and 7. The RAOs are as follows:

- **RAO 1:** Prevent unacceptable risk to human health from ingestion of and incidental exposure to groundwater containing contaminant concentrations above federal and state standards and risk-based thresholds.
- **RAO 2:** Prevent unacceptable risk to human health and ecological receptors from groundwater discharges to surface water containing contaminant concentrations above federal and state standards and risk-based thresholds.

- **RAO 3:** Prevent unacceptable risk from contaminants migrating and/or leaching through soil that will result in groundwater concentrations that exceed standards and risk-based thresholds for protection of surface water and groundwater.
- **RAO 4:** Prevent unacceptable risk to human health and ecological receptors from exposure to the upper 4.6 m (15 ft) of soil, structures, and debris contaminated with nonradiological constituents at concentrations above the unrestricted land-use standards for human health (provided in MTCA Method B) or soil contaminant levels protective of ecological receptors.
- **RAO 5:** Prevent unacceptable risk to human health and ecological receptors from exposure to the upper 4.6 m (15 ft) of soil, structures, and debris contaminated with radiological constituents. For human health and ecological receptors:
  - Prevent exposure to radiological constituents at concentrations at or above a dose rate limit that causes an ELCR threshold of 1×10^{-6} to 1×10^{-4} above background for the residential exposure scenario.
  - Protect ecological receptors based on a dose rate limit of 0.1 rad/day for terrestrial wildlife populations.
- **RAO 6:** Manage direct exposure to contaminated soils deeper than 4.6 m (15 ft) to prevent an unacceptable risk to human health and the environment.
- **RAO 7:** Restore groundwater impacted from 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 releases to cleanup levels, which include DWSs, within a time frame that is reasonable given the particular circumstances of the site.

These RAOs address the risks identified in the risk assessment, are protective of human health and the environment and are compatible with the RAOs in the previous RODs for these OUs.

8.2 Cleanup Levels

Cleanup levels are the specific endpoint contaminant concentrations that have been developed for each media and/or exposure pathway, that provide protection of human health and the environment and comply with Applicable or Relevant and Appropriate Requirements (ARARs).

Soil cleanup levels for 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 were developed based on direct human contact (Table 5) as well as groundwater and surface water protection (Table 6). These cleanup levels apply to soil and debris. The direct contact cleanup levels for radionuclides were set at the lower of the risk-based level of $1x10^{-4}$ cancer risk or 15 mrem/year radiation dose which was used in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 interim actions. For europium-152, europium-154, and cobalt-60 the 15 mrem/year radiation dose that was used for the interim actions was retained as the cleanup level since the risk-based level of $1x10^{-4}$ cancer risk was higher. The cleanup levels as indicated in Table 5 for these radionuclides are 3.3, 3.0, and 1.4 pCi/g respectively. The calculated $1x10^{-4}$ cancer risk-based levels were 3.7, 4.4, and 3.1 pCi/g respectively. Direct contact cleanup levels for non-radionuclides are based on current state standards (2007 MTCA standards at WAC 173-340-740) for unrestricted use using a hazard index of one and a cancer risk of $1x10^{-6}$.

Soil cleanup levels for the protection of groundwater and surface water were calculated based on site-specific data and specific parameters using the Subsurface Transport Over Multiple Phases (STOMP) code with a one-dimensional model for all contaminants (Table 6). For highly mobile contaminants (retardation coefficient < 2), the model assumes the entire vadose zone from ground surface to groundwater is contaminated. For less mobile contaminants (retardation coefficient ≥ 2), the model assumes the top 70 percent is contaminated and the bottom 30 percent is not contaminated. Since cleanup levels are based on a residential scenario, a groundwater recharge rate of approximately 72 mm per year was used representing an irrigated condition. A soil cleanup level for groundwater or surface water

protection was not selected for some contaminants because the model indicated the contaminants will not reach groundwater within 1,000 years at concentrations above the cleanup levels in Table 7.

Groundwater cleanup levels for 100-FR-3 are based on site-specific data, current federal DWSs, state water quality standards and risk-based concentrations that are more stringent than the DWS for TCE using a MTCA calculation method plus EPA-approved toxicity information (Table 7).

Table 5. Soil Cleanup Levels for Protection of Human Health

Media: Soil and Debris
Site Area: 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs

Contaminant of Concern	Units	Cleanup Level (≤4.6 m [15 ft] bgs)	Basis for Cleanup Level
Radionuclides			
Cesium-137	pCi/g	4.4	Direct contact residential scenario
Cobalt-60	pCi/g	1.4	Residential interim remedial action cleanup level
Europium-152	pCi/g	3.3	Residential interim remedial action cleanup level
Europium-154	pCi/g	3.0	Residential interim remedial action cleanup level
Nickel-63	pCi/g	608	Direct contact residential scenario
Strontium-90	pCi/g	2.3	Direct contact residential scenario
Chemicals			
Arsenic	mg/kg	20	MTCA Method A
Hexavalent Chromium	mg/kg	240	MTCA Method B
Lead	mg/kg	250	MTCA Method A
Mercury	mg/kg	24	MTCA Method B
Nitrate	mg/kg	568,000	MTCA Method B
Aroclor 1254	mg/kg	0.50	MTCA Method B
Aroclor 1260	mg/kg	0.50	MTCA Method B
Benzo(a)pyrene	mg/kg	0.14	MTCA Method B
TPH–Diesel Range	mg/kg	2,000	MTCA Method A
TPH–Motor Oil (High Boiling)	mg/kg	2,000	MTCA Method A

MTCA = Washington State's Model Toxics Control Act
MTCA Method A and B = Soil Cleanup Levels for Unrestricted Land Use
bgs = below ground surface

Table 6. Soil Cleanup Levels for Protection of Groundwater and Surface Water

Media: Soil and Debris
Site Area: 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs

Contaminant of Concern	Soil Cleanup Levels for Protection of Groundwater and Surface Water (Ground Surface to Water Table)		
	100-FR-1 and 100-FR-2	100-IU-2	100-IU-6
Radionuclides (pCi/g)			
Cesium-137	—	—	—
Cobalt-60	—	—	—
Europium-152	—	—	—
Europium-154	—	—	—
Nickel-63	—	—	—
Strontium-90	24,600	64,200	104,000
Chemicals (mg/kg)			
Arsenic	—	—	—
Hexavalent Chromium	2.0	2.0	2.0
Lead	—	—	—
Mercury	—	—	—
Nitrate	1,790	6,360	11,300
Aroclor 1254	—	—	—
Aroclor 1260	—	—	—
Benzo(a)pyrene	—	—	—
TPH–Diesel Range	2,000	2,000	2,000
TPH–Motor Oil (High Boiling)	2,000	2,000	2,000

TPH = total petroleum hydrocarbon
Note: Basis for soil cleanup level for groundwater and surface water protection is the soil leach model in the 100-F/IU RI/FS.

Table 7. Cleanup Levels for 100-FR-3 COCs – Groundwater

Media: Groundwater
Site Area: 100-FR-3 OU
Available Use: Drinking water and all other uses

Contaminant of Concern	Units	Cleanup Level	Basis for Cleanup Level
Strontium-90	pCi/L	8	DWS
Hexavalent chromium	µg/L	10/48*	WAC 173-201A/WAC 173-340-720
Trichloroethene	µg/L	4	Risk-based MTCA cleanup level for drinking water
Nitrate	mg/L	45	DWS

*Cleanup levels for hexavalent chromium are 48 µg/L in the upland groundwater and 10 µg/L where groundwater discharges to surface water.
DWS = drinking water standard (Maximum Contaminate Levels [MCLs] and non-zero Maximum Contaminant Level Goals [MCLGs])
WAC = Washington Administrative Code
WAC 173-201A = "Water Quality Standards for Surface Waters of the State of Washington."
WAC 173-340-720 = "Model Toxics Control Act—Cleanup," "Groundwater Cleanup Standards."

9.0 Description of Alternatives

This section describes the remedial alternatives that were developed for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs that were evaluated in the 100-F/IU RI/FS Report. The alternatives were developed to address source and groundwater OUs independently. The alternatives evaluated are as follows:

- **100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 Source OUs:**
  - Alternative S-1, No Action
  - Alternative S-2, RTD and ICs
- **100-FR-3 Groundwater OU:**
  - Alternative GW-1, No Action
  - Alternative GW-2, MNA and ICs
  - Alternative GW-3, Pump-and-Treat with In Situ Treatment and MNA
  - Alternative GW-4, Enhanced Pump-and-Treat

The following subsections provide general descriptions and expected outcomes of each of the alternatives evaluated in the 100-F/IU RI/FS Report.

9.1 Description of Remedy Components for Source OUs

9.1.1 Alternative S-1: No Action

Estimated capital cost: $0
Estimated annual O&M cost: $0
Estimated present value (discounted): $0
Estimated time to achieve cleanup levels for Waste Sites: Would not be met.

Consideration of a No Action alternative is a requirement of the NCP (40 CFR 300.430[e][6], "Remedial Investigation/Feasibility Study and Selection of Remedy"). The No Action alternative is included to provide a baseline for comparison against the other alternatives. Under the No Action alternative, no

active remedial action would be taken to address potential threats to human health and the environment posed by the contamination. All ongoing actions would cease, including ICs. The No Action alternative would not remediate the waste sites and as a result, these waste sites would have contamination that is not protective of human health and the environment.

9.1.2 Alternative S-2: RTD and ICs

Estimated capital cost: $9.63 million
Estimated O&M cost: $27.9 million
Estimated present value (discounted): $20.6 million
Estimated time to achieve cleanup levels: 3 to 5 years

Alternative S-2 uses RTD at waste sites identified in Table 1 with contamination exceeding the soil cleanup levels to depths as specified in Tables 5 and 6 for protection of human health and for protection of groundwater and surface water. Contaminated soil and debris are excavated as needed to meet cleanup levels using shallow and deep excavation technology, transported to the ERDF, and treated as necessary to meet land disposal restrictions prior to disposal at the facility. The remediated sites will be backfilled, recontoured, and planted with native vegetation. The waste sites identified for RTD in Table 1 are not expected to have contamination deeper than 4.6 m (15 ft) bgs, based on information that is known about the sites and the remediation of similar sites in the 100-IU-2 and 100-IU-6 OUs.

ICs are required to be established and maintained as necessary to prevent exposure until levels protective of unlimited use/unrestricted exposure (UU/UE) are met. ICs are mechanisms to control uses of land, facilities, and environmental media to prevent unacceptable human health and environmental exposure to residual contaminants that could pose risks above levels deemed protective. ICs generally include non-engineered restrictions on activities and access to land, groundwater, surface water, waste sites, waste disposal areas, and other areas or media that may contain hazardous substances. Common types of ICs include procedural restrictions for access, warning notices, permits, easements, deed notifications, leases and contracts, and land-use controls.

Alternative S-2 requires ICs during the period before completion of the remedial action and following remedial action implementation. For Alternative S-2, direct human contact with deep soils is not part of the RME and is not expected, but ICs are included as a conservative measure to control the potential circumstances where excavation or drilling might bring these contaminants to the surface. The ICs needed for Alternative S-2 are identified in Table 8. For sites with ICs based on radionuclide contamination, the expected year that ICs can be removed is indicated after the site number. The concentrations of radionuclide COCs at these sites are protective of groundwater. The rough order of magnitude cost for excavating and removing contaminated soil from the deep radionuclide waste sites is estimated at $160 million.

Table 8. Alternative S-2 — ICs at Remediated Waste Sites

Risk Driver	Institutional Controls
Waste sites with deep (greater than 4.6 m [15 ft] bgs) radiological contamination exceeding human health direct contact cleanup levels.*	**Excavation Restrictions:** 100-F-10 — 2057 100-F-19:1 — 2113 100-F-19:2 — 2057 100-F-19:3 — 2113 100-F-29 — 2057 100-F-34 — 2113 116-F-2 — 2108 116-F-6 — 2122 116-F-9 — 2074 116-F-12 — 2113 116-F-14 — 2110 118-F-6 — 2033 118-F-8:3 — 2278 118-F-8:4 — 2059 UPR-100-F-1 — 2057
Waste site with groundwater/surface water protection risk if irrigation were applied.	**Prohibit Irrigation:** 116-F-14
* These sites have contamination at depth where human exposure is not expected and at concentrations that will not cause exceedances of cleanup levels in groundwater or surface water. Institutional controls would be applied to prevent contaminated material beyond 4.6 m (15 ft) bgs from being brought to the surface or otherwise encountered from drilling or excavation.	

With the exception of site 116-F-14, there were no threats to groundwater quality or surface water quality from waste sites in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs. If irrigation of the land surface overlying waste site 116-F-14 were to occur, residual Cr(VI) contamination (EPC of 6.79 mg/kg) could pose a threat to surface water quality. Residual concentrations of Cr(VI) were previously demonstrated to be protective of surface water based on interim action evaluation using a 1:1 dilution attenuation factor for groundwater-to-river contaminant migration. However, re-evaluation using current modeling parameters (and no assumed groundwater-to-river dilution/attenuation) was conducted for 116-F-14 and concluded that under the native vegetation recharge scenario (no irrigation), the residual concentrations falls below the MTCA (WAC 173-340-720) groundwater cleanup level of 48 µg/L, as well as below the surface water quality standard (10 µg/L). For the irrigation recharge scenario (what cleanup levels are based on), the residual groundwater concentration would exceed the surface water quality standard. This indicates that residual Cr(VI) contamination at this site will not cause exceedances of either the groundwater or surface water standards if irrigation is not applied. For information purposes, a rough order of magnitude cost ($107 million) was developed for RTD of 116-F-14 to a depth of approximately 7.62m (25ft).

Furthermore, the review of groundwater monitoring data indicates that the 116-F-14 site has not constituted a source of Cr(VI) groundwater contamination. Comparing water table maps with groundwater plume maps from annual groundwater reports shows that the Cr(VI) plume is consistently upgradient and/or cross gradient from this waste site. Monitoring wells located downgradient of this

waste site also consistently report undetected Cr(VI). Therefore, ICs for Alternative S-2 includes an irrigation prohibition above waste site 116-F-14 for surface water protection.

9.2 Description of Remedy Components for the 100-FR-3 Groundwater OU

9.2.1 Alternative GW-1: No Action

Estimated capital cost: $0
Estimated annual O&M cost: $0
Estimated present value (discounted): $0
Estimated time to achieve cleanup levels: 35 years for Cr(VI), 80 years for nitrate, 150 years for strontium-90, and 50 years for TCE

Under the No Action alternative, no active remedial action would be taken to address potential threats to human health and the environment posed by the COCs present in the 100-FR-3 OU. All existing actions would cease, including ICs and monitoring, which would potentially allow exposure to contaminated groundwater.

9.2.2 Alternative GW-2: MNA and ICs

Estimated capital cost: $4.93 million
Estimated O&M cost: $54.7 million
Estimated present value (discounted): $36.3 million
Estimated time to achieve cleanup levels: 35 years for Cr(VI), 80 years for nitrate, 150 years for strontium-90, and 50 years for TCE

Alternative GW-2 relies upon MNA processes to reduce groundwater COC concentrations to concentrations less than the cleanup levels for 100-FR-3 OU groundwater shown in Table 7. Estimated timeframes to achieve cleanup levels are identified above. ICs would be established and maintained to prevent exposure to contaminated groundwater until cleanup levels are achieved.

MNA relies on natural attenuation processes that include a variety of physical, chemical, or biological processes, which, under favorable conditions, act without human intervention to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in soil or groundwater. These in situ processes include biodegradation, dispersion, dilution, sorption, volatilization, radioactive decay, and chemical or biological stabilization, transformation, or destruction of contaminants.

The primary natural attenuation processes for COCs present in 100-FR-3 include biodegradation and abiotic degradation, radioactive decay, dispersion, volatilization, and sorption.

The MNA evaluation used a multiple lines-of-evidence approach as described in *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites* (OSWER Directive 9200.4-17P) that considered the occurrence, mechanisms, rates, and expected performance of natural attenuation processes in site conditions. Key elements of the overall evaluation included demonstrating the following:

1. Effective source control and performance monitoring
2. A clear and meaningful trend of decreasing contaminant mass and/or concentration over time at appropriate monitoring or sampling points

3. Directly or indirectly, the type(s) of natural attenuation processes that are active at the site, and the rate at which such processes will reduce contaminant concentrations to required levels

The source of the contamination is no longer contributing to the plume due to the extensive source remediation (1,506,000 tons of contaminated material removed) conducted for the 100-FR-1 and 100-FR-2 source OUs under the interim action RODs (see Table 1). The remaining waste sites in the 100-IU-2 and 100-IU-6 source OUs required for RTD under this ROD were not the type that received concentrated or high-volume liquid waste that contributes to groundwater contamination.

A point attenuation rate assessment and numerical modeling was conducted showing declining trends for many of the evaluated monitoring locations in each plume. This included 6 Cr(VI) plume monitoring wells, 11 nitrate plume monitoring wells, 7 TCE plume monitoring wells, and 1 strontium-90 plume monitoring well. The simulations show that concentrations decline over time and that MNA will meet the remediation goals when combined with ICs during the remedy period.

Assessment of existing groundwater quality data were used for the MNA evaluation. From the set of all 100-FR-3 monitoring wells, a subset of appropriate locations was selected for evaluating natural attenuation rates for each COC plume. This included 6 Cr(VI) plume monitoring wells, 11 nitrate plume monitoring wells, 7 TCE plume monitoring wells, and 1 strontium-90 plume monitoring well. Of importance to attenuation processes, a variety of facies were identified in the 100-FR-3 aquifer. With respect to attenuation processes, facies are important because of their hydrogeochemical properties that are different from surrounding units and can affect contaminants in distinct ways. These facies can provide microenvironments (distributed as localized inclusions within the dominant matrix of the Hanford formation) that provide conditions favorable for biological and geochemical degradation and transformation/attenuation processes. The primary natural attenuation processes for COCs present in 100-FR-3 include biodegradation and abiotic degradation, radioactive decay, dispersion, volatilization, and sorption.

Additionally, the expected timeframes for plume attenuation (Table 10) is reasonable when compared to the other alternatives and is within a timeframe where ICs can be used to prevent exposure (i.e., the expected period is less than that of remedies selected at other Hanford operable units and ICs can be expected to be maintained over this period).

MNA for groundwater is a component of Alternative GW-2 for all of the COC plumes. The performance monitoring component includes installation of new wells, periodic sampling, laboratory analysis, and data evaluation to assess the natural attenuation processes, rates of attenuation, and overall protectiveness. Operations and maintenance (O&M) activities for this remedy include inspection, maintenance, and periodic replacement of monitoring wells. The monitoring will continue until cleanup levels are achieved.

DOE would control well drilling through excavation permits and will restrict groundwater use until such time as the groundwater achieves levels protective of UU/UE. Groundwater use would be restricted through ICs to limited research purposes and for monitoring and treatment, as approved by EPA or the Washington State Department of Ecology.

9.2.3 Alternative GW-3: Pump-and-Treat with In Situ Treatment and MNA

Estimated capital cost: $80.2 million
Estimated O&M cost: $124 million
Estimated present value (discounted): $177 million
Estimated time to achieve cleanup levels: 5 years for Cr(VI), 75 years for nitrate, 150 years for strontium-90, and 10 years for TCE

Alternative GW-3 reduces Cr(VI), nitrate, strontium-90, and TCE concentrations through an ex situ pump-and-treat system, with in situ treatment of nitrate, Cr(VI), and TCE. The strontium-90 plume and the southern portion of the nitrate plume would be reduced through MNA. ICs would be maintained to prevent exposure to contaminated groundwater until cleanup levels are achieved.

Pump-and-treat uses a network of extraction and injection wells targeting each of the COC plumes, combined with ex situ treatment at a central treatment facility, before reinjecting treated groundwater into the aquifer. Ex situ groundwater treatment would use ion-exchange technology for Cr(VI), nitrate, and strontium-90. Groundwater contaminated with TCE would be treated using an air stripper. The groundwater pump-and-treat systems would include routine and preventive maintenance programs, as well as replacement of pump-and-treat system components at the end of their design life.

In situ treatment would be accomplished by amending a portion of the treated water from the pump-and-treat system with a carbon substrate before reinjection into the upgradient portion of the nitrate, Cr(VI), and TCE plumes. The substrate type and concentration would be determined during remedial design.

Alternative GW-3 uses pump-and-treat for the higher concentration northern half of the nitrate plume, and it relies on MNA to attenuate the lower concentration in the southern portion of the plume. Pump-and-treat remediation has demonstrated limited effectiveness in reducing strontium-90 concentration because of the relative immobility of strontium-90. MNA, as described under Alternative GW-2, would be used for residual strontium-90 and nitrate until cleanup levels are achieved.

9.2.4 Alternative GW-4: Enhanced Pump-and-Treat

Estimated capital cost: $96.5 million
Estimated O&M cost: $124 million
Estimated present value (discounted): $194 million
Estimated time to achieve cleanup levels: 10 years for Cr(VI), 25 years for nitrate, 150 years for strontium-90, and 10 years for TCE

Alternative GW-4 reduces Cr(VI), strontium-90, TCE, and nitrate concentrations through enhanced pump-and-treat for the 100-FR-3 OU plumes, including the southern, less concentrated portion of the nitrate plume. Groundwater pump-and-treat is used to control plume migration through hydraulic containment and to remediate the groundwater plume through an extensive extraction well network and treatment. The treatment system uses ion exchange for Cr(VI), strontium-90, and nitrate, and air stripping for TCE. The groundwater pump-and-treat systems include routine and preventive maintenance programs, as well as replacement of pump-and-treat system components at the end of their design life. MNA, as described under Alternative GW-2, would be used for strontium-90 following the pump-and-treat period until cleanup levels are achieved. ICs would also be maintained to prevent exposure to contaminated groundwater until cleanup levels are achieved.

9.3 Common Elements of Each Alternative

Remedial action alternatives developed for 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs have some components in common:

Institutional Controls. For 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs, Alternatives S-2, GW-2, GW-3 and GW-5 require ICs before, during and after the active phase of remedial action implementation where ICs are required to protect human health and the environment. ICs are used to control access to residual contamination in soil and groundwater above standards for unlimited use and unrestricted exposure. DOE will be responsible for implementing, maintaining, reporting on and enforcing ICs. Although the DOE may later transfer these procedural responsibilities to another party by

contract, property transfer agreement or through other means, the DOE shall retain ultimate responsibility for remedy integrity. In the event that land is transferred out of federal ownership, appropriate provisions will be included in transfer terms or conveyance documents to maintain effective ICs (such as easements and covenants). ICs to support achievement of the RAOs are the following:

- Signage and access control to waste sites
- Maintenance and operation of an excavation permit program for protection of environmental and cultural resources and site workers
- Administrative controls limiting groundwater access and use where groundwater is above cleanup levels
- In the event that land is transferred out of federal ownership, deed restrictions (proprietary controls such as easements and covenants) are required that are legally enforceable against subsequent property owners

MNA for Groundwater in the 100-FR-3 OU. The MNA component is a remedial strategy that monitors natural attenuation processes until cleanup levels are met. MNA is distinguished from no action in that it measures and documents contaminant concentration reductions arising from various naturally occurring physical, chemical, and biological processes. The primary natural attenuation processes for COCs present in 100-FR-3 groundwater include biodegradation and abiotic degradation, radioactive decay, dispersion, volatilization, and sorption.

For each alternative that includes MNA as a component of a broader alternative, MNA complements other actions, including the source control (waste site) remedial actions. The MNA component includes periodic sampling, laboratory analysis, and data evaluation to assess attenuation process and overall protectiveness.

MNA for 100-FR-3 groundwater is a common element for the following:

- Alternative GW-2. To address all COC plumes.
- Alternative GW-3. To address the low concentration portion of the nitrate plume where concentrations between one and two times the cleanup level occur, and to address residual strontium-90 following cessation of pump-and-treat.
- Alternative GW-4. To address residual strontium-90 following cessation of pump-and-treat.

100-FR-3 Groundwater Monitoring. In addition to and as part of the MNA, groundwater monitoring will be performed to evaluate the effectiveness of MNA, as well as active engineered remedies.

100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 RTD and 100-FR-3 Monitoring – Transition from Interim to Final Action. In-progress interim action RTD at the 100-IU-2 and 100-IU-6 OUs shall achieve the cleanup levels in this ROD. All other aspects of the interim actions shall continue to be performed in accord with the existing RD/RAWP. DOE shall develop, and submit for EPA approval, a new RD/RAWP for this ROD prepared in accordance with the Tri Party Agreement. When the new RD/RAWP is approved, that document will direct future remedial actions and the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 interim remedial actions will be terminated.

9.4 Expected Outcomes of Each Alternative

Under Alternative S-2, the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs would be cleaned up to achieve MTCA residential cleanup standards for unrestricted use. Soil cleanup levels for the waste sites identified for RTD in Table 1 will be achieved in 3-5 years.

Available uses of 100-FR-3 groundwater under each of the groundwater alternatives will be unrestricted use upon achieving cleanup levels. Strontium-90 cleanup levels will be met in approximately 150 years under all alternatives. Cr(VI) cleanup levels will be met in approximately 5 to 35 years. Nitrate cleanup level will be met in approximately 25 to 80 years. TCE cleanup level will be met in approximately 10 to 50 years.

10.0 Comparative Analysis of Alternatives

This section of the ROD summarizes the comparative analysis of alternatives presented in the respective feasibility study portion of the 100-F/IU RI/FS Report for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs. The major objective of the analysis was to evaluate the relative performance of the alternatives with respect to the nine CERCLA evaluation criteria, as described in 40 CFR 300.430(f)(5)(i), so the advantages and disadvantages of each alternative are clearly understood. The nine CERCLA evaluation criteria are as follows:

- Overall protection of human health and the environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume through treatment
- Short-term effectiveness
- Implementability
- Cost
- State acceptance
- Community acceptance

The first two criteria, overall protection and compliance with ARARs, are defined under CERCLA as "threshold criteria." Threshold criteria must be met for an alternative to be eligible for selection. The next five criteria are defined as "primary balancing criteria." These criteria are used to weigh major trade-offs among alternatives. The last two criteria, state acceptance and community acceptance, are defined as "modifying criteria." In the final comparison of alternatives to select a remedy, both balancing criteria and modifying criteria are considered. The criteria were considered for each alternative, however, given that Alternative S-1 (No Action) fails the "threshold criteria," information regarding the performance of this alternative with respect to the "primary balancing criteria" is not included. Table 9 shows summaries of the comparative analysis for the groundwater alternatives.

Table 9. Evaluation of Groundwater Alternatives

Criterion	Alternative GW-1, No Action Rating	Alternative GW-2, MNA and ICs Rating	Alternative GW-3, Pump-and-Treat with In Situ Treatment and MNA Rating	Alternative GW-4, Enhanced Pump-and-Treat Rating
Overall Protection of human health and the environment	No	Yes	Yes	Yes
Compliance with ARARs	N/A	Yes	Yes	Yes
Long-Term Effectiveness and Permanence	N/A	★★★	★★★	★★★
Reduction of Toxicity, Mobility, or Volume by Treatment	N/A	★☆☆	★★☆	★★★
Short-Term Effectiveness	N/A	★★☆	★★☆	★★☆
Implementability	N/A	★★★	★★☆	★★☆
Net Present Value of Alternative (Discounted)	**N/A**	**$36,261,000**	**$176,780,000**	**$193,814,000**

Note: The comparative evaluation metrics are defined as follows:
★★★ = Performs very well against the criterion with no apparent disadvantages or uncertainty.
★★☆ = Performs moderately well against the criterion but with some disadvantages or uncertainty.
★☆☆ = Expected to perform less well against the criterion with more disadvantages or uncertainty.

ARAR = applicable or relevant and appropriate requirement
IC = institutional control
MNA = monitored natural attenuation
N/A = not applicable

10.1 Overall Protection of Human Health and the Environment

Overall protection of human health and the environment addresses whether each alternative provides adequate protection of human health and the environment by considering how risks posed through each exposure pathway are eliminated, reduced, or controlled through treatment, engineering controls, and/or institutional controls.

Alternatives S-1 and GW-1 (No Action) propose no remediation of waste sites or contaminated groundwater and no ICs and therefore, are not protective of human health and the environment. For the waste sites in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 Source OUs, Alternative S-2 (RTD and ICs) is protective of human health and the environment. Protectiveness is achieved by eliminating, reducing or controlling risks through excavation and treatment (as needed) of contaminated soil and debris or applying ICs at waste sites with deep contamination.

For groundwater cleanup, Alternatives GW-2, GW-3, and GW-4 are protective of human health and the environment by eliminating, reducing, or controlling risks through engineering controls and/or institutional controls. Alternatives GW-2 through GW-4 would provide adequate protection from

exposure to groundwater contamination by enforcement of institutional controls. Alternatives GW-3 and GW-4 would reduce some contaminant plumes quickly through pump-and-treat systems, however, all three alternatives rely on MNA for the strontium-90 plume.

10.2 Compliance with Applicable or Relevant and Appropriate Requirements

Section 121(d) of CERCLA and 40 CFR 300.430(f)(1)(ii)(B) require that remedial actions at CERCLA sites at least attain legally applicable or relevant and appropriate Federal and state requirements, standards, criteria, and limitations, which are collectively referred to as ARARs, unless such ARARs are waived under CERCLA Section 121(d)(4). Compliance with ARARs addresses whether a remedy will meet all of the ARARs or provide a basis for invoking a waiver.

Alternatives S-1 and GW-1 do not require action and, therefore, ARARs are not implicated. Alternatives S-2, GW-2, GW-3, or GW-4 all will comply with ARARs, without any ARAR waivers.

10.3 Long-Term Effectiveness and Permanence

The long-term effectiveness and permanence criterion evaluates the risk remaining at the site after cleanup levels have been met. The evaluation considers (1) the magnitude of the residual risk, and (2) the adequacy and reliability of controls.

For the waste sites identified for RTD in Table 1, Alternative S-2 provides very good long-term effectiveness and permanence because COC-contaminated soil and debris exceeding cleanup levels would be removed and transported to the ERDF. Long term controls include restrictions on excavation, drilling, and irrigation.

Groundwater Alternatives GW-2, GW-3, and GW-4 are rated high in long-term effectiveness and permanence (Table 8). The alternatives use a combination of both active treatment and natural attenuation that permanently reduce COC concentrations over different time frames. Table 10 presents the estimated remedial action time frames. At the end of the remedial time frame, the COC concentrations under each of the alternatives will be permanently reduced to levels that are protective of human health and the environment.

Table 10. Comparison of Remedial Action Time Frame Estimates for Groundwater (Years)

Contaminant of Concern	Cleanup Level	GW-1: No Action	GW-2: MNA and ICs	GW-3: Pump-and-Treat with In Situ Treatment and MNA	GW-4: Enhanced Pump-and-Treat
Hexavalent Chromium	10 µg/L	35	35	5	10
Hexavalent Chromium	48 µg/L	20	20	5	5
Nitrate	45 mg/L	80	80	75	25
Trichloroethene	4 µg/L	50	50	10	10
Strontium-90	8 pCi/L	150	150	150	150

Note: The remedial action time frame estimates are based on modeling the maximum concentration observed in groundwater for that contaminant

MNA = monitored natural attenuation
IC = institutional control

10.4 Reduction of Toxicity, Mobility, or Volume through Treatment

The reduction of toxicity, mobility, or volume through treatment criterion assesses the anticipated performance of the treatment technologies that may be included as part of a remedial action.

Alternative S-2 provides reduction of toxicity, mobility, or volume through treatment, only as required to meet applicable land disposal restriction requirements for disposal of excavated soil and material at ERDF.

Alternative GW-4 provides the highest reduction of toxicity, mobility, or volume through treatment. The majority of the COC mass is removed from the aquifer using groundwater extraction and treatment. Groundwater extraction and injection wells are also used to contain the COC plumes, preventing their migration into uncontaminated areas. Alternative GW-3 provides a moderate degree of toxicity, mobility, or volume reduction because it employs treatment of contaminants in groundwater extracted from the northern portion of the 100-FR-3 OU plumes, but relies on MNA for the southern portion of the nitrate plume. Alternative GW-2 relies on MNA rather than active treatment; therefore, it is rated the lowest (Table 9).

10.5 Short-Term Effectiveness

Short-term effectiveness addresses the period of time needed to implement the remedy and any adverse impacts on workers, the community, human health and the environment that may be posed during construction and implementation of the remedy until cleanup levels are achieved.

The short-term effectiveness for Alternative S-2 rates moderately well. Risks to the community are low because of the remote location of the waste sites. Potential risk occurs during material handling and from excavation sidewall instability. Environmental risk and risks to workers are controlled and minimized using engineering measures and personal protective equipment. The cleanup levels for the waste sites identified for RTD in Table 1 are met in a short time frame.

Groundwater Alternatives GW-2, GW-3, and GW-4 are expected to perform moderately well relative to this criterion, and all are rated the same (Table 9). Although Alternatives GW-3 and GW-4 achieve cleanup levels sooner for Cr(VI), nitrate, and TCE, the time frames for each of these three groundwater alternatives to achieve the cleanup level for strontium-90 are similar. Alternative GW-2 has a lower potential for adverse impact to the community, workers, or the environment because there is less construction-related activity in comparison to Alternatives GW-3 and GW-4.

10.6 Implementability

The criterion of implementability is used to compare the technical and administrative feasibility of the remedial alternatives. Factors considered include the availability of materials and services needed to implement the remedy components.

Alternative S-2 is readily implementable because the excavation required for RTD of the waste sites is a proven and well established practice at the site. All needed facilities, materials and services are readily available, and minimal administrative challenges exist.

Alternative GW-2 is more readily implemented than Alternatives GW-3 or GW-4 because it involves only the installation of additional monitoring wells. Alternatives GW-3 and GW-4 are both moderately implementable because they require installation of a greater number of wells and treatment systems based on established technology, which represents a moderate technical challenge. The in situ treatment for Alternative GW-3 does require specialized biological reagents, but it is also a proven technology. All of the groundwater alternatives present comparable administrative challenges (Table 9).

10.7 Cost

The costs for the groundwater alternatives are the lowest for Alternative GW-2 and the highest for Alternative GW-4. Estimated design, construction, O&M, and decommissioning costs were developed for each alternative. The O&M costs were estimated based on the alternative-specific remedial time frames. The total present value costs are $20.6 million for Alternative S-2, $36.3 million for Alternative GW-2, $177 million for Alternative GW-3, and $194 million for Alternative GW-4.

10.8 State Acceptance

The Washington State Department of Ecology, the support regulatory agency, has not concurred with the selected remedies identified in this ROD at this time.

10.9 Community Acceptance

Numerous comments were received on the proposed plan. The public voiced concerns over the proposed Alternative GW-2, including the length of monitored natural attenuation (MNA) and the efficacy of groundwater cleanup. The concerns were largely based on a desire for a more active and expedited remedy and generally preferred Alternative GW-4. Other concerns were that ICs will not be sufficient or effective enough to prevent future human exposure to contaminants. Many of the commenters are in favor of the use of excavation/remove-treat-dispose (RTD) approach for deep contamination where ICs will be applied. The public's comments, along with the agency responses, are included in the Responsiveness Summary in Part III of this ROD.

11.0 Principal Threat Waste

Principal threat wastes are source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include soils containing significant concentrations of highly toxic materials and surface or subsurface soils containing high concentrations of contaminants that are, or potentially are mobile due to wind entrainment, volatilization, surface runoff, or subsurface transport. Contaminated groundwater is generally not considered to be source material.

Principal threat wastes associated with the OUs that are the subject of this ROD, such as fuel fragments and concentrated liquid sodium dichromate, have been removed through earlier cleanup actions. No waste remains in the source OUs with highly toxic or highly mobile constituents that cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur.

12.0 Selected Remedies

This ROD presents the selected final remedial actions for the Hanford site 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs, 100 Area, Benton County, Washington. The remedies were selected, in accordance with CERCLA, as amended by SARA, and to the extent practicable, the NCP. This decision is based on the information contained in the Administrative Records for each of the OUs, which includes the public comments on the Proposed Plan for these OUs. The following subsections provide a summary of the rationale for the selected remedy, the description of the selected remedy, the summary of estimated remedy costs, and expected outcomes of the selected remedy.

12.1 Summary of the Rationale for the Selected Remedy

The selected remedies are protective of human health and the environment and achieve substantial risk reduction through RTD of waste sites and MNA of groundwater and by preventing exposure to contamination that would pose unacceptable risk through imposition of ICs until cleanup levels are met.

Alternative S-2 was the only soil alternative evaluated that is protective of human health and the environment, which is a statutory requirement for remedy selection. It performs well against the balancing criteria and has demonstrated effectiveness for waste site remediation under interim actions.

Alternative GW-2 achieves risk reduction through a combination of MNA and ICs. The timeframe to achieve cleanup levels ranges from 20 years (Cr[VI]) to 150 years (strontium-90). Alternative GW-3 uses pump-and-treat (ex situ treatment) in combination with enhanced in situ treatment to transform nitrate, Cr(VI), and TCE to less toxic compounds in timeframes that are much shorter than Alternative GW-2; however, GW-3 relies on MNA to address the low concentration portion of the nitrate plume and to address strontium-90 at timeframes that are equal to GW-2 (150 years). Alternative GW-4 reduces Cr(VI), TCE, and nitrate concentrations through expanded pump-and-treat with timeframes that are similar to GW-3 and shorter than GW-2 for these COCs. The expanded system uses additional groundwater extraction wells to accelerate cleanup of the low concentration portion of the nitrate plume. However, GW-4 also relies on MNA to address residual strontium-90 following cessation of pump-and-treat in a timeframe that is the same as GW-2 and GW-3 (150 years).

Although Alternatives GW-3 and GW-4 achieve cleanup levels sooner for Cr(VI), nitrate, and TCE, the time frames for each of these three groundwater alternatives to achieve the cleanup level for strontium-90 are similar. Alternative GW-2 has a lower potential for adverse impact to the community, workers, or the environment because there is less construction-related activity in comparison to Alternatives GW-3 and GW-4. The cost for the alternatives from lowest to highest are GW-2, GW-3 and GW-4. For implementability Alternative GW-2 performs the best. Alternative GW-4 performs best for reduction of toxicity, mobility, or volume (TMV) by treatment since it captures all of the nitrate plume.

Alternative GW-4 performs best regarding community acceptance given the preference for treatment rather than MNA expressed by many of the commenters (although MNA is a component of all three groundwater remedies). For Alternatives S-2 many commenters preferred RTD of the 15 waste sites with deep contamination instead of relying on long term ICs.

The selected remedies meet the threshold criteria and provide the best balance of tradeoffs among the other alternatives with respect to the balancing and modifying criteria. The selected remedy satisfies CERCLA § 121(b) to: (1) be protective of human health and the environment; (2) comply with ARARs (or justify a waiver); (3) be cost-effective; (4) use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable; and (5) satisfy the preference for treatment as a principal element.

12.2 Detailed Description of the Selected Remedies

The selected remedies may change somewhat as a result of the remedial design and construction process. Any changes to the remedies described in the ROD will be documented using a technical memorandum in the administrative records, an Explanation of Significant Differences, or a ROD amendment, as appropriate.

12.2.1 RTD at Waste Sites for 100-IU-2 and 100-IU-6

RTD of 91 waste sites identified in Table 1 to achieve RAOs and cleanup levels as follows: (a) RTD the soil and debris with COCs exceeding cleanup levels identified in Table 5 above as deep as 4.6 m (15 ft) bgs to protect human health and ecological receptors from direct exposure to contaminants, (b) RTD the soil and debris below 4.6 m (15 ft) bgs with COCs exceeding cleanup levels in Table 6 for groundwater and river protection and (c) the excavated waste sites will be backfilled and recontoured, after which native vegetation will be planted, and established. Contaminated soil and debris with concentrations above the cleanup levels will be excavated from the waste sites using shallow and deep excavation

technology, treated as necessary to meet applicable land disposal restriction and disposal facility requirements and sent to ERDF, which is considered onsite, or another facility approved by EPA.

12.2.2 MNA for 100-FR-3

MNA will be used for all COCs in 100-FR-3 to reduce groundwater concentrations to concentrations less than the cleanup levels shown in Table 7. Overall plume behavior is controlled by a combination of the source strength (flux of contaminants into the groundwater) and the rate and capacity of attenuation in the groundwater. Without a continuing source, the net plume response will be to diminish over time. The primary natural attenuation processes for COCs present in 100-FR-3 include biodegradation and abiotic degradation, radioactive decay, dispersion, volatilization, and sorption. The required performance monitoring component includes installation of new wells, periodic sampling, laboratory analysis, and data evaluation needed to assess and confirm the natural attenuation processes, rates of attenuation, and overall protectiveness. The monitoring will continue until cleanup levels are achieved.

12.2.3 Institutional Controls Component Common to All OUs

ICs are required before, during and after the active phase of remedial action implementation where ICs are needed to protect human health and the environment. ICs are used to control access to residual contamination in soil and groundwater above standards for unlimited use and unrestricted exposure. DOE shall be responsible for implementing, maintaining, reporting on and enforcing ICs. Although the DOE may later transfer these procedural responsibilities to another party by contract, property transfer agreement or through other means, the DOE shall retain ultimate responsibility for remedy integrity and ICs. In the event that land is transferred out of federal ownership, deed restrictions (proprietary controls such as easements and covenants) are required that are legally enforceable against subsequent property owners.

The current implementation, maintenance and periodic inspection requirements for ICs at the Hanford Site are described in approved work plans, including the Sitewide Institutional Controls Plan (DOE/RL-2001-41) that was prepared by DOE and approved by EPA and the Washington State Department of Ecology (Ecology) in 2002. No later than 180 days after the ROD is signed, DOE shall update the Sitewide Institutional Controls Plan to include the ICs required by this ROD and specify the implementation and maintenance actions that will be taken, including periodic inspections. The revised Sitewide Institutional Controls Plan shall be submitted to EPA and Ecology for review and approval as a Tri-Party Agreement primary document. The DOE shall comply with the Sitewide Institutional Controls Plan as updated and approved by EPA and Ecology.

The following institutional control performance objectives are required to be met as part of this remedial action. Land-use controls will be maintained until cleanup levels are achieved and the concentrations of hazardous substances are at such levels to allow for unlimited use and unrestricted exposure and EPA authorizes the removal of restrictions. ICs to be implemented by DOE to support achievement of the RAOs include the following:

- In the event that land is transferred out of federal ownership, deed restrictions (proprietary controls such as easements and covenants) are required that are legally enforceable against subsequent property owners.
- In the event of any unauthorized access (e.g. trespassing), DOE shall report such incidents to the Benton County Sheriff's Office for investigation and evaluation of possible prosecution.
- Activities that would disrupt or lessen the performance of any component of the remedies are prohibited.
- Signage and access control to waste sites with contamination above cleanup levels will be provided.

- Maintain the integrity of any current or future remedial or monitoring system such as monitoring wells.
- Prohibit the development and use of property for residential housing, elementary and secondary schools, child care facilities and playgrounds until cleanup levels are met.
- DOE shall employ and maintain an excavation permit program for protection of human health against unacceptable exposure, and protection of environmental and cultural resources.
- The DOE shall report on the effectiveness of ICs for all OUs that are the subject of this ROD in an annual report, or on an alternative reporting frequency specified by the lead regulatory agency. Such reporting may be for OUs individually or may be part of the Hanford Sitewide ICs report.

Measures that are necessary to ensure continuation of ICs shall be taken before any lease or transfer of any land subject to ICs. DOE will provide notice to Ecology and EPA at least 6 months before any transfer or sale of land subject to ICs so that the lead regulatory agency can be involved in discussions to ensure that appropriate provisions are included in the transfer terms or conveyance documents to maintain effective ICs. If it is not possible for DOE to notify Ecology and EPA at least 6 months before any transfer or sale, DOE will notify Ecology and EPA as soon as possible, but no later than 60 days before the transfer or sale of any property subject to ICs. In addition to the land transfer notice and discussion provisions, DOE further agrees to provide Ecology and EPA with similar notice, within the same time frames, as to federal-to-federal transfer of property. DOE shall provide a copy of the executed deed or transfer assembly to Ecology and EPA. DOE shall notify EPA and Ecology immediately upon discovery of any activity inconsistent with the specific ICs.

12.2.4 Institutional Controls Component Unique to 100-FR-1 and 100-FR-2

The following institutional control performance objectives are required to be met as part of this remedial action for 100-FR-1 and 100-FR-2 OUs. Land-use controls will be maintained until cleanup levels are achieved and the concentrations of hazardous substances are at such levels to allow for unlimited use and unrestricted exposure and EPA authorizes the removal of restrictions. ICs to be implemented by DOE to support achievement of the RAOs include the following:

- Exposure to contamination deeper than 4.6 m (15 ft) bgs is not anticipated. Where contamination at depth exceeds the residential use cleanup levels, ICs are required to ensure future activities do not bring this contamination to the surface or otherwise result in exposure to contaminant concentrations that exceed the cleanup levels.
- Prohibit irrigation over or near waste site 116-F-14 that represents an unacceptable surface water protection risk.

12.2.5 Institutional Controls Component Unique to 100-FR-3

The following institutional control performance objectives are required to be met as part of this remedial action for 100-FR-3. Land-use controls will be maintained until cleanup levels are achieved and the concentrations of hazardous substances are at such levels to allow for unlimited use and unrestricted exposure and EPA authorizes the removal of restrictions. ICs to be implemented by DOE to support achievement of the RAOs include the following:

- DOE shall employ and maintain an excavation permit program limiting 100-FR-3 groundwater access and use to research purposes and for monitoring and treatment in areas where groundwater is above cleanup levels (see Figure 8).
- Prevent access or use of the groundwater for drinking water purposes until cleanup levels are met.

12.2.6 Land Use Control Boundary

For federal facility RODs, EPA requires the inclusion of a land use control boundary map. The land use control boundary for the 100-IU-2 and 100-IU-6 OUs are shown in Figure 6. The land use control boundary for the 100-FR-1 and 100-FR-2 OUs are shown in Figure 7 and the land use control boundary for 100-FR-3 is shown in Figure 8.

Figure 6. 100-IU-2 and 100-IU-6 OU IC Boundary

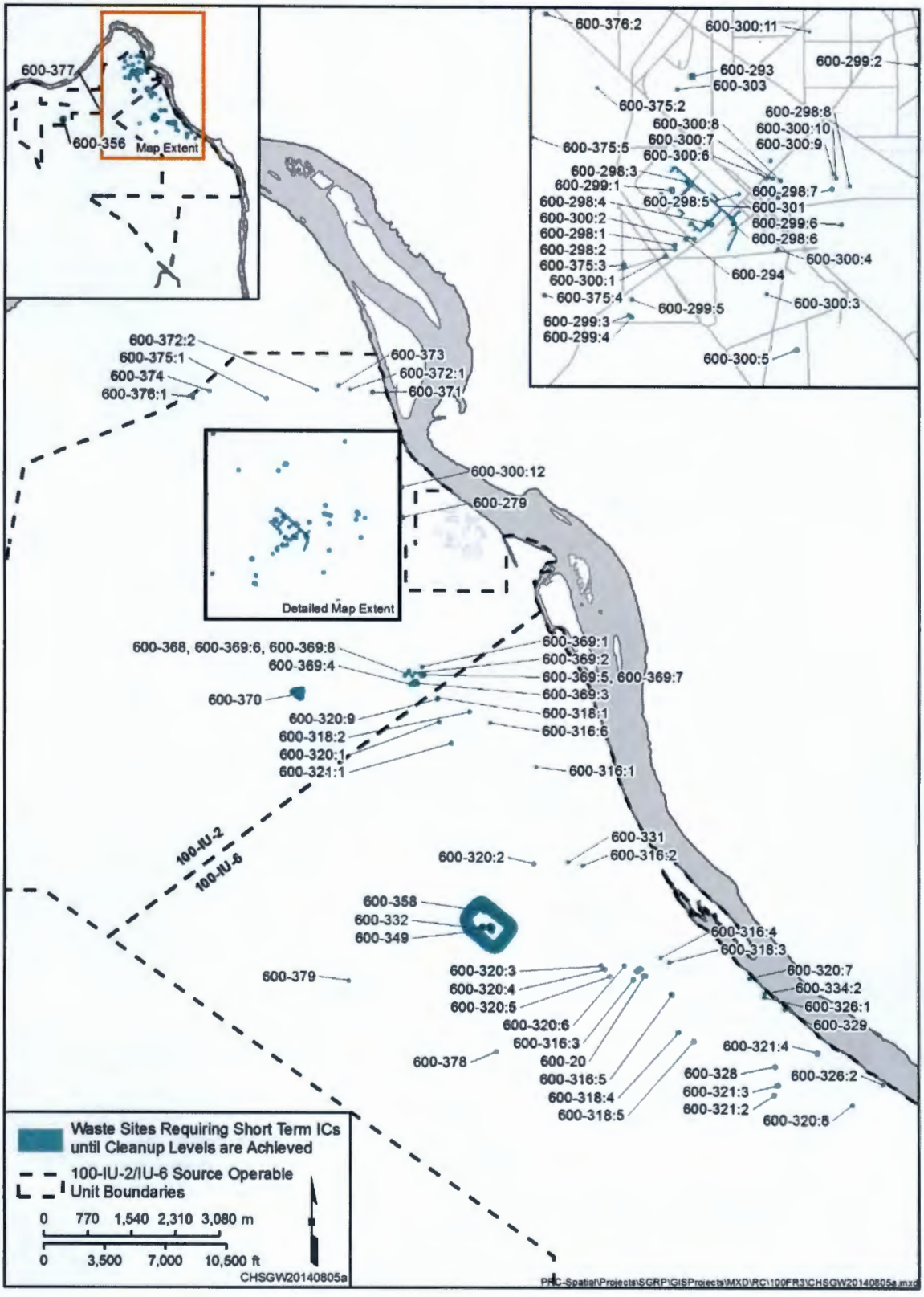


Figure 7. 100-FR-1 and 100-FR-2 OU IC Boundary

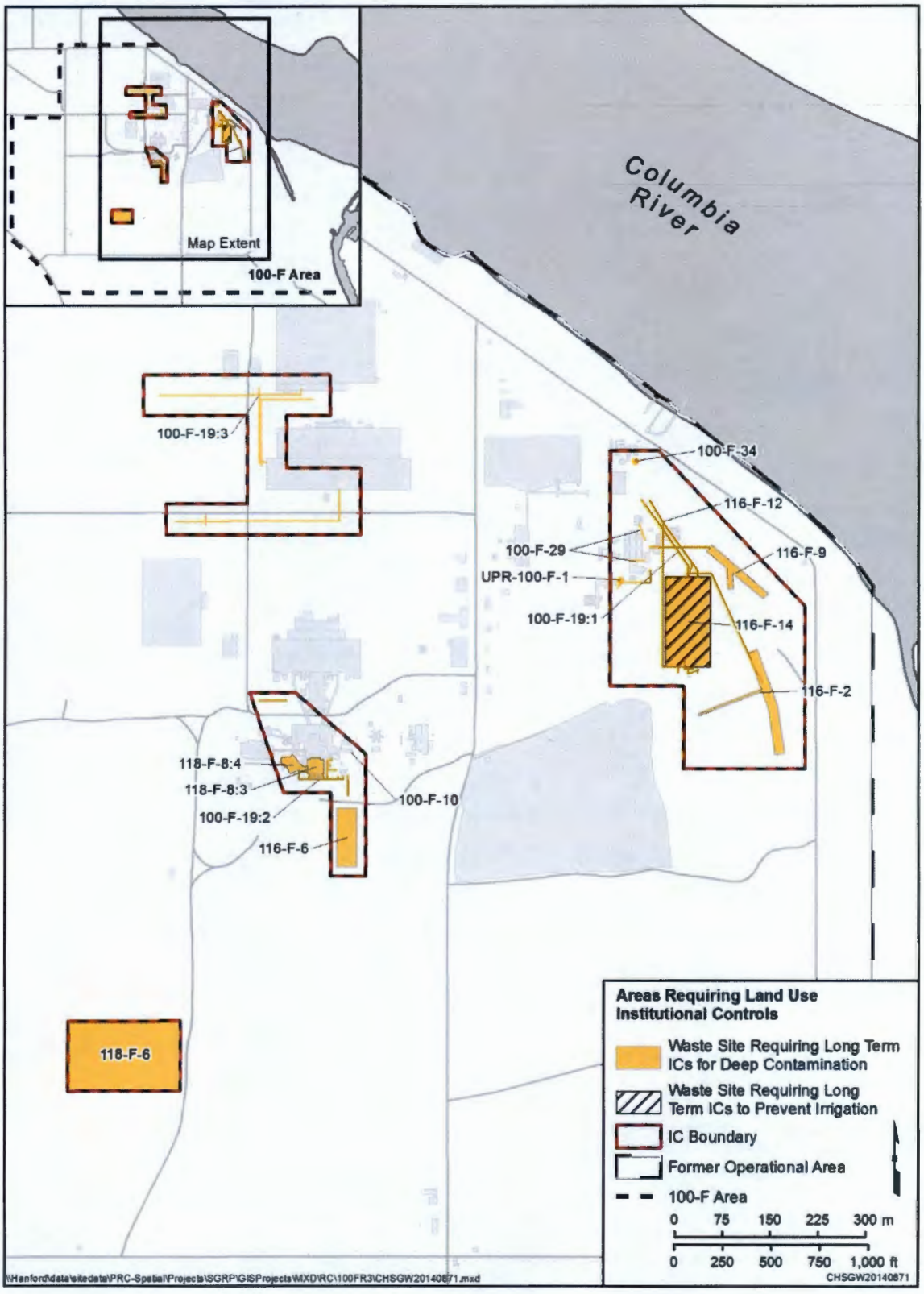
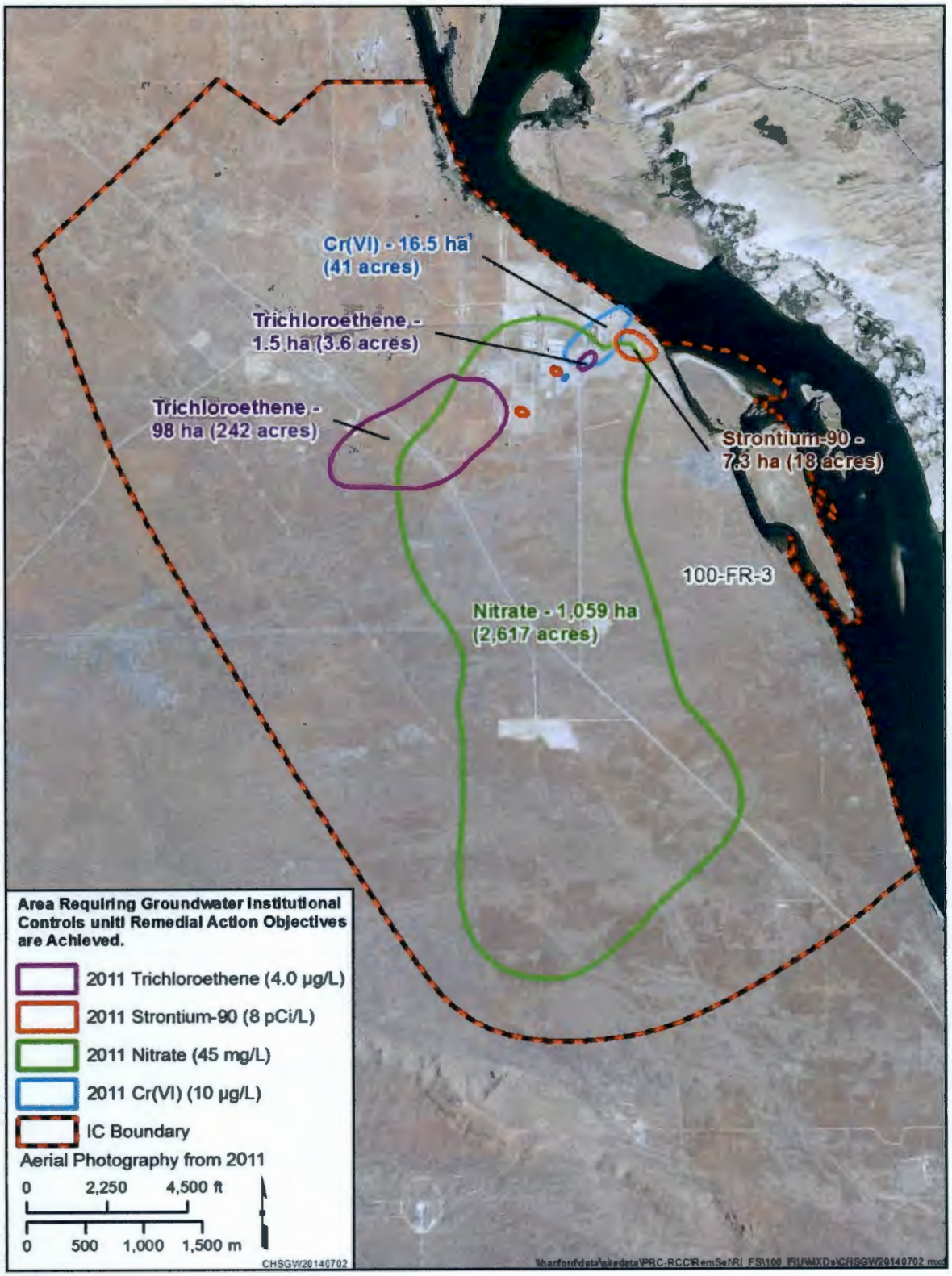


Figure 8. 100-FR-3 OU IC Boundary



12.2.9 Groundwater Performance Monitoring for 100-FR-3

Groundwater performance monitoring will be integrated into the sampling and analysis portion of the RD/RAWP. Sampling will be sufficient to document changes in contaminant plumes for all groundwater COCs. As part of monitoring the lateral extent of plumes, groundwater will be monitored in the near vicinity of the Columbia River throughout 100-FR-3 to ensure lateral extent of the plumes are defined. Monitoring will continue until COCs have attained the cleanup levels and are expected to continue to meet cleanup levels and EPA approves termination of the monitoring. Considered in the evaluation will be processes that can affect concentrations such as river fluctuations, waste site activities and land use activities. Groundwater monitoring will be performed to evaluate the effectiveness of the selected 100-FR-3 remedy to achieve cleanup levels. The monitoring will be for groundwater COCs (Cr[VI], nitrate, TCE and strontium-90).

12.2.10 Transition from Interim to Final Action for 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6

In-progress interim action shall use the cleanup levels in this ROD immediately upon issuance of this ROD. All other aspects of the interim actions shall continue to be performed in accord with the existing RD/RAWP. DOE shall develop, and submit for EPA approval, a new RD/RAWP prepared in accordance with the Tri-Party Agreement. When the new RD/RAWP is approved, that document will direct future remedial actions and will replace all interim action ROD work plan requirements.

12.3 Summary of the Estimated Remedy Costs

The summary of costs for the selected remedy is shown in Table 11. The net present worth value (discounted) represents the dollars that would need to be set aside today, at the defined interest rate, to ensure that funds would be available in the future, as they are needed to implement the remedial action alternative. Net present worth costs were estimated using the real discount rate published in Appendix C of "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs" (OMB Circular No. A-94, 2012). The costs for maintaining programmatic ICs and 5-year reviews are included with the cost estimates. Programmatic ICs costs were allocated between CERCLA and non-CERCLA site activities. At the time of the cost estimate there were 22 CERCLA RODs, so each ROD was allocated an equal portion of the CERCLA programmatic ICs costs. The total non-discounted cost for the ICs for 150 years is estimated to be $26,000,000 for each ROD. The total discounted cost for the ICs at Hanford, is estimated at $10,000,000 for each ROD. The total non-discounted cost for the 5-year reviews for 150 years is estimated to be $630,000 per ROD. The total discounted cost for the 5-year reviews for 150 years is estimated to be $190,000 per ROD. Costs estimates are within +50 to -30 percent accuracy expectation.

Table 11. Cost for Selected Remedies

Costs Summary		
Waste Site Remediation	Capital	$9,630,000
	Annual O&M	$26,640,000
	Periodic	$1,118,000
	Nondiscounted Total	$37,388,000
	Net Present Value (Discounted)	$20,579,000
Groundwater	Capital	$4,930,000
	Annual O&M	$30,636,000
	Periodic	$24,073,000
	Nondiscounted Total	$59,639,000
	Net Present Value (Discounted)	$36,261,000
Total	Capital	$14,560,000
	Annual O&M	$57,276,000
	Periodic	$25,191,000
	Nondiscounted Total	$97,027,000
	Net Present Value (Discounted)	$56,840,000

O&M = Operations and Maintenance
Costs for ICs are included in the costs for waste site remediation.
Periodic costs include additional O&M and/or construction activities, including costs to replace an installed remedy or components of an installed remedy, and services that are not included in initial capital costs or annual O&M costs. Periodic costs may be one-time costs or costs that occur at intervals over the life of the remedy.

12.4 Expected Outcomes of the Selected Remedies

Final cleanup levels and the basis for the cleanup levels are provided above in Table 5, Table 6 and Table 7. Waste site cleanup in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs when completed will support residential land use. As indicated in Table 1, if contamination below 4.6 m (15 ft) bgs exceeds the direct contact surface cleanup level for that area, land use will be limited to prevent direct exposure to the deep contamination in accord with the ICs. Waste site cleanup identified for RTD in Table 1 is expected to be completed in the next 3 to 5 years. Remediated waste sites will not pose an unacceptable ecological risk. Groundwater use will be restricted where contamination is above cleanup levels to prevent use as drinking water. The groundwater Cr(VI) plume is expected to meet the cleanup levels in 35 years, the nitrate plume in 80 years, the TCE plume in 50 years and the strontium-90 plume in 150 years.

13.0 Statutory Determinations

Under CERCLA Section 121 and the NCP Section 300.430(f)(5)(ii), the remedy must be protective of human health and the environment, comply with ARARs (unless a statutory waiver is justified), are cost-effective, and use permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element, and a bias against offsite disposal of untreated wastes.

CERCLA Section 121(c) and the NCP Section 300.430(f)(4)(ii) requires review, at least every five years, to determine if adequate protection of human health and the environment is being maintained in those instances where remedial actions result in hazardous substances, pollutants, or contaminants remaining onsite above levels that allow for unlimited use and unrestricted exposure.

The preamble to the NCP states that when noncontiguous facilities are reasonably close to one another and wastes at these sites are compatible for a selected treatment or disposal approach, CERCLA Section 104(d)(4) allows the lead agency to treat these related facilities as one site for response purposes and, therefore, allows the lead agency to manage waste transferred between such noncontiguous facilities without having to obtain a permit. The 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs and ERDF are reasonably close to one another, and the wastes are compatible for the selected disposal approach. Therefore, these OUs and ERDF are considered to be a single site for response purposes.

The following subsections discuss how the selected remedies for these OUs meets the statutory requirements.

13.1 Protection of Human Health and the Environment

The selected remedies (Alternatives S-2 and GW-2) for remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 OUs will be protective of human health and the environment through removal of contaminated soils, MNA to achieve cleanup levels in groundwater, long-term groundwater performance monitoring and institutional controls. Cleanup levels are set at levels that reduce risk to the acceptable risk range and comply with ARARs. All waste that is removed will be treated as necessary to meet waste acceptance criteria for disposal. Some waste to be removed will be treated in-situ prior to removal where necessary to protect workers or to manage airborne emissions. ICs apply to prevent exposure to contamination in the soil and groundwater that exceeds levels protective of human health and the environment.

13.2 Compliance with ARARs

The NCP Section 300.430(f)(5)(ii)(B) and (C) require that a ROD describe the Federal and state ARARs that the selected remedy will attain and any ARARs the remedy will not meet, the waiver invoked, and the justification for any waivers. All Federal and state ARARs will be met upon completion of the selected remedies, and no ARARs are being waived.

The ARARs are the substantive provisions of any promulgated Federal environmental or more stringent state environmental or facility siting standards, requirements, criteria, or limitations that are determined to be legally applicable or relevant and appropriate for a CERCLA site or action. Applicable requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility siting laws that specifically address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance found at a CERCLA site (40 CFR § 300.5). Relevant and appropriate requirements are those cleanup standards, standards of control, and other substantive requirements, criteria, or limitations promulgated under Federal environmental or state environmental or facility siting laws that, while not legally "applicable" to circumstances at a particular CERCLA site, address problems or situations sufficiently similar to those encountered at the site that their use is well-suited (40 CFR § 300.5). A definitive list of the Federal and Washington State ARARS that are to be complied with by the selected remedy are provided in Table 12. Only the substantive requirements, standards, criteria or limitations must be met for on-site remedial action.

Table 12. Federal and Washington State ARARs for the Selected Remedies

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Groundwater			
***Safe Drinking Water Act of 1974* (Public Law 93-523, as amended; 42 USC 300f, et seq.); "National Primary Drinking Water Regulations" (40 CFR 141)**			
"Maximum Contaminant Levels for Organic Contaminants" (40 CFR 141.61) "Maximum Contaminant Level Goals for Organic Contaminants" (40 CFR 141.50(b))	Establishes MCLs and non-zero MCLGs for drinking water. The standards/goals are designed to protect human health from adverse effects of organic contaminants in the drinking water.	These levels regulate the concentrations of contaminants in public drinking water supplies and are considered relevant and appropriate for groundwater and for surface water used potentially for drinking water. Although 100-FR-3 groundwater is not currently used for drinking water, it is a potential drinking water source and discharges into the Columbia River, which is used for drinking water.	100-FR-3. To be met through MNA and source control measures.
"Maximum Contaminant Levels for Inorganic Contaminants" (40 CFR 141.62) "Maximum Contaminant Level Goals for Inorganic Contaminants" (40 CFR 141.51(b))	Establishes MCLs and nonzero MCLGs for drinking water. The standards/goals are designed to protect human health from adverse effects of inorganic contaminants in the drinking water.	These levels regulate the concentrations of contaminants in public drinking water supplies and are considered relevant and appropriate for groundwater and for surface water used potentially for drinking water. Although 100-FR-3 groundwater is not currently used for drinking water, it is a potential drinking water source and discharges into the Columbia River, which is used for drinking water.	100-FR-3. To be met through MNA and source control measures.
"Maximum Contaminant Levels for Radionuclides" (40 CFR 141.66)	Establishes MCLs for drinking water. The standards are designed to protect human health from the adverse effects of radionuclides in the drinking water.	These levels regulate the concentrations of contaminants in public drinking water supplies and are considered relevant and appropriate for groundwater and for surface water used potentially for drinking water. Although 100-FR-3 groundwater is not currently used for drinking water, it is a potential drinking water source and discharges into the Columbia River, which is used for drinking water.	100-FR-3. To be met through MNA and source control measures.
"Hazardous Waste Cleanup—Model Toxics Control Act" (RCW 70.105D, as amended); "Model Toxics Control Act—Cleanup" (WAC 173-340)			
"Potable Groundwater Defined" (WAC 173-340-720(2)) "Method B Cleanup Levels for Potable Ground Water" (WAC 173-340-720(4)(b)(i-iii)(A)&(B)) "Adjustments to Cleanup Levels" (WAC 173-340-720(7)) "Points of Compliance" (WAC 173-340-720(8)) "Compliance Monitoring" (WAC 173-340-720(9)(b-f))	Groundwater shall be classified as potable unless exclusion criteria are met. These groundwater cleanup requirements are ARARs where they are more stringent than federal MCL ARARs. Adjustments to CULs are made in accordance with WAC 173-340-720(7). Points of compliance are established throughout 100-FR-3. Groundwater sample analysis shall be conducted on unfiltered samples unless a filtered sample is shown to be more representative.	Groundwater in 100-FR-3 contains contaminants that require remediation. It is not currently used for drinking water but is a potential drinking water source. Groundwater discharges into the Columbia River, which is used for drinking water.	100-FR-3. The groundwater cleanup levels for chemicals are calculated using Method B equations (720-1 and 720-2) for non-carcinogens and carcinogens, respectively. The selected remedy will comply with the standards using MNA and source control measures, with the 100-FR-3 points of compliance being throughout the 100-FR-3 aquifer.
"Water Well Construction" (RCW 18.104, as amended); "Minimum Standards for Construction and Maintenance of Wells" (WAC 173-160)			
"How Shall Each Water Well Be Planned and Constructed?" (WAC 173-160-161)	Identifies well planning and construction requirements. Water wells must not be a conduit for contamination and be constructed to yield the necessary quantity of water.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by constructing water wells that meet these standards.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
"What Are the Requirements for Preserving the Natural Barriers to Ground Water Movement Between Aquifers?" (WAC 173-160-181)	Identifies the requirements for preserving natural barriers to groundwater movement between aquifers.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by constructing water wells that meet these standards.
"What Are the Minimum Standards for Resource Protection Wells and Geotechnical Soil Borings?" (WAC 173-160-400)	Identifies the minimum standards for resource protection wells and geotechnical soil borings.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by building wells that meet these standards.
"What Are the General Construction Requirements for Resource Protection Wells?" (WAC 173-160-420)	Identifies the general construction requirements for resource protection wells.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by building wells that meet these standards.
"What Are the Minimum Casing Standards?" (WAC 173-160-430)	Identifies the minimum casing standards.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by building wells that meet these standards.
"What Are the Equipment Cleaning Standards?" (WAC 173-160-440)	Identifies the equipment cleaning standards for construction and maintenance of wells.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by building wells that meet these standards.
"What Are the Well Sealing Requirements?" (WAC 173-160-450)	Identifies the well sealing requirements for resource protection wells.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by building wells that meet these standards.
"What Is the Decommissioning Process for Resource Protection Wells?" (WAC 173-160-460)	Identifies the decommissioning process for resource protection wells.	Wells are used to monitor groundwater.	100-FR-3. The selected remedy will comply by decommissioning wells and borings to meet these standards.
Surface Water			
***Clean Water Act of 1972* (Public Law 107-303, as amended; 33 USC 1251, et seq.), Section 303c; "Water Quality Standards" (40 CFR 131)**			
"Toxics Criteria for Those States Not Complying with Clean Water Act" (40 CFR 131.36(b)(1) as applied to Washington, 40 CFR 131.36(d)(14))	Establishes numeric water quality criteria for priority toxic pollutants for the protection of human health and aquatic organisms which supersede criteria adopted by the state, except where the state criteria are more stringent than the federal criteria.	Groundwater from 100-FR-3 that discharges into the Columbia River contains priority toxic pollutants that require remediation to meet toxics criteria standards.	100-FR-3. These standards apply where groundwater discharges to the river. The selected remedy will comply through MNA, infiltration control and source control measures.
"Water Pollution Control" (RCW 90.48, as amended); "Water Quality Standards for Surface Waters of the State of Washington" (WAC 173-201A)			
"Toxic Substances" (WAC 173-201A-240(3))	Establishes chemical water quality standards for surface waters of the State of Washington for protection of aquatic life.	Groundwater in 100-FR-3 contains contaminants that require remediation and discharges into the Columbia River.	100-FR-3. These standards apply where groundwater discharges to the river. The selected remedy will comply through MNA control and source control measures
"Toxic Substances" (WAC 173-201A-240(6))	Establishes water quality standards for surface waters of the State of Washington. Risk-based criteria for carcinogenic substances shall be selected such that the upper-bound excess cancer risk is less than 1×10^{-6} for individual contaminants.	Contaminated groundwater that requires remediation to protect drinking water uses discharges to the Columbia River. Surface water is not contaminated by 100-FR-3 discharges in excess of this standard.	100-FR-3. Columbia River surface waters of the State currently comply with this standard for discharges from 100-FR-3. The selected remedy will further reduce 100-FR-3 discharges and comply with this standard.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Soil and Vadose Zone			
"Hazardous Waste Cleanup—Model Toxics Control Act" (RCW 70.105D, as amended); "Model Toxics Control Act—Cleanup" (WAC 173-340)			
"Unrestricted Land Use Soil Cleanup Standards" (WAC 173-340-740(3)) Unrestricted Land Use Soil Cleanup Standards, Adjustments to Cleanup Levels" (WAC 173-340-740(5)) Unrestricted Land Use Soil Cleanup Standards, Point of Compliance" (WAC 173-340-740(6)) "Unrestricted Land Use Soil Cleanup Standards, Compliance Monitoring" (WAC 173-340-740(7))	Requires that soil cleanup levels result in no significant adverse effects on terrestrial ecological receptors. Requires human health protection from both groundwater contaminated due to leaching and direct soil contact. Total excess cancer risk may not exceed $1x10^{-5}$ or a non-cancer hazard index of 1 for chemical contaminants. Soil points of compliance are throughout the site. Soil cleanup levels apply to the less than 2mm size fraction of dry samples, or also larger size fractions if they could be crushed.	Soil in 100-IU-2 and 100-IU-6 contains contaminants that require remediation to meet Method B soil cleanup levels calculated based on an unrestricted land use.	100-IU-2 and 100-IU-6. The selected remedy will comply through RTD of contaminants that exceed the standards. Table 5 includes soil cleanup levels to protect direct exposure that meet the risk and hazard requirements. Table 6 includes soil cleanup levels for the protection of groundwater and surface water due to leaching from soil contamination.
"Deriving Soil Concentrations for Groundwater Protection" (WAC 173-340-747(3) through (8))	Establishes soil concentrations that will not cause contamination of groundwater at levels that exceed the groundwater cleanup levels established under "Groundwater Cleanup Standards" (WAC 173-340-720).	Soil in 100-IU-2 and 100-IU-6 contains contaminants that require remediation to ensure protection of groundwater. Although 100-FR-3 groundwater is not currently used for drinking water, it is a potential drinking water source Groundwater discharges into the Columbia River, which is used for drinking water.	100-IU-2 and 100-IU-6. The selected remedy will comply through RTD of contaminants that exceed the standards. Table 6 includes soil cleanup levels to protect groundwater and surface water due to leaching from soil contamination.
Air			
"Washington Clean Air Act" (Chapter 70.94 RCW, as amended); "General Regulations for Air Pollution Sources" (WAC 173-400)			
"General Standards for Maximum Emissions" (WAC 173-400-040)	All sources and emission units are required to meet the general emission standards unless a specific source standard is available. General standards apply to visible emissions, particulate fallout, fugitive emissions, odors, emissions detrimental to health and property, sulfur dioxide, and fugitive dust.	Soil remedial action at 100-IU-2 and 100-IU-6 provides the potential for emissions subject to these standards because selected remedial action could result in emissions of regulated hazardous air pollutants.	100-IU-2 and 100-IU-6. Remedial actions that have the potential to release hazardous air emissions will meet standards.
"Emission Standards for Sources Emitting Hazardous Air Pollutants" (WAC 173-400-075)	Establishes emission standards for hazardous air pollutants. Adopts, by reference, "National Emission Standards for Hazardous Air Pollutants" (NESHAP [40 CFR 61]) and appendices.	100-IU-2 and 100-IU-6 OUs contain hazardous pollutants that could become airborne.	100-IU-2 and 100-IU-6. Remedial actions will be designed and performed in compliance with the standards.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
"Washington Clean Air Act" (Chapter 70.94 RCW, as amended); "Controls for New Sources of Toxic Air Pollutants" (WAC 173-460)			
"Control Technology Requirements" (WAC 173-460-060) "Ambient Impact Requirement" (WAC 173-460-070) "Table of ASIL, SQER and de Minimis Emission Values" (WAC 173-460-150)	Shall not establish, operate or cause to be established or operated any new or modified toxic air pollutant source which is likely to increase TAP emissions without installing and operating BACT. Non-process fugitive emissions activities are exempt for the requirement to apply BACT. Requires compliance with the limits air pollutants include carcinogens and noncarcinogens listed in "Table of ASIL, SQER and de Minimis Emission Values" (WAC 173-460-150).	Hazardous contaminants detected in soil and/or 100-FR-3 groundwater include constituents that would constitute toxic air pollutants if released to the air.	100-FR-3, 100-IU-2 and 100-IU-6. Remediation activities with the potential to emit hazardous air emissions identified in this standard will comply.
"Washington Clean Air Act" (Chapter 70.94 RCW, as amended); "Ambient Air Quality Standards and Emission Limits for Radionuclides" (WAC 173-480)			
"Ambient Standard" (WAC 173-480-040)	Requires that emissions of radionuclides in the air shall not cause a maximum effective dose equivalent of more than 10 mrem/year to the whole body to any member of the public. Per "Applicability" (WAC 173-480-020), the ambient standard applies to the entire state. Measurements may be made at all points up to property lines of point, area and fugitive emission sources.	Hazardous contaminants detected in soil and 100-FR-3 groundwater contains radionuclides that could be emitted to ambient air during remedial actions.	100-FR-3, 100-IU-2 and 100-IU-6. Remediation activities (e.g., RTD) that have the potential to emit radionuclides above maximum acceptable levels will be controlled to meet standards.
"General Standards for Maximum Permissible Emissions" (WAC 173-480-050(1))	At a minimum, all emission units shall make every reasonable effort to maintain radioactive materials in effluents to unrestricted areas ALARA; control equipment at sites operating under ALARA shall be defined as reasonably available control technology and as low as reasonably achievable control technology.	The potential for fugitive and diffuse emissions because of excavation and related activities will require efforts to minimize those emissions.	100-IU-2 and 100-IU-6. Remediation activities (e.g., RTD) that have the potential to emit radionuclides to residential areas will meet standards.
"Emission Monitoring and Compliance Procedures" (WAC 173-480-070(2))	Compliance is determined by calculating the dose to members of the public at the point of maximum annual air concentration in an unrestricted area where any member of the public may be located.	Hazardous contaminants detected in soil in 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 include radionuclides that could be emitted to unrestricted areas during remedial actions.	100-IU-2 and 100-IU-6. Remediation activities (e.g., RTD) that have the potential to emit radionuclides to unrestricted areas will meet standards.
"Emission Standards for New and Modified Emission Units" (WAC 173-480-060)	Requires that construction, installation, or establishment of new air emission control units use best available radionuclide control technology.	Hazardous contaminants detected in soil in 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 includes radionuclides that could be emitted from air emission control units during remedial actions.	100-IU-2 and 100-IU-6. Remediation activities (e.g., RTD) that require air pollution control measures and/or equipment and have the potential to emit radionuclides to the ambient air will meet standards.
"Nuclear Energy and Radiation" (RCW 70.98, as amended); "Radiation Protection—Air Emissions" (WAC 246-247)			
"National Standards Adopted by Reference for Sources of Radionuclide Emissions" (WAC 246-247-035(1)(a)(i)) (adopts by reference, "Prohibited Activities"[40 CFR 61.05])	Identifies prohibition on any owner or operator of any stationary source subject to a national emission standard for hazardous air pollutants from constructing or operating the new or existing source in violation of any such standard.	Remedial actions in 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 have the potential to emit hazardous air pollutants.	100-IU-2 and 100-IU-6. Remedial actions that require air pollution control measures and/or equipment and have the potential to emit radionuclides to the ambient air will meet this standard.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
"National Standards Adopted by Reference for Sources of Radionuclide Emissions" (WAC 246-247-035(1)(a)(i) and (ii) Adopts by reference "General Provisions" 40 CFR 61Subpart A, "Radionuclides other than Radon" 40 CFR 61 Subpart H,	Requires the owner or operator of each stationary source of hazardous air pollutants subject to a national emission standard for a hazardous air pollutant to determine compliance with numerical emission limits in accordance with emission tests established in NESHAP "Emission Tests and Waiver of Emission Tests" (40 CFR 61.13) or as otherwise specified in an individual subpart. Compliance with design, equipment, work practice, or operational standards shall be determined as specified in the individual subpart. Also, maintain and operate the source, including associated equipment for air pollution control, in a manner consistent with good air pollution control practice for minimizing emissions.	Remedial actions in 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 have the potential to emit hazardous air pollutants.	100-IU-2 and 100-IU-6. Remedial actions involve stationary sources that provide a potential to emit regulated hazardous air pollutants (e.g., decontamination stations, or waste removal or storage activities). Associated design, equipment, work practice and/or air emissions controls will be maintained and operated to meet these standards.
"Radiation Protection, Air Emissions, General Standards" (WAC 246-247-040(3) and (4))	Requires that ALARA-based control technology Best Available Controls be used to control emissions depending on whether there is new construction or there is an existing emission unit, and whether there is a significant modification of an emission unit.	Hazardous contaminants that would be subject to radionuclide air emission standards and resultant requirements have the potential to be detected in, and emitted from, structures, components, debris, soil, and remediation equipment during remedial actions.	100-IU-2 and 100-IU-6. Remedial actions will use BARCT or ALARACT to meet this standard.
"Monitoring, Testing and Quality Assurance" (WAC 246-247-075)	Establishes the substantive monitoring, testing, and quality assurance requirements for radioactive air emissions. Emissions from nonpoint and fugitive sources of airborne radioactive material will be measured.	Hazardous contaminants that would be subject to radionuclide air emission standards and resultant requirements have the potential to be detected in and emitted from, structures, debris, soil, and remediation equipment during remedial actions.	100-IU-2 and 100-IU-6. Monitoring, testing and quality assurance requirements will be defined and followed to meet this standard.
***Clean Air Act of 1990* and amendments; "National Emission Standard for Asbestos" (40 CFR 61, Subpart M),**			
"Applicability" (40 CFR 61.140) "Standard for Demolition and Renovation" (40 CFR 61.145)	Defines regulated ACM and regulated removal and handling requirements. Includes substantive sampling, inspection, handling, and disposal requirements for regulated sources having the potential to emit asbestos. Specifically, no visible emissions are allowed during handling, packaging, and transport of ACM.	Encountering ACM on pipelines or buried asbestos within the 100-FR-1, 100-FR-2, 100-IU-2 and 100-IU-6 is possible during remediation activities.	100-IU-2 and 100-IU-6. Site investigation, remediation activities and associated handling, packaging, transportation and disposal of ACM will meet standards.
Standard for Waste Disposal for Manufacturing, Fabricating, Demolition, Renovation, and Spraying Operations (40 CFR 61.150)	Includes substantive requirements for the removal and disposal of asbestos from demolition and renovation activities.	Pipelines, other debris and soil contain ACM.	100-IU-2 and 100-IU-6. Site remediation activities and associated handling, packaging, transportation and disposal of ACM will meet standards.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Solid Wastes			
***Toxic Substances Control Act of 1976* (Public Law 107-377, as amended; 15 USC Section 2605, et seq.); "Polychlorinated Biphenyls (PCBs) Manufacturing, Processing, Distribution in Commerce, and Use Prohibitions" (40 CFR 761)**			
"Applicability," "PCB Waste" (40 CFR 761.50(b)1, 2, 3, and 7) "Applicability," "Storage for Disposal" (40 CFR 761.50(c))	Establishes substantive PCB requirements for the storage and disposal of PCB wastes including liquid PCB wastes, PCB items, PCB remediation waste, PCB bulk product wastes, and PCB/radioactive wastes at concentrations greater than 50 ppm.	Remediation is expected to generate PCB and PCB/radioactive waste.	100-IU-2 and 100-IU-6. Management and disposal of remediation waste with PCBs will meet standards.
"Disposal Requirements," "PCB Liquids" (40 CFR 761.60(a)) "Disposal Requirements," "PCB Articles" (40 CFR 761.60(b)) "Disposal Requirements," "PCB Containers" (40 CFR 761.60(c))	Establishes substantive requirements applicable to the handling and disposal of PCB liquids, PCB articles, and PCB containers.	PCB liquids, articles, and/or containers may be encountered and/or generated during the remedial actions for 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Standards will be met for PCB liquids, articles and debris handling, storage and disposal.
"PCB Remediation Waste" (40 CFR 761.61)	Provides substantive cleanup and disposal options for PCB remediation waste based on the concentration at which the PCBs are found.	PCB remediation wastes may be encountered and/or generated during the remedial actions for 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Standards will be met for PCB remediation wastes
Solid Wastes			
"Standards for Owners and Operators of Hazardous Waste Treatment, Storage, and Disposal Facilities" (40 CFR 264)			
"Staging Piles" (40 CFR 264.554)	Establishes the substantive requirements for staging and accumulation of remediation waste during remedial operations.	Remediation wastes may be generated and accumulated during remedial actions at 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Standards will be met for remediation waste.
"Hazardous Waste Management" (RCW 70.105, as amended); "Dangerous Waste Regulations" (WAC 173-303)			
"Identifying Solid Waste" (WAC 173-303-016) "Recycling Processes Involving Solid Waste" (WAC 173-303-017)	Identifies those materials that are and are not solid wastes and identifies those materials that are and are not solid wastes when recycled.	Solid wastes will be generated during 100-IU-2 and 100-IU-6 remedial actions which will be subject to solid waste and dangerous waste designation requirements.	100-IU-2 and 100-IU-6. Standards will be met for remediation activities
"Designation of Dangerous Waste" (WAC 173-303-070)	Establishes the substantive method for determining if a solid waste is a dangerous waste (or an extremely hazardous waste).	Dangerous/hazardous waste will be generated during 100-IU-2 and 100-IU-6 remedial actions.	100-IU-2 and 100-IU-6. Standards will be met for remediation (including waste treatment) activities that generate wastes.
"Requirements for Universal Waste" (WAC 173-303-077)	Identifies certain batteries, mercury-containing equipment and lamps as exempt from regulation under WAC 173-303-140 and WAC 173-303-170 through 173-303-9906 (excluding WAC 173-303-960). These wastes are subject to regulation under WAC 173-303-573, "Land Disposal Restrictions" (WAC 173-303-140) and WAC 173-303-170 through 173-303-9907 (excluding WAC 173-303-960, "Special Powers and Authorities of the Department"). These wastes are subject to regulation under "Standards for Universal Waste Management" (WAC 173-303-573).	Waste sites in 100-IU-2 and 100-IU-6 contain universal wastes.	100-IU-2 and 100-IU-6. Remediation activities will meet standards for universal wastes.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
"Recycled, Reclaimed, and Recovered Wastes" (WAC 173-303-120) "Recycled, Reclaimed, and Recovered Wastes" (WAC 173-303-120(3)) "Recycled, Reclaimed, and Recovered Wastes" (WAC 173-303-120(5))	Defines the requirements for the recycling of materials that are solid and dangerous waste. Specifically, "Recycled, Reclaimed, and Recovered Wastes" (WAC 173-303-120[3]) provides for the management of certain recyclable materials, including spent refrigerants, antifreeze, and lead acid batteries. "Recycled, Reclaimed, and Recovered Wastes" (WAC 173-303-120[5]) provides for the recycling of used oil.	Wastes that can be recycled, reclaimed or recovered have the potential to be generated during 100-IU-2 and 100-IU-6 remedial actions.	100-IU-2 and 100-IU-6. Recycling of wastes subject to these requirements will be done in a manner that satisfies standards.
"Land Disposal Restrictions" (WAC 173-303-140)	Establishes treatment requirements and disposal prohibitions for land disposal of dangerous waste and incorporates by and the federal land disposal restrictions (40 CFR 268).	Remediation may generate waste subject to land disposal restrictions.	100-IU-2 and 100-IU-6. Wastes subject to these requirements will be treated as required and disposed in a manner that satisfies standards.
"Requirements for Generators of Dangerous Waste" (WAC 173-303-170)	Establishes the requirements for dangerous waste generators. "Requirements for Generators of Dangerous Waste" (WAC 173-303-170[3]) which includes the substantive provisions of "Accumulating Dangerous Waste On-Site" (WAC 173-303-200) by reference.	100-IU-2 and 100-IU-6 remedial actions may generate dangerous wastes.	100-IU-2 and 100-IU-6 remediation wastes (contaminated soil, personnel protective gear, treatment chemicals) may be dangerous waste, and will be managed in accord with these requirements.
"Accumulating Dangerous Waste On-Site" (WAC 173-303-200)	Establishes the requirements for accumulating wastes onsite. "Accumulating Dangerous Waste On-Site" (WAC 173-303-200) further includes certain substantive standards from "Use and Management of Containers (WAC 173-303-630) and "Tank Systems" (WAC 173-303-640) by reference.	100-IU-2 and 100-IU-6 remedial actions may generate dangerous wastes.	100-IU-2 and 100-IU-6 remediation wastes (contaminated soil, personnel protective gear, treatment chemicals) may be dangerous waste, and accumulations of such will be in accord with these requirements.
"Use and Management of Containers" (WAC 173-303-630)	Establishes requirements for dangerous waste facilities that store containers of dangerous waste.	Remedial actions may involve management of dangerous waste in containers that are subject to this standard.	100-IU-2 and 100-IU-6. Investigation and remedial actions that produce or manage containers of dangerous waste will be managed to meet standards.
"Corrective Action Dangerous Waste Regulation Requirements" (WAC 173-303-64620(4))	Requires corrective action to be "consistent with" specified sections of Model Toxics Control Act.	The substantive portions of this regulation establish minimum requirements for HWMA corrective action.	At 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
"Solid Waste Management—Reduction and Recycling" (RCW 70.95, as amended); "Solid Waste Handling Standards" (WAC 173-350)			
"Owner Responsibilities for Solid Waste (WAC 173-350-025) "Performance Standards" (WAC 173-350-040) "On-Site Storage, Collection and Transportation Standards" (WAC 173-350-300) "Remedial Action" (WAC 173-350-900)	Establishes minimum functional performance standards for the proper handling and disposal of solid waste, not otherwise excluded. Provides requirements for the proper handling of solid waste materials originating from residences, commercial, agricultural and industrial operations, and other sources, and identifies those functions necessary to ensure effective solid waste handling programs at both the state and local level.	Covered solid waste will be generated during implementation of remedial actions.	100-IU-2 and 100-IU-6. Remedial actions that generate covered solid waste will meet standards.
Historical and Archeological Resources			
***National Historic Preservation Act of 1966* (Public Law 89-665, as amended, 16 USC 470, et seq.)**			
"Protection of Historic Properties" (36 CFR 800)	Requires federal agencies to consider the impacts of their undertaking on cultural properties through identification and evaluation. Potential project adverse effects are to be avoided or mitigated. Need to take actions as necessary to minimize harm to any National Historic Landmarks	Cultural and historic sites have been identified within 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Historical and cultural reviews have been done to identify cultural and historic sites. Additional reviews will be done at remedial action areas where existing reviews are not sufficient. For any discoveries appropriate actions will be taken to meet standards.
***Protection and Enhancement of the Cultural Environment* (Executive Order 11593)**			
"National Historic Landmarks Program" (36 CFR 65)	These regulations set forth the criteria for establishing national significance. Requires that federal agencies shall, to the maximum extent possible, undertake such planning and actions as may be necessary to minimize harm to landmarks.	Cultural and historic sites have been identified within 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Remedial actions shall comply with this standard.
***Native American Graves Protection and Repatriation Act of 1990* (Public Law 101-601, as amended, 25 USC 3001, et seq.); "Native American Graves Protection and Repatriation Regulations" (43 CFR 10)**			
"Native American Graves Protection and Repatriation Regulations" (43 CFR 10)	Establishes federal agency responsibility for discovery, protection and appropriate disposition of human remains, associated and unassociated funerary objects, sacred objects, and items of cultural patrimony.	Native American archaeological, cultural, and historic sites have been identified within 100-IU-2 and 100-IU-6; Native American remains and associated objects have the potential to be present.	100-IU-2 and 100-IU-6. Remedial activities will be conducted to identify, protect and provide for appropriate disposition of covered human remains, objects and items. Native American Tribal consultation will be conducted in the event of discovery.
***Archeological and Historic Preservation Act of 1974* (Public Law 93-291, as amended; 16 USC 469a-1 through 469a-2(d))**			
"Applicant Requirements" 16 USC 469a-1 through 469a-2(d)	Requires that Federal projects do not cause the loss of archaeological or historic data. This act mandates preservation of the data; it does not require protection of the actual waste site or facility.	Archaeological and historic sites have been identified within, 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Remediation activities will prevent irreparable loss of significant scientific, prehistoric or archeological data, the data will be preserved.

Regulatory Citation	Description of Regulatory Requirement	Rationale for Including	Application
Natural and Ecological Resources			
***Endangered Species Act of 1973* (Public Law 93-205, as amended; 7 USC Section 136; 16 USC Ch. 1531, et seq.)**			
"Endangered Species Act of 1973", as Amended 16 U.S.C. §§ 1531-1544, specifically Sections 7 and 9(a). 50 CFR Part 17 (listings, prohibitions) 50 CFR Part 402 ,50 CFR Parts 222-224 (endangered and threatened marine species), 50 CFR 226.212 (critical habitat for Northwest salmon and steelhead)	Prohibits actions by federal agencies that are likely to jeopardize the continued existence of listed species or result in the destruction or adverse modification of habitat critical to them. Also prohibits the taking of any endangered species.	100-FR-3 groundwater discharges into the Hanford Reach of the Columbia River which contains the Upper Columbia River spring-run Chinook salmon and the steelhead which are endangered. The spring-run Chinook salmon do not spawn in the Hanford Reach but use it as a migration corridor. Steelhead spawning has been observed in the Hanford Reach. The bull trout is listed as a threatened species but is not considered a resident species and is rarely observed in the Hanford Reach.	100-FR-3. Remediation actions will be managed to avoid jeopardy and/or adversely affect a listed species or critical habitat.
***Migratory Bird Treaty Act of 1918* (16 USC 703-712; Ch. 128; July 13, 1918; 40 Stat. 755), as amended**			
Migratory Bird Treaty Act of 1918 (16 USC 703-712) 50 CFR Parts 10 and 21	Protects all migratory bird species and prevents "take" of protected migratory birds, their young, or their eggs." Federal agencies are required to avoid or minimize impacts to migratory bird resources, restore or enhance their habitat and prevent or abate its detrimental alteration.	Migratory birds utilize 100-IU-2 and 100-IU-6.	100-IU-2 and 100-IU-6. Remedial actions will require mitigation measures to deter nesting by migratory birds on, around or within remedial action site and methods to identify and protect occupied bird nests in a manner that complies with requirements.
"Powers and Duties," "Habitat Buffer Zone for Bald Eagles—Rules" (RCW 77.12.655); "Permanent Regulations," "Bald Eagle Protection Rules" (WAC 232-12-292)			
"Bald and Golden Eagle Protection Act" (16 USC § 668, 50 CFR Part 22)	Protects eagle habitat to maintain eagle populations so the species is not classified as threatened, endangered, or sensitive in Washington State.	Bald eagles nest, feed, and overwinter along the shores of the Columbia River.	100-IU-2 and 100-IU-6. Remedial actions will be performed in a way to protect bald eagle habitat.

ACM = asbestos-containing material
ALARA = as low as reasonably achievable
ALARACT = as low as reasonably achievable control technology
BACT (BARCT) = best available (radionuclide) control technology
CERCLA = *Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
COPC = contaminant of potential concern
EPA = U.S. Environmental Protection Agency
HHE = human health and the environment
HWMA = Hazardous Waste Management Act
MCL = maximum contaminant level
MCLG = maximum contaminant level goal
MNA = monitored natural attenuation
NRC = U.S. Nuclear Regulatory Commission
PCB = polychlorinated biphenyl
RTD = removal, treatment, and disposal

13.3 Cost Effectiveness

The selected remedies are cost-effective. In making this determination, the following definition was used: "A remedy shall be cost-effective if its costs are proportional to its overall effectiveness." (NCP

§300.430(f)(1)(ii)(D)). This was accomplished by evaluating the "overall effectiveness" of those alternatives that satisfied the threshold criteria (i.e., were both protective of human health and the environment and ARAR-compliant). Overall effectiveness was evaluated by assessing three of the five balancing criteria in combination (long-term effectiveness and permanence; reduction in toxicity, mobility and volume through treatment; and short-term effectiveness). Overall effectiveness was then compared to costs to determine cost-effectiveness. The relationship of the overall effectiveness of these remedial alternatives were determined to be proportional to their costs and hence these alternatives represent a reasonable value for the money to be spent.

The estimated present worth cost of the selected remedies is $57 million ($20 million for Alternative S-2 and $37 million for Alternative GW-2). The selected remedy for groundwater will provide an overall level of protection comparable to Alternatives GW-3 and GW- 4 at a significantly lower cost ($177 million and $193 million respectively). The additional cost for pump-and-treat of the groundwater plumes in Alternatives GW-3 and GW-4 do not provide a significant increase in protection of human health and the environment since both of these alternatives rely on MNA to address strontium-90 contamination with timeframes similar to the selected remedy for groundwater.

13.4 Use of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Practicable

This determination looks at whether the selected remedy provides the best balance of trade-offs among the alternatives with respect to the balancing criteria set forth in NCP §300.430(f)(1)(i)(B), such that it represents the maximum extent to which permanence and treatment can be practicably utilized. NCP §300.430(f)(1)(ii)(E) provides that the balancing shall emphasize the factors of "long-term effectiveness" and "reduction of toxicity, mobility or volume through treatment," and shall consider the preference for treatment and bias against offsite disposal or untreated waste. The modifying criteria were also considered in making this determination.

Contaminated soil resulting from waste sites using RTD will be treated to reduce toxicity and mobility when necessary to (a) protect workers and prevent unacceptable environmental releases during the remedial action and after disposal; and/or (b) meet applicable land disposal restrictions or the waste acceptance criteria of the disposal facility. Treatment may be in-situ or during excavation as needed to control worker exposure. RTD is a permanent solution that includes treatment for some of the waste.

MNA uses natural attenuation processes that permanently reduce COC concentrations over time. However, it is considered passive treatment rather than active treatment.

DOE and EPA have determined that the selected remedies represent the maximum extent to which permanent solutions and treatment technologies can be utilized in a practicable manner at the site. Of those alternatives that are protective of human health and the environment and comply with ARARs. DOE and EPA have determined that the selected remedies provide the best balance of trade-offs in terms of the five balancing criteria, while also considering the statutory preference for treatment as a principal element and bias against off-site treatment and disposal and considering State and community acceptance.

13.5 Preference for Treatment as a Principal Element

Principal threat waste is defined as source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained or would present a significant risk to human health or the environment should exposure occur. They include soils containing significant concentrations of highly toxic materials and surface or subsurface soils containing high concentrations of contaminants that are, or potentially are mobile due to wind entrainment, volatilization, surface runoff, or subsurface transport.

The NCP states that "EPA expects to use treatment to address the principal threats posed by a site, wherever practicable" (40 CFR § 300.430(a)(1)(iii)(A)). Principal threat wastes associated with these OUs, such as fuel fragments and concentrated liquid sodium dichromate, have been removed through earlier cleanup actions. No waste sites remain in the source OUs with principal threat waste.

The selected remedy for 100-IU-2 and 100-IU-6 requires treatment of RTD waste as necessary to meet applicable land disposal restrictions and the waste acceptance criteria of the disposal facility and as necessary to reduce air releases and worker exposure during excavation and waste management. The selected remedy for 100-FR-3 uses natural attenuation processes that permanently reduce COC concentrations over time. However, it is considered passive treatment rather than active treatment. The statutory preference for treatment as a principal element is only met in part and only for wastes that must be treated before they can be land disposed. However, no principal; threat waste remains and the selected remedies are protective of human health and the environment, satisfy ARARs and provide the best balance of trade-offs in terms of the five balancing criteria, while also considering State and community acceptance.

13.6 Five-Year Review Requirements

A review, in accordance with CERCLA Section 121 (c) and 40 CFR 300.430[f][4][ii], is required at a minimum every five years if a remedy is selected that results in hazardous substances, pollutants or contaminants remaining at the site above levels that allow for unrestricted use and unlimited exposure. Since the selected remedies will not achieve levels that allow for UU/UE, DOE will conduct five-year reviews in accordance with CERCLA Section 121(c) and NCP Section 300.430(f)(4)(ii)). Reviews will begin no later than five years after the initiation of the remedial action to help ensure the selected remedy is protective of human health and the environment.

14.0 Documentation of Significant Changes

No significant changes were made to the remedy.

PART III: RESPONSIVENESS SUMMARY

1.0 Introduction

This responsiveness summary was prepared in accordance with the requirements of Section 117(b) of CERCLA, as amended. The purpose of this responsiveness summary is to summarize and respond to significant public comments, criticisms, and new information submitted during the public comment period on the Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units on the Hanford Site.

2.0 Community Involvement

A formal public comment period on the Proposed Plan, originally scheduled to run from June 9, 2014, through July 9, 2014, was extended in response to requests from stakeholders. The public comment period ran from June 9, 2011 through August 11, 2014. Notice of the comment period and public meeting on the Proposed Plan was published in the *Tri-City Herald* on June 9, 2014. A fact sheet was mailed to the Hanford mailing list and sent electronically to those on the Hanford Listserv on June 9, 2014, which provided information on how to access the Proposed Plan as well as links to key technical documents, and information on the public meeting to be held in Hood River, OR, along with the associated webinar. A second notice was published in the *Tri-City Herald* and sent electronically to those on the Hanford Listserv on June 16, 2014 to inform the public about the new date for the public meeting.

Individuals sent written comments through the mail or electronically. Written and verbal comments were also received at the public meeting held on July 23, 2014, in Hood River, OR. A live webinar of the public meeting was also broadcast on the internet for those who could not attend the public meeting in person, and comments could be submitted as part of that webinar.

3.0 Comments and Responses

Comments were received from both individuals and groups covering a range of topics and varying perspectives. The public comments were separated and grouped into the following categories:

- Alternative Selection
- Institutional Control (ICs)
- Strontium-90 Remediation
- Land Use and Cleanup Levels
- Tribal Issues
- Endangered Species
- Public Involvement
- Supports Proposed Plan
- Supports No Action
- General Comments

Appendix A provides all the public comments received on the Proposed Plan and identifies which categories each of the comments was placed in. A summary of significant public comments received and agency responses is provided below by category.

Comment 1. Alternative Selection – Some comments questioned the range of alternatives considered for soil and groundwater. Numerous comments received on the Proposed Plan expressed concern over the proposed Alternative GW-2, including the length of monitored natural attenuation (MNA) and the efficacy of groundwater cleanup. The concerns were largely based on a desire for a more active and expedited remedy and generally preferred Alternative GW-4, suggesting that the methods that result in

shorter estimated time periods of groundwater cleanup for some of the plumes are well worth the extra cost. Additional comments received were related to the balancing criteria used in the Proposed Plan, specifically on the comparisons on cost, short-term effectiveness, and long-term effectiveness and permanence.

Response: The range of alternatives considered in the proposed plan was a result of the screening of various technologies in the Feasibility Study. The screening was done in accordance with CERCLA regulations which require that technologies be evaluated based on the criteria of effectiveness, implementability, and cost. The evaluation focused on the effectiveness criteria to ensure the most effective technologies were carried forward in the analysis. Those technologies that were most effective were included in the alternatives evaluated. For soil, RTD has been demonstrated to be effective for the interim actions while other soil technologies were determined to be not as effective for the waste sites. In addition to no action, three groundwater alternatives varying in the type and degrees of treatments were evaluated.

The selected remedy for groundwater (Alternative GW-2) uses MNA processes including biodegradation and abiotic degradation, radioactive decay, dispersion, volatilization, and sorption to effectively reduce groundwater COCs to concentrations less than the cleanup levels for the 100-FR-3 OU. Alternatives GW-2, GW-3, and GW-4 are each protective of human health and the environment. Currently, 100-FR-3 groundwater is not used as drinking water, and ICs implemented as part of this ROD will prevent use as drinking water until cleanup levels are met. Although Alternatives GW-3 and GW-4 include pump-and-treat technology to achieve cleanup levels sooner for Cr(VI), nitrate, and TCE, the time frames for each of these three groundwater alternatives to achieve the cleanup level for strontium-90 is 150 years, meaning ICs on groundwater use are required for the same amount of time in all groundwater alternatives. Pump and treat is not effective for remediating strontium-90 contaminated groundwater because most of the strontium-90 binds to the soil, so it is not effectively removed by extracting groundwater (See response to Comment 3 for more information). Alternatives GW-2, GW-3, and GW-4 are also equal in long term effectiveness and permanence once cleanup levels are achieved, since at the end of the remedial time frame, the COC concentrations under each of the alternatives will be reduced to levels that are protective of human health and the environment. Alternative GW-2 has a lower potential for adverse impact to the community, workers, or the environment because there is less construction-related activity in comparison to Alternatives GW-3 and GW-4 and has the lowest cost.

The selected groundwater remedy, Alternative GW-2, will achieve protective cleanup levels. While MNA is expected to take as long as 150 years for strontium-90, ICs will ensure that humans are not exposed to contaminants in the groundwater until protective cleanup levels are achieved. Based on recent monitoring and modeled groundwater concentrations into the future, contaminated groundwater will not pose an unacceptable risk to human health or ecological receptors in the river. MNA provides a reliable mechanism to restore groundwater to cleanup levels and when combined with ICs meets the groundwater remedial action objectives (RAOs). The selected remedy includes the installation of new wells with regular sampling required to assess natural attenuation and to ensure that RAOs and remedy cleanup requirements are met.

CERCLA requires that the selected remedy be reviewed no less often than every five years to ensure that human health and the environment are being protected by the remedial action. If a remedy is found to be not protective, then additional evaluations and changes to the remedy would be considered.

Comment 2. Institutional Controls – Comments were received stating that ICs will not be sufficient or effective enough to prevent future human exposure to contaminants. Many of the commenters are in favor of the use of excavation/remove-treat-dispose (RTD) approach for the sites where long-term ICs will be applied, or a new soil cleanup alternative for removal of contaminants (such as strontium-90) as a means

of cleaning up soil and ground water. Comments also stated that the remedy should not rely on government long-term stewardship of groundwater controls.

Response:

The Tri-Party agencies understand there is some public concern over the ability to maintain control of the Hanford Site far into the future. We acknowledge that there is uncertainty associated with the future of society beyond hundreds of years into the future. However, after cleanup decisions are made, CERCLA requires those decisions be reviewed no less often than every five years to ensure that human health and the environment are being protected by the remedial action. If a remedy is found to be not protective, then additional evaluations and changes to the remedy would be considered.

The residential scenarios used to establish the cleanup levels for radiological and nonradiological analytes include potential exposure to the top 4.6 m (15 ft) of soil as part of the reasonable maximum exposure scenario. This represents a reasonable estimate of the depth of soil that could be excavated and distributed at the soil surface as a result of residential site development activities (e.g. residential basement excavation). Direct human contact with deep soils is not expected, but ICs are included as a conservative measure to control the potential but unexpected circumstances where excavation or drilling might bring these contaminants to the surface. ICs are required to be maintained as long as necessary for the selected remedy to be protective. As cleanup levels are achieved at each soil or groundwater IC location, the IC will be removed. ICs for contaminated soil below 4.6 m (15 ft) will be maintained until all soil contamination is below the cleanup levels selected for the top 4.6 m (15 ft).

DOE has established a Hanford site-wide long-term stewardship program to implement, maintain, enforce, and monitor ICs that requires EPA approval and will be compliant with the requirements of the ROD. Although the DOE may later transfer these procedural responsibilities to another party by contract, property transfer agreement, or through other means, the Federal Government shall retain ultimate responsibility for remedy integrity. In the event that land is transferred out of federal ownership, deed restrictions or other controls (e.g. proprietary controls such as easements and covenants) are required that are legally enforceable against subsequent property owners. DOE anticipates that the Hanford Site will remain under federal ownership for the foreseeable future.

Comment 3. Strontium-90 Remediation – Numerous comments were received concerning the levels of strontium-90 in the soil and groundwater at the proposed areas of cleanup. Most of these comments state that 150 years for MNA to meet state and federal cleanup standards for strontium-90 is too long. Some commenters expressed concern that the strontium-90 plume has the potential to reach the Columbia River in fewer than 150 years, and recommend using technologies, such as Permeable Reactive Barriers (PRBs), to prevent contaminant migration.

Response: While the strontium-90 contamination in the OUs that are the subject of this ROD exceed levels protective of human health they do not pose a risk to the environment. Although there is a localized area within the plume where higher strontium-90 concentrations occur (maximum of 180 pCi/L in 2013), this occurrence does not pose a threat to the environment. Strontium-90 has low mobility in the current subsurface environment due to its natural sorption properties in soil and the low horizontal groundwater-flow gradient in the 100-F Area. This has been confirmed by near-shore monitoring well and aquifer tube groundwater sampling results that have shown only low and generally declining concentrations of strontium-90 in recent years. Monitoring results since 2007 have reported only one aquifer tube sample slightly exceeding the 8 pCi/L DWS, at 9.6 pCi/L. Computer modeling performed in the RI/FS report that simulates the future fate and transport of the strontium-90 plume does not show significant migration from its current position, nor does it show concentrations above 8 pCi/L reaching the river shoreline in the future. The 8 pCi/L DWS is well below the levels of ecological concern. Toxicity thresholds using biota concentration guides for strontium-90 are 278 pCi/L for riparian animals

and 53,900 pCi/L for aquatic animals including fish. The strontium-90 plume does not pose a threat to the environment that would require an alternative other than MNA- and ICs-based Alternative GW- 2 to be protective. Additionally, the expected timeframes for strontium-90 plume attenuation for Alternative GW-2 is reasonable when compared to the other alternatives and is within a timeframe where ICs can be used to prevent exposure.

An apatite PRB enhances the subsurface soil's existing natural sorption properties by emplacing apatite to increase the soil's sorption capacity where it can further slow and reduce strontium-90 plume migration. However, the PRB technology does not destroy or eliminate the strontium-90, it only further immobilizes what strontium-90 might be present in groundwater as it migrates through the barrier. In areas with significantly higher concentrations of strontium-90, this is an effective technology. For example, the PRB is effectively being applied at the 100-NR-2 OU where there is significantly higher contamination levels than those observed at the 100-FR-3 OU. However, with the relatively lower levels of strontium-90 at 100-FR-3 OU, this is not an effective technology since the soil has already sorbed with the strontium-90 contamination. In 2013 the highest level at 100-FR-3 OU was 180 pCi/L versus 14,000 pCi/L at 100-NR-2. PRB technologies were retained for evaluation in the FS, however due to the factors described above the PRB was not included in any of the final alternatives evaluated.

Comment 4. Land Use and Cleanup Levels – Many comments indicated that MNA and ICs were not sufficient enough to prepare the 100-F and 100-IU Areas for unrestricted uses. Commenters suggested that the public might use the land for future recreation, residential, and/or tribal development, and fear the soil and groundwater will still contain contamination at elevated levels. Commenters are concerned that public and private groundwater wells will be used, because additional new sources of withdrawal of water from the Columbia River are not allowed. Commenters also recommended using more stringent groundwater cleanup levels.

Response: The DOE's reasonably anticipated future land use for this area is conservation and preservation. The EPA believes that other uses, including residential use, are reasonably anticipated future land use for these areas. The DOE and EPA have opted to use the more protective residential land use scenario for the 100-F/IU area.

The cleanup levels in this ROD are protective of residential uses evaluated in the risk assessments done for the 100-F/IU area and the Hanford River Corridor. The risk assessments used a broad basis for toxicological information in accordance with EPA risk assessment guidance. The cleanup levels in this ROD also satisfy ARARs in accord with CERCLA and the "National Oil and Hazardous Substances Pollution Contingency Plan" (commonly known as the "National Contingency Plan," or NCP) (40 CFR 300.430[f][2]). DOE and EPA believe the cleanup levels are protective of reasonably anticipated future land uses.

The residential scenario for exposure to chemicals used Washington State's MTCA cleanup levels (WAC 173-340) for assessing risks from chemicals in soil. The MTCA (WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards") levels were used. MTCA provides chemical-specific standards that define acceptable risk levels based on reasonable residential maximum exposure scenarios. For direct contact, these MTCA-based cleanup levels are based on a six-year exposure of a child through incidental soil ingestion, but do not include consumption of site-derived food. For the inhalation pathway, the MTCA (WAC 173-340) Standard Method B air cleanup levels are based on exposure of adults and children from inhalation of vapors and dust in ambient air. These scenarios described above are based on exposure to the top 4.6 m (15 ft) of soil.

The cleanup levels for radionuclides are based on a 30-year residential scenario in which the receptor lives on the waste site, being exposed to the top 4.6 m (15 ft) of soil, and derives their food from the waste site and their water from impacted groundwater below the waste site. The direct-contact cleanup

rules for radionuclides were set at the lower of the risk-based level of 10^{-4} cancer risk or 15 mrem/year radiation dose.

In some areas of the 100-FR-3 OU, groundwater remains contaminated above cleanup levels, and withdrawal for uses other than research purposes and monitoring is currently prohibited by DOE site controls. The selected remedy for the 100-FR-3 OU requires restrictions on use of groundwater until the cleanup levels are met, expected to be as long as 150 years. These restrictions prevent the installation of public and private groundwater wells. Protective cleanup levels will be met through MNA, and long-term monitoring will be ongoing to assess and ensure the performance of the selected MNA remedy. When cleanup levels are met, the selected MNA remedy would restore groundwater to its highest beneficial use as a potential future drinking water source.

Institutional controls are a necessary part of this remedy because some contamination will remain in place that will not allow for unlimited use of the land and unrestricted exposure. For the selected remedy, the ICs only apply to the following specific areas: (1) areas with deep soil contamination that would exceed acceptable exposure levels if brought to the surface; (2) the area with deep soil contamination that may contribute to surface water contamination if irrigated; or (3) areas with groundwater contamination that exceed cleanup levels. ICs are required to be maintained as long as necessary for the selected remedy to be protective.

As contamination will remain above levels that allow for UU/UE, CERCLA requires that the selected remedy be reviewed no less often than every five years to ensure that human health and the environment are being protected by the remedial action. If a remedy is found to be not protective, then additional evaluations and changes to the remedy would be considered.

Comment 5. Tribal Issues – Comments indicated that there is an obligation to protect treaty rights while also meeting cleanup thresholds. The decision must be protective of the health of tribal members for all exposure scenarios and tribal uses, provide environmental justice, and not cause disproportionate impacts. Some comments stated that tribal treaties, which reserves specific rights and resources, should be acknowledged as an ARAR.

Response: Cleanup levels are established based on the risk assessment and ARARs. The RI/FS risk assessment included two tribal-authored scenarios, however, the residential land use scenario was used as the reasonable maximum exposure for the 100-F/IU areas risk assessment and for cleanup decisions, including the establishment of cleanup levels. The cleanup levels for chemical contaminants in soil were derived using the state's MTCA Method B cleanup levels (WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards"). The soil cleanup levels for radionuclides are based on a residential scenario in which the receptor lives off the land at a waste site. The receptor lives on the waste site, derives their food from the waste site and derives their water from groundwater below the waste site that is impacted by mobile contaminants that leach from the waste site into the groundwater as enhanced by irrigation. DOE and EPA believe the cleanup levels are protective of reasonably anticipated future land uses. The information in the risk assessment is available to tribal nations and their members to review.

Under CERCLA, ARARs are applicable or relevant and appropriate requirements under federal environmental, state environmental, or facility siting laws that address a hazardous substance, pollutant, contaminant, remedial action, location or other circumstance at a CERCLA site. Treaties do not meet the definition of an ARAR and thus cannot be waived as ARARs under CERCLA. The Treaties reserve specific rights and resources in the unique legal relationship between the Federal Government and Indian tribal governments. Consultation with the tribes allow for discussion on how to address these specific rights and resources. While Treaties are not ARARS, there are several ARARS that provide protection for cultural and natural resources such as the "Protection of Historic Properties" (36 Code of Federal Regulations (CFR) 800); "National Historic Landmarks Program" (36 CFR 65); "Native American

Graves Protection and Repatriation Regulations" (43 CFR 10)(25 USC §§ 3001 et seq.); National Historic Preservation Act (16 USC 470, et seq.); and the "Archeological and Historic Preservation Act" (16 USC 469a 1 through 469a 2(d)).

Comment 6. Endangered Species – Comments were received that Endangered Species Act consultation with resource agencies should be conducted to determine how the proposed actions may affect any threatened or endangered species. Many commenters are concerned about the potential impact of contaminated groundwater reaching the Columbia River and affecting salmon that live and spawn nearby.

Response: The Hanford Reach contains three species listed as threatened or endangered under the federal Endangered Species Act (ESA) (7 USC 136, 16 USC 1531). These include the upper Columbia River spring-run Chinook salmon, steelhead, and bull trout. The spring-run Chinook salmon do not spawn in the Hanford Reach but use it as a migration corridor. Steelhead spawning has been observed in the Hanford Reach. The bull trout is not considered a resident species and is rarely observed in the Hanford Reach.

The ESA, section 7, includes an administrative requirement that federal agencies consult with U.S. Fish and Wildlife Service (USFWS) and/or the National Marine Fisheries Service (NMFS) before taking any action that may affect an endangered or threatened species. Administrative requirements are not part of the ARAR. The selected remedies identified in the ROD for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units includes the ESA as an ARAR. Therefore, substantive ESA requirements to protect endangered species must be met. DOE and EPA determined there was no effect on fish species listed as threatened or endangered. This determination of no effect was discussed with the NMFS who did not disagree with the DOE and EPA determination.

The selected remedy will not jeopardize the continued existence of listed species or result in the destruction or adverse modification of habitat critical to them. This conclusion is based on two lines of evidence. First, the preferred remedy does not take an action in the Columbia River, so there will not be any direct physical effects on fish or their habitat. Secondly, there are no adverse effects of contaminants on listed species of fish before, during or after the remedial actions as discussed below.

The 100-F/IU RI/FS contains both human health and ecological risk assessments. The ecological risk assessment identified Cr(VI) and nitrate as ecological COCs from a Hanford source (Appendix L; DOE-RL-2010-98). The human health risk assessment identified Cr(VI), nitrate, TCE, and strontium-90 as COCs as posing risks for human health in groundwater. Because there were four contaminants identified as groundwater COCs (based on human health risk), the ESA evaluation is based on all four contaminants. The Columbia River rapidly dilutes groundwater contaminants to relatively low concentrations, so the primary concern for ecological risk to aquatic biota is from exposure to pore water in sediments. Larval fish are exposed to pore water while they are living in the sediments, which is when they have the highest sensitivity to contaminants. These four COCs in groundwater are discussed in more detail below.

The nitrate no observable effect concentration for steelhead as identified in Appendix H of the 100-F/IU RI/FS at the water hardness representative of the Columbia River is 199 mg/L. Nitrate concentrations in groundwater in the 100-F/IU area range from 0.91 to 139 mg/L. These are inland concentrations in the groundwater which are not currently upwelling in the Columbia River. Over time, the nitrate in groundwater will attenuate, but is expected to eventually reach the river. Concentrations that reach the river in the future will likely be much lower than currently observed in groundwater. Nitrate concentrations will have no effect on steelhead when the nitrate-contaminated groundwater reaches the Columbia River.

The maximum concentration detected of TCE in the most recent sampling of nearshore wells (2013) was 15 µg/L. No measurements were taken in porewater. The lowest chronic risk value for fish is 11,100 µg/L

for TCE (ORNL ES/ER/TM-96/R2, 1996, *Toxicological Benchmarks for Screening Potential Contaminants of Concern for Effects on Aquatic Biota*). Steelhead are not affected by TCE.

The maximum detected concentration of strontium-90 in the most recent sampling (2013) in nearshore groundwater wells was 26 pCi /L and the maximum in the aquifer tube samples was 5.8 pCi /L. Porewater concentrations for the 100-F/IU area were non-detect. The final water biota concentration guides (screening levels) recommended for strontium 90 are 278 pCi/L for riparian animals and 53,900 pCi/L for aquatic animals including fish. Predicted future concentrations are below both these biota concentration guides, and current concentrations do not exceed the lowest of the biota concentration guides throughout the plume. Hence, there is no evidence of adverse effects to steelhead from strontium-90.

Cr(VI) concentrations in the 100-F Area groundwater ranged from 2.2 to 93 µg/L. A salmonid (including steelhead) no observable effect concentration of 266 µg/L was presented in Appendix H of the 100-F/IU RI/FS. Cr(VI) in groundwater at 100-FR-3, throughout the current plume, is below no effect thresholds for steelhead. Cr(VI) has no effect on steelhead.

Comment 7. Public Involvement – One commenter was concerned that there was not enough of an effort to direct members of the public to the hearing in Hood River (i.e., appropriate and visible signage, as well as informed hotel staff). Others believed that the webinar format for the public hearing was ineffective and that if the webinar does not work or is not used, then more public meetings should be held. Another comment suggested that the comment period for very significant river-corridor issues should be extended to 90 days to allow ample time for interested parties to respond. One comment identified a lack of detail in the Fact Sheet for the duration of ICs in Alternative S-2.

Response: Public involvement is important to the DOE and EPA, and stakeholders and the public are expected to be included in the decision-making process at Hanford. The Hanford public involvement team engaged stakeholders and the public throughout the CERCLA process for selecting this remedy.

DOE and EPA appreciate the suggestion to have better signage at the meeting location and more informed hotel staff that can direct people to the meeting location. This is input that can be used to help improve our process for public meetings.

A webinar was held in conjunction with the public meeting in Hood River, OR, on July 23, 2014. The use of the webinar during the public meeting is a new approach being used to provide access to those not able to attend the meeting in person. The webinar was designed to allow for full participation, including allowing webinar participants to ask questions and provide comments for the record. DOE and EPA regret that some webinar participants reported difficulties hearing the entire public meeting, and we appreciate the feedback so we can continue to make improvements. The webinar is a technology that DOE and EPA would like to continue using, however, the opportunity to request a public meeting to be held during the public comment period will always be provided. Public meetings were held in all locations where a timely request was submitted. DOE and EPA did not receive additional requests for public meetings after the webinar and public meeting that was held in Hood River, OR.

The NCP requires a minimum of 30 days to comment on the information contained in the RI/FS Report and Proposed Plan. In addition, the public comment period must be extended by a minimum of 30 additional days, upon timely request. A formal public comment period on the Proposed Plan, originally scheduled to run from June 9, 2014, through July 9, 2014, was extended through August 11, 2014, in response to requests from stakeholders. DOE and EPA believed that the 60 day public comment period provided a reasonable opportunity for submission of written and oral comments on the Proposed Plan and the material contained in the Administrative Record file.

The fact sheet is a high level summary of the Proposed Plan, meant for a general audience, and is not intended to present all details of the proposed remedy. The lengths of ICs for the range of alternatives were provided in the Proposed Plan. The fact sheet directed readers to the proposed plan for a summary of the proposed remedy.

Comment 8. Supports Proposed Plan – Two commenters support the Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units.

Response: The Tri-Party agencies would like to acknowledge those comments. The selected remedy is the preferred remedy from the proposed plan.

Comment 9. Supports No Action – One commenter suggested no action for soil and groundwater stating that the proposed plan is above and beyond the Vision 2015.

Response: CERCLA decisions are made based on risks to human health and the environment, not on DOE's 2015 Vision. The 100-F/IU RI/FS Report and risk assessments indicated that these OUs have contaminants at elevated levels that pose unacceptable risks to human health and the environment. Under the No Action alternatives, no active remedial action would be taken to address actual and potential threats to human health and the environment posed by the contaminants present in soil and groundwater, and all existing actions would cease, including ICs and monitoring. Although the No Action alternative would achieve cleanup levels through natural attenuation in groundwater, monitoring progress would not be assessed and ICs would not be used to prevent groundwater use before cleanup levels are achieved, which would potentially allow humans to be exposed to COCs at levels that pose significant risk to human health. Therefore, DOE and EPA determined remedial actions are needed.

Comment 10. General Comments – General comments that were not specific to a particular part of the Proposed Plan were also received. Some commenters expressed concern with increases in cancer risks in the 100-F/IU area due to groundwater plumes originating from the central part of Hanford. Additional comments were concerned with contamination threats to communities living down-river from the Hanford Site. Others suggested that the Isolated Unit (IU) areas and F Reactor (FR) areas be separated into two decisions, instead of combined into one, as well as avoiding the combination of other areas into one decision unit; commenters were concerned that the public would be confused about the large area, or put more of its focus on the FR area.

Response: Contaminated groundwater originating from Central Plateau source OUs, which would be the central part of the site, extends to the aquifer beneath the 100-IU-2 and 100-IU-6 OUs and includes iodine-129, nitrate, and tritium. These groundwater contaminant plumes will be addressed through the CERCLA process as part of the Central Plateau groundwater OUs (200-PO-1 and 200-BP-5).

Many communities downstream of the Hanford Site draw water from the Columbia River for all or part of their domestic water supply. The City of Richland's water uptake is the closest to the Hanford Site. No alternative water sources have been required for the City of Richland because of contamination resulting from Hanford operations. The selected remedy for groundwater in 100-FR-3 will effectively reduce groundwater COCs to concentrations less than the cleanup levels. When cleanup levels are met, the selected remedy would restore groundwater to its highest beneficial use as a potential future drinking water source and in the interim 100-FR-3 groundwater discharges to surface water will not cause unacceptable risk to human health or ecological receptors.

The 100-IU-2 and 100-IU-6 OUs, were initially associated with the Hanford and White Bluffs town sites, and were combined with the 100-FR-1, 100-FR-2, and 100-FR-3 OUs due to their proximity to the 100-F Area. Over time, as waste sites were discovered, the 100-IU-2 and 100-IU-6 OUs were expanded to include these waste sites. Although, when combined, these OUs cover a large area, the combination of

these OUs does not unduly complicate the review as similar waste sites are found in the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs.

ACRONYMS

ARAR	applicable or relevant and appropriate requirement
bgs	below ground surface
CERCLA	*Comprehensive Environmental Response, Compensation, and Liability Act of 1980*
CFR	*Code of Federal Regulations*
COC	contaminant of concern
COPC	contaminant of potential concern
CRC	Columbia River Component
Cr(VI)	hexavalent chromium
DOE	U.S. Department of Energy
DWS	drinking water standard
ELCR	excess lifetime cancer risk
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
ERDF	Environmental Restoration Disposal Facility
FS	feasibility study
HRNM	Hanford Reach National Monument
IC	institutional control
LFI	limited field investigation
LIGO	Laser Interferometer Gravitational-Wave Observatory
MNA	monitored natural attenuation
MTCA	*Model Toxics Control Act—Cleanup* (WAC 173-340)
NCP	National Contingency Plan ("National Oil and Hazardous Substances Pollution Contingency Plan" [40 CFR 300])
NEPA	*National Environmental Policy Act of 1969*

O&M	operations and maintenance
OU	operable unit
PCB	polychlorinated biphenyl
PRG	preliminary remediation goal
RAO	remedial action objective
RCBRA	River Corridor Baseline Risk Assessment
RCRA	*Resource Conservation and Recovery Act of 1976*
RI	remedial investigation
RME	Reasonable Maximum Exposure
ROD	Record of Decision
RTD	removal, treatment, and disposal
STOMP	Subsurface Transport Over Multiple Phases
TCE	trichloroethene
TPH	total petroleum hydrocarbon
Tri-Party Agreement	*Hanford Federal Facility Agreement and Consent Order*
Tri-Parties	U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington State Department of Ecology
UU/UE	unlimited use/unrestricted exposure
USFWS	U.S. Fish and Wildlife Service
WAC	*Washington Administrative Code*

REFERENCES

40 CFR 141, "National Primary Drinking Water Regulations," *Code of Federal Regulations*. Available at: http://www.ecfr.gov/cgi-bin/text-idx?SID=d2e85ff265b49d8e97c0cd3292841953&node=40:24.0.1.1.3&rgn=div5.

40 CFR 300, "National Oil and Hazardous Substances Pollution Contingency Plan," *Code of Federal Regulations*. Available at: http://www.ecfr.gov/cgi-bin/text-idx?SID=d2e85ff265b49d8e97c0cd3292841953&node=40:29.0.1.1.1&rgn=div5.

Appendix B, "National Priorities List."

40 CFR 300.5, "Definitions."

40 CFR 300.400, "General."

40 CFR 300.430, "Remedial Investigation/Feasibility Study and Selection of Remedy."

40 CFR 1500, "Purpose, Policy, and Mandate," *Code of Federal Regulations*, Available at: http://www.ecfr.gov/cgi-bin/text-idx?SID=4aa29efc28658023dd2df98dd5c42ea4&node=40:34.0.3.3.1&rgn=div5.

American Antiquities Act of 1906, 16 USC 431-433. Available at: http://www.nps.gov/history/local-law/anti1906.htm.

Clinton, W.J., 2000, *Establishment of the Hanford Reach National Monument*, Memorandum to the Secretary of Energy, Office of the Press Secretary, Washington, D.C., June 9. Available at: http://clinton6.nara.gov/2000/06/2000-06-09-memorandum-on-hanford-reach-national-monument.html.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980, 42 USC 9601, et seq. Available at: http://epw.senate.gov/cercla.pdf.

Section 105, "National Contingency Plan."

Section 117(a), "Public Participation," "Proposed Plan."

Section 121(b), "Cleanup Standards," "General Rules."

DOE O 451.1B Chg 3, 2012, *National Environmental Policy Act Compliance Program*, U.S. Department of Energy, Washington, D.C. Available at: http://energy.gov/sites/prod/files/DOEO4511B_011912.pdf.

DOE/EIS-0222-F, 1999, *Final Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Washington, D.C. Available at:
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158842.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158843.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158844.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158845.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158846.
http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D199158847.

DOE/EIS-0222-SA-01, 2008, *Supplement Analysis, Hanford Comprehensive Land-Use Plan Environmental Impact Statement*, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=DA06917281.

DOE, Ecology, and EPA, 2012, *Hanford Federal Facility Agreement and Consent Order Hanford Public Involvement Plan*, U.S. Department of Energy, Richland Operations Office; Washington State Department of Ecology; and U.S. Environmental Protection Agency, Richland, Washington. Available at: http://www.hanford.gov/files.cfm/FacAgreementand-Consent-Order_FINAL.pdf.

DOE/RL-92-24, 2001, *Hanford Site Background: Part 1, Soil Background for Nonradioactive Analytes*, Rev. 4, 2 vols., U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0096062. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0096061.

DOE/RL-93-82, 1995, *Limited Field Investigation Report for the 100-FR-1 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196005401.

DOE/RL-93-83, 1994, *Limited Field Investigation Report for the 100-FR-3 Operable Unit*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D196084471.

DOE/RL-96-12, 1996, *Hanford Site Background: Part 2, Soil Background for Radionuclides*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D1808987.

DOE/RL-96-17, 2009, *Remedial Design Report/Remedial Action Work Plan for the 100 Area*, Rev. 6, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=1112281625.

DOE/RL-2007-21, 2012, *River Corridor Baseline Risk Assessment, Volume I: Ecological Risk Assessment*, Volume 1, Parts 1 and 2, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0093215. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0093214.

DOE/RL-2007-21, 2011, *River Corridor Baseline Risk Assessment, Volume II: Human Health Risk Assessment*, Volume II, Parts 1 and 2, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0093676. http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0093675.

DOE/RL-2008-46-ADD4, 2010, *Integrated 100 Area Remedial Investigation/Feasibility Study Work Plan, Addendum 4: 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units*, Rev. 0 REISSUE, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=1006220804.

DOE/RL-2010-98, 2012, *Remedial Investigation/Feasibility Study for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units*, Draft A, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0090560.

DOE/RL-2010-117, 2012, *Columbia River Component Risk Assessment, Volume I: Screening-Level Ecological Risk Assessment*, Volume I, Part 1, Rev. 0, Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0092299.

DOE/RL-2010-117, 2012, *Columbia River Component Risk Assessment, Volume II: Baseline Human Health Risk Assessment*, Volume II, Part 1, Rev. 0, Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/pdf.cfm?accession=0090731.

DOE/RL-2011-118, 2012, *Hanford Site Groundwater Monitoring for 2011*, Rev. 0, U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0091795.

ECF-HANFORD-11-0038, 2012, *Soil Background Data for Interim Use at the Hanford Site*, Rev. 0, CH2M HILL Plateau Remediation Company, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0088381.

Ecology, EPA, and DOE, 1989a, *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. Available at: http://www.hanford.gov/?page=81.

Ecology, EPA, and DOE, 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://www.hanford.gov/?page=82.

Ecology, EPA, and DOE, 1998, *Action Memorandum for the 105-F and 105-DR Reactor Buildings and Ancillary Facilities, Hanford Site, Benton County, Washington*, Washington State Department of Ecology, U.S. Environmental Protection Agency, and U.S. Department of Energy, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198146374.

Endangered Species Act of 1973, Pub. L. 93-205, as amended, 7 USC 136, 16 USC 1531, et seq. Available at: http://www.nmfs.noaa.gov/pr/pdfs/laws/esa.pdf.

EPA and DOE, 1997, *Action Memorandum: 100 B/C Area Ancillary Facilities and the 108-F Building Removal Action, U.S. Department of Energy Hanford Site, Richland, WA*, U.S. Environmental Protection Agency and U.S. Department of Energy, Richland Operations Office, Richland, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D198146374.

EPA, Ecology, and DOE, 2004, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=D4855290.

EPA, Ecology, and DOE, 2009, *Explanation of Significant Differences for the 100 Area Remaining Sites Interim Remedial Action Record of Decision: Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Olympia, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0908240150.

EPA, Ecology, and DOE, 2011, *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2010*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Seattle, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=0084011.

EPA, Ecology, and DOE, 2012, *100 Area "Plug-In" and Candidate Waste Sites for Fiscal Year 2011*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Seattle, Washington. Available at: http://pdw.hanford.gov/arpir/index.cfm/viewDoc?accession=1202240339.

EPA/AMD/R10-97/044, 1997, *Amendment to the Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Washington State Department of Ecology, and U.S. Department of Energy, Seattle, Washington. Available at: http://www.epa.gov/superfund/sites/rods/fulltext/a1097044.pdf.

EPA/ESD/R10-00/045, 2000, *Explanation of Significant Differences for the 100 Area Remaining Sites Record of Decision: 100-IU-6 Operable Unit*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Seattle, Washington. Available at: http://www.epa.gov/superfund/sites/rods/fulltext/e1000045.pdf.

EPA/ROD/R10-00/121, 2000, *Interim Remedial Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-2, 100-HR-2, and 100-KR-2 Operable Units, Hanford Site (100 Area Burial Grounds), Benton County, Washington*, U.S. Environmental Protection Agency, Washington State Department of Ecology, and U.S. Department of Energy, Seattle, Washington. Available at: http://www.epa.gov/superfund/sites/rods/fulltext/r1000121.pdf.

EPA/ROD/R10-95/126, 1995, *Interim Remedial Action Record of Decision for the 100-BC-1, 100-DR-1, and 100-HR-1 Operable Units, Hanford Site, Benton County, Washington*, U.S. Environmental Protection Agency, Region 10, Seattle, Washington. Available at: http://www.epa.gov/superfund/sites/rods/fulltext/r1095126.pdf.

EPA/ROD/R10-99/039, 1999, *Interim Action Record of Decision for the 100-BC-1, 100-BC-2, 100-DR-1, 100-DR-2, 100-FR-1, 100-FR-2, 100-HR-1, 100-HR-2, 100-KR-1, 100-KR-2, 100-IU-2, 100-IU-6, and 200-CW-3 Operable Units, Hanford Site, Benton County, Washington (100 Area Remaining Sites)*, U.S. Department of Energy, U.S. Environmental Protection Agency, Region 10, Washington State Department of Ecology, Seattle, Washington. Available at: http://www.epa.gov/superfund/sites/rods/fulltext/r1099039.pdf.

National Environmental Policy Act of 1969, 42 USC 4321, et seq. Available at: http://www.epw.senate.gov/nepa69.pdf.

O'Leary, H.R., 1994, "National Environmental Policy Act Policy Statement" (memorandum for Secretarial Officers and Heads of Field Elements), Secretary of Energy, U.S. Department of Energy, Washington, D.C., June 13. Available at: http://scms.sc.doe.gov/Docs/NEPA%20Policy%20Statement.htm.

OMB Circular No. A-94, 2012, Appendix C, "Guidelines and Discount Rates for Benefit-Cost Analysis of Federal Programs"

Presidential Proclamation 7319, 2000, *Establishment of the Hanford Reach National Monument*, Administration of William J. Clinton, June 9. Available at: http://www.gpo.gov/fdsys/pkg/WCPD-2000-06-12/pdf/WCPD-2000-06-12-Pg1322.pdf.

RCW 70.105D, "Hazardous Waste Cleanup--Model Toxics Control Act," *Revised Code of Washington*, Olympia, Washington. Available at: http://apps.leg.wa.gov/RCW/default.aspx?cite=70.105D.

Resource Conservation and Recovery Act of 1976, 42 USC 6901, et seq. Available at: http://www.epa.gov/epawaste/inforesources/online/index.htm.

USFWS, 2008, *Hanford Reach National Monument: Final Comprehensive Conservation Plan and Environmental Impact Statement; Adams, Benton, Grant and Franklin Counties, Washington*, U.S. Fish and Wildlife Service, Burbank, Washington. Available at: http://astro.berkeley.edu/~kalas/ethics/documents/environment/final-ccp-no-maps.pdf.

WAC 173-201A, "Water Quality Standards for Surface Waters of the State of Washington," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-201A.

WAC 173-340, "Model Toxics Control Act—Cleanup," *Washington Administrative Code*, Olympia, Washington. Available at: http://apps.leg.wa.gov/WAC/default.aspx?cite=173-340.

WAC 173-340-720, "Groundwater Cleanup Standards."

WAC 173-340-740, "Unrestricted Land Use Soil Cleanup Standards."

WAC 173-340-900, "Tables."

Appendix A

Comments Received During Public Comment Period on the Proposed Plan for the Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units

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The table below provides the comments received during the public comment period conducted from June 9, 2014 through August 11, 2014. In some instances the "Comment" column does not include the entire text of the comment, but instead references the comment letter itself. The referenced comment letters are provided at the end of the table and are identified based on the "Tracking ID" provided in the table. The "Comment Categories in Responsiveness Summary" column in the table indicates which responsiveness summary categories address the comment.

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
100-FIU-001	Written	Roger Amundson	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-002	Written	Sarah Bahn	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-003	Written	Ruth Berkowitz	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-004	Written	Faye Brehm	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-005	Written	Liv Brumfield	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-006	Written	Phyllis Clausen	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy:	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Cleanup Levels
100-FIU-007	Written	Martha Clemons	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-008	Written	Nancy Coscione	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's	Sr-90 Remediation Alternative Selection Institutional Controls

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			nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Land Use and Cleanup Levels
100-FIU-009	Written	Alan Crymes	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-010	Written	Mary Duvall	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area	Sr-90 Remediation Alternative Selection

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Institutional Controls Land Use and Cleanup Levels
100-FIU-011	Written	Steve Goldstein	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-012	Written	Samuel Harriman	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology,	Sr-90 Remediation Alternative Selection

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Institutional Controls Land Use and Cleanup Levels
100-FIU-013	Written	Beth Hartwell	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-014	Written	Jeff Hopkins	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology,	Sr-90 Remediation

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-015	Written	Marc Johnston	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-016	Written	Kathy Kershner	Dear U.S. Department of Energy, U.S. Environmental Protection Agency,	Sr-90 Remediation

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-017	Written	Jeff Kipilman	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
100-FIU-018	Written	Annette Klapstein	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-019	Written	Walter Kortge	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			protect public health based on unrestricted uses.	
100-FIU-020	Written	Ron Martin	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-021	Written	Sarah Martin	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-022	Written	Bonnie New	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-023	Written	Jeromy Posey	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-024	Written	Robert Price	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-025	Written	Bruce Ruttenberg	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, I am submitting this drafted e-mail to ensure that I get the details correct, but I want to add a few comments of my own: I attended the DOE public meeting in Hood River a few weeks ago, a first for me. I live in Hood River and The Columbia is one of the reasons we chose to live in this area. The Columbia is an ever present, powerful, integral part of life here; a vibrant, essential resident. Frankly, I was disturbed and dismayed by the weak, inadequate response of the DOE representatives at that meeting. I know these are good men, doing their "jobs"; but have we come nowhere in the last 30 years regarding federal response to environmental disasters? The proposal to	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			simply allow "natural attenuation" of these toxic substances which are not indigenous to this area, is unconscionable, to say nothing of absurd. It seems to me this is yet another example of our federal government breaking trust with local people: Native Peoples, perhaps most importantly, as well as those of us who are imports to this region. Do we really want to perpetuate THAT legacy? In the strongest words possible, I object to DOE's cleanup plan as stated. The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing" 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-026	Written	Cathyx Sampson-Kruse	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-027	Written	Brian Sharp	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-028	Written	Cheryl Stewart	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-029	Written	Ceiridwen Terrill	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-030	Written	Sam Valdez	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-031	Written	Irene Zimmerman	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-032	Written	Jasmine Zimmer-Stucky	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-033	Written	Martin Bensky	I was delighted to read that the Department of Energy (DOE) is taking a logical position in favor of American taxpayers over hysteria-mongers who demand cleanup far beyond any sensible limits required by health and safety of people and the environment. if rational regulations, based on valid health physics data rather than the fatally flawed Linear No-Threshold hypothesis, were the basis for cleanup decision-making, the DOE recommendation for dissipation as part of the cleanup process would be the obvious path to follow. There are credible risk assessments that support the DOE recommendation. Those assessments reach the same conclusion that DOE has reached, without even including realistic health physics data. I hope you will implement the process described in the Tri-City Herald article. You will face opposition from my liberal Democrat brethren, but you should certainly stand your ground on your position. Thank you.	Supports Proposed Plan
100-FIU-034	Written	Mike Conlan	DOE: I strongly support the option that completely cleans or cleans as much as possible, the areas involved. I believe that would be option GW-4. When we're talking about radiation leaking into the Columbia now & the	Alternative Selection

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			next couple of hundred years that has to be the main issue not cost -	
100-FIU-035	Written	Joan Conover	DOE must actively clean up the groundwater. There is an approach with pumps and filters--just do it. Does not make any difference as to cost. DOE created the mess, DOE can clean it up correctly and not by ignoring the problem and hoping 150 or 300 or more years will fix it naturally. DOE can not guarrentee there will not be a plume reaching the Columbia, we have already seen in the past radiation polluted sealife in the Pacific from Hanford. When the health problems of the families in the nearby Hanford/Tricity counties, the babies born without brains, the babies aborted, the TERRIBLE loss to families is happening, this is not the time for DOE to keep hiding their poor design choices for storage of nuclear radiation. Ignoring the groundwater is contaminiated, and making a PAPERFILE solution, is not appropriate or safe for the many people who use the Columbia, its not safe for the environment. Clean it up now, not in 100 years.	Alternative Selection
100-FIU-036	Written	Doris Fulton	Please select Alternative 4 active goundwater cleanup using technology to remove strontium. Excavation and disposal of radioactive materials will take 3-5 years whereas the preferred alternative to remove contaminated groundwater will require 150 years to meet the current standards. Please clean-up this mess for my grandson and the children of Washington state.	Alternative Selection Sr-90 Remediation
100-FIU-037	Written	Steven Gary	Dear USDOE, I understand that the USDOE 100 Area Clean Up Plan that is preferred is depending on natural processes that take 150 years to reach standards. The 16 sites that contain cesium-137, cobalt-60, europium-152 and 154, nickel-63 and strontium-90 at contamination levels considered by the Hanford Advisory Board dangerous to human health can be cleaned up in 3 to 5 years using Alternative 4. It is an active groundwater cleanup with technologies to remove Strontium. The estimated cost is $156. This is a small amount to pay when thinking about what can go wrong over 150 years and how much has been spent and wasted at Hanford already. The	Sr-90 Remediation Alternative Selection Institutional Controls Tribal Issues

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			proposed Monitored Natural Alternative does not fully comply with the treaties of Yakama Nation. It does not put the people, wildlife and environment of Washington first. I urge you to use Alternative 4 in cleaning up the radioactive plume at Hanford.	
100-FIU-038	Written	Carol Hiltner	In my personal experience, the DOE has hedged, dissembled, fudged, delayed, and outright lied at every opportunity. Based on past performance, the likelihood is that the situation is much worse than we yet know. A difference of $156 million is a pittance compared to the amounts spent to MAKE the mess. And it's a false economy to breach treaty rights, damage health, and render the groundwater unuseable.	Alternative Selection
100-FIU-039	Written	Carl Holder	The Vision 2015 shows the 100F A - Complete. The proposed work is above and beyond The Vision 2015. Public Comment: Soil - NO ACTION Ground Water - NO ACTION	Supports No Action
100-FIU-040	Written	Teresa M.J. Holt	I urge Alternative 4 of active groundwater cleanup, plus technologies to remove Strontium. 150 years to reach standards for contaminated groundwater is unacceptable. People will be exposed, regardless of USDOE's claims it can prevent groundwater and deep soil exposure with "institutional controls." I do not believe USDOE has exercised those 'institutional controls' effectively up to this point. I do not believe we can rely on them to do so in the future. Something different needs to be done. As a mother, I urge active cleanup technologies to prevent exposure to people who will drink or use the groundwater. Imagine that this issue involved an oil company that spilled oil along Washington coastline. Would you consider 150 years an acceptable timeline for the oil company to 'fix'	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels Tribal Issues

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			its' mistake? 'Would you consider 150 years a 'solution'? What do you want to tell your grandchildren about your role in this issue? Additionally, I believe the Native American tribes will be disproportionately harmed by the 150 year option. I am not a Native American but I believe the US government and US citizens need to begin to act honorably and abide by the 1855 Treaty.	
100-FIU-041	Written	Charlotte Kanemori	Dear Sir: 150 years to reach standard for contaminated groundwater is unacceptable!!!!!!!!! I urge you to active cleanup technologies to prevent exposure to people who drink or use groundwater!!!!!!!	Sr-90 Remediation Alternative Selection
100-FIU-042	Written	Michael Luzzo	I was looking for your public comment site. This was for the meeting for the proposed plan for cleaning up F Reactor at Hanford Wa. I'm only concerned about manufacturing lines. If chemicals dissipate as you say; and don't have persistency. I'm fine with it. I'm only concerned about poly chains and. the like anyway. Sodium for example would dissipate. Your Hexavalent Chromium may be a issue. So just continue cleanup and I don't if you do as was recently done and put waste in approved landfill and skip your habits of using make or buy decisions to do thing. Buying best available technologies off of a shelf is fine to.	General Comments Outside Document Scope
100-FIU-043	Written	Leslie McClure	We've learned that taxpayer money could be used to expand an ALPS, the experimental 3 channel-machine designed to extract all radioactive contamination, except Tritium from Japan. Is that approach being considered/used at Hanford? With the proximity of the Tri-Cities and the popularity of Washington wines, doing nothing is not an option!	Outside Document Scope
100-FIU-044	Written	Gary Bushman	As a resident of Hood River, and a major advocate of the entire Columbia River Gorge, Hanford is a concern. This site must be cleaned up.	General Comments

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			The hazard this site continues to impose on the entire Columbia Region is unacceptable. Please let's push to get this site cleaned up ASAP. There is no excuse not to.	
100-FIU-045	Written	Heidi Logosz	DOE, There is nothing I can add to what has already been presented by those in strong support of the thorough cleanup of Hanford. Please do not minimize the gravity of this situation. I support the CRK suggestions.	General Comments
100-FIU-046	Written	John Wood	All of this pollution began indoors, in buildings on the Hanford Site, and has steadily been spreading far and wide. DOE and DEQ have been raking material leaked and dispursed back towards a central leaky pile that is much larger than the buildings of their origins. The costs of the most expensive options discussed here are less than one fifth of the cost of some of the modern bombers of which we order whole flights with almost no objections over cost. And we do not have another enemy who "needs" to be nuked. So clean up Hanford by using the defense budget. We need defense against this radiation. We spend much, much more just to review domestic emails to prevent a dirty bomb from "going off." Hanford IS our dirty bomb, and DOE is the bomber insuring that we all recieve a dose of contamination through its failure to act. (I urge Alternative 4 for active groundwater cleanup as well as cleaning up the strontium 6). This is the greatest nation in the world trying to do the worst possible job.	Alternative Selection Sr-90 Remediation General Comments
100-FIU-047	Written	Steve Hudson *Chair*, Hanford	HAB Consensus Advice #268 *Re: 100-F Area Remedial Investigation/Feasibility Study (RIFS) and Proposed Plan (Draft A)*, adopted	Institutional Controls

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		Advisory Board	June 7, 2013; HAB Letter *Re: 100-F RI/RS, Rev. 0*, June 5, 2014; and HAB Consensus Advice #280 *Re: Remedial Investigation/Feasibility Study and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units; DOE/RL-2012-41, Rev 0*, adopted September 5, 2014. *Note: Full letter(s) attached at the end of the table.*	Alternative Selection Land Use and Cleanup Levels General Comments
100-FIU-048	Written	Ken Niles, *Administrator*, Nuclear Safety Division, Oregon Department of Energy	Dear Ms. Ballinger: Thank you for the opportunity to provide comments on the *Remedial Investigation/Feasibility Study and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units*, (DOE/RL-2012-41, Rev. 0). While Oregon supports the decision to proceed with remediation of the 100-F/IU River Corridor area, we reiterate that we disagree, as we did in commenting on the Draft A version of the Proposed Plan, with the choice of Groundwater Alternative GW-2 which relies solely on monitored natural attenuation (MNA) and institutional controls (ICs). Oregon prefers Groundwater Alternative GW-4, which, according to the Balancing Criteria discussion in the Proposed Plan "provides the highest reduction of toxicity, mobility or volume through treatment." More importantly, the GW-4 alternative was deemed better in the Balancing Criteria due to the fact that "Groundwater extraction and injection wells are also used to contain the plumes, preventing their migration into other uncontaminated areas." Clearly, since the GW-4 alternative addresses both the northern and southern parts of the plume, it provides the most protectiveness of any of the alternatives. The faster, more complete remedy achieved by implementation of Alternative 4 would minimize DOE's potential liabilities under the Natural Resource Damage Assessment provisions of CERCLA. One deficiency in all of the considered alternatives is the choice to take no active measures to remediate the strontium 90 plume. Instead, the preferred alternative is 150 years of MNA. While modeling has shown that the strontium will decay before reaching the river, monitoring data in at least one aquifer tube contradicts that conclusion. Rising strontium levels	Alternative Selection Sr-90 Remediation Institutional Controls

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			in aquifer tube C6306 indicates that the plume is moving toward the river. The 100-F strontium 90 groundwater plume immediately adjacent to the river should be addressed with a relatively short section (300 meters) of Apatite Permeable Reactive Barrier, which was tested and proven effective at 100-N Area. We also reiterate that MNA should not be considered effective short-term treatment for groundwater, as was done in the Balancing Criteria Analysis, and that MNA should certainly not be ranked equal to the pump-and-treat alternatives (GW-3 and GW-4) that actually remove contaminants from the groundwater. The pump-and-treat alternatives clearly demonstrate a greatly improved short-term treatment by the reduction in time needed to reach cleanup levels for chromium 6 (10 years for GW-4, versus 35 years for MNA) and nitrate (25 years for GW-4, versus 80 for MNA). There are 16 waste sites with deep vadose zone contamination (Table 2, Proposed Plan) containing levels of cesium, cobalt, europium-152 and -154, nickel 63 and strontium-90 contamination considered dangerous to human health. While MNA and ICs are likely protective for the 20 to 108 years for 15 of the waste sites to reach cleanup levels, that is not the case with contaminated soil beneath the 100-F Fuel Basin, 118-F-8:3. For that waste site, it is estimated to take 264 years to reach cleanup levels. We recommend remove-treat-dispose for this waste site to reduce the overall projected time needed for protective ICs. We believe incorporating these recommendations in the 100-F/IU Areas would result in a clean-up approach that would be most reasonably protective of human health and the Columbia River. If you have any questions or comments about our recommendations, please contact Dale Engstrom of my staff at 503-378-5584 (or dale.engstrom@odoe.state.or.us). *Note: Full letter attached at the end of the table.*	
100-FIU-049	Pub Mtg-	Dan Serres	Yeah. I've already had a chance to speak, so I feel a little awkward going	Sr-90 Remediation

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	HR		first, so I'm happy to defer to other folks. But I think we've got a small enough crowd, I'll just start by saying a couple things. One, I think the idea of having a no- action alternative and then a one action alternative, the soil remediation, kind of -- that's clearly inadequate. There probably are a range of things you could do with digging deeper in some of these areas and I think the plan lacks that full range of alternatives that would normally be presented in this type of analysis. Secondly, I would just say that the idea that 150 years is going to be a reasonable time frame for dealing with strontium or other contaminants, it just -- it doesn't pass the test of -- kind of the laugh test for most folks. A hundred fifty years is a long time and none of us really believe that it's reasonable to believe so much contamination of the soil or its usual controls to mitigate or for MNA to, you know -- for that process to decay it away. So I guess what we would ask is that you take a much more active approach and look at Groundwater No. 4, that alternative, as something that makes a lot more sense. And then sort of ultimately on the process, I think that -- the other thing that was really glaring to me was the fact that you've got almost a third of the Hanford site. I mean, it's a huge swath of Hanford lumped into this one big decision. The issues that face the areas just right near the reactor are very different than all the inactive units that surround it, and so I would suggest that these really should have been separate decisions. It doesn't make sense to lump in, you know, hundreds of -- you know, 150 square miles and then this one reactor area that's very acutely contaminated. Those things are so different, it makes it very difficult for the public to address the key issues in either one. And so I would suggest, respectfully, that that -- that's maybe something you should think about parsing out and separating going forward. Lastly, I would -- I would say that in the F area, there's a real need to consult with federal agencies when it comes to threatened and endangered species. This is an incredibly critical area for salmon recovery, and the lack of consultation on this river corridor of decisions is something that we think is a glaring flaw in -- in	Alternative Selection Institutional Controls Endangered Species Public Involvement

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			how we're moving forward. So, with that, thank you.	
100-FIU-050	Pub Mtg-HR	Abgail Cermak	Thank you. I'm Abigail Cermak. Just like Dan, I also had an opportunity to speak, but I do have a couple things to mention. One's going back to the Groundwater 4 alternative and the fact that maybe when people look at the price tag, it's sticker shock. But if we're looking at the cost of that plan over the time frame, it seems to be -- that we wouldn't be spending very much money to implement that plan, especially when you look at the fact that we're spending $2 billion a year total on Hanford? Two hundred million seems like nothing, especially if you stretch it over, you know, the time frame. Secondly, I think it's odd -- and this goes back to the groundwater alternatives. I think it's odd that there's such a huge cost difference between Groundwater 2 alternative, which is preferred, and then the Groundwater 3 and Groundwater 4. It seems like there's no middle ground cost taken into consideration, and that with the Groundwater 4, even with that remedy, we're not addressing strontium-90 or suggesting anything other than natural attenuation for the alternatives. I believe that's about it. Thank you.	Sr-90 Remediation Alternative Selection
100-FIU-051	Pub Mtg-HR	Jurgen Hess	Thank you. Jurgen Hess, Hood River. What should the standards be for cleaning up this area? I think it should be left the way it was prior to the initial development in the 1940s. That should be the standard. Anything else is something kind of contrived. And particularly the 150 years. I mean, to me, with all these brains, the scientists that you have, if you can't remediate strontium-90 in less than 90 years, you've got to go back -- or 150 years, you've got to go back to the drawing board. You've got to figure it out. Your predecessors figured out how to use this material to make nuclear bombs. You've got to figure that out. The water should be completely cleaned up for unrestricted use using active cleanup, not MNA, monitored attention. I particularly agree with -- with the position of the Yakama Nation on Alternative 4, with that exception; 150 years, I think, is unconscionable. Consider permeable barriers like the 100-N area. It was done there; why not here? And I have to agree with Dan Serres that when I	Sr-90 Remediation Alternative Selection

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			looked at the map, I said: Here's the real festering problem and yet, this huge area is so different. I think we need to separate these out and do two different kinds of things dealing with the two different -- the nature of that. You have a specific problem in one area, and the rest of it is so completely different. Thank you.	
100-FIU-052	Pub Mtg-HR	John Wood	Yeah, I've got a little something here. And I mean this in the best of faith. I know you guys are doing your job and there's a lot of constraints and everything else, but, realistically, we've got to fix this. And so kind of to put things in perspective, I'm not a scientist, but I am a realist. And, you know, what I see is that all this pollution began indoors in buildings on the Hanford site and it's steadily been spreading far and wide and it's covering an enormous area. The DOE and DEQ have been raking this material leaked and dispersed back towards a central leaky pothole that's much harder than the building -- that's much larger than the buildings of its origins. And the cost of the most expensive options discussed here are really not that big. They're less than a fifth of the cost of one of the big bombers that we've been buying whole fleets of, and there's almost no objection over the cost of those. So we don't really have another enemy at the moment who needs to be nuked. So what we can do, perhaps, is to clean up Hanford by appealing to those who have the purse strings and use some of our defense budget. Because what we need, as citizens of America, all of us, is we need defense against a bunch of stuff that isn't just AK-47s and homemade bombs. We need defense against stuff like this, radiation and -- well, heck, microbes and disease organisms, all kinds of stuff. The defense budget we've got is unlimited and it's only applied towards, basically, bullets. This is what we need defense against, and the future needs defense against it as well. So we spend a whole lot more than, I think, the most expensive alternative here just to monitor domestic citizen emails every year to find out if there's going to be a dirty bomb. Well, there's your dirty bomb, right there. And the DOE seems to be the bomber who's trying to ensure that we all get a dose of contamination	Alternative Selection General Comments

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			through its failure to act. Okay? We've got to get going. We're supposed to be -- we tell ourselves that we're the greatest nation in the world, but we're trying to do the worst possible job cleaning up the mess that was made in good faith long ago. That's all I have to say.	
100-FIU-053	Pub Mtg-HR	Brian Brown	Yes. I'd just like to go on the record saying that I'm not in favor of the DOE's preferred alternative. Monitor natural attenuation seems like a do-nothing approach, and this really seems to me like there's too much at stake to take the easy way out. I think that I would be more in favor, personally, of the Alternative 4 in that it seems to take a more proactive approach. And my guess is that if I were to look at this situation in 150 years, it would likely be the least costly because it seems to me like, over the course of these 150 years, the cost of these plumes moving and then having to contain the entire site instead of individual leakages, the plumes. And it really is the government's responsibility to bring the site back somewhat close to what it was beforehand. And I think that what the citizens would like to see is for the reach of the Columbia River through the Hanford Reservation to be available for unrestricted use along the corridor. Thank you.	Sr-90 Remediation Alternative Selection Land Use and Cleanup Levels
100-FIU-054	Pub Mtg-HR	Nathan Zorich	My name's Nathan Zorich and, as you can tell by my hat, I'm a proud graduate of Richland High School. Growing up in Richland, I learned a lot about the history of the Hanford Nuclear Reservation and what went on there. And I think there's a lot to be proud about for a while. I think a lot of shortcuts were taken during and before the war to really kind of speed up production. It's after that, that things really fell apart. And that's the legacy that we really need to deal with. When the federal government came in and took that land from Washington State and its citizens, it had to be a gold mine. I think the state was behind that. Through time, we continue to take shortcuts and do a slipshod job of containing their work. And now I think it's the government's responsibility to clean that up. They saved a lot of money by taking shortcuts; now it's time to spend some money to make that right with the citizens of Washington and people of the northwest and	Sr-90 Remediation General Comments Land Use and Cleanup Levels Endangered Species

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			people that live up and down the Columbia corridor. I currently have six nieces and nephews that still live in Richland. Richland pulls its drinking water from the Columbia River. They've grown up there, they've lived there most of their lives, and I worry about them. I want them to be healthy. And I think cleaning up strontium in this region's important for their health, for the health of fish and wildlife in the region. Thank you.	
100-FIU-055	Pub Mtg-HR	Gerry Pollet	Gerry Pollet, speaking for Heart of America Northwest and our 16,000 members in Washington and Oregon. The Energy Department says over and over again that it is going to be done with cleanup along the Columbia River by 2016. Oh, dream on. What agreat idea that would be. And to do it, the Energy Department would need to actually spend a little bit of money instead of saying we can save 150 million and leave contamination in place for 150 years. When did you change the definition of the word "done"? That's what I'd like to know. "Done" does not mean leaving it behind. It means when you cleaned it up to allow for unrestricted use. When we say "unrestricted use," we don't mean you can walk on it a few days a year, but don't dream of effectively using the area for its highest and most likely uses in the future along the Columbia River. The Energy Department is not the boss of the world, it turns out, oddly enough, and it will not determine what the future land uses will be of the Hanford Reach and the Columbia River corridor when it is, quote/unquote, done with cleanup. Part of this decision will be made by Fish and Wildlife Service for the Hanford Reach National Monument. It will be made by many other entities, but it is not something that is decided in the Department of Energy's land use plan document, which EPA and the state of Washington sent to the Energy department when it was issued. You may not use this in cleanup decision-making. It only governs your land use decisions while you are operating the site. And I have to say, it is shameful that Washington state and EPA appear to have lost your institutional memories. You need to go back into your own records and say: We told you, you can't use this as a decision-making document. Because that is clearly what the Energy Department's	Sr-90 Remediation Alternative Selection Institutional Controls Tribal Issues Land Use and Cleanup Levels General Comments

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			doing today, and you are sitting here and saying: This plan is great. The Energy Department says the land use is going to be conservation, the occasional visitor. Well, putting aside history, let's turn to what the law says. The federal Superfund law, CERCLA, says that we have to clean up so that the additional cancer risks for the most exposed individuals who are likely to use the site under foreseeable circumstances, will be one additional cancer for one in 10,000 people who use it. Ten thousand people use it? Maximum number of cancer is one. But the starting point, EPA's rules say, is no more than one additional cancer for every million people who use the site. And federal law says Washington State's cleanup standards apply as well. And when they are more stringent, they must be followed. Washington State's cleanup law, called MTCA, Model Toxics Control Act, says that the additional cancer risk rate may not be more than one additional cancer for every million people exposed to each individual contaminant and one additional cancer for every 100,000 people who are likely to be exposed in the future. Now, remember that. Federal law says you can go down to one in 10,000; Washington State's law is 10 times more protective. Washington State's law very clearly includes radionuclides as carcinogens because, guess what? They are carcinogenic. It's a shocker, I know. But yet the Energy Department's documents say: We are only applying the Superfund surplus standard to radionuclides for cancer risk, even though Washington State law clearly advised we're only going to apply Washington state cancer risk standards to the non-radiological risks. Where did they get this? They decided that's the way they would have liked the law to be, not the way the law is. And Washington State, you need to speak up about this because it is your law. And despite what you heard earlier tonight, the Department of Energy's conservation plan -- conservation land use, in other words -- we visit occasionally the national monument. Well, the national monument only extends for a short way inland. What about the other sites? Energy Department says it's all going to be conservation, but they have no idea	

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			how it will be enforced, as we heard earlier, nor have they ever taken into account, nor has EPA or Ecology commented on the fact that you have no legal regime under which we can prevent the use of groundwater in the future when the Energy Department is no longer running the site unless Washington state changes its laws. Now, some of us would love to see Washington State change its law to say when you drill a well, you need a permit. But that isn't the case. But Washington State does have a law that says you can't withdraw any more water out of the Columbia River. So, ironically, the Energy Department says we're going to have people who are using this area, visiting it, we may have some campgrounds, we may have a ranger residing here for the Reach National Monument; where will they get their water? Energy Department says out of the Columbia River. Well, illegal. Where will they get their water? Well, they'll probably dig a well. Now, there is something else when we talk about unrestricted land use. Who are the people who are most likely to be using this area of the Columbia River intensely because they have a legal right to do so? Now, there's a picture up on the screen right now of a person kayaking along the river. That person made camp and they use groundwater for drinking water out of a well. They will -- if the use tap water, let's look at what their risks may be. But we know that the people who are most likely to be exposed, what we call the reasonable maximum exposure scenario, are Native American Nations with treaty rights to not only fish at our usual and accustomed stations, which include this entire stretch of the river, but to live along it and fish and gather plants and resources as part of that. So what is the cancer risk under that scenario? As reviewed by the River Corridor Base Line Risk Assessment -- oh, I guess 2011, we're talking about a tribal cancer risk where, essentially, one out of every 1,000 tribal members exercising their treaty rights dies of cancer. Cancer risks. Approximately for every one person who dies in the general population, you have three additional cancers. Native Americans, sadly, have a much higher fatal cancer risk rate. It's one, two or worse. So you're going to have	

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			twice that number, perhaps three times that number, with cancer. Children are, of course, three to ten times more susceptible to cancer from the same carcinogenic exposure as an adult. So how does this jibe? The law says, under federal Superfund, only one in 10,000 people can get cancer. State law, one in 100,000. And the River Corridor Baseline Risk Assessment says that if we allow Native Americans to have unrestricted use, as guaranteed by treaty rights -- and Washington State EPA, and U.S. DOE are all committed to ensuring that those treaty rights are respected and that they are allowed to return and use these lands and river resources -- the cancer risk under the scenario run by the agency's, you know, baseline risk assessment is a one in 1,000 cancer risk level. That's not only unacceptable and immoral, if you say to people it's unrestricted, come on back, it's not any different than handing tribes a smallpox-infested blanket as we've done a century ago, is it? Come on back; your cancer risk, we're going to tell you in fine print, is much, much higher than is acceptable for the general public. Furthermore, there's been no analysis of how this action complies with the Federal Civil Rights Act and our environmental justice standards, including Title VII, and puts at risk, for instance, state agency funding because you have a very clear disparate impact on the foreseeable population exposed, the Native American tribes, when you have -- would otherwise say, well, to the general, non-minority public: You have a cancer risk that's acceptable. Washington State's cancer risk law needs to be applied here and reversely so, and includes both radionuclides and the non-rad, and they have to be summed together and then we have to take actions based on cleaning up to meet that level from restricted use. And that includes, where we know we have the ability to do so, taking action on the strontium-90 as we are doing elsewhere along Hanford Reach. Ironically, here the Energy Department says: Nah, we're not interested in doing it. But at N area, the 300 area, the Energy Department says: We have technologies that we're going to try. We're going to rely on them there. We're concerned about relying on	

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			them without them being proven, ironically; here they're saying we're not going to try at all. That's wrong. They need to be tried, and we cannot allow a claim that we're going to prevent public use of the -- any area of the Hanford Reach for 150 years or even an additional 50 years. Let's get the Hanford Reach cleaned up so that it is safe for public and tribal use in the next decade and a half, which is accomplishable for the groundwater, and we can accomplish that for the soil sites by cleaning up the deeper contamination, going to 40 feet where necessary instead of 15 for the soil sites, and cleaning up the groundwater and using technologies to do so. And then we can actually all say together how proud we are that we cleaned up the Columbia River and we're done, not saying that we changed the definition of what we mean by when we say we're done: You can use the site, we're done. Come on in. Fine print: Your children will have an unacceptably high cancer risk. Thank you.	
100-FIU-056	Pub Mtg-HR	Greg deBruler	Since nothing I said was recorded, so I'll go back and start again. Thank you. My name is Greg Debruin, and these are my formal comments. Thank you, Gerry, very much for hitting the nail on the head. Admiral Watkins, when the Hanford group signed in 1989, said to the tribes, said to the state of Washington and the state of Oregon: We're going to clean up Hanford, return the land back to the way it was. Okay? It was a simple statement. It was a commitment. John Wagner, a good friend of mine, came back and said: We have a problem here. We've got a big problem. We've got an agency that doesn't want to talk about risk, that doesn't want to talk about how contaminated the site is, who at Congress wants to cut our funding off, and somehow we have to justify the work we're doing. So we have an agency that wanted to hide everything for a long, long time. And the sad part is, 25 years later, we're playing games. The risks are real. The commitments are real. Think of just one group, the Native Americans. It's their land. Their usual and custom places. They get to come back here and fish, live, and live happily. But then think of the white folks just downstream and then all the other people of color that live off the	Sr-90 Remediation Alternative Selection Tribal Issues General Comments

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			Columbia River. The Tri-Cities. Your home. And you say: Oh, it's going to be fine. No, it's not fine. You don't check the duckweed every 14 days for the contaminants that are flowing downriver. You haven't done that in forever. Never have, never will. If you'd do it on a bridge because they can tell you the daily flux and load of all the contaminants coming in. So what we have here is we have a commitment. When Keith Klein came in from Rocky Flats, we had a vision. His vision was that by 2011 -- or '10, I think it was, we're going to release the sites along the Columbia River. This is the goal. Then it changed to 2015. So I'm really shocked that the state of Washington is sitting here saying, and EPA is sitting here saying: Oh, yeah, we're fine with this. Well, great. Okay. So DOE's taking our land. They aren't giving it back to us. They're saying you can have it in 150 years. Maybe. But if you're on there and you're exposed, the risk is too high. But we don't want to look at that part of the law. We only want to look at the part of law that we're applying, but it doesn't apply to the other people that could be using it. The state of Washington says, well, wait. Our land's being taken. Oh, but the state of Washington shouldn't be saying another thing. Oh, but you're taking our groundwater. Wait, you can't take our groundwater. You can't take it over the 200 area, you can't take it anywhere. You can't take that resource from it. If you do, there's huge damages to pay. But yet you're taking it from us. But yet Ecology's sitting here saying we're perfectly fine with the situation. And EPA's saying it. I'm saying: Excuse me? You're taking our water. And yet we can't use the Columbia River anymore because we can't draw out of there anymore. And yet, this is a good decision. Hmm. Interesting. The other thing we're saying in this document is the money; 194 million is too much money. There's really no justification for $194 million. You can probably take 30 million off the top and still get it done. It's just the way the game works. But we're sitting here trying to tell the public that this is the best that we can do. We don't talk about strontium-90 and the fact that pump and treat worked for how many years in the N area. Did a great job until finally there	

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			was a push back, says: Oh, we aren't getting the best bang for the buck. Let's turn it off, even though it was still capturing strontium-90. Then we used kitty litter. Sure. But here? Oh, we got strontium-90, don't worry about it. We got nitrate. Nah, don't worry about it. We've got these contaminants sitting right at the edge of the river; don't worry about it. So how is it that you can actually say this when there's so many points that have been brought up tonight that there's gaps, there's assumptions, there's false promises, there's violations of treaty rights, there's violation of state law. And yet will Congress come up here and sit down and say -- and I understand this is -- believe me, 25 years of my life looking at how the federal agency runs, and it's -- you guys are driven to do a job. You're being paid to do your analysis, to get a decision on paper, to move forward because your boss is upstairs that wants the decision. But the problem is, it's not integrated. The problem is we aren't really creating solutions that is a win-win for everybody. We talk about money, but yet Hanford takes $2 billion out of the federal coffers, more than EM has, over half of what EM has, and yet we're producing this as a result? You know, for me, it's kind of an insult to the management because we aren't creating solutions that are getting the deliverables that are required under law and under treaty rights and none of our expectations of future generations and to the people that live here in the future. We can do that. But the system you work in right now doesn't want that. They want to play this malleable game where we create a solution over here and hope we can slide it off so we can clean it up and maybe call it clean and then move on. So you came to this meeting tonight and now you realize it doesn't work. You know. Unfortunately, you have to go back to somebody that's upstairs and say to somebody: You know, we've got some issues here we need to resolve. And to keep it really focused, really focused, you can't take our groundwater. Period. You can't do it. The state of Washington should be just absolutely livid, saying: Excuse me? You're taking our groundwater? Hey, (whistles). No. We'll see you in court. But I know why, 25 years of fighting this battle,	

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			it's the Tri-Party Agreement. No, it's not. It's three agencies who are best friends sitting round trying to figure out the easiest way to move down this thing while we still all get paid, we eventually retire, and then we're done and somebody else can pick up this ball and try to move it forward. No. No. I'm sorry. It's time to get the job done. It's time to come in and put together a plan that is real, meaningful, and meets the requirements of the people that are sitting here and the people that aren't sitting here. We have the technologies. We have the money. We don't have the agencies that's willing to go ahead and say: Oh, we've got to go to -- you know, Dan, it might cost us $220 million because we've got to do a little extra work because of all these things we've pointed out. So big deal. We do it. But then in five years, or seven years, or eight years, whatever the number is, it's done. It's clean. Everybody goes, yep, we did that one. But for some reason, there's some bean counter somewhere -- and I've never found one. Believe me, I've been to headquarters and all over looking for the magical bean counter when it's full. There is no magic number. When we first started that cleanup, it was like $700 million, and Tom Grogan said it was a train wreck of money. And I looked at him and said, baloney. Here we are at 1.2 billion at that time. I said: You get over $2 billion a year. They did. And they stayed at $2 billion a year forever. The problem is the machine isn't doing the work, isn't efficient. And it's not creating solutions. It's creating excuses to create more jobs to continue the process. So I say: No, shut this thing down. Go back to the drawing boards. Come up with solutions that give the people the deliverables that meet the requirements under law. And if you can't do it, then find a different job and find somebody else that'll come in and do it for you. Because you didn't do it. It didn't pass. Thank you. And thank you for your work and I'm sorry that you're trapped on this morph, but that's the way it is. Good night.	
100-FIU-057	Written	Dan Serres, *Conservation Director,* and	*Public Comments on Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units*, August 11, 2014.	Public Involvement Institutional Controls

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		Abigail Cermak, *Hanford Coordinator*, Columbia Riverkeeper	*Note: Full letter attached at the end of the table.*	Sr-90 Remediation Alternative Selection Endangered Species General Comments Tribal Issues Land Use and Cleanup Levels
100-FIU-058	Written	Gerry Pollet, *Executive Director*, Heart of America Northwest	*Comments of Heart of America Northwest and Heart of America Northwest Research Center on the Proposed Final Cleanup Plan for the 100-F Reactor Area along the Columbia River*, August 11, 2014. *Note: Full letter attached at the end of the table.*	Sr-90 Remediation Alternative Selection Public Involvement General Comments Outside Document Scope Institutional Controls Tribal Issues Land Use and Cleanup Levels
100-FIU-059	Written	Russell Jim, *Yakama Nation*	*Review of the Proposed Plan (DOE/RL-202-4I, Rev 0) 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units and Remedial*	Sr-90 Remediation

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		ERWM Program Manager, Confederated Tribes and Bands of the Yakama Nation, ERWM	*Investigation/Feasibility Study (DOE/RL-2010-98)*, August 11, 2014. *Note: Full letter attached at the end of the table.*	Alternative Selection Public Involvement General Comments Outside Document Scope Institutional Controls Tribal Issues Land Use and Cleanup Levels
100-FIU-060	Written	Amelia Apfel	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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100-FIU-061	Written	Catherine Arp	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-062	Written	John D'Avolio	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			protect public health based on unrestricted uses.	
100-FIU-063	Written	Wind Eagleheart	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-064	Written	Ann Frodel	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-065	Written	Stephen Grove	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-066	Written	Erin Johnson	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-067	Written	Dorothy L	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-068	Written	Robbie Lapp	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4).	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-069	Written	Poppy Mantone	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-070	Written	Dani Maron-Oliver	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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			plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-071	Written	Sara Martin	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-072	Written	Steve Mashada	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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100-FIU-073	Written	Melanie McCloskey	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-074	Written	Nina Montenegro	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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100-FIU-075	Written	Sarah Naidoo	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-076	Written	Evan Neptune	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

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100-FIU-077	Written	Pat Rasmussen	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-078	Written	Linda Reedijk	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy:	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and

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100-FIU-079	Written	Brad Roberts	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses. It's time to clean up the mess and not put it off for another generation to to deal with. Lace up your boots and get with it, you have a job you are not getting done.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-080	Written	Arnold Rochlin	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area	Sr-90 Remediation Alternative Selection

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100-FIU-081	Written	Holly Schmitz	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-082	Written	Vladimir Sergeyev	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology,	Sr-90 Remediation Alternative Selection

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Institutional Controls Land Use and Cleanup Levels
100-FIU-083	Written	James Thompson	Greetings: The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plume (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-084	Written	Theodora Tsongas	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, So-called natural attenuation is a	Sr-90 Remediation

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			do nothing policy and completely inadequate. Administrative controls will not prevent access and exposure either now or in the future. The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. So I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-085	Written	Barbara Wilson	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
100-FIU-086	Written	Pam Wood	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, We are in an unprecedented time of crisis and opportunity. Now is the time for us to change the way we have been living on our planet--using Earth as a supply house and sewer--and move into a life-sustaining way of living on (and with) our planet. The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses. The future ones are counting on us to take responsibility for the mistakes we have made in the past. Please strongly consider these points in the cleanup of Hanford.	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels
100-FIU-087	Written	Beth Call	**Comment on Cleanup Plans for Hanford's F Reactor Area Along the Columbia River (100-F/IU)** The Department of Energy's preferred plan for cleaning up contaminated groundwater in Area 100-F/IU shows little regard for the health of present day residents of the area and their descendents for the next 150 years and	Sr-90 Remediation Alternative Selection Tribal Issues

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			beyond. Option GW-2 depends on "natural attenuation" and "institutional controls" to reduce contaminants of concern, and "prevent exposure". This option has never been tested and there is no evidence to date suggesting highly toxic wastes like chromium or radioactive Strontium would ever dissipate. Meanwhile, all those who live along the Columbia River and depend on its groundwater, including the Yakama Nation who have fishing rights dating back to the 1855 Treaty, would be exposed to these life threatening contaminants. A much better option is Alternative 4, which uses tested active technologies for groundwater cleanup, plus technologies to remove Strontium. This process for cleanup of soil sites by excavation and disposal would take 3-5 years (USDOE), a vast improvement over 150 years! Why is the USDOE even considering the "natural attenuation" plan?! To save money, $156 million! Surely protecting the lives of all those, present and future, who depend on the groundwater that will seep into the Columbia River is worth $156 million! Comment submitted to 100 FIUPP@rl.gov	
100-FIU-088	Written	Erica Elliott	Dear Ms. Ballinger, 150 years to reach standards for contaminated groundwater is unacceptable. People will be exposed, regardless of the USDOE's claims it can prevent groundwater and deep soil exposure with "institutional controls." Please pursue active cleanup technologies to prevent exposure to people who will drink or use the groundwater. Specifically, adopt Alternative 4 of active groundwater cleanup, plus technologies to remove strontium.	Sr-90 Remediation Alternative Selection Institutional Controls
100-FIU-089	Written	Eldon Haines	Dear U.S. Department of Energy, U.S. Environmental Protection Agency,	Sr-90 Remediation

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			and Washington Department of Ecology, To reduce radioactivity from a nuclide by a factor of 1,000 requires about 10 half-lives. Depending on the amount of radioactive waste today, a factor of 1,000 probably won't be enough. Multiply the half-lives by 10 to see how long the 1,000 factor will take: Cs 137302 years Sr 90288 years Co 6053 years Eu 152135 years Eu 15486 years Ni 631,001 years There's plenty of time for dangerous levels of these nuclides to reach the Columbia River. We can't risk that. We must clean these nuclides from the ground water before it gets to the Columbia. We can't wait for "monitored natural attenuation."	Alternative Selection
100-FIU-090	Written	Keith Kirts	Dear U.S. Department of Energy, U.S. Environmental Protection Agency, and Washington Department of Ecology, Radioactive sludge stays in the river forever in practical terms, poisoning everything it touches. It does not disperse in the water. It does poison the fish. You know that, perhaps better than I do, but fingers crossed, turning the head is not a policy. It's suicide. Close it down. Clean it up. No more Nukes. Keith Kirts UCLA Geology - retired, living down wind. The U.S. Department of Energy draft cleanup plan for the 100 F/IU Area	Sr-90 Remediation Alternative Selection Institutional Controls Land Use and Cleanup Levels

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
			falls short of delivering on the government's promise to cleanup Hanford's nuclear legacy and protect the Columbia River. I urge you to revise the plan and require that Energy: 1)Use innovative cleanup technologies to protect the Columbia River from strontium-90 instead of taking a monitor and wait—or "do nothing"—approach. 2)Employ pump-and-treat groundwater technology for the entire nitrate plum (Alternative GW-4). 3)Clean up the 100 F/IU Area to levels that allow for unrestricted uses. I urge you to revise the plan and require soil and groundwater cleanup to protect public health based on unrestricted uses.	
100-FIU-091	Written	Ayumi Miyazaki	Please dig up and dispose of toxic waste at Hanford. Thank you.	General Comments
100-FIU-092	Written	Maureen Thompson	Greetings: YES, please dig up the Hanford waste tanks and clean up this toxic life destroying mess.	General Comments
100-FIU-093	Written	Paul Cheoketen Wagner	Hi, For the sake of humanity and people especially indigenous people who eat many times more fish from below Hanford than the EPA would say is safe to consume, Please dig up all of the toxic waste at Hanford and dispose of it properly. We are not a third world county and we have to clean up our toxic messes. Let's act like decent people. Thank you	Institutional Controls Tribal Issues
100-FIU-094	Written	Silas Whitman, *Chairman*, Nez Perce Tribal Executive	*Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units; DOE/RL-2012-41, Revision 0*, August 13, 2014.	Supports Proposed Plan Outside Document

Tracking ID	Method	Commenter	Comment	Comment Categories in Responsiveness Summary
		Committee	*Note: Full letter attached at the end of the table.*	Scope Tribal Issues Institutional Controls General Comments

Comment Number 100-F/IU-047

June 7, 2013,
June 5, 2014, September 5, 2014,
Letters from the Hanford Advisory Board

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HANFORD ADVISORY BOARD

A Site Specific Advisory Board, Chartered under the Federal Advisory Committee Act

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June 7, 2013

Matt McCormick, Manager
U.S. Department of Energy, Richland Operations
P.O. Box 550 (A7-50)
Richland, WA 99352

Dennis Faulk, Manager
U.S. Environmental Protection Agency, Region 10
309 Bradley Blvd,, Suite 115
Richland WA 99352

Re: 100-F Area Remedial Investigation/Feasibility Study (RIFS) and Proposed Plan (Draft A)

Dear Messrs. McCormick and Faulk,

Background

The Hanford Advisory Board (Board) appreciates the opportunity to provide comments and advice for the *Remedial Investigation/Feasibility Study and Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units, Draft A* (Proposed Plan). Final Hanford River Corridor cleanup decisions are important because inadequate cleanup actions could potentially impact the Columbia River. The 100-F/IU Remedial Investigation and Feasibility Study (RI/FS) and Proposed Plan will provide a template for subsequent River Corridor decisions that follow. It is important to the Board that these decisions are dependable, protective, defensible, and well supported.

The Proposed Plan, as the culmination of the RI/FS process, presents remediation alternatives designed by the U.S. Department of Energy (DOE) and its contractors to address the identified contamination and selects one of the alternatives as the best solution.

The 100-F Operable Units make up the 100-F reactor site adjacent to the Columbia River just upstream from the Hanford Townsite. The 100-F reactor was one of the single-pass, plutonium-producing operations that also included laboratories that conducted a number of

animal studies. The site contained the usual surface and groundwater contaminants associated with a River Corridor reactor site, as well as added impacts from the animal housing. Like 100-KE, but smaller in magnitude, the 100-F reactor now in Interim Safe Storage has a groundwater plume of spent fuel-related contaminants beneath it.

The Board offers no advice for the IU-2 and IU-6 Operable Units at this time.

The draft Proposed Plan for Remediation of the 100-FR-1, 100-FR-2 and 100-FR-3 Operable Units consists of four alternatives, one alternative with no action except for the completion of source removal of waste sites at the surface, one that relies on institutional controls and monitored natural attenuation (MNA) for groundwater cleanup (basically the same), and two that include pump-and-treat remediation for the groundwater plumes. The first pump-and-treat remediation alternative (GW-3) remediates the hexavalent chromium plume as well as the northern half of the nitrate plume, uses bio-augmentation, and uses air stripping to treat trichloroethylene (TCE). The final pump-and-treat remediation alternative (GW-4) adds treatment for the entire nitrate plume and does not include bio-augmentation.

Advice:

- The Board advises that DOE identify Groundwater Alternative GW-4 as the preferred alternative that as pointed out in the Balancing Criteria discussion in the Proposed Plan, "provides the highest reduction of toxicity, mobility or volume through treatment." More importantly, (also in the Balancing Criteria) the GW-4 alternative was deemed better due to the fact that "Groundwater extraction and injection wells are also used to contain the Contaminants of Concern plumes, preventing their migration into other uncontaminated areas (like the Columbia River)." Clearly this alternative addresses both the northern and southern parts of the plume, and provides the most protectiveness of any of the alternatives.

- The Board advises that the Tri-Party Agreement (TPA) agencies choose Alternative GW-4 instead of the current preferred Alternative GW-2, which only includes the use of institutional controls (IC) and MNA for remediation of the site. There is no reasonable way to ensure that ICs will effectively protect human health for the projected 175 years that the Proposed Plan projects will be required for natural attenuation of the 16 waste sites with deep vadose zone contamination

(Table 2). These 16 sites contain vadose zone cesium-137, cobalt-60, europium-152 and -154, nickel-63 and strontium-90 contamination at levels considered dangerous to human health. If the MNA alternative were to be selected, the worst offender of these sites (118-F-8:3, with 175 years to reach cleanup levels under MNA) should be considered for removal, treatment and disposal to reduce the overall projected time needed for protective ICs. The remaining sites require less time to decay to acceptable levels (13 to 75 years) and here ICs could be considered protective over this more reasonable monitoring period.

- The Board advises that a more proactive solution, like a permeable reactive barrier, is required to prevent the 100-F strontium-90 groundwater plume from entering the Columbia River. Samples from several aquifer tubes immediately adjacent to the Columbia River have detected rising strontium-90 levels. The preferred alternative's 150 years of MNA is not a reasonable timeframe for remediation of the strontium-90 plume. Allowing strontium-90 to decay is inappropriate when tested technology is available to address the plume. This strontium-90 groundwater plume should be addressed with the tested and apparently successful apatite Permeable Reactive Barrier like that used at 100-N.

- The Board advises the TPA agencies to base cleanup decisions/actions on the goal of restoring Hanford groundwater to its highest beneficial use (per the Model Toxics Control Act [MTCA]) to protect human health, the environment, and the Columbia River as stated in MTCA regulations (see the Proposed Plan, page 24 and reference to the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]; and the National Oil and Hazardous Substances Pollution Contingency Plan [NCP, 40 CFR 300]).

- The Board advises the TPA agencies to choose alternatives that meet the goal of unrestricted use along the River Corridor. Language in the Proposed Plan and selected preferred alternatives indicates that DOE is not considering cleanup to unrestricted use standard and is moving toward a less stringent cleanup based on the Comprehensive Land-Use Plan. The Board believes it is misleading to the public for the Proposed Plan to state "Where the toxicity and mobility of source material combine to pose a potential human health excess lifetime cancer risk (ELCR) greater that one in a thousand (1×10^{-3}), treatment alternatives should be identified (A guide to Principal Threat and Low Level Threat Wastes [EPA

1991])." [1] The point of departure for CERCLA remediation is stated as 1 x 10^{-6} and the Board believes that every effort should be made to meet this standard (EPA 1997). The cleanup exposure scenario needs to be protective of children, including Native Americans exercising their treaty rights to "live along and fish" the Hanford Reach. MTCA requires use of permanent remedies when practicable and cleanup of carcinogens to meet a risk level of 1 x10^{-5} for carcinogens.

Sincerely,

Steve Hudson, Chair
Hanford Advisory Board

This advice represents Board consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: Jeff Frey, Deputy Designated Official, U.S. Department of Energy, Richland Operations Office
Jane Hedges, Washington State Department of Ecology
Catherine Alexander, U.S. Department of Energy, Headquarters
The Oregon and Washington Delegations

1 From the Proposed Plan, referencing 1991 EPA guidance

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June 5, 2014

Kim Ballinger
U.S. Department of Energy, Richland Operations
P.O. Box 550 (A7-75)
Richland, WA 99352

Re: 100-F RI/FS, Rev. 0

Dear Kim,

On June 7, 2013, the Hanford Advisory Board (Board) adopted Advice #268 addressing the 100-F Area Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan (Draft A). At that time, the Board anticipated a subsequent opportunity to provide detailed comments on 100-F RI/FS, Rev. 0 would be possible. Unfortunately the public comment period for 100-F RI/FS, Rev. 0 and the Board meeting schedule made this impossible.

Therefore, with all due respect, the Board requests that Advice #268 be added to and considered as an appropriate public comment on 100-F RI/FS, Rev. 0. Thank you.

Sincerely,

Steve Hudson, Chair
Hanford Advisory Board

This letter represents Board consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: Jeff Frey, Deputy Designated Official, U.S. Department of Energy
Jane Hedges, Washington State Department of Ecology
Dennis Faulk, U.S. Environmental Protection Agency
David Borak, U.S. Department of Energy, Headquarters
The Oregon and Washington Delegations

HANFORD ADVISORY BOARD

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September 5, 2014

Doug Shoop, Acting Manager
U.S. Department of Energy, Richland Operations
P.O. Box 550 (A7-75)
Richland, WA 99352

Dennis Faulk, Manager
U.S. Environmental Protection Agency, Region 10
309 Bradley Blvd., Suite 115
Richland, WA 99352

Re: Remedial Investigation/Feasibility Study and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units; DOE/RL-2012-41, Rev 0

Dear Messrs. Shoop and Faulk,

The Hanford Advisory Board (Board) has greatly appreciated all of the opportunities that have been extended by the Tri-Party Agreement (TPA) agencies to allow early comment on the 100-F Area Proposed Plan. On June 7 2013, the Board adopted Advice #268 concerning the initial 100-F Area Remedial Investigation/Feasibility Study (RI/FS) and Proposed Plan (Draft A), and the Board continues to support that advice.

The Board would like to continue our dialogue by submitting attached Advice #268 for the record, during the 100-F Area Proposed Plan (Rev. 0) public comment period, since little of the 100-F Proposed Plan has changed from Draft A. As stated in our advice, "Final Hanford River Corridor cleanup decisions are important because inadequate cleanup actions could potentially impact the Columbia River."

A core Board value is attaining a cleanup level that allows unrestricted use of the land and water on the River Corridor in a reasonable time frame. The Board is very concerned about the extremely long time that the proposed Institutional Controls (ICs) will have to be maintained and enforced.

The Board further notes that due to the contamination that will remain at the site, the length of 100-F IC enforcement has been revised from 175 years to 264 years (in the *RI/FS and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units; DOE/RL -2012-41, Rev. 0*), which makes the issue all the more important and relevant. The Board repeats its advice that this time period is longer than what is considered to be reasonable, and that the TPA agencies should, at the least, remove, treat and dispose (RTD) the contamination under waste site 118-F-8:3 to reduce the overall time of exclusion and protection, instead of relying on Monitored Natural Attenuation (MNA). The Board notes an indefinite IC period prohibiting irrigation on waste site 116-F-14 (Liquid Retention Basin) as another cause for concern.

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The TPA agency response to advice point one of #268 that "when evaluating all of the balancing criteria, the proposed Alternative (GW-2) is similar to GW-4 in long-term effectiveness and permanence and short term effectiveness" is insufficient. The Board believes that this statement belies the alternative comparison which, when comparing the time-until-clean periods for each alternative, identifies that the pump-and-treat times are generally shorter. Pump-and-treat alternatives, as soon as they are applied, reduce contaminants and reduce the overall time needed until cleanup goals are attained. Because pump- and-treat alternatives remove contaminants from the aquifer, they are permanent solutions. The 100-F Area alternative evaluation by balancing criteria appeared to be driven, for the most part, by cost. Cost of remediation should not be a determining criterion which denies TPA agencies the ability to attain unrestricted use of the river corridor, a core Board value.

The RI/FS and Proposed Plan fail to analyze the probability of failure of ICs over this extended time period, and the potential risks resulting from failure at various time periods. Presenting this information and adopting a Plan which prevents excess risk due to reasonably foreseeable failures of ICs is a substantive requirement of federal and state cleanup laws.

The Board has found that in addition to Advice #268, further advice is warranted.

- The Board advises the TPA agencies to take remedial action as appropriate to significantly reduce the time for cleanup goals to be attained. The Board advises that the periods proposed for the use of ICs in the 100-F Proposed Plan (Rev.0) are far too long, therefore the currently proposed MNA is not acceptable for 100-F.

- The Board advises the TPA agencies to reconsider the relative value of removing contaminants when evaluating balancing criteria for the Proposed Plan alternatives, as described in the background.

- The Board advises the TPA agencies to perform additional RTD at waste site 118-F-8:3 to reduce the lengthy duration of ICs at100-F.

- The Board advises that the RI/FS and Proposed Plan and future documentation should discuss the indicators of failures of MNA and define triggers to require future detailed evaluation during the CERCLA five-year reviews. Especially with a need for ICs to be maintained over 264 years, the consequences of events (500-year flood, probable maximum flood and catastrophic failure of Grand Coulee Dam), should also be considered.

- The RI/FS and Proposed Plan should discuss the likelihood of failures of ICs over the hundreds of years proposed. The Board advises that the TPA agencies should describe the potential

consequences in terms of the risk-based standards for the populations likely to be exposed should ICs fail or be terminated at different time frames.

Sincerely,

Steve Hudson, Chair
Hanford Advisory Board

This advice represents Board consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: Jeff Frey, Deputy Designated Official, U.S. Department of Energy Richland Operations Office
David Borak, U.S. Department of Energy, Headquarters
The Oregon and Washington Delegations

Attachment: HAB Advice #268

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June 7, 2013

Matt McCormick, Manager
U.S. Department of Energy, Richland Operations
P.O. Box 550 (A7-50)
Richland, WA 99352

Dennis Faulk, Manager
U.S. Environmental Protection Agency, Region 10
309 Bradley Blvd,, Suite 115
Richland WA 99352

Re: 100-F Area Remedial Investigation/Feasibility Study (RIFS) and Proposed Plan (Draft A)

Dear Messrs. McCormick and Faulk,

Background

The Hanford Advisory Board (Board) appreciates the opportunity to provide comments and advice for the *Remedial Investigation/Feasibility Study and Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units, Draft A* (Proposed Plan). Final Hanford River Corridor cleanup decisions are important because inadequate cleanup actions could potentially impact the Columbia River. The 100-F/IU Remedial Investigation and Feasibility Study (RI/FS) and Proposed Plan will provide a template for subsequent River Corridor decisions that follow. It is important to the Board that these decisions are dependable, protective, defensible, and well supported.

The Proposed Plan, as the culmination of the RI/FS process, presents remediation alternatives designed by the U.S. Department of Energy (DOE) and its contractors to address the identified contamination and selects one of the alternatives as the best solution.

The 100-F Operable Units make up the 100-F reactor site adjacent to the Columbia River just upstream from the Hanford Townsite. The 100-F reactor was one of the single-pass, plutonium-producing operations that also included laboratories that conducted a number of

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The Board offers no advice for the IU-2 and IU-6 Operable Units at this time.

The draft Proposed Plan for Remediation of the 100-FR-1, 100-FR-2 and 100-FR-3 Operable Units consists of four alternatives, one alternative with no action except for the completion of source removal of waste sites at the surface, one that relies on institutional controls and monitored natural attenuation (MNA) for groundwater cleanup (basically the same), and two that include pump-and-treat remediation for the groundwater plumes. The first pump-and-treat remediation alternative (GW-3) remediates the hexavalent chromium plume as well as the northern half of the nitrate plume, uses bio-augmentation, and uses air stripping to treat trichloroethylene (TCE). The final pump-and-treat remediation alternative (GW-4) adds treatment for the entire nitrate plume and does not include bio-augmentation.

Advice:

- The Board advises that DOE identify Groundwater Alternative GW-4 as the preferred alternative that as pointed out in the Balancing Criteria discussion in the Proposed Plan, "provides the highest reduction of toxicity, mobility or volume through treatment." More importantly, (also in the Balancing Criteria) the GW-4 alternative was deemed better due to the fact that "Groundwater extraction and injection wells are also used to contain the Contaminants of Concern plumes, preventing their migration into other uncontaminated areas (like the Columbia River)." Clearly this alternative addresses both the northern and southern parts of the plume, and provides the most protectiveness of any of the alternatives.

- The Board advises that the Tri-Party Agreement (TPA) agencies choose Alternative GW-4 instead of the current preferred Alternative GW-2, which only includes the use of institutional controls (IC) and MNA for remediation of the site. There is no reasonable way to ensure that ICs will effectively protect human health for the projected 175 years that the Proposed Plan projects will be required for natural attenuation of the 16 waste sites with deep vadose zone contamination

(Table 2). These 16 sites contain vadose zone cesium-137, cobalt-60, europium-152 and -154, nickel-63 and strontium-90 contamination at levels considered dangerous to human health. If the MNA alternative were to be selected, the worst offender of these sites (118-F-8:3, with 175 years to reach cleanup levels under MNA) should be considered for removal, treatment and disposal to reduce the overall projected time needed for protective ICs. The remaining sites require less time to decay to acceptable levels (13 to 75 years) and here ICs could be considered protective over this more reasonable monitoring period.

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- The Board advises the TPA agencies to base cleanup decisions/actions on the goal of restoring Hanford groundwater to its highest beneficial use (per the Model Toxics Control Act [MTCA]) to protect human health, the environment, and the Columbia River as stated in MTCA regulations (see the Proposed Plan, page 24 and reference to the Comprehensive Environmental Response, Compensation, and Liability Act [CERCLA]; and the National Oil and Hazardous Substances Pollution Contingency Plan [NCP, 40 CFR 300]).

- The Board advises the TPA agencies to choose alternatives that meet the goal of unrestricted use along the River Corridor. Language in the Proposed Plan and selected preferred alternatives indicates that DOE is not considering cleanup to unrestricted use standard and is moving toward a less stringent cleanup based on the Comprehensive Land-Use Plan. The Board believes it is misleading to the public for the Proposed Plan to state "Where the toxicity and mobility of source material combine to pose a potential human health excess lifetime cancer risk (ELCR) greater that one in a thousand (1×10^{-3}), treatment alternatives should be identified (A guide to Principal Threat and Low Level Threat Wastes [EPA

1991])." [1] The point of departure for CERCLA remediation is stated as 1 x 10^{-6} and the Board believes that every effort should be made to meet this standard (EPA 1997). The cleanup exposure scenario needs to be protective of children, including Native Americans exercising their treaty rights to "live along and fish" the Hanford Reach. MTCA requires use of permanent remedies when practicable and cleanup of carcinogens to meet a risk level of 1 x10^{-5} for carcinogens.

Sincerely,

Steve Hudson, Chair
Hanford Advisory Board

This advice represents Board consensus for this specific topic. It should not be taken out of context to extrapolate Board agreement on other subject matters.

cc: Jeff Frey, Deputy Designated Official, U.S. Department of Energy, Richland Operations Office
Jane Hedges, Washington State Department of Ecology
Catherine Alexander, U.S. Department of Energy, Headquarters
The Oregon and Washington Delegations

1 From the Proposed Plan, referencing 1991 EPA guidance

Comment Number 100-F/IU-048
July 3, 2014, Letter from the Oregon Department of Energy

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Oregon
John A. Kitzhaber, M.D., Governor

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July 3, 2014

Kim Ballinger
U.S. Department of Energy
Richland Operations Office
P.O. Box 550, A7-75
Richland, Washington 99352

Dear Ms. Ballinger:

Thank you for the opportunity to provide comments on the *Remedial Investigation/Feasibility Study and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units,* (DOE/RL-2012-41, Rev. 0). While Oregon supports the decision to proceed with remediation of the 100-F/IU River Corridor area, we reiterate that we disagree, as we did in commenting on the Draft A version of the Proposed Plan, with the choice of Groundwater Alternative GW-2 which relies solely on monitored natural attenuation (MNA) and institutional controls (ICs). Oregon prefers Groundwater Alternative GW-4, which, according to the Balancing Criteria discussion in the Proposed Plan "provides the highest reduction of toxicity, mobility or volume through treatment." More importantly, the GW-4 alternative was deemed better in the Balancing Criteria due to the fact that "Groundwater extraction and injection wells are also used to contain the plumes, preventing their migration into other uncontaminated areas." Clearly, since the GW-4 alternative addresses both the northern and southern parts of the plume, it provides the most protectiveness of any of the alternatives. The faster, more complete remedy achieved by implementation of Alternative 4 would minimize DOE's potential liabilities under the Natural Resource Damage Assessment provisions of CERCLA.

One deficiency in all of the considered alternatives is the choice to take no active measures to remediate the strontium 90 plume. Instead, the preferred alternative is 150 years of MNA. While modeling has shown that the strontium will decay before reaching the river, monitoring data in at least one aquifer tube contradicts that conclusion. Rising strontium levels in aquifer tube C6306 indicates that the plume is moving toward the river. The 100-F strontium 90 groundwater plume immediately adjacent to the river should be addressed with a relatively short section (300 meters) of Apatite Permeable Reactive Barrier, which was tested and proven effective at 100-N Area.

We also reiterate that MNA should not be considered effective short-term treatment for groundwater, as was done in the Balancing Criteria Analysis, and that MNA should certainly not be ranked equal to the pump-and-treat alternatives (GW-3 and GW-4) that actually remove

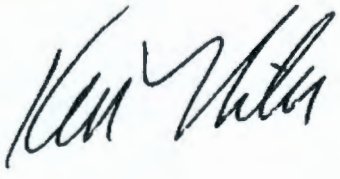
contaminants from the groundwater. The pump-and-treat alternatives clearly demonstrate a greatly improved short-term treatment by the reduction in time needed to reach cleanup levels for chromium^{6} (10 years for GW-4, versus 35 years for MNA) and nitrate (25 years for GW-4, versus 80 for MNA).

There are 16 waste sites with deep vadose zone contamination (Table 2, Proposed Plan) containing levels of cesium, cobalt, europium-152 and -154, nickel 63 and strontium-90 contamination considered dangerous to human health. While MNA and ICs are likely protective for the 20 to 108 years for 15 of the waste sites to reach cleanup levels, that is not the case with contaminated soil beneath the 100-F Fuel Basin, 118-F-8:3. For that waste site, it is estimated to take 264 years to reach cleanup levels. We recommend remove-treat-dispose for this waste site to reduce the overall projected time needed for protective ICs.

We believe incorporating these recommendations in the 100-F/IU Areas would result in a clean-up approach that would be most reasonably protective of human health and the Columbia River.

If you have any questions or comments about our recommendations, please contact Dale Engstrom of my staff at 503-378-5584 (or dale.engstrom@odoe.state.or.us).

Sincerely,



Ken Niles
Administrator, Nuclear Safety Division

cc: Dennis Faulk, U.S. Environmental Protection Agency
Jane Hedges, Washington Department of Ecology
Stuart Harris, Confederated Tribes of the Umatilla Indian Reservation
Russell Jim, Yakama Indian Nation
Gabriel Bohnee, Nez Perce Tribe

Comment Number 100-F/IU-057
August 11, 2014, Letter from the Columbia Riverkeeper

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COLUMBIA RIVERKEEPER
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August 11, 2014

Mail: Kim Ballinger
U.S. Department of Energy, Richland
Operations Office
P.O. Box 550, MSIN A7-75
Richland, WA 99352

J.D. Dowell
U.S. Department of Energy
Richland Operations
PO Box 550
Richland, WA 99352

Via email to 100FIUPP@RL.gov

RE: Public Comments on Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units

Dear U.S. Department of Energy:

Columbia Riverkeeper (Riverkeeper) submits the following comments on the U.S. Department of Energy's (Energy) Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units (hereafter "Proposed Plan"). Riverkeeper has significant concerns about Energy's Proposed Plan to deal with radioactive and toxic pollution in the 100 F Area and surrounding inactive units. The Proposed Plan could set a precedent for how Energy approaches important decisions for cleanup at Hanford, and Riverkeeper urges Energy to take a proactive, protective approach to dealing with dangerous waste in the 100 F Area.

Energy's Proposed Plan relies heavily on monitored natural attenuation (MNA) and institutional controls (ICs) to address radioactive and chemical pollution, and the Proposed Plan fails to provide a well-reasoned and supported explanation of why Energy cannot remove more radioactive and chemical contamination from soils and groundwater. Riverkeeper urges Energy to revise the Proposed Plan to address these serious shortfalls.

RIVERKEEPER'S COMMITMENT TO HANFORD CLEANUP

Riverkeeper is a 501(c)(3) nonprofit organization with a mission to protect and restore the Columbia River, from its headwaters to the Pacific Ocean. Since 1989, Riverkeeper has played an active role in monitoring and improving cleanup activities at the Hanford Nuclear Reservation (Hanford). A legacy of the Cold War, the Hanford site continues to leach radioactive pollution into the Columbia River. Hanford's legacy is not a local issue. Nuclear contamination from Hanford threatens the Pacific Northwest's people, a world renowned salmon fishery, and countless other cultural, economic and natural resources.

Riverkeeper's staff and members are dedicated to a long-term solution for Hanford cleanup. Hanford is one of the world's most contaminated sites. Despite this status, the public and Riverkeeper members continue to catch and consume fish from the Columbia River, drink water from the Columbia, and recreate near and downstream of Hanford. The federal government has a duty to ensure that Hanford's nuclear legacy does not compromise current and future generations use and enjoyment of the Columbia River, nearby upland areas and the groundwater beneath the Hanford site. Riverkeeper is deeply invested in environmental justice issues and continues to advocate for clean water, strong salmon runs, and healthy communities.

COMMENTS ON PUBLIC PARTICIPATION

Riverkeeper encourages Energy to strive for more robust public participation in future River Corridor cleanup decisions. Riverkeeper suggests the following improvements to encourage greater public participation in Energy's cleanup decisions:

- In a Proposed Plan, Energy should address areas that have common geography or cleanup challenges. In its proposed Plan, Energy combines Inactive Unit (IU) areas along with F Reactor (FR) areas, and its decision implicates a huge swath of the Hanford site. Recently, Energy made the decision to transition large areas of the Hanford site to its long-term stewardship (LTS) program. These IU areas are distinctly different from the reactor areas – FR 1, 2 & 3.

The IU areas overlie groundwater plumes contaminated with radioactive and chemical waste, much of which may originate outside the proposed decision area. We are concerned that, by lumping cleanup of the IU areas into a plan that primarily focuses on the F Reactor area (FR 1,2, & 3), the public will be confused about the massive geographic scope and importance of Energy's decision. We urge Energy to make separate decisions for the FR 1, 2 &3 from the IU areas currently included in Energy's Proposed Plan. Additionally, Energy should strive in future decisions to avoid combining areas with disparate issues, both geographically and technically.

- Energy should routinely provide adequate public notice before scheduling public meetings. In May, Energy scheduled public hearings with little prior notice to interested stakeholders. We appreciate that the meeting was shifted to July 23rd, a date which afforded more opportunity for public review of the plan than the original June hearing date. However, we urge Energy to establish routinely a 90-day public comment period for very significant River Corridor issues, such as the recent 300 Area and the current F Area Proposed Plan.

- During public hearings, we encourage Energy to provide adequate signage to direct interested members of the public to the hearing. Without Riverkeeper efforts, several members of the public (and hotel staff) would likely have failed to locate the Hood River public hearing.

COMMENTS ON 100 F AREA PROPOSED PLAN

A. Energy's Preferred Alternative Relies Heavily on Monitored Natural Attenuation and Institutional Controls, Which Do Not Protect Human Health and the Environment

Energy's preferred alternative fails to protect human health and the environment by relying on monitored natural attenuation (MNA) and institutional controls (ICs), an approach that will leave large quantities of hazardous chemical and radiological waste in soils and groundwater for decades.

For example, using its MNA approach, Energy anticipates that Strontium-90 (Sr-90) will remain above acceptable levels for 150 years. In addition to Sr-90, Energy's Proposed Plan leaves other dangerous contaminants in Hanford's soils and groundwater. According to the Proposed Plan, Energy's models indicate that contaminants will require decades to naturally attenuate:

> Cr(VI) attenuates to concentrations less than the 'Water Quality Standards for Surface Waters of the State of Washington' (WAC 173-201A) within 35 years. Strontium-90 concentrations attenuate to concentrations below the DWS within 150 years. TCE concentrations attenuate to concentrations below the DWS within 50 years. Nitrate concentrations attenuate to concentrations below the DWS within 80 years.[1]

Unfortunately, Energy's proposal to leave dangerous radioactive and toxic pollution in Hanford soils and groundwater reveals that the Proposed Plan conflicts with Tri-Party Agreement goals for protecting future uses of the River Corridor. The Hanford Advisory Board (HAB) directly addressed Energy's proposal, stating,

> [The Plan] only includes the use of institutional controls (IC) and monitored natural attenuation (MNA) for remediation of the site. There is no reasonable way to ensure that ICs will effectively protect human health for the projected 175 years that the Proposed Plan projects will be required for natural attenuation of the 16 waste sites with deep vadose zone contamination …These 16 sites contain vadose zone cesium-137, cobalt-60, europium-152 and -154, nickel-63 and strontium-90 contamination at levels considered dangerous to human health. [2]

Although HAB's advice pertains to Draft A of Energy's Proposed Plan (rather than Rev.0), the HAB's fundamental argument still holds for Energy's final Proposed Plan: Energy should remove pollution in soils and groundwater rather than leaving the contamination for decades in areas close to the Columbia River.

Contrary to advice offered by the HAB, Energy's Proposed Plan establishes an exceptionally long timeframe during which Energy's preferred, proposed MNA remedy will allow dangerous contamination to remain in the environment. In fact, in some cases, Energy's Proposed Plan departs from the Draft Plan by increasing the projected timeframe during which contamination in the vadose zone and groundwater will impact the Columbia. For example, the Proposed Plan projects that soils in the 118-F-8:3 site will remain dangerous for many decades, requiring a prohibition on excavation in the site for 264 years. Additionally, Energy's proposal for site 116-F-14 creates an even more ominous problem, establishing an indefinite institutional control prohibiting irrigation at the site. By prohibiting irrigation at site 116-F-14, Energy hopes to limit the mobilization of toxic hexavalent chromium into the groundwater that feeds into the Columbia River rather than using a pump-and-treat, remove-treat-dispose (RTD) or other more active approach.

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[1] Proposed Plan. P. 20.
[2] HAB Advice 268. P. 1.

To justify its chosen course, Energy must find that the timeframe for MNA is "reasonable," and that ICs are likely to succeed for as long as the Proposed Plan indicates that they will be needed. We urge Energy to consider the commonsense advice from the HAB, which concludes that Energy's prolonged use of MNA and ICs will present a significant risk to human health and the environment at Hanford. The HAB addressed Energy's Proposed Plan by stating that "there is no reasonable way to ensure" that Energy's approach will remain effective for the very long time period required for MNA to succeed.[3]

Energy's plan for soil remediation confounds any reasonable expectation of protecting the environment. Energy proposes, under Alternative S-2, that site 118-F-8:3 will require 264 years of ICs prohibiting e excavation by future human users of the area. Additionally, according to Energy's Proposed Plan, groundwater contaminated with radioactive strontium will exceed drinking water standards for at least 150 years. According to the Proposed Plan, "Concentrations of strontium-90 in groundwater above the 8 picocuries per liter (pCi/L) DWS are present in an area of 7.3 ha (18 ac)."[4] Furthermore, for non-radioactive contaminants, Energy's projects that MNA will require 80 years for nitrate and 50 years for TCE to meet standards. Energy regards this decades-long MNA period as a "reasonable" timeframe, although technologies exist that would significantly shorten cleanup. In stark contrast to Energy's conclusions, the HAB concluded that the Proposed Plan did not offer a "reasonable time frame" for remediation.[5]

According to the EPA, Energy should use a proactive cleanup approach when possible, particularly when pollutants can migrate through soils to groundwater. An EPA guidance document from 2010 states: "When relying on natural attenuation processes for site remediation, EPA prefers those processes that degrade or destroy contaminants. Also, EPA generally expects that MNA will only be appropriate for sites that have a low potential for contaminant migration."[6] As noted above, areas addressed in the Proposed Plan pose a long-term risk to the groundwater that feeds into the Columbia River. In particular, hexavalent chromium and St-90 will impact groundwater and percolate through soils towards the Columbia River for over 150 years.

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[3] HAB Advice 268. June 2013.
[4] Proposed Plan, P. 11. See also site map on P. 12.
[5] *Id.*
[6] USEPA. 2007. *Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, and Underground Storage Tank Sites,* EPA/OSWER No. 9200.4-17P, Office of Solid Waste and Emergency Response, Washington DC (1999c). Page 3. Cited in USEPA 2010. Monitored Natural Attenuation of Inorganic Contaminants in Ground Water
Volume 3 Assessment for Radionuclides Including Tritium, Radon, Strontium, Technetium, Uranium, Iodine, Radium, Thorium, Cesium, and Plutonium-Americium.

Emphasizing the importance of limiting contaminant migration, EPA's guidance document added, "MNA should not be used where such an approach would result in either plume migration or impacts to environmental resources that would be unacceptable to the overseeing regulatory authority." Energy's Proposed Plan conflicts with this principle because the Proposed Plan requires ICs that prevent the excavation of soils or the irrigation of certain sites for 150 years or more. Clearly, Energy's MNA approach risks the migration of dangerous contamination and severely hampers future generations' use of Hanford's soils and groundwater.

At a different site at Hanford, the 300 Area, the National Remedy Review Board asked Energy and EPA to provide more supporting evidence before relying on MNA in future decisions at Hanford. The Remedy Review Board recommended that "future decision documents provide additional supporting evidence for monitored natural attenuation (MNA) consistent with Agency guidance.[7] EPA's recommendations continued by stating that "decision documents should identify mechanisms of natural attenuation for all contaminants for which MNA is being selected."[8]

Considering the very long timeframes involved in mitigating soil and groundwater pollution in Hanford's 100-F Area, Energy fails to provide existing lines of evidence to support the anticipated efficacy of the agency's proposed MNA approach to cleanup. Energy should reflect on recent cleanup decisions in order to inform its decision for the 100-F area. For instance, last year, during in its consideration of cleanup in the 300 Area, the National Remedy Review Board stated that Energy should remove contaminants that could be re-mobilized during the decades required for the pollution to attenuate to acceptable levels.[9] Similarly, for the 100-F Area, we urge Energy to reconsider its cleanup approach because the Proposed Plan's reliance on MNA and ICs will likely fail.

Fundamentally, in its response to HAB EPA misrepresents the efficacy of its approach for groundwater remediation, stating "when evaluating all of the balancing criteria, the proposed Alternative (GW-2) is similar to GW-4 in long-term effectiveness on permanence and short term effectiveness."[10] Energy failed to provide adequate evidence in the Proposed Plan to support this conclusion. In contrast, when comparing the time-until-clean periods for each alternative, the Proposed Plan identifies that the pump-and-treat times are generally shorter. Pump-and-treat

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(OSWER Directive No 9200.4-17P, April 1999, Use of Monitored Natural Attenuation at Superfund, RCRA Corrective Action, And Underground Storage Tank Sites; EPA/600/R-07/139, October 2007, Monitored Natural Attenuation of Inorganic Contaminants in Ground Water Volume 2 – Assessment for Non-Radionuclides; EPA/600/R-10/093, September 2010, Monitored Natural Attenuation of Inorganic Contaminants in Ground Water Volume 3 – Assessment for Radionuclides.."

[7] *Id.*

[8] USEPA. 2012. National Remedy Review Board. Recommendations for the 100-K, 200-UP-1, and 300 Areas of the Hanford Site.

[9] TPA Agency Response to HAB Advice 268. September 2013. P. 1.

alternatives or other more active approaches may actually reduce contaminants, curtail the overall time needed until cleanup is attained and durably actually remove contaminants from the aquifer, are better at permanence. Unfortunately, EPA gives far too much weight to cost in applying balancing criteria in evaluating alternatives in the 100-F Area. Cost of remediation should not be a criterion that, on its own and in the absence of an accurate weighing of other balancing criteria, leads EPA and Energy to support a proposed alternative that fails to achieve an unrestricted use standard in the River Corridor.

Over the decades necessary to remediate the chemical and radioactive pollution in the F Area, the use of ICs should not supplant an active response that treats, contains, or removes pollution that could impact groundwater and or the Columbia River.

B. Energy's Cleanup Plan Fails to Provide a Reasonable Range of Alternatives for Cleanup of Hanford Soils

Energy's Proposed Plan provides only two options for cleaning up contaminated soils in the F Area. Soil alternative S-1 takes no action, while alternative S-2 engages in a limited cleanup of soils in the F Area. Because Energy has determined that there is a basis for action, the No Action alternative is effectively a baseline for evaluating the only Action Alternative, S-2. Even in the "action" alternative, Energy plans to leave dangerous contamination in the soil at 100-F for decades. In short, Energy fails to provide a cleanup alternative that Riverkeeper can support by limiting its consideration of options so narrowly that neither alternative provides a solution that protects human health and the environment.

Energy's approach to the 116-F-8:3 site exemplifies the shortcomings of the Proposed Plan. At 116-F-8:3, contamination poses a threat to people who might excavate below 15 feet in Hanford's soils, and ICs would be needed for 264 years to prevent people from being exposed to dangerous waste. Even worse, the Proposed Plan requires an indefinite prohibition on irrigation in site 116-F-14, an open-ended institutional control that is designed to prevent future users of the area from mobilizing hexavalent chromium through irrigation from the vadose zone into groundwater.

Energy dismisses more aggressive cleanup options without giving them adequate consideration. For example, the Proposed Plan acknowledges that deeper excavation of some sites may warrant further consideration, but the Proposed Plan dismisses an RTD option with little discussion because of its cost. Energy writes, "A rough order of magnitude cost for excavation of the 116-F-14 site as an alternative to prohibiting irrigation was calculated to be $107 million and was not evaluated further as one of the alternatives."[11] Energy provides little

[11] Proposed Plan at 26.

detail for how it reached this cost estimate. In addition, Energy fails to provide a reasonable assessment of the relative cost of maintaining ICs indefinitely versus an RTD approach in site 116-F-14.

Energy must present the public with a reasonable range of alternatives – including alternatives that prevent soil contamination from reaching groundwater. For toxic chromium, strontium, and nitrate plumes, Energy gives only cursory treatment to the pollution that continues to percolate through the vadose zone in the F Area. As noted above, even Energy acknowledges that it has failed to provide a detailed assessment of an alternative that, without institutional controls, would prevent hexavalent chromium from being mobilized by human activity in the F Area.

Energy's Proposed Plan conflicts with Washington laws that compel the agency to clean up soils in a manner that protects groundwater. MTCA requires that soil cleanup levels protect against contamination of groundwater beneath the soil cleanup site. WAC 173-340-700(6)(b); WAC 173-340-747(2)(a). State law is clear that soil cleanup levels should be based on the need to protect groundwater or surface water. WAC 173-340-745(b)(iv). Given that chromium in the 116-F-14 site presents a risk to groundwater and potentially the Columbia River (particularly if the irrigation IC fails), cleanup actions for the site must protect existing and future beneficial uses of both groundwater and surface water. As a result of the deficiencies in its Proposed Plan, Energy should reconsider its cleanup approach because the Proposed Plan conflicts with Washington laws that protect groundwater and surface water from dangerous contamination.

C. Energy's Cleanup Plan Fails to Assess Reasonable, Proactive Alternatives for Remediating Groundwater

Energy should reevaluate its cleanup approach for soil and groundwater areas that pose a long-term threat to human health and the environment, particularly those that require ICs for decades or more. For example, in comments on its draft Plan, the HAB urged Energy to assess a more proactive approach for remediating strontium pollution near the Columbia River. HAB stated:

> The Board advises that a more proactive solution, like a permeable reactive barrier, is required to prevent the 100-F strontium-90 groundwater plume from entering the Columbia River. Samples from several aquifer tubes immediately adjacent to the Columbia River have detected rising strontium-90 levels. The preferred alternative's 150 years of MNA is not a reasonable timeframe for remediation of the strontium-90 plume. Allowing strontium-90 to decay is inappropriate when tested technology is available to address the plume. This strontium-90 groundwater plume should be addressed with the

tested and apparently successful apatite Permeable Reactive Barrier like that used at 100-N.[12]

During public hearings, Energy indicated that it had decided not to investigate a permeable reactive barrier (PRB). Energy argued that PRBs immobilized, but did not remediate, strontium in Hanford's soils. In contrast, Energy has deployed a PRB successfully in the N Area, close to the Columbia River. Energy should use its experience in the N Area and evaluate how a PRB could reduce the influx of strontium reaching the Columbia River in the N Area. Thus far, Energy has failed to provide any meaningful consideration of a PRB in the 100-F Proposed Plan, despite a specific recommendation by the HAB to do so.

Moreover, Energy declines more aggressive approaches, such as those suggested in GW-4, for pollutants that pose a long-term risk to Hanford's groundwater. For instance, Energy's Proposed Plan relies on MNA rather than pump-and-treat alternatives. Furthermore, Energy leaves a persistent nitrate plume to MNA although the nitrate pollution would require roughly 80 years to attenuate. HAB recommends, and Riverkeeper agrees, that Energy should take a more active approach using an enhanced pump-and-treat system, which would address both the northern and southern portions of the nitrate plume and reduce the timeframe for chromium attenuation.[13]

D. Cleanup Should Protect Unrestricted Future Use of the F Area.

In agreement with advice from the HAB, Riverkeeper objects to Energy's over-reliance on institutional controls. The use of ICs should be addressed with appropriate acknowledgement and deference to future users of the Hanford site, in particular tribal nations whose treaty rights guarantee their use of the Columbia River and the River Corridor. Energy should not rely on the Comprehensive Land Use Plan (CLUP) as a justification for short-changing key cleanup decisions. Rather, as recommended by the HAB, Energy should proceed towards cleanup that achieves an unrestricted use standard. The HAB wrote:

> The Board advises the TPA agencies to choose alternatives that meet the goal of unrestricted use along the River Corridor. Language in the Proposed Plan and selected preferred alternatives indicates that DOE is not considering cleanup to unrestricted use standard and is moving toward a less stringent cleanup based on the Comprehensive Land-Use Plan.[14]

[12] HAB Advice 268. June 2013.
[13] HAB Advice 268. June 2013.
[14] HAB Advice 268. June 2013.

Energy's Proposed Plan falls far short of achieving unrestricted use in the River Corridor, leaving pollution in the soils that will restrict the excavation of soils and usage of groundwater. For 150 years, the site will remain too polluted for groundwater use because of Sr-90 contamination. Additionally, soil pollution in the 116-F-14 and 116-F-8:3 will pose a long-term risk to potential future users of the River Corridor. Riverkeeper concurs with the HAB that Energy's Proposed Plan is unacceptable because it severely curtails future uses of the Columbia River rather than achieving the "unrestricted use" goal established by HAB members.

E. Riverkeeper Supports Selection of Energy's GW-4 Alternative

Of the alternatives presented for groundwater cleanup, Columbia Riverkeeper strongly prefers GW-4. Even though GW-4 presents a higher up-front cost, it also performs better in limiting the ongoing risk of contamination to future generations who may use Hanford's groundwater or River Corridor. According to the HAB, based on Energy's own ranking system, it is clear that GW4 is the best alternative for remediating groundwater pollution in the F Area. Addressing the Draft Plan, HAB wrote:

> The Board advises that DOE identify Groundwater Alternative GW-4 as the preferred alternative that as pointed out in the Balancing Criteria discussion in the Proposed Plan, "provides the highest reduction of toxicity, mobility or volume through treatment." More importantly, (also in the Balancing Criteria) the GW-4 alternative was deemed better due to the fact that "Groundwater extraction and injection wells are also used to contain the Contaminants of Concern plumes, preventing their migration into other uncontaminated areas (like the Columbia River)." Clearly this alternative addresses both the northern and southern parts of the plume, and provides the most protectiveness of any of the alternatives.[15]

As discussed above, and in contrast to EPA's unfounded claim that GW-2 and GW-4 perform similarly, the preferred alternative in the Proposed Plan fails to attain the same level of protectiveness as GW-4, which significantly reduces the timeframe during which Energy will be required to rely on IC's to protect people from exposure to dangerous contaminants. Riverkeeper supports the June 2013 HAB advice, which recommended that Energy undertake a more aggressive, protective approach by selecting Alternative GW-4.

F. The Incomplete and Flawed River Corridor Baseline Risk Assessment is not an Appropriate Source for Risk Assessment Metrics in Energy's Proposed Plan.

[15] HAB Advice 268. June 2013.

The Proposed Plan relies on a document, the River Corridor Baseline Risk Assessment (RCBRA), that state and federal agencies, as well as the HAB, deemed severely flawed.[16] Riverkeeper urges Energy to consider input on the RCBRA's deficiencies and to revise the RCBRA. Until Energy finalizes the RCBRA and resolves issues raised by TPA agencies, the Yakama Nation, the HAB, and others, the agency should refrain from relying on its conclusions in cleanup plans, including the Proposed Plan for the 100-F Area.

For example, both the Proposed Plan and the RCBRA fail to address adequately the cumulative chemical and radiological risk of contaminants that are likely to enter the 100 F Area from outside its boundary as a result of migrating plumes from other areas of the Hanford site. For example, uranium, iodine-129, and other contaminants are expected to flow from the Central Plateau through groundwater into the100 F Area and IU's incorporated into the Proposed Plan. In short, the Proposed Plan should not rely on the RCBRA, which has unresolved flaws such as anticipating a heavy reliance on institutional controls and lacking analysis of plumes entering the River Corridor from the Central Plateau over the long term.

G. Energy Must Consult with the Services Under Section 7 of the Endangered Species Act.

Pursuant to Section 7 of the Endangered Species Act (ESA), Energy must consult with the National Marine Fisheries Service (NMFS) and the U.S. Fish and Wildlife Service (USFWS) to determine how the proposed action may affect any threatened or endangered species in the Columbia River. Riverkeeper has raised this issue in multiple comments on Hanford cleanup and other federal actions at Hanford. *See* Columbia Riverkeeper Comment on Mercury Storage at Hanford (Aug. 2009); Columbia Riverkeeper Comment on Tri-Party Agreement Proposed Changes and Consent Decree (Dec. 2009); Columbia Riverkeeper Comment on Tank Closure Waste Management Environmental Impact Statement (May 2010); and Columbia Riverkeeper Comment on 300 Area Proposed Plan (September 2013).

Section 7 of the Endangered Species Act (ESA), the heart of the ESA's requirements for federal actions, imposes strict substantive and procedural duties on federal agencies to ensure that their activities do not cause jeopardy to listed species or adverse modification to their critical habitat. 16 U.S.C. § 1536(a)(2). The ESA mandates consultations to ensure that an agency action "is not likely to jeopardize the continued existence of any" listed species or adversely modify critical habitat. 16 U.S.C. § 1536(a)(2). Because Energy's Proposed Plan may affect listed species and critical habitat, Energy has an affirmative duty to consult with the National Marine Services and the U.S. Fish and Wildlife Service.

[16] *See* Hanford Advisory Board Advice No. 246 (June 3, 2011); Letter from EPA to the Hanford Advisory Board (Sept. 16, 2011).

CONCLUSION

In light of the shortcoming of the Plan, Riverkeeper urges Energy to evaluate a broader range of alternatives, abandoning its over-reliance on MNA, which will not achieve protection of the Columbia River, human health, and the environment in a reasonable timeframe. Riverkeeper asks EPA and Ecology to advocate for a more aggressive cleanup strategy, one that provides a more adequate balancing analysis and does not give disproportionate weight to the cost of more protective solutions.

We look forward to working with Energy on the monumental task of protecting the public and future generations from Hanford's nuclear legacy. Thank you for considering Riverkeeper's input on the proposed cleanup plan for the remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units.

Sincerely,

Dan Serres
Conservation Director
Columbia Riverkeeper

Abigail Cermak
Hanford Coordinator
Columbia Riverkeeper

cc:

Dennis Faulk, U.S. Environmental Protection Agency
Jane Hedges, Washington Department of Ecology
Jean Vanni, Yakama Nation ERWM Program
Alex Nazarali, Confederated Tribes of the Umatilla Indian Reservation
Jonathan Matthews, Nez Perce Tribe
Dale Engstrom, Oregon Department of Energy

Comment Number 100-F/IU-058
August 11, 2014, Letter from the Heart of America Northwest

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Heart of America Northwest
The Public's Voice for Hanford Cleanup
444 NE Ravenna Blvd. Suite 406 - Seattle, WA 98115 - phone: (206)382-1014

Comments of Heart of America Northwest and Heart of America Northwest Research Center on the Proposed Final Cleanup Plan for the 100-F Reactor Area along the Columbia River

August 11, 2014

Synopsis of our Comments and Failure to Meet Expectations for Public Information, Involvement and Comment:

On behalf of our 16,000 members and on behalf of future generations who will seek to use the Columbia River Corridor we object most strongly to the USDOE's and EPA's "Preferred Alternative" Plan which would deprive the public of unrestricted use of the Columbia River shoreline areas for hundreds of years.

The 100-F/IU Area is where the U.S. Department of Energy's shutdown and "cocooned" F-Reactor sits alongside the Columbia River. The F Reactor produced plutonium for nuclear weapons. The F Area along the River "has a groundwater plume of spent fuel-related contaminants beneath it. ... (There are) 16 (deep soil) sites that contain ...cesium-137, cobalt-60, europium-152 and -154, nickel-63 and strontium-90 contamination at levels considered dangerous to human health."

Now, there are scores of contaminated soil areas grouped into 5 "operating units" and contaminated groundwater.

The importance of this cleanup plan was summarized by The Hanford Advisory Board (HAB), whose advice we have participated in drafting and support:

> "Final Hanford River Corridor cleanup decisions are important because inadequate cleanup actions could potentially impact the Columbia River. The (100 Area cleanup) Plan will provide a template for subsequent River Corridor decisions that follow. It is important to the Board that these decisions are dependable, protective, defensible, and well supported."

How Long Should it Take to Clean Up the Contamination – or, How Long Can USDOE Prevent People From Using the Area and Water?

150 to 264 Years??? That is NOT Reasonable and, indeed, is illegal.

USDOE's Preferred Proposed Plan for the groundwater is not a plan to actively clean up the groundwater. Instead Option "GW-2" would rely on "natural attenuation" and "institutional controls" "to reduce contaminants of concern, and "prevent exposure." The period of restriction to prevent all use of the groundwater is proposed to be 150 years. For soil sites, the Proposed Plan includes restricting use of soil areas for up to 264 years.

USDOE has adopted a strategic plan which it repeatedly touts in public that cleanup of the Columbia River Corridor, the 100 (9 reactor areas) and 300 (fuel fabrication and testing areas), will be completed by 2016.

This has always been an impossibility and a deliberate misleading of the public and Congress as to what constitutes cleanup being completed. USDOE wants to say it is done, but the areas are not cleaned up if unrestricted public uses are forbidden and dangerous for hundreds of years.

If USDOE and EPA adopt the Preferred Alternative for the F Area, under which access to, use of, and exposure to groundwater and shoreline resources will have to be restricted for hundreds of years, such claims will be exposed as meaningless public relation lies. Worse, if USDOE invites the public to use the River Corridor, while these risks remain in place – ultimately leading to likely exposures due to the predictable failure of paper plans to prevent use and exposure ("institutional controls") – the agencies will again be imposing cancer and illness on both the general public and Native Americans seeking to exercise their Treaty Rights to use the Corridor to fish, live along, gather resources and engage in both religious and cultural practices. As such, this Plan will have a demonstrable "disparate impact" in violation of Treaty Rights and anti-discrimination statutes.

This Plan and Preferred Alternative do not meet the EPA's rules for public acceptance, balancing of cost versus long term restrictions, disparate impacts on minority populations, the requirement to restore groundwater to beneficial uses within reasonable timeframes, and numerous other standards.

Nor do the Plan and Preferred Alternative meet Washington State's standards (which EPA must ensure are met), including that permanent cleanup measures must be preferred over engineered barriers, much less institutional control plans. Cost is not allowed to change the allowable risk. The Agencies have ignored the requirement that the risk be measured based on the reasonable likelihood of failure of institutional controls, not based on the unfounded, public relations based claim that the USDOE can prevent exposures to contamination which is not deeply buried and is in the incredibly valuable groundwater resource.

The Plan has absolutely zero public acceptability, which is a part of EPA's mandate for Plan review and approval. For example, at the February, 2014 Hanford Advisory Board Meeting, following a briefing from the TPA agencies, the Board held an impromptu Sounding Board on the 100-F Proposed Plan. Each Board member expressed their expectations for clean-up and repeatedly voiced their concern about the extremely lengthy time that Institutional Controls will have to be maintained and enforced.

At the public meeting on the Plan, not one member of the public agreed that preventing public use and exposure for 175 years was reasonable.

Neither the USDOE materials provided the public nor the presentations at the public meetings revealed that public and Tribal use of Columbia River shoreline areas under the Plan would have to be prevented for 264 years, not the 175 years previously discussed, or the 150 years presented to the public in the public summary of the Plan and hearing presentation. For 264 year restriction requirement, see *Remedial Investigation/Feasibility Study and Proposed Plan for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2 and 100-IU-6 Operable Units; DOE/RL -2012-41, Rev. 0*).

The TPA agencies' F Area fact sheet for public notice and comment was factually inaccurate and misleading. The fact sheet presented the "timeline" for alternative plans with a maximum timeframe of 150 years for Strontium 90 to reach today's standards from "monitored natural attenuation" for the groundwater alternatives. The fact sheet stated that the preferred alternative for soil sites was retrieval, treatment and disposal (RTD), with NO MENTION THAT THE CONTAMINATION LEVELS PROPOSED TO BE LEFT IN THE NEAR SURFACE AREAS, particularly 118-F-8, WOULD REQUIRE 264 YEARS OF RESTRICTIONS ON PUBLIC USE.

The Hanford Advisory Board already issued advice that the 175 year period was unreasonable and unacceptable, and is poised to issue stronger advice at its September meeting.

The public notice and materials for comment on the Plan were misleading in failing to disclose the 264 year period for institutional controls.

The "webinar" format for regional public participation in the one public meeting and hearing, held at Hood River in July, was a total failure and misleading to the public and citizen groups.

Had the agencies informed us honestly that no members from the public listening on the phone or web based application would be able to offer public comment, we would never had agreed to the agencies holding just one public meeting on this important Plan. This Plan is so important to the public because it is the first of many "final" cleanup plans to be proposed for the Columbia River Corridor, and because of the Plan's clash with public values for resources, shorelines and groundwater to be cleaned up for unrestricted public use in a reasonable timeframe.

We agreed not to insist on additional meetings based on the expectation that anyone who could not attend the one hearing in person would be able to not only hear and see the presentations, but to fully participate, ask questions and give comments. No one on the phone or webinar was invited to, or enabled to, provide comments.

Not only did the technology fail some people who could not hear, but *the agencies never intended to enable the public to comment on the phone or via web messages to be shared with all hearing attendees during the meeting.*

The detailed comments given by our organizational representatives and members, as well as from all members of the public, should be recorded for the record and properly summarized and responded to. Without recording, we have no assurance that our comments were actually incorporated into the administrative record. All comments by our representatives and members are hereby incorporated into our formal comments. We expect that they will be in the record and responded to.

The comment period should not be closed. Instead, a new Plan should be produced which meets public values for cleanup in a reasonable timeframe, and new public meetings around the region should be held on a new Plan.

150 Years, 264 Years, Indeed 50 Years, are NOT Reasonable Timelines for Cleanup – USDOE has no ability to prevent reasonably foreseeable exposures during such long time frames:

150 years is not a reasonable timeline for cleanup, particularly along the Columbia River shorelines. Leaving contamination in soil sites requiring restricted use for decades, such as 118-F-8:3, with contamination requiring controls to prevent public and Tribal use for 264 years, and relying on institutional controls to prevent exposure to groundwater instead of cleaning up to enable drinking and domestic uses, are not compatible with, and conflict with:

- the designation of the Hanford Reach National Monument;
- CERCLA public acceptance criteria;
- CERCLA standards for when institutional controls can be relied upon;
- Treaty Rights for the three Nations with rights to fish and utilize resources along the Columbia;
- Washington State's substantive standards[1] requiring cleanup to utilize permanent remedies to the extent practicable – with use of institutional controls as the lowest priority[2];
- Washington State standards for use of a reasonable maximum exposure scenario (in this case, the scenario is one that involves full exercise of Treaty rights and unrestricted uses of resources based on the reasonable expectation that institutional controls will fail within decades)[3];
- EPA's own guidance and standards for exposure to residual contamination, including radionuclides and the foreseeable failure of institutional controls, including that the risk level must not exceed one additional cancer for every ten thousand exposed individuals (1E-4) with every effort to prefer plans that prevent exposure below one in one hundred thousand (1E-5);
- Washington State's risk based cleanup standard for carcinogens – that the risk from residual contamination, summing all carcinogens, including radionuclides, must not exceed one additional cancer for every one hundred thousand exposed individuals under the reasonable maximum exposure scenario (1E-5)[4][5];

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[1] Under CERCLA, EPA and USDOE must ensure that Washington State standards are met as well as federal standards. Under CERCLA, if any state environmental law establishes a more stringent cleanup standard than Federal law with respect to hazardous substances, and it is "legally applicable or relevant and appropriate" standard, then the CERCLA cleanup must attain the more stringent state standard. *42 U.S.C. § 9621(2)(A)*. Washington law definitively states that MTCA's cleanup standards, set forth in WAC 173-340-700 to 173-340-760, are "legally applicable" under this section of CERCLA. *WAC 173-340-702* ("When evaluating cleanup actions performed under the federal cleanup law, the department shall consider . . . WAC 173-340-700 through 173-340-760 . . . to be legally applicable requirements under Section 121(d) of the Federal Cleanup Law.")

[2] The agencies have failed to even analyze engineering alternatives for this and other contaminated sites with contamination below fifteen feet. This is a per se violation of the standard, since the alternatives were not even considered, such as placing subsurface caps in conjunction with further excavation and use of appatite and phosphates to prevent further migration. The alternatives considered simply go from RTD to institutional controls. As discussed further, the Plan also fails to analyze the reasonable likelihood of failure of the institutional and engineering controls. Standards must be met, under WAC 173-340, based on the reasonably foreseeable failure of such controls. Instead, this Plan illegally and unreasonably assumes that the controls will not fail over decades and hundreds of years.

[3] WAC 173-340-708(3):

> (a) Cleanup levels and remediation levels shall be based on estimates of current and future resource uses and reasonable maximum exposures expected to occur under both current and potential future site use conditions, as specified further in this chapter.
>
> . (b) The reasonable maximum exposure is defined as the highest exposure that is reasonably expected to occur at a site under current and potential future site use. WAC 173-340-720 through 173-340-760 define the reasonable maximum exposures for groundwater, surface water, soil, and air. These reasonable maximum exposures will apply to most sites where individuals or groups of individuals are or could be exposed to hazardous substances. For example, the reasonable maximum exposure for most groundwater is defined as exposure to hazardous substances in drinking water and other domestic uses.

The reasonable maximum exposure scenario, in accord with this standard, must include exposure to the groundwater and its use in drinking water and other domestic uses – including culturally significant uses, in accord with Treaty Rights to live seasonally along the Columbia River under the Treaties of 1854 for the Yakama, CTUIR and Nez Perce Tribes.

[4] The Department of Ecology (Ecology) has formally stated that MTCA applies to sites contaminated with radionuclides. *See Department of Ecology Toxics Cleanup Program, Concise Explanatory Statement for the Amendments to the Model Toxics Control Act Cleanup Regulation Chapter 173-340 WAC (Publication Number 01-09-043), 117–18 (Feb. 21, 2001).* In its official explanatory statement accompanying a MTCA rules update, Ecology clearly and unambiguously stated its position that the law applies to radionuclides: "Ecology believes that MTCA

- The designation of the F Area groundwater and soil sites proposed for over a hundred years of exclusion as part of the legally designated "Shorelines of State Significance".

The TPA Agencies should, at the least, remove, treat and dispose (RTD) the contamination under waste sites 118-F-8:3 and 116-F-14 for example – in combination with engineered measures, including excavation followed by application of binding chemicals to reduce migration and the unreasonable time period now proposed for exclusion from the area. Monitored Natural Attenuation is NOT reasonable for the Shorelines of State Significance and areas designated for the Hanford Reach National Monument.

The TPA agencies' response to HAB Advice 268, that "when evaluating all of the balancing criteria, the proposed Alternative (GW-2) is similar to GW-4 in long-term effectiveness and permanence and short term effectiveness," does not comport with the data and analyses in the agencies' own RIFS and analyses of alternatives. Use of Pump and Treat technologies is shown as reducing the time period needed to reach standards in every alternative. Further, the analyses failed to consider engineered alternatives for soil sites, which would also reduce groundwater contamination, e.g., use of deeper excavations, followed by injection of binding chemicals, and, then, placing a cap to prevent both water infiltration and inadvertent intrusions.

We agree with, and reiterate, the proposed draft Hanford Advisory Board advice stating that:

> "Pump-and-treat alternatives, as soon as they are applied, are better at reducing contaminants, better at reducing the overall time needed until cleanup is attained and because they actually remove contaminants from the aquifer, are better at permanence. The 100-F Area alternative evaluation by balancing criteria appeared to be driven, for the most part, by cost. Cost of remediation should not be a criteria which denies their ability to attain unrestricted use of the river corridor, a core Board value.
>
> "The RI/FS and Proposed Plan fail to analyze the likely failure of institutional controls over this extended time period, and do not present the resultant exposures and risks resulting from failure. Presenting this information and adopting a Plan which prevents excess risk due to reasonably foreseeable failures of institutional controls, as with engineered remedies, is a substantive requirement from both CERCLA and Washington State's MTCA."

The RI/FS and Proposed Plan do not meet requirements to discuss the likelihood of failures of institutional controls over the hundreds of years proposed, and the agencies should adopt a Plan which meets risk based standards for the populations likely to be exposed following the reasonably foreseeable failures of institutional controls.

The Plan must meet the requirements of WAC 173-340-708(3):

> (a) Cleanup levels and remediation levels shall be based on estimates of current and future resource uses and reasonable maximum exposures expected to occur under both current and potential future site use conditions.

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applies to the cleanup of radionuclide contaminated sites." *Id.* at 118. The agency described its reasons for that conclusion. First, the "statutory definition of hazardous substances in RCW 70.105D.020 includes a reference to CERCLA and other laws that address radionuclides." *Id.* Second, Ecology's rules already contain "several definitions and Method A table values pertaining to radionuclides."

[5] MTCA requires any "known or suspected carcinogens" to be cleaned up to an estimated cancer risk of no less than one in one million (1×10^{-6}). *WAC 173-340-705(2)(c)(ii).* This cleanup standard may be reduced to one in one-hundred thousand (1×10^{-5}) when there are multiple hazardous substances present at the site, *WAC 173-340-705(4),* but under no circumstances can it fall below that risk level.

1. The reasonable maximum exposure scenario must reflect substantive compliance with Treaty Rights within a reasonable time period. This includes the Tribal exposure scenarios, which include exposure to groundwater from multiple sources, including drinking, sweat lodges, showers, eating plants and fish…
2. The groundwater under Hanford is the last major water resource in Eastern Washington. The flows of the Columbia River and other surface waters from the Cascades to eastern Washington are projected to drop significantly. This will lead to increased pressures for use of Hanford's groundwater – making the restriction on use for 150 years even more unreasonable and increasing the conflict with the reasonable maximum exposure scenario standards which require planning for the use of the groundwater.
3. The TPA agencies have repeatedly failed to consider in reliance on institutional controls to prevent exposure to groundwater for the 100 F Area and, previously for the 300 Area, that water withdrawals from the Columbia River are illegal. Yet, the USDOE's plans are based on water withdrawals from the River, rather than from groundwater.
4. On the other hand, USDOE proposes to rely on undefined, and unworkable, institutional controls to prevent use of groundwater. The Plan and analyses fail to consider that Washington State has no restrictions or permits required for installation of groundwater withdrawal wells for fairly large numbers of users. Thus, there is no regime under which restrictions on groundwater use would be enforceable or applied.

The Proposed Plan does not meet legal standards, is entirely unreasonable and violates public values in relying on institutional controls to prevent exposures for hundreds of years, and should be rejected. The agencies should adopt a plan that analyzes and includes engineering alternatives in conjunction with much greater retrieval and removal of contamination from soil sites. For groundwater, the sit back and watch the contamination approach, called "monitored natural attenuation" by the agencies to add lipstick to the mask, is unacceptable. We urge adoption of a new variation of Alternative 4 of active groundwater cleanup, plus technologies to remove strontium. Active cleanup measures must be adopted for cleanup and restoration of the precious groundwater resource alongside the Columbia River within a reasonable time period.

For questions or responses:
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Comment Number 100-F/IU-059
August 11, 2014, Letter from the Confederated Tribes and Bands of the Yakima Nation ERWM

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Confederated Tribes and Bands
of the Yakama Nation ERWM

Established by the
Treaty of June 9, 1855

August 11, 2014

Dennis Faulk, Hanford Project Manager
U.S. Environmental Protection Agency
309 Bradley Blvd., Suite 115
Richland, WA 99352

Kim Ballinger, U.S. Department of Energy
Richland Operations Office
P.O. Box 550, A7-75
Richland, WA 99352

Subject: Review of the Proposed Plan (DOE/RL-202-41, Rev 0) 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units and Remedial Investigation/Feasibility Study (DOE/RL-2010-98)

Dear Ms. Ballinger and Mr. Faulk:

The U.S. Environmental Protection Agency (EPA) anticipates issuing the Record of Decision (ROD) under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) for the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units Operable Units this year. The Confederated Tribes and Bands of the Yakama Nation appreciate the opportunity to review and provide comments on these documents.

The Confederated Tribes and Bands of the Yakama Nation is a federally recognized sovereign pursuant of the Treaty of June 9, 1855 made with the United States of America (12 Stat. 951). The U.S. Department of Energy Hanford site was developed on land ceded by the Yakama Nation under the 1855 Treaty with the United States. The Yakama Nation retains reserved rights to this land under the Treaty.

The Hanford Reach is one of the most cultural resource-rich areas in the western Columbia Plateau. Pre-Hanford uses of the area included agriculture and use by Native American tribes. Archaeological evidence demonstrates the importance of this area to Native American tribes, whose presence can be traced for more than 10,000 years. The near-shore area of the rivers (Columbia, Snake, and Yakima) contained many village sites, fishing and fish processing sites, hunting areas, plant-gathering areas, and religious sites. Upland areas were used for hunting, plant gathering, religious practices, and overland transportation.

Chinook salmon, sockeye salmon, coho salmon, and steelhead trout use the river as a migration route to and from upstream spawning areas and are of economic importance. The Treaties of 1855 provide for the peoples of three Nations to "live along" and fish the River Corridor.

The Yakama Nation's vision for the cleanup and closure of the Hanford Site includes meeting the following objectives:

1. Compliance with Yakama Nation Treaty Rights, including full access to cultural (and natural) resources by the Yakama Nation and its members within its ceded land and aboriginal territory, including on the Hanford Site.
2. Official recognition that Native Americans living near the Hanford site are the most vulnerable people to environmental contaminants, as underscored by EPA's Columbia River Fish Contaminant Survey.
3. Protection of the health of Yakama Nation tribal members and the environment so that the Hanford Site and all its resources (including the Columbia River, its islands, other surface waters, geologic resources, groundwater, air, and biological resources such as plants, fish, and wildlife) are safe for all exposure scenarios and tribal uses.

The Yakama Nation supports cleanup actions that are complete, permanent, and are based on proven technology. We do not support remedial actions that leave large quantities of long-lived radionuclides or dangerous waste in place and rely on long-term stewardship or institutional controls to address future potential exposure scenarios. Long-term stewardship and institutional controls will not be effective for wastes that remain dangerous for hundreds or thousands of years. Assuming that contaminants remain in place implies that a Long-Term Stewardship Program Plan must be implemented which will remain effective longer than most human institutions have ever existed.

The Yakama Nation further supports the following key principles for all remedial actions that are completed on the Hanford Site:

1. Cleanup decisions that follow the CERCLA RI/FS process and requirements through the finalization and approval of CERCLA documents (including risk assessments and supporting secondary documents) prior to development of Proposed Plans and final RODs.
2. Cleanup decisions based on adequate site-specific characterization, including for the vadose zone and groundwater.
3. Cleanup actions that comply with all applicable or relevant and appropriate federal and state regulatory requirements.
4. Cleanup actions that are compatible with clean closure criteria.

As mentioned above, the Yakama Nation does not support remedial actions that leave significant quantities of contamination in place at the Hanford Site, nor do we support remedial actions which would preclude clean closure.

We look forward to discussing our vision of cleanup and our concerns regarding the current cleanup plans for Hanford with you further.

Sincerely,

Russell Jim
Yakama Nation ERWM Program Manager

Attachment: #1

cc:
Douglas Shoop, Acting Manager, US Department of Energy
Ken Niles, Oregon Department of Energy
Stuart Harris, CTUIR
Gab Bohnee, Nez Perce
Marlene George, YN ERWM
Administrative Record

Attachment #1: **Yakama Nation ERWM Comments on the 100-F Area Proposed Plan & Remedial Investigation / Feasibility Study:**

1. Protection of Yakama Nation treaty rights, including full access to cultural resources on the Hanford Site by the Yakama Nation:

Ensuring Treaty compliance is a critical intergovernmental concern. By and through this document, USDOE supports the participation of Yakama Nation in activities related to remediation and restoration of resources affected by Hanford and implements its trust responsibility and enforceable obligations to the Yakama Nation. From the YN ERWM's perspective, efforts to include the tribal program in the development of the RI/FS/PP were weak.

a. The Treaty, which reserves specific rights and resources for the Yakama Nation, should be acknowledged as an ARAR or a "must comply" standard for cleanup decisions. This includes the right to practice in full subsistence activities in Yakama usual and accustomed use areas. All future Interim and Final Record(s) of Decision(s) should be in harmony with treaty rights of the Yakama Nation under the Treaty of 1855 including upland treaty rights.

b. The Proposed Alternatives do not fully comply with the Treaty of 1855 between the Yakama Nation and the United States of America. Land Use & Protection of Yakama Nation treaty rights, including full access to cultural resources on the Hanford Site by the Yakama Nation is not ensured through this Proposed Plan, nor are DOE's trust responsibility and enforceable obligations to the Yakama Nation evident. All potential impacts to treaty-reserved rights and resources should be thoroughly evaluated and considered in a revised RI/FS and Proposed Plan and supporting documents. The preferred alternative should be consistent with the USDOE's American Indian Policy, with the federal trust responsibility, and with the terms of the Treaty of 1855. YN believes the preferred alternative is lacking this consistency.

c. Protection of the health of Yakama Nation tribal members and ensuring sustainable habitability of Hanford for Yakama Nation Tribal members including their safety and welfare or trust resources is a major concern of the Yakama Nation Environmental Restoration and Waste Management Program. Accumulated scientific evidence demonstrates that Native Americans are, as a statistical cohort, subject to the highest risk of disease and cancer from exposure to environmental contaminants. The Columbia River Basin Fish Contaminant Survey is a technical report that assesses the amount of chemical pollution in certain species of fish, and the potential health risks from eating fish those fish. The study is based on fish samples collected between 1996 and 1998 from tribal fishing waters in Washington, Oregon and Idaho. EPA funded the study which was coordinated by the four member tribes of the Columbia River Intertribal Fish Commission (CRITFC).

   YN believes there should be official recognition that Native Americans living near the Hanford site are the most vulnerable people to environmental contaminants, as underscored by EPA's Columbia River Fish Contaminant Survey. Adults in CRITFC's member tribes who eat fish frequently (48 meals per month) over a period of 70 years may have cancer risks that are up to 50 times higher than those in the general public who consume fish about once a month.

d. The 100-F Area site boundaries include the Columbia River and its shorelines. Portions of the site are within the boundaries of the National Monument. Interactions among media (i.e., soils and groundwater) at the 100-F Area are important. As such, the effect of source control actions on the remediation levels or time frames for other media should be evaluated. Data should *not* be selective (e.g., excluding waste sites or contaminants) but should include all data sources applicable to evaluating current and future conditions at all upland, riparian, and nearshore operational and non-operational areas. A holistic approach would ensure that protective decisions are made for the site in its entirety.

e. It is the belief of the YN that a Federal interagency committee composed of the Department of Interior, the EPA, and USDOE convene to define mutually the terms and conditions of habitability for native people of the Columbia River Basin (including residual contamination standards) and to establish an agreement with the Yakama Nation.
    i. Porewater and aquifer sampling data shows exceedances of water quality cleanup standards.

f. None of the Alternatives were evaluated against the nine balancing criteria based on effects on traditional cultural properties (TCP). Currently, there are several projects and major decisions that will be made that effect the entire Hanford site, yet still a comprehensive TCP study has not been performed. Site wide undertakings and decisions such as clean up levels, restoration, vegetation management, land use plans, the use of barriers and institutional controls need to take into consideration the effects on TCPs. It is the obligation of DOE under the National Historic Preservation Act (NHPA), Section 110, to inventory and evaluate properties to determine eligibility under the agency's jurisdiction. DOE has not been holding up to their Section 110 obligation of identifying cultural properties on the Hanford site. There are known TCP that have not been evaluated such as, White Bluffs, Coyote Rapids, the Columbia River, Wahluke Slope, as well as other known and potentially unknown TCPs in the Hanford area. Cultural properties are only being addressed through the Section 106 process, on a project by project basis, which is entirely ineffective. This piecemeal method does not allow for a comprehensive landscape study and does not allow for proper consultation with YN. Full compliance with government-to-government requirements are not fulfilled by the vague statements found in the Proposed Plan (example: page 2). The YN expects a discussion of the culturally sensitive areas with reference to both historic and prehistoric Native American use within the Proposed Plan. Implied agreement with implementation of a ROD change rather than an MOA is misleading to the public. The YN requests consultation with DOE on this issue.

g. The Proposed Plan, while identifying the physical presence of Gable Mt. or Gable Butte, it does not include discussion of the TCP or the ongoing deliberations to extend the TCP boundaries. Nor does is discuss implications/effects of final ROD decisions upon these areas or the area known as West Lake. The discussion of these areas needs to be more robust.

a. It is unclear as to what is in place to ensure compliance with the Antiquities Act of 1906. Under the Antiquities Act of 1906, the Hanford Reach National Monument (HRNM) was created by Proclamation 7319 in 2000. The Proclamation lists the resources that are to be protected including: riparian, aquatic and upland shrub stepped habitats, native plant and animal species as well as archaeological, historic and sacred sites throughout the monument. While the majority of the HRNM is managed by USFWS, the river corridor lands underlying the Hanford reactors and operational areas are managed by DOE, the

current land owner. The DOE-managed portions of the HRNM include the 100-F Area addressed in the Alternatives. These lands contain high levels of contamination and significant cultural resources. For example there is an identified archaeological cultural resource site located within the boundaries of the 100-F-59/128-F-2 waste site for which the impacts are unknown or quantified.

b. It is recognized in the Proclamation (HRNM) that DOE has the responsibility to clean up hazardous substances and the restoration of natural resources. The Proclamation further states, "As Department of Energy and US Fish and Wildlife Service determine that lands within the monument managed by the Department of Energy become suitable for management by the US Fish and Wildlife Service, the US Fish and Wildlife Service will assume management by agreement with the Department of Energy." Clearly it was the intent of the President that the HRNM land would be cleaned, restored and then managed by the USFWS.

   The entire HRNM would then be managed according to the mission of the USFWS guided by the HRNM Comprehensive Conservation Plan (CCP), which states a primary purpose of, "Protect and restore biological, cultural, geological and paleontological resources." Areas in the River Corridor 100 Areas are some of the most contaminated, and it remains the obligation of DOE to clean and restore these areas within the HRNM and areas that could affect the HRNM in consultation with the Department of Interior. Anything other than complete cleanup and restoration of the HRNM would be in direct conflict with the Antiquities Act, Proclamation 7319, and the HRNM CCP.

2. Land Use:

Language in the Proposed Plan and selected Preferred Alternatives indicates that DOE is not considering cleanup to unrestricted use and is striving toward a less stringent cleanup based on the Comprehensive Land-Use Plan (i.e. use of Method A-Industrial Standards for Arsenic vs. Method B-Unrestricted Standards). While cleanup decisions may ultimately be defined by management boundaries, the risk assessment should be based upon actual human behaviors.

a. It is stated that cleanup actions will support reasonably anticipated future land uses consistent with the Hanford Reach National Monument and "Record of Decision: Hanford Comprehensive Land-Use Plan Environmental Impact Statement (the "CLUP') (HCP EIS) (64 FR 61615). CLUP is designated for 50 years operational and 100 years for institutional controls. Beyond that time period, the site could be used for any and all types of land use; including irrigation. The Preferred Alternative for groundwater with ICs for extended time periods is inconsistent with the CLUP. It is known that there will be continued releases above cleanup levels for over 100 years. Yakama Nation ERWM remains concerned that any remedy reviews (i.e. 5 year ROD reviews) will not include appropriate sampling actions or technological systems review to confirm performance of these IC.

b. Furthermore, the final CLUP did not include any suggestions, or address any concerns provided by the Yakama Nation.[1]

c. The CLUP was a Federal undertaking that determined what type of activities could occur within the Hanford landscape, yet traditional cultural properties (TCP) were never addressed. Areas designated for industrial use, research and development, and conservation mining could have significant impacts on the landscape, and adversely affect a TCP should one be present

3. **Cultural Resources & Institutional Controls**:

The philosophy underlying the cleanup of Hanford should be guided explicitly by the goal of allowing Native Peoples to safely live the lifestyle to which they are entitled. This way of thinking will be particularly important when considering how to incorporate non-quantitative elements into the Preferred Alternative such as the spiritual or cultural value of a site.

There is the assumption of, and over-reliance on, the use of Institutional Controls to ensure protectiveness rather the primary objective which is protectiveness of the environment and human health through selection of remedies that employ treatment technologies that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants. The use of institutional controls can be an adverse effect to cultural sites, particularly traditional cultural properties. The effects of institutional controls on cultural sites were not evaluated in the RI/FS or the PP.

a. Currently, there are several projects and major decisions that will be made that affect the entire Hanford Site, yet still a comprehensive Traditional Cultural Property (TCP) study has not been performed so that the effects can be determined. Site wide undertakings and decisions such as clean up levels, restoration, vegetation management, land use plans, the use of barriers and institutional controls need to take into consideration their effects on TCPs. It is the obligation of DOE under the National Historic Preservation Act (NHPA), Section 110, to inventory and evaluate properties to determine eligibility under the agency's jurisdiction.

b. Cultural resources have not been adequately addressed in either of the 100-F documents (RI/FS and PP). Please refer to the EPA document, CERCLA Compliance with Other Laws Manual: Part II[2] (hereafter referred to EPA Guidance), where it details out how to be in compliance with the NHPA during the CERCLA process in Section 4 (attached). Section 4.1.3 clearly states efforts should be made to identify cultural resources. Generally DOE carries out these efforts during the Section 106 process for each project, however between 2003 and 2011, 127 projects were carried out under the "no potential to cause effect" classification in the 100-F Areas. This means these projects were completed

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[1] Yakama Nation letter to John Wagoner, Manager, Department of Energy, Richland Operations Office, June 30, 1998.

[2] RPA, CERCLA Compliance with Other laws Manual: Part II. Clean Act and Other Environmental Statues and State Requirements, EPA/540/G-89/009, OSWER Directive 9234. 1-02, August 1989

without proper Tribal consultation, and did not have a full Section 106 cultural review. Research has indicated the Section 106 process for many projects in the F-Area is suspect and needs to be reviewed to ensure DOE was compliant with the NHPA.

c. As outlined in the EPA Guidance document Section 4, once cultural properties are identified it needs to be determined if they are eligible and if the proposed actions will have an adverse effect on the eligible properties. Institutional controls on TCPs/cultural sites can be an adverse effect. Further the EPA Guidance states any **adverse effects to eligible properties must be mitigated, "this mitigation plan should be included in an MOA signed by the consulting parties** (page 4-10)". EPA Guidance 4.1.4.2 states "The remedial design process should provide for scheduling and funding of the development and implementation of a detailed cultural resources mitigation plan".

d. The EPA Guidance 4.1.5 (page 4-11) details proper documentation, "Compliance with the NHPA requirements should be documented in the RI/FS report, describing, as appropriate, the determination of whether cultural resources are or are not present; the results of the Cultural resource survey (CRS) process and recommendations on the eligibility of the identified cultural resources for the National Register; the impact, if any, on such resources; and the associated mitigation measures to minimize potential "no adverse" or "adverse" effects. When cultural resources are present, the ROD should identify the NHPA as an ARAR. For each alternative, the ROD should identify whether the alternative will comply with substantive NHPA requirements. **For the selected remedy, the ROD should also include a brief statement describing what compliance with NHPA entails, e.g. that there will be no impact on cultural resources or what mitigation measures will be required."**

e. The 40 CFR 300.435(b)(2) states; "During the course of the RD/RA, the lead agency shall be responsible for ensuring that all federal and state requirements that are identified in the ROD as applicable or relevant and appropriate requirements for the action are met."

f. It is evident the RI/FS and Proposed Plan documents do not meet EPA guidelines. DOE has not performed the necessary tasks to determine effects to cultural resources, **in consultation with the YN ERWM to determine effective avoidance, minimization, and/or mitigation measures.** The **final ROD must reflect compliance with NHPA**, which will be impossible with current data.

g. YN ERWM requests EPA and DOE to complete the necessary task of **"describing what compliance with NHPA will entail" and if necessary based on proper field evaluation complete a necessary MOA to mitigate for any adverse effects to the newly discovered TCPs, in consultation with YN ERWM.** The YN ERWM expects a discussion of the culturally sensitive areas with reference to both historic and prehistoric Native American use within the Proposed Plan. Implied agreement with implementation of a ROD change rather than an MOA or outlining actions within the ROD is misleading to the public.

h. THE YN ERWM program requests consultation regard decisions for D-Island. We remain concerned as it is as bounded by a casual recreational user scenario)

(page 8-37, RI/FS) which is not protective of YN tribal members.

i. Although the report speaks of ethnographic studies by PNNL, there has been no attempt to identify new cultural properties or traditional cultural properties in many years, as mandated under Section 110 of the National Historic Preservation Act. The Hanford Cultural Resource Management Plan outlined a process for identifying one TCP per year; however this has not been done. DOE has not been meeting their Section 110 obligation of identifying cultural properties on the Hanford site. There are known TCP that have not been evaluated that include:
    i. White Bluffs
    ii. Coyote Rapids
    iii. Columbia River
    iv. Wahluke Slope
    v. Other known and potentially unknown TCPs in the Hanford area.

    Cultural properties are only being addressed through the Section 106 process, on a project by project basis, which is entirely ineffective. This piecemeal method does not allow for a comprehensive landscape study and does not allow for proper consultation with YN ERWM. None of the Alternatives were evaluated against the nine balancing criteria based on effects on a TCP. The YN ERWM Program requests this be done.

j. It is unclear as to what is in place to ensure compliance with the Antiquities Act of 1906. Under the Antiquities Act of 1906, the Hanford Reach National Monument (HRNM) was created by Proclamation 7319 in 2000. The Proclamation lists the resources that are to be protected including: riparian, aquatic and upland shrub stepped habitats, native plant and animal species as well as archaeological, historic and sacred sites throughout the monument. While the majority of the HRNM is managed by USFWS, the river corridor lands underlying the Hanford reactors and operational areas are managed by DOE. These lands contain high levels of contamination and significant cultural resources.

4. Institutional Controls

Use of institutional controls must be addressed in light of, and with appropriate deference to, Yakama Nation treaty rights which guarantee use of the land for specific purposes which are considered inseparable from the Yakama way of life.

a. Table 5 of the Proposed Plan (page 35) and Table 9-1 (DOE/RL-2010-98, Draft A; RI/FS) indicate indefinite IC to prohibit irrigation for waste site 116-F-14 (107-F liquid Retention Basin) based on cost and previous use of a dilution factor for groundwater-to-river is not compliant with WAC 173-340-720(8)(d)(i)(C) or 173-340-730(6)(b). Nor does it give consideration of all nine CERCLA balancing criteria.

b. Section 300.430 (CERCLA-Remedial investigation/feasibility study and selection of remedy) states the use of institutional controls shall not substitute for active response measures (e.g., treatment and/or containment of source material, restoration of ground waters to their beneficial uses) as the sole remedy unless such active measures are determined not to be practicable, based on the balancing of trade-offs among alternatives

that is conducted during the selection of remedy. RTD should have been evaluated in at least one of the alternatives and was not. Indefinite ICs due to hexavalent chromium contamination at the 116-F-14 waste site (107-F liquid retention basin) is unacceptable.

c. Regarding the use of institutional controls at DOE waste sites, the National Research Council pointed out: "While there is typically a tacit recognition that engineered barriers and waste stabilization approaches have limited periods of effectiveness, these technologies are frequently employed with inadequate understanding of, or attention to, the factors that are critical to their success. These include the need for well-conceived plans for performance monitoring that identify and correct potential failures and plans for maintenance and repair, including possible total system replacement" (NRC, 2000). YN ERWM requests this level of detail be included in the Proposed Plan and ROD.

   This level of planning, both technical and financial, does not appear to have been included in the cleanup planning. Cost estimates need revision to include these elements.

d. Text within the document discussing "residual contamination" at depths below remediation actions is misleading to the public. Contamination is occurring; the 'deep zone' [vadose zone] has not been demonstrated to meet cleanup levels. Again, there is the assumption of and over-reliance on use of Institutional Controls to ensure protectiveness rather the primary objective which is protectiveness of the environment and human health through preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element.

   YN remains concerned that any remedy reviews (i.e. 5 year ROD review) will not include actual sampling actions or technological systems review to confirm performance of these IC.

e. The use of institutional controls as part of proposed remedial alternatives does not comply with unrestricted access to the site or Yakama Nation Treaty Rights, and is likely an adverse effect to cultural sites. DOE's use of institutional controls as a means of preventing, without fail, exposure to residual contamination in the subsurface and groundwater remains both troubling and ultimately unproven. The Nuclear Regulatory Commission adamantly favors Institutional Controls for only 100 years.

f. All statements included in the Proposed Plan and RI/FS documents that convey the USDOE's "beliefs" or "positions" regarding the extent of tribal treaty rights, including statements that it is the USDOE's position that Hanford is not "open and unclaimed land," should be removed from the documents. All potential impacts to treaty-reserved rights and resources should be thoroughly evaluated and considered in a revised RI/FS and Proposed Plan and supporting documents. The preferred alternative should be consistent with the USDOE's American Indian Policy, with the federal trust responsibility, and with the terms of the Treaty of 1855.

5. Evaluation of Comparative Analysis of Alternatives:

a. We do not believe the Preferred Alternative of MNA as a remedy for the groundwater meets the selection criteria, in particular in its ability to demonstrate no adverse impacts

to drinking water supplies, other groundwaters, surface waters, ecosystems, sediments, air, or other environmental resources.

i. YN remains concerned the health of Yakama Nation tribal members as there will be continued effects and potential new COCs from the Tank Farms and the 100-F Area Reactors which are not considered in this Proposed Plan. CERCLA (*EPA/540/G-89/004-Guidance for Conduction Remedial Investigations and Feasibility Studies Under CERCLA)* asks that all *primary sources* of contamination be included in RI/FS evaluations. The reactors and adjacent waste sites are and will remain principal threat sources for decades. Soil contamination should be documented in both vertical and horizontal directions from all potential sources. None of the Alternatives fulfill this requirement as none included sources underlying the reactors or adjacent waste sites.

ii. As upland plumes enter the river, we are concerned that any remedy reviews will not include actual sampling actions or technological systems review to confirm performance or to consider these missing source area contaminants.

iii. YN ERWM Program recommends the 100-F Area ROD includes a detailed schedule for completion of the reactor removal, and the event that removal does not occur, a contingency to address the remaining soil contamination.

b. **YN requests consideration of modification of Alternative S-2 for soil remediation**: RTD of the 116-F-14(107-F) waste site to eliminate need for un-ending IC restrictions against unrestricted use of groundwater and the use of an Apatite Barrier (Permeable Reactive Barrier [as tested and used at 100-N]) is a successful technology currently employed in the 100-N to capture/remove Strontium-90 from the groundwater (see comments under Groundwater). Both actions will aid in the prevention of ongoing Strontium-90 and probable hexavalent chromium transport into the Columbia River.

i. On page 21, it is stated that the 116-F-14 waste site (the 107-F liquid retention basin near the Columbia River) contains hexavalent chromium at levels *exceeding the soil levels necessary for protection of surface water subject to groundwater discharge.* This non-compliance is later dismissed (i.e., the need for further remediation) with the claim that indefinite ICs (prohibiting irrigation) will suffice. Use of indefinite ICs is not acceptable; nor achievable. This site should be further remediated as well as the 118-F-6(with its shallow as well as deep contamination) and 118-F-8:3 (with its 264 years of excavation restriction ICs).

ii. None of the Preferred Alternatives included this option. Simply stating that "*the in situ treatment for Alternative GW-3 does require specialized biological reagents but it is a* proven technology" does not relieve DOE from the obligation to develop and consider all reasonable alternatives. As stated, the apatite barrier is a proven technology and should have been indentified in an Alternative. (*see* "EPA expects to consider using innovative technology when such technology offers the potential for

comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies" Section 300.430 (CERCLA-Remedial investigation/feasibility study and selection of remedy).

iii. Samples from several aquifer tubes immediately adjacent to the Columbia River have detected rising strontium-90 levels. The preferred alternative's 150 years of MNA is not a reasonable timeframe for remediation of the strontium-90 plume. Allowing strontium-90 to decay is inappropriate when tested technology is available to address the plume.

c. There was no consideration of the adequacy and reliability of controls factor during the evaluation of the Long-term Effectiveness and Permanence of the alternatives. There was no apparent assessment of the reliability of management controls for providing continued protection from residuals over the length of use of ICs. Avoiding such evaluation and assessment of the potential need to replace technical components of the alternatives, such as a cap, a slurry wall, or treatment systems (e.g., Sr-90 barrier, groundwater wells/treatment systems) and the potential exposure pathway and risks posed should the remedial action need replacement does not present a realistic cost estimate.

i. The cleanup and restoration of the River Corridor 100 Areas within the Hanford Reach National Monument (HRNM) remains DOE's obligation. Transition F-Area out of its cleanup contract with Washington Closure Hanford and into a long-term stewardship contract under Mission Support Alliance has been completed. This transition happen before the final Record of Decision was approved and does not require public involvement.

ii. Declaring that F-Area clean-up is complete and transitioning the site to long-term stewardship before the final cleanup plan has been reviewed by the public and the final decision has been made about what needs to be done to complete the cleanup is misleading to the public. F-Area will not be "cleaned-up" until groundwater standards have been met and remediation of the Reactor site and associated wastes sites is complete. The environmental consequences of doing this action or not doing it have not been evaluated. It is clear that none of the Alternatives were evaluated against the nine balancing criteria based on what happens with the soil operable unit's transition to Long-term Stewardship prior to completion of full remediation (including reactor and associated waste sites and groundwater plume) under the Record of Decision (e.g., Was a cost benefit analysis of remedy costs including long-term stewardship costs done?) This evaluation should be done as this action will clearly need to be reflected and integrated into the final ROD.

6. **Groundwater: General Comments**: The Tri-Party Agencies' goal for Hanford groundwater should be to restore it to its highest beneficial use (per MTCA) to protect human health, the environment, and the Columbia River as stated in the MTCA regulations (Proposed Plan, page 18 and reference to CERCLA - The NCP (40 CFR 300)). The groundwater beneath Hanford is a valuable resource that will likely be much-needed in the future. It should be

cleaned up and restored to the highest beneficial use – as drinking water, for irrigating crops, and for all other uses. Contamination sources within the vadose zone that will likely contribute to future groundwater contamination must be removed, treated as necessary, and disposed in an appropriate disposal facility.

Caution is appropriate if young children might be exposed, such as in the Nonresident Tribal scenario, because they are particularly at risk for methemoglobinemia, the critical effect for nitrate exposure (IRIS 2009). **YN supports Alternative GW-4 for groundwater remediation and the use of an apatite barrier to capture the Sr-90.**

a. The Preferred Alternative (GW-2, ICs and Monitored Natural Attenuation [MNA]), for remediation of the 100-F Area Groundwater plumes fails several of the specific statutory requirements for remedial actions that must be addressed in the ROD as supported by the FS. Among these statutory requirements, the remedial actions must attain ARARs, utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent possible, and satisfy the preference for treatment that CERCLA includes a preference for remedies that employ treatment that permanently and significantly reduces the volume, toxicity, or mobility of hazardous substances, pollutants, or contaminants as a principal element. MNA does not treat or remove, or reduce the toxicity and mobility. The Preferred Alternative GW-2, ICs and Monitored Natural Attenuation (MNA), does nothing to reduce toxicity mobility or volume of the hazardous substances or reduce the associated risks

b. Rather than employ technologies to do so, there is an apparent preference to rely on the daily and seasonal Columbia River stage fluctuations which result in a groundwater/surface water mixing and the "significant reduction in contaminant concentrations before groundwater enters the river (DOE-RL-2010-98 DRAFT, pg. 861, line 24[Chapter 8-98]). YN does not believe the Preferred Alternative of MNA as a remedy for the groundwater meets the selection criteria, in particular in its ability to demonstrate no adverse impacts to drinking water supplies, other groundwaters, surface waters, ecosystems, sediments, air, or other environmental resources.

c. Current designation of long-term effectiveness and permanence should be higher for Alternative #4 than the other Alternatives. The weight applied to ranking of the effectiveness of the alternatives to be incorrect. Alternative GW-4 (with the exception of strontium contamination for which there is no proposed remediation) far better meets this definition than the other alternatives (i.e., The NCP (40 CFR 300) defines effectiveness as the "degree to which an alternative reduces toxicity, mobility, or volume through treatment; minimizes residual risk; affords long-term protection; complies with ARARs; minimizes short-term impacts; and how quickly it achieves protection."). Adjust the evaluations for Alternatives 2&3 downwards appropriately.

    i. Groundwater extraction and injection wells are also used to contain the Contaminants of Concern plumes, preventing their migration into other uncontaminated areas (like the Columbia River)." Clearly this alternative addresses both the northern and southern parts of the plume, and provides the most protectiveness of any of the alternatives.

d. There is no reasonable way to ensure that ICs will effectively protect human health for the projected 175 years that the proposed plan identifies will be required for the

attenuation of the waste sites with deep vadose zone contamination (Table 2). YN requests additional waste site remediation (see comment 'e' below).

i. Migration of elevated concentrations of contaminants is not only occurring today, but has been estimated to be even greater in the future. The Preferred Alternative overly relies upon institutional controls that cannot be confidently relied on during the extended time period long-lived radionuclides (including those in the soils and the GW plume beneath the F-Reactor) will remain toxic.

e. The Proposed Plan and the RI/FS both state there are no soil groundwater contaminant sources (with the exception of hexavalent chromium contamination from the 116-F-14 waste site) from within the 100-F/IU OUs and that groundwater contamination underlying the 100-IU-2 and 100-IU-OUs originating from the Central Plateau source OUs (i.e., *see* TC & WM EIS) will be addressed by the CERCLA decisions for the groundwater OUs (200-PO-1 and 200-BP-5) associated with the Central Plateau.

i. These include iodine-129, nitrate, and tritium. These decisions are decades in the future. These COCs (and others; cesium -137, cobalt-60, europium-152 and -154, nickel-63, and strontium -90 from the 100-F waste sites with deep vadose zone, i.e. below 15ft) will continue to flow untreated/remediated into the Columbia River adding further unaccounted residual contamination to the 100-F Area.

ii. CERCLA asks that all *primary sources* of contamination be included in RI/FS evaluations. As upland plumes enter the river, the YN is concerned that any remedy reviews will not include actual sampling actions or technological systems review to confirm performance or to consider these missing source area contaminants. YN requests how this upland contamination plume will be evaluated and that these details are included in the proposed plan and ROD.

iii. The decision to address groundwater contamination only from where the contamination is considered to have originated begs the question of whether the treatment process (i.e. the final ROD remedy) at a waste site disassociated from 100-F or 100-IU will adequately address current 100-F or 100-IU groundwater contamination issues.

YN requests details of this interconnectedness to be included in the proposed plan to ensure continuity and protection of HHE at 100-F Area and the Columbia River.

- The question remains as to whether all localized upland/offsite vadose zone contaminants will continue to be removed in the future should the remedy for groundwater OU at the *originating source* be discontinued or determined not to be protective of human health and the environment.

iv. The presence of hexavalent chromium was noted in pore water at locations with corresponding concentrations in bulk sediment samples and implications for possible sediment transport. Additionally hexavalent chromium was found in pore water at locations within the Hanford

Townsite study area where previously unknown as well. (*Field Summary Report for Remedial Investigation of Hanford Site Releases to the Columbia River, Hanford Site, Washington: Collection of Surface Water, Pore Water, and Sediment Samples for Characterization of Groundwater Upwelling* November 2010 4-2 (WCH-380 Rev. 1).

Discussions of what actions DOE intends to take to resolve the issue of Hexavalent Chromium transport are not and should be included in the alternatives presented in the proposed plan.

v. Discussion of contaminate fate and transport modeling states Cr(VI) concentrations to attenuate to less than water quality standards for surface water of the state of Washington within 35 years. YN requests clarification as to whether this includes consideration of potential source of groundwater contamination from the 116-F-14 waste site vadose zone.

This site is unrealistically identified to need indefinite ICs to prohibit irrigation because it will contaminate the groundwater. To not consider the concentration levels of the 116-F-14 soils is to underestimate the length of time needed for the groundwater to achieve cleanup levels. YN requests consideration and inclusion of the concentration of Cr(VI) and its fate and transport in estimation of attenuation rates for Cr(VI) in the 100-F area groundwater.

vi. Discussions of human health soil risks, contaminate fate and transport modeling, groundwater risks, and Alternative S-2 and GW-2 convey to the public the impression that within a very short time period (*'estimated time to achieve cleanup levels: 3 to 5 years)* to maximum 150 years, the 100-F Area will be available for unrestricted use and will not have contamination concerns. In reality ICs will be needed for an estimated time of up to 264 years for soil excavation and 150 years to indefinite at 116-F-14 for irrigation. Merely referencing a chapter in the RI/FS does a disservice to the public YN requests edits to these sections to clearly detail the risks and required ICs.

vi. Clearly the discussions within these documents (and other reports; aquifer tube samples) supports the need to define the Columbia River adjacent to the Hanford site boundaries as an Operable Unit. YN ERWM program requests clarification as to what consideration is being given to establish an operable unit for the Columbia River.

f. YN disagrees with the statement of no unacceptable risks posed to groundwater quality or surface water quality in the other waste sites that make up the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs due to soil contamination (see page 21 of the Proposed Plan). Use of Method A is identified in the Summary of 100-F/IU Proposed Soil Cleanup Levels Based on Human Health PRGs. Any application of Method A along the River Corridor is not appropriate and contradicts previous DOE and EPA commitments. All waste sites with COCs/COPCs evaluated under Method A should be reevaluated to determine compliance with unrestricted use; Method B standards.

i. Provide clarification as to the regulatory authority and decision-making process for use of Method A standards in an otherwise unrestricted (Method B) area and how its use achieves the highest beneficial use of the groundwater.

ii. Figure 8, page 15, PP: The shape of the Nitrate plume appears inconsistent with previous figure (draft Figure #10) flow directions and size. Provide clarification as to the re-shaping of the nitrate plume.

iii. The following COCs were removed from Table 1-Soil and Groundwater COC without justification/clarification: Carbon-14, Cobalt-60, Iodine-129, Technetium-99, Cadmium, Chromium-Total, Cobalt, Copper, Nickel, Silver, Zinc, Aroclors-1016, 1221, 1242, and 1248. Clarify if the following hydrocarbons are included under the clarification of TPH: Benzo(a)pyrene, Benzo(b)fluoranthene, Benzo(K)fluoranthene, Chrysene, Dibenz(a,h) anthracene, Indeno(1,2,3-cd)pyrene, Pyrene. Include. Boron, Selenium, and Vanadium should be retained as COCs for F-Area and their risks evaluated.

iv. Provide the public a reference link or document identification number for agreement of Tri-Parties to Uranium Kd value used; discuss retention of Uranium as a COC.

g. It is known that under the EPA tap water scenario used to provide quantitative risk and hazard contributions from all measured contaminants in groundwater for the 100-FR-3 OU, the noncancer aggregate HI for the 100-FR-3 is greater than one. Yet this information is not included in the PP and it is seemingly dismissed through the process of individually segregating them. Clarification is requested on why these individual COCs/COPCs were not reduced such that the aggregate HI would be less than one per the process outlined under MTCA.

h. Statements within the Proposed Plan are confusing to reader. It is stated that Cr(VI) has not be determined to be an ongoing risk for aquatic communities within the area of discharge of the 100-F/IU OUs yet the plume has been and is noted to have moved to groundwater and been identified in some porewater samples and within the river channel. More sampling is needed to make a clear determination and this should be included in the RI/FS and developed further in the ROD to ensure risk from transport of Cr(VI) into the Columbia River is not occurring at levels above standards. See previous comment.

i. The Preferred Alternative (or Proposed Plan) does not include the required description of the contingency measures that will be implemented should the monitoring show that natural attenuation is unable to confirm the natural attenuation processes are reducing COC concentrations in accordance with expectations and a timeline for achievement of defined, measurable reductions in concentrations levels to achieve the cleanup goals.

i. Conditions that would trigger the contingency should also be specified (e.g., continued plume migration or contaminant levels are well above levels predicted for a specified time) (EPA 540-R-98-031). The Proposed Plan and Preferred Alternative should incorporate remedial actions that will meet these thresholds and state explicitly the contingency measures and additional actions that will be taken should CERCLA monitoring

demonstrate the Preferred Alternative has not worked as planned. YN ERWM requests DOE update the Proposed Plan to provide details for public review including cost of implementation of contingency measures.

ii. Use of natural attenuation as a component of a groundwater remedy requires contingencies for additional or more active remedial actions to be incorporated that are triggered by specific contaminant concentration levels in the site groundwater monitoring network (or other criteria as appropriate).[3] These contingencies were not developed or included in the RI/FS or the Proposed Plan.

j. The basis given in support the consideration for MNA included the statement that the 'source of the observed contamination is no longer contributing to the plume' is inconsistent with the statements elsewhere for the need of ICs due to residual contamination and the statement that the 'remaining source control recommended will address sources contributing to groundwater contamination'. Correct or clarify as needed.

k. Costs: The proposed plan does not include the needed robust discussion of the required performance monitoring component. Cost estimates should also be presented. Existing groundwater plumes near the reactor, the retention basins, the cribs, and the cooling water head houses should be considered for specific monitoring of potential future vadose zone contributions.

l. The use of an Apatite Barrier (Permeable Reactive Barrier [as tested and used at 100-N]) is a successful technology currently employed in the 100-N to capture/remove Sr-90 from the groundwater. None of the Preferred Alternatives included this option. Simply stating that "*the in situ treatment for Alternative GW-3 does require specialized biological reagents but it is a* proven technology" does not relieve DOE from the obligation to develop and consider all reasonable alternatives. As stated, the apatite barrier is a proven technology and should have been indentified in an Alternative. (*see* "EPA expects to consider using innovative technology when such technology offers the potential for comparable or superior treatment performance or implementability, fewer or lesser adverse impacts than other available approaches, or lower costs for similar levels of performance than demonstrated technologies" Section 300.430 (CERCLA-Remedial investigation/feasibility study and selection of remedy).

m. The Preferred Alternative puts at risk the TPA groundwater cleanup requirements in Milestone M-016-110-T02. Exceedence is known. (e.g., Statements in PP: Groundwater contaminants at levels that exceed federal and state standards in the 100-FR-3 OU are nitrate, Cr(VI), trichloroethene, and strontium-90; While the plume exceeds the10 µg/L water quality standard in the groundwater, aquifer tubes and pore water sampling indicate infrequent exceedances of this level near the surface water interface.).

n. There are areas of uncertainty within the groundwater modeling approach (STOMP-1D), and its application is inappropriate until all issues are resolved. The graded approach to evaluating groundwater protection and STOMP-1D modeling has many uncertainties (e.g., what criteria will be used to assess the validity of the Preliminary Remediation Goals [PRGs] as they apply to site conditions).

[3] EPA; Directive 9234.2-25

i. Application of this model for making cleanup decisions is inappropriate until all issues are resolved. These resolutions should be presented to the public for clarity of understanding.

o. YN believes there are some noted incorrect applications of regulations which need correction and re-evaluation of risks to the groundwater (e.g. as noted in an earlier WA State Department of Ecology comment: The text states "the surface water standard applies where protection of surface waste subject to groundwater discharges to the Columbia River." WAC 173-340-720(4)(b)(ii) (2007) indicates that WAC 173-340 Method B for potable groundwater applies for the protection of surface water beneficial uses, and references WAC 173-340-730; in this way, water quality standards are incorporated in WAC 173-340-720. WAC 173-340-730(3)(b)(i) also gives the relationship of water quality standards and WAC 173-340.) YN supports use of the aquatic water quality criteria to apply to the ground water because the property abuts the surface water.

p. Miscellaneous comments: YN requests edits to groundwater contamination section to clarify that wastes sites in the 100-FR-1 & 2 OUs that were sources of groundwater contamination have been remediated to meet cleanup standards for unrestricted use to depth of 15ft and met MTCA Method B standards. To state source waste sites *were removed* is to improperly imply to the public that no contamination remains below in the vadose zone.

q. Clarify reduction in the various plume sizes from Draft A to Rev. 0.

r. Include date range for plume data on Figure 8.

s. Finish sentence "Cr(VI) concentrations are generally below the.."

t. Figure 8 seems to indicate the TCE plume is also beneath 100-IU-2/6. Clarify why TCE is not a contaminant plume beneath 100-IU-2/6.

u. Include discussion and details for "Non-operational Lands." Simple reference to RI/FS will not be sufficient.

v. Better clarify relationship between DOE and USFWS with regards to control of land use, ownership, and management of River Corridor and the HRNM. (See page 18)

7. Comments Regarding Human Risks:

a. There remains unacceptable risk to the YN tribal members from both chemical and radiological contaminants. Much of the risk assessments are based on the RCBRA and other supporting documents. See following excerpts (and risk values) from the RCBRA (River Corridor Baseline Risk Assessment Volume II, Part 1: Human Health Risk Assessment August 2011), the Proposed Plan, and 100-F & UI 2/6 RI/FS.

i. Volume II, Part 1: Human Health Risk Assessment August 2011pg 7-34: For the Nonresident Tribal scenarios, the total cancer risk estimates exceed 10^{-4} and HIs exceed 1.0 for all ROD areas, mostly due to exposures that are associated with ingestion of plants assumed to be

gathered from the Hanford Site. A large proportion of Nonresident Tribal cancer risk and HI is related to arsenic soil concentrations that are approximately equivalent to levels in areas unaffected by Hanford Site activities. When cancer risk estimates are calculated without the contribution of arsenic, the total cancer risk estimates still exceed 10^{-4} for all six ROD areas. The key risk drivers other than arsenic are technetium-99, carbon-14, strontium-90, benzo(a)pyrene, and Aroclor-1254, predominantly by the plant and game ingestion pathways.

ii. Because the Native American resident scenarios include very high food ingestion rates, strontium-90 continues to play a significant role in food-related exposures at year 2075. By year 2150, however, Native American resident cancer risks above 1×10^{-4} are also dominated by arsenic exposure from ingestion of garden produce. Average arsenic concentrations at remediated waste sites range between 1.1 and 17.3 parts per million. Some of these arsenic concentrations exceed the Hanford Site background value of 6.5 parts per million (DOE/RL-92-24). However, all of the RME values for arsenic are less than the IAROD cleanup value of 20 parts per million, which is based on the MTCA Method A unrestricted cleanup level. YN does not support the proposed cleanup value for arsenic.

b. G4.2.1 Use of Groundwater as a Potential Drinking Water Source: The total ELCR is 9.3 × 10-4 for nonradiological analytes and 5.0 × 10-5 for radiological analytes. The HI 6.6, which is greater than the EPA target HI of 1.0.

c. G4.2.11 Use of Groundwater to Generate Steam for Sweat Lodge Use: The total ELCR *with* contributions from aerosolized nonvolatile analytes is 1.0 × 10-1 for nonradiological analytes and 1.1 × 10-3 for radiological analytes, which are both greater than the EPA upper target risk threshold of 1 × 10-4. The HI *with* contributions from nonvolatile analytes is 80, which is greater than the EPA target HI of 1.0.

d. G4.3.1 100-FR-3 Groundwater OU: The total cumulative ELCRs for the CTUIR and Yakama Nation exposure scenarios are 9.1× 10-4 and 9.8 × 10-4, respectively. The total cumulative ELCR for the EPA tap water scenario is 2.3 × 10-4.

e. All scenarios are greater than the EPA upper target risk threshold of 1 × 10-4 . Major contributors to risk for the Native American scenarios and the EPA tap water scenario are trichloroethene, strontium-90, and tritium. The total HI is 5.1 for both the CTUIR and Yakama Nation exposure scenarios. The HI for the EPA tap water scenario is 2.4. Lithium is the primary contributor to the non-cancer HI for the Native American scenarios.

f. Caution is appropriate if young children might be exposed, such as in the Tribal and Nonresident Tribal scenarios, because they are particularly at risk for methemoglobinemia, the critical effect for nitrate exposure (IRIS 2009). The Preferred Alternative does not actively address Strontium- 90 or far-field Nitrate and should.

g. Risks to the YN Tribal members should <u>also</u> be calculated and included in the Alternative selection decision-making process using the YN risk scenario post 150 years of remedy selection.

h. YN disagrees with the following RI/FS text: "The PRGs are calculated using a target cancer risk level of 1×10^{-4}, which is comparable with the cleanup achieved through the interim actions as established by the interim action RODs." The point of departure for CERCLA remediation is stated as 1×10^{-6}. Every effort should be made to meet this standard. (USEPA, 1997; see bullets below).

i. Alternatives should be identified to establish remedies which meet or exceed the combined excess lifetime cancer risk level of 1×10^{-5}. PRGs for individual radionuclides based on a 1×10^{-4} target cancer risk are not supported by EPA guidance as outlined in bullets below.

   i. EPA's Regulatory risk 'Point of Departure' (target risk cleanup value) is $1X10^{-6}$. Although a risk range of $1x1^{0-4}$ to $1x1^{0-6}$ is permissible, to state that the 'regulatory risk target threshold of $1x10^{-4}$' has met is misleading to the public. Edit language throughout document to clearly clarify that the preferred risk target is $1x1^{0-6}$. Based on the requirements of MTCA and CERCLA regulations the radiological and nonradiological cancer risks should be combined and compared to the standard that Washington State has determined is protective of human health. This standard has an upper limit of lifetime risk for combined carcinogens of $1x10^{-5}$.

   ii. While the USDOE's practice has been to apply MTCA risk requirements only to nonradiological contaminants, MTCA defines radionuclides as hazardous substances. Although MTCA does not include cleanup levels for individually named radionuclides, it clearly states that "radionuclides are hazardous substances under the act." [Washington Administrative Code (WAC) 173-340-200]. Radionuclides are carcinogens, and MTCA defines the maximum allowable incremental cancer risk level for individual carcinogens as $1x10^{-6}$. It defines the maximum allowable incremental lifetime cancer risk level for multiple carcinogens and multiple exposure pathways as $1x10^{-5}$.

   iii. MTCA's inclusion of both chemicals and radionuclides in assessing cancer risks is consistent with U.S. Environmental Protection Agency (USEPA) guidance on establishing cleanup levels for CERCLA sites with radioactive contamination (USEPA, 1997). That guidance states that:

      - The USEPA is aware of "no technical, policy, or legal rationale for treating radiation risks differently from other risks addressed under CERCLA."
      - The USEPA uses a consistent methodology for assessing cancer risks at CERCLA sites no matter the type of contamination.
      - The USEPA classifies radionuclides as known carcinogens.
      - Cancer risks for radionuclides should generally be estimated using the slope factor approach.
      - Cancer risks from radiological and non-radiological contaminants should be summed to provide risk estimates

for persons exposed to both types of carcinogenic contaminants.

j. Radiation exposure risk from the National Academy of Sciences (BEIR VII Report, 2005), from which acceptable risk levels are supposed to be updated, indicates 15 millirem of annual exposure is projected to cause a lifetime cancer risk of 8 fatal cancers in adults for every 10,000 exposed – this is 8 times the CERCLA maximum risk level and 80 times the state MTCA level.

    i. Annual exposure values would be more representative if reduced to approximately 5millirem. YN requests use of 5mrem standard.

k. The YN has unresolved concerns (presented previously to DOE and EPA) with the use of River Corridor Baseline Risk Assessment and its 'sub-documents'[i.e. *Tier 1 Risk-Based Soil Concentrations Protective of Ecological Receptors at the Hanford Site* (CHPRC-00784) or *Tier 2 Terrestrial Plant and Invertebrate Preliminary Remediation Goals (PRGs) for Nonradionuclides for Use at the Hanford Site* [ECF-HANFORD-11-0158]] as a major supporting document in cleanup decisions for the River Corridor Areas. YN does not support use of without public review opportunities. Inclusion of secondary documents within a primary document necessarily requires public review and comment opportunities. These documents are not finalized or approved nor have our comments and concerns been addressed. [4]

l. Use of the words medium and low to categorize risk is incorrect (see RI/FS Page 1-53). Risk that is not between the ranges of 1×10^{-6} to 1×10^{-4} simply exceeds the regulatory standards for cleanup. As stated, this last paragraph and the above paragraphs, is misleading the public. Clearly under 'frequent-use' [understood to be equated to unrestricted] risk exceeds cleanup standards.

m. The Proposed Plan discussion of Ecological Risks at Riparian and Near-Shore Areas indicates is a risk for exceedances of hexavalent chromium to discharge to surface waters. Values used to determine estimated porewater concentration to surface water screening values (cited in Appendix L; Table L-73) uses an incorrectly proposed Kd of 0.8 for hexavalent chromium. If corrected to a more representative Kd value of 0.0, it is evident that maximum concentration values will be greater than surface water screening values in all categories (i.e. for metals near waste site; metals in slough areas, metals in northern shore, metals in the 128-F-2 Area C/aka 100-F-59).

    YN requests recalculation of risk using a Kd of 0.0 for hexavalent chromium and additional soil remediation at all waste sites with exceedence of risk.

n. Appendix L; Table L-72 indicates Chromium and Hexavalent Chromium exceedances of maximum soils and sediment concentrations for riparian soils, sediments, and Columbia River background sediments for the 128-F-2 Area C (aka 100-F-59). Furthermore, discussions throughout Appendix L regarding this waste site report other chromium/hexavalent chromium exceedances.

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[4] See our February 28, 2011 letter to the Tri-Party Agencies (DOE-Matt McCormick, EPA-Dennis Faulk, and Ecology- Jane Hedges

The statement is made that "confirmation and verification sampling at the 100-F-59 site (128-F-2 Area C) is not included in the riparian soil summary tables which only included RCBRA samples. The verification sampling chromium results from the 100-F-59 waste site are displayed in Figure L-12 and L-13 and included detects as high as 671 mg/kg within what is referred to as Area C. The slough area south of the waste site also had concentrations up to 371 mg/kg. In total the 100-F-59 soil samples had 12 samples that exceeded terrestrial invertebrate ESLS and 19 that exceeded aquatic invertebrate ESLs. The 100-F-59 area also included samples above the wildlife ESL of 109 mg/kg."

Obviously there is an issue with Chromium/Hexavalent Chromium at this site. Presenting the site in such terms that it appears not subject to either terrestrial ecological or aquatic receptor standards completely misses the point of being protective of HHE. Clarification is needed. Furthermore, YN requests additional ecological sampling be performed at 128-F-2 Area C (aka 100-F-59) waste site and additional seep and aquifer tube sampling be performed nearby.

YN requests additional details or a MOA for the 128-F-2 Area C (aka 100-F-59) waste site to be included in the proposed plan and ROD for these sites.

n. These documents are basically 'cookie-cutter' documents, similar to the 100 D/H Area RI/FS/PP. As such, YN see our similar applicable comments on the risk assessment process (e.g., determination of EPCs, comparison of EPC to PRGs for elimination, etc).

q. YN concerns remain regarding the methodology used to calculate the EPCs. EPA's ProUCL methods were identified yet in some instances a 95UCL was not calculated (a maximum value used instead). Use of the max ignores most of the information in the data set. When the number of measurements is small (e.g., n<5) or the detection frequency is low (<5%), ProUCL ultimately recommends collection of more samples to compute defensible statistics.[5] Collection of additional samples was not done. Some unremediated waste sites may have exceedances of PRGs, which would provide the basis for remedial action or further evaluation. YN requests clarification on this issue.

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[5] quotes from EPA sources, supporting use of the 95% UCL:

1) Dec 2002 OSWER 9285.6-10 (http://www.hanford.gov/dqo/training/ucl.pdf)

"It is important to note that defaulting to the maximum observed concentration may not be protective when sample sizes are small, because the observed maximum may be smaller than the population mean..... The use of the maximum as the default EPC is reasonable only when data samples have been collected at random from the exposure unit and sample size is large" (p. 20).

2) ProUCL Ver. 3.0 (Singh et al, 2004)
(http://www.epa.gov/nerlesd1/tsc/images/prouc13apr04.pdf)
"It is recommended that the maximum observed value NOT be used as an estimate of EPC....It should be noted that for highly skewed data sets, the sample mean indeed can even exceed the upper percentiles (e.g., 90%, 95%), and consequently, a 95% UCL of the mean can exceed the maximum. This is especially true when dealing with log normally distributed data sets of small sizes" (p. 55).

r. Reasonable Maximum Exposure (RME) Modeling: YN requests clarification on how the RME modeling proposed in this plan & the methods to develop it are consistent with WAC 173-340-702(14) and WAC 173-340-747 criteria.

8. Soil Remediation:

a. The statement that "residential cleanup levels also allow for conservation and preservation uses and minimize the need for IVs and long-term monitoring is misleading to the public and incorrect. Covering three difficult to understand concepts in one 20 word sentence does not provide the level of details necessary for reader understanding. Delete sentence or fully develop the topics.

Residential use is an activity allowed under MTCA Method B. MTCA Method B values for unrestricted use covers all land uses. The terms *conservation and preservation* (as defined by the CLUP and used throughout this document, include mining and grazing) combined with Method B makes no sense as MTCA Method B assumes no excavation below 15 ft, which could occur with mining. YN requests edits to this document, as needed, to include details on how and where EPA and DOE intend to meld the two differing land uses.

b. Conservation land use is the basis for the preliminary remediation goals (PRGs). YN disagrees with this land use designation to develop PRGs. Our Treaty rights guarantee unrestricted land-use. All PRGs should be calculated based on unrestricted land-use, Method B standards at a minimum. Additionally, see YN referenced letter regarding use of CLUP.[6]

c. Soil contamination should be documented in both vertical and horizontal directions from all potential sources *(EPA/540/G-89/004-Guidance for Conduction Remedial Investigations and Feasibility Studies Under CERCLA)*. Contamination underneath the reactor is not addressed or considered. None of the Alternatives fulfill this requirement.

YN requests risks from soil and groundwater contamination beneath the reactor are included in the risk calculations for human health and environment.

d. Text within the document discussing "residual contamination" at depths below remediation actions is misleading to the public. Contamination is occurring; the 'deep zone' [vadose zone] has not been demonstrated to meet cleanup levels. Rewrite discussions in the Human Health Soil Risks and Groundwater Risks sections to clearly state that further removal, treatment, and disposal would be required should contamination be brought to the surface.

i. Statements on pages 20 and 21 appear contradictory ('There were no unacceptable risks posed to groundwater quality or surface water quality in the other waste sites that make up the 100-FR-1, 100-FR-2, 100-IU-2, and 100-IU-6 OUs.'). The 118-F-6 site had residual strontium-90 contamination above risk thresholds at a depth of 2 to 4 m (6.6 to 13.1 ft) bgs. This indicates Sr-90 is present at the 15ft depth - the required depth to demonstrate

[6] YN letter to John Wagoner, DOE, dated June 30, 1998.

compliance. It too remains a soil source of contamination to groundwater along with the 116-F-14 site. YN requests additional site remediation.

ii. Additionally, the statement in the Ecological Risks at Upland Areas section, page 21, that 'once human health cleanup levels are achieved, residual contamination would not be sufficient to adversely impact population and communities of ecological receptors' is not supported by the proposed PRG for Mercury (see CHPRC-00784, *Tier 1 Risk-Based Soil concentrations Protective of Ecological Receptors at the Hanford Site; CHPRC-01311, Tier 2 Risk-Based Soil Concentrations Protective of Ecological Receptors at the Hanford Site; ECF-HANFORD-11-0158, Tier 2 Terrestrial Plant and Invertebrate Preliminary Remediation Goals (PRGs) for Nonradionuclides for Use at the Hanford Site.*) .

e. YN requests deletion of the following section 6.2.2.2.9 (and elsewhere as needed) text; "As a result, risks are overstated because the UCL and the EPC do not take credit for the existing clean backfill that covers the remediated waste site." Risk is calculated based on residual contamination and this statement is or may mislead the public.

f. YN requests deletion of the following RI/FS text (and similar text throughout the RI/FS/PP documents) to state the actual cumulative value and identify the risk drivers and contaminants: "The risk assessment for the 116-F-4 Pluto Crib (shallow and deep decision unit) reports a cumulative total ELCR within the EPA risk range of 1×10^{-4} to 1×10^{-6}".

MTCA requires a cumulative risk of no more than 1×10^{-5}. YN requests clarification as to whether all waste sites cleanup met the MTCA cumulative risk value of 1×10^{-5}. If not, YN requests clarification as to what further remedial actions will be taken.

e. YN requests the proposed cleanup levels listed in Table 6 be revised to lower PRG for mercury from 24mg/kg to 0.30mg/kg to be most protective.

f. YN requests PRG for TCE of 2.7ug/L for soil cleanup levels for protection of surface waters be included given the time frame for MNA and to ensure the protection of HHE.

YN requests clarification to be included in the RI/FS/PP documents as to how the process of degradation of trichloroethylene to vinyl chloride was considered in the decision of MNA to remediate TCE.

YN requests clarification to be included in the RI/FS/PP documents as to how MNA prevents further migration of contaminate plumes; determination of the rates(s) of attenuation and how that rate is changing with time (EPA 9200.4-17P).

g. Text within the document identifying 20mg/kg for arsenic as an unrestricted land use clean up value is misleading. It implies Washington State Department of Ecology concurrence with use of this value on the Hanford site as background. The 20mg/kg cleanup level is the WAC 173-340 (1996) Method A value. The YN believes it is inappropriate to apply Method A on the complex Hanford site as it is used for sites which contain a small number of hazardous substances.

Its application has resulted in residual levels for arsenic which do not reflect the Unrestricted Land Use Soil Cleanup Standards WAC 173-340-740(3)]) 2007 Method B value (0.67 mg/kg) and the MTCA ("Deriving Soil Concentrations for Groundwater Protection" [WAC 173-340-747(3)(a)]), groundwater protection value (0.00737 mg/kg) cleanup values (which would default to site background levels of 6.5mg/kg). This 20 mg/kg value for arsenic exceeds the 1×10^{-6} individual cancer risk based on the MTCA.

i. YN requests the proposed cleanup levels listed in Table 6 be revised to lower PRG for arsenic from 20mg/kg to 6.5mg/kg to be most protective.

ii. In simple terms, the risk analysis showed that casual users of the River Corridor as it is have low enough risk to be safe. However, all of the residential user scenarios have unacceptably high risk. Some of the risk was associated with uranium, mercury, chromium, cadmium, and radiological contaminates. But a major part of the high risk levels found in the residential scenarios is from consumption of arsenic contaminated plants, animals and water.

While much of the arsenic is assumed to be from pre-Hanford agricultural practices, there was a portion that could be attributed to Hanford operations. YN requests that amount of the Hanford process arsenic load should be determined, and the cleanup of that arsenic should be a part of the Hanford cleanup plan.

iii. The arsenic contamination and related risk issue is not incorporated in the proposed RI/FS studies. The YN believes and requests there be a more global evaluation of arsenic contamination on the Hanford site.

g. The Proposed Soil cleanup levels for Hexavalent Chromium to ensure protection of groundwater should be set at 0.2 mg/kg. This value is found using a Kd value of 0 mL/g and more accurately depicts movement of this contaminant through soils. Furthermore, fate and transport simulations presented in DOE/RL-2010-98 should be recalculated using 0.0 Kd value.

i. YN requests concentrations in the groundwater and along the shoreline and the subsequent timeline for decline in concentration are re-evaluated using a zero kd value.

ii. YN requests the proposed cleanup levels listed in Table 7 be revised to lower PRG for hexavalent chromium from 2.0mg/kg to 0.2mg/kg to be most protective.

h. The Proposed Plan lists only 16 waste sites which will require use of IC to prevent exposure to contaminated groundwater. Of these 16 sites, only 4 were evaluated in the RCBRA.

i. Clarification is requested as to whether the remaining sites had risk assessments performed.

i. A review of CVP documents (most dating 2001-2008) for a number of waste sites raised concerns. YN requests clarification as to whether each waste sites' cleanup documentation was re-evaluated against current standards.

i. Several indicate the use of outdated standards or as of yet agreed to (by the Tri-Parties) values (i.e. the 100 Area Analogous Sites RESRAD Calculations (BHI 2005a) to calculate non-radiological COCs,[e.g. copper, lead, selenium, TPH; Aroclor-1254].

ii. Many state use of MTCA 1996 values or soil RAGs based on "100 time groundwater cleanup rules and 100 times dilution attenuation factor times surface water quality criteria.

iii. Cross-contamination of asphalt from nearby roadways is given as a reason for elimination of PAHs from waste sites RAO determinations and it is unclear why this was allowed.

iv. Some CVPs (e.g. 116-F-5 crib &100-F-2/-11/15/16, 116-F-10 French drains] indicated need to prevent deep zone soil intrusion and are not listed as such in Table 5 of the proposed plan. YN requests clarification as to why these areas listed on Table 5 of the proposed plan.

v. There were inconsistent values given for some Columbia River Protection RAGs (e.g., Sr-90) between some CVPs and clarification is requested by the YN.

o. YN requests a review of the determination made for waste sites 100-F-59/128-F-2. We have concerns as this area also known to have an identified cultural site. The proposed plan does not discuss how impacts to this site are to be mitigated. YN requests details or an MOA to be included in the proposed plan and ROD for these sites.

i. Review of the determination made for waste sites 100-F-42/-43 and 116-F-16 is requested as well. Both sites were not remediated below the OLWM and they clearly entered the River.

ii. Furthermore, chromium concentrations were evaluated using RESRAD at the 100-F-45 site. The vadose zone is ~7ft. It seems improbable that this will not migrate to groundwater/river within 1000 years. Recalculate.

p. 'ARCL' sites are identified and discussed in Section 6.5.2 of the RI/FS. It appears these sites were only evaluated using the casual recreational user exposure scenario. YN request the risk associated with these sites be recalculated using the unrestricted scenario.

q. Statement is made on several CVP (e.g. 100-F-45) " All exceedances will be evaluated in the context of additional lines of evidence for ecological effects as a part of the final closeout decision for the Columbia River corridor portion of the Hanford Site.
It is unclear where this information is to be found. Clarification is requested.

r. YN disagrees with many of the scientific management decision point (SMDP) reasons given for elimination of a waste site from the being carried forward into the FS. YN requests review and clarification of this process within the RI/FS/PP.

s. YN disagrees with approach used in some ecological risk evaluations that suggest protection of ecological receptors (i.e., no sufficient or adverse impact populations and communities) based on size of remedial actions relative to receptor home ranges or other available habitat. It results in underestimates of affects and risks.

t. YN requests all sites with the status of 'no further action' and requiring IC for deep soil zones be evaluated against current MTCA 2007 standards while not backsliding from

previously more stringent IROD cleanup values. The YN requests DOE include a table within the PP to include the cleanup numbers that were generated for each Interim closed/closed waste site in the RI/FS and compared to MTCA 2007 clean up numbers.

u. Although DOE states they have evaluated these sites using a slightly different risk approach, how the determination that these sites require no further action is unclear. YN requests DOE include this evaluation in the Proposed Plan and tables that list the interim ROD cleanup values and the Proposed Plan cleanup values for each contaminant.

9. **Orchard Lands:** The Proposed Plan makes no mention of waste sites to be addresses under a separate CERCLA decision as a part of the Orchard Lands OU. The only clear language for discussing the relationship between the 100-F/IU/FS scope and the Orchard Lands is found on pages 4-3 to 4-4 in the RI/FS.

   a. Similar language needs to be included in the PP to discuss the overlap between these two projects.

   The RI/FS makes the statement "An RI of the 100-OL-1 OU will be conducted to determine if actions are needed to mitigate potential environmental or human health impacts. If results from the RI indicate a need for action, an FS will be conducted to identify and evaluate a range of remedial alternatives."

   a. Clarifying text needs to be inserted regarding the evaluation of impacts to known/unknown cultural resources within the Orchards Lands OU.

10. **NEPA:** The relationship of NEPA and NEPA values to related information is not fully presented.

    a. Rewrite for clarity and include discussion that some of the required assessments supporting NEPA values are not yet made until after the RI/FS is approved. The statement, "NEPA values were incorporated into the FS" gives the impression that NEPA values were done in the FS, and that is the end of NEPA values. This is incorrect. Many of NEPA values are incorporated and enforce implementation of applicable laws and regulations into later phases of the CERCLA documentation process, including the ROD and RD/RAWP. For example, applicable cultural, historic, and ecological resources are evaluated for, and implemented through *Hanford Cultural Resources Management Plan* (DOE/RL-98-10) and *Hanford Site Biological Resources Management Plan* (DOE/RL-96-32) at a time closer to the actual remediation activities.

11. **General Comments on the Remedial Action Objectives:**

    a. The purpose of Remedial Action Objectives (RAOs) is to explain and address site risks and to include an action (and specifics/details) to be taken achieve the objective. RAOs are the measurement tools for evaluating the success of the ROD remedy during the CERCLA 5 year review process. Without a specific action, the metrics for measurement are filled with subjectivity and uncertainty.

i. Five of the seven RAOs do not have a definitive task or standard to be met. An Example of a specific action to include using RAO#3: Prevent COCs migrating and/or leaching through the soil that will result in groundwater concentrations exceeding federal and state standards and risk-based thresholds for protection of surface water and groundwater *by treatment of the contaminated soils or RTD.*

ii. Clarify all RAOs with specific action(s) to be performed and/or standard(s) to be met.

12. Acronym List:

YN requests DOE not employ the acronym or terms UU/UE (unlimited use/unlimited exposure). These terms are not familiar and need additional clarification and justification for application defined in the Proposed Plan. Method B is unrestricted use. Unlimited use/unlimited exposure may not have the same connotation or legal status.

13. Glossary:

YN requests the following edits to the definitions of these terms:

a. **Environmental Restoration Disposal Facility (ERDF)**: The Hanford Site's onsite state and federally approved facility for the disposal of hazardous (radioactive and nonradioactive) waste and contaminated environmental media in accordance with RCRA and CERCLA response action decision documents and ERDF waste acceptance criteria.

b. **Interim safe storage:** The first stage of final disposition of a Hanford site reactor. It consists of (1) ensuring that facility hazardous substances are and will remain safe and secure; and (2) reducing the footprint of the reactor building to the primary shield wall, and sealing all openings such that the facility is in an environmentally safe and secure condition prior to initiation of disposition.

c. **Limited field investigation (LFI):** LFIs are an initial step in characterizing the nature and extent of contamination in the vadose zone, structures, and debris that received radioactive liquid effluent discharges.

d. **Operable unit (OU):** A discrete portion of the Hanford Site, as identified in Section 3.3 of the ***Tri-Party Agreement*** Action Plan (Ecology et al., 1989b, *Hanford Federal Facility Agreement and Consent Order Action Plan*). An OU at Hanford is a group of land disposal sites and groundwater plumes placed together for the purposes of performing a RI/FS and subsequent cleanup actions. The primary criteria for placement of a site into an OU include geographic proximity, similarity of waste characteristics and site type, and the possibility for economies of scale.

e. **Preliminary remediation goal (PRG):** An ARAR-specified or risk-based concentration for a contaminant that is protective of HHE for a specified exposure pathway. PRGs are established during the Feasibility Study (FS), are based on scientific information, and are used as a target for remedial cleanup levels during the remediation of a site. Alternatives are developed in the FS and evaluated based on how well they meet PRGs. PRGs are often proposed as final cleanup levels which are set in the ROD.

f. **Proposed Plan:** A document that briefly describes the remedial alternatives analyzed, proposes a preferred remedial action alternative, and summarizes the information relied

upon to select the preferred alternative. The public is provided with an opportunity to comment on the preferred alternative, as well as the other alternatives under consideration as presented in the Proposed Plan.

g. **Pump-and-treat:** The extraction of contaminated groundwater and treatment of contaminants with one or more of an assortment of technologies designed to meet cleanup standards.

h. **Record of Decision (ROD):** The CERCLA document identifying the remedy to be implemented at a site after the RI/FS/Proposed Plan process has been completed.

i. **Remedial action:** Action(s) performed to prevent, remove, or mitigate the release or threatened release of a hazardous substance into the environment and to protect HHE.

j. **Remedial action objective (RAO):** An RAO is a medium-specific (e.g., soil) or operable unit-specific goal for protecting human health and the environment that specifies the contaminants of concern, exposure routes, and receptors.

k. **Removal, treatment, and disposal (RTD):** A cleanup method where soil and debris are excavated in such a way that no contaminants above the approved remedial action cleanup levels or concentration remain. Excavated material is treated (if required for disposal) and sent to an onsite or offsite engineered facility for disposal.

l. **Tri-Party Agreement:** DOE, EPA, and Ecology signed the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) on May 15, 1989. It is a legally binding document. The general purposes of the agreement are as follows: to ensure that environmental impacts are thoroughly investigated and appropriate response actions taken as necessary to protect HHE; to provide a framework for permitting of treatment, storage and disposal units; ensure compliance with the *Resource Conservation and Recovery Act of 1976* (RCRA) and the Washington Hazardous Waste Management Act for treatment, storage, and disposal units; to establish a procedural framework and schedule for developing, prioritizing, implementing and monitoring appropriate response actions at the Hanford Site in accordance with CERCLA, the NCP, Superfund guidance and policy, RCRA and RCRA guidance and policy; and to facilitate cooperation, exchange of information and coordinated participation of the parties in such actions.

14. Miscellaneous Comments: YN requests the following:

a. Descriptions of activities are not robust enough to allow the reader to put into perspective the expanse of the impacts and the cleanup efforts or the deliberations of the Tri-Party Agencies in their decision-making processes. Throughout the entire Proposed Plan, Rev 0, YN identified the deletion of much of the necessary and informational details (e.g. text, references, and figures) provided in Draft A and requests its inclusion.

   i. Example: Discussion of site background (pg 4 & 6) needs more depth for better reader understanding of the Hanford site area background and F-Area facilities and operations which affected human health and the environment.
   ii. Groundwater flow direction discussions
   iii. Draft A figure #6.
   iv. Ecological Risks

b. Our previous comments on Draft A led to of removal questionable text rather than the solution to the concern voiced. See our previous concerns regarding Cultural Resources. Why was the next removed and our concerns not addressed. YN ERWM request original concerns be addressed.

c. Edit or delete following text: "...if it were brought to the surface." Deep contamination (below 15ft), if brought to the surface, would require RTD, not just ICs. ICs are proposed to prevent this from occurring at waste sites which have identified residual contamination exceeding cleanup levels.

d. Previous number of waste sites in the OUs was listed as 400, now listed as 304. Clarify reason for difference and if these did or did not have contamination requiring remediation. Include in proposed plan more depth of details as presented in Draft A.

e. Retain discussion of Remedial Alternatives as detailed in Draft A, page 3. This discussion clarifies choice of the preferred alternative and presents a better flow of information to the reader's understanding. Simply jumping to Alternative #s S-2 and GW-2 without explanation only saves a half of a page of paper.

f. Figure 2: Suggest use of Draft A figure 2. Better title, better definition all around. Figures 8 & 9 define the groundwater plumes better and.

g. Additional details as to the remediation of the remaining active facilities and infrastructure within the 100-IU-2 and -6 OU.

h. Identify RI/FS data tables as reference source for Table 1 in PP. Include previously included and now deleted COCs from Table 1 in PP.

i. Delete new statement that implies dilution is a solution; "The Columbia River rapidly dilutes groundwater contaminants to low concentrations, so the primary concern for ecological risk to aquatic biota is from exposure to groundwater via upwelling through the riverbed gravel, cobbles, and sand."

j. Discussion of preliminary remediation goals (PRGs) in Draft A provides a more robust discussion. YN suggests inclusion of more details and use of the word *cumulative* as opposed to *total*.

k. YN requests inclusion of information regarding ecological receptors PRGs, etc as provided in Draft A text and Summary table for PRGs for the Protection of Ecological Receptors. Clarify reason for no freshwater sediment PRGs.

l. YN requests more depth to ICs discussion and reference to RI/FS chapter/sections.

m. Edit and clarify Alternative #3 to state 'incidental' in situ treatment of hexavalent chromium.

n. Include 'potential chemical/action/location' sections from Draft A.

o. Clarification needed. Edit to state 'achieve cleanup levels' or delete sentence: "At the end of the remedial time frame, the COC concentrations under each of the alternatives will be

reduced to levels that are protective of HHE." Concentrations should achieve or be below cleanup levels at end of time frame. Clarify if this was intent of statement.

p. Clarify source of proposed soil PRGs for protection of groundwater and surface water for Nitrate.

Comment Number 100-F/IU-094
August 13, 2014, Letter from the Nez Perce Tribe

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Actionee: Greg Sinton

Action/Comments:

Due Date: ACTION

Title Proposed Plan for Remediation of the 100-FR-1, 100-FR-2,100-FR-3, 100-IU-2, and 100-IU-6 Operable Units; DOE/RL-2012-41, Revision 0

Document: NA (NPT)

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Nez Perce

TRIBAL EXECUTIVE COMMITTEE
P.O. BOX 305 • LAPWAI, IDAHO 83540 • (208) 843-2253

August 13, 2014

Kim Ballinger
Richland Operations Office
U.S. Department of Energy
P.O. Box 550, MSIN A7-756
Richland, WA 99352

Re: Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units; DOE/RL-2012-41, Revision 0

Dear Ms. Ballinger:

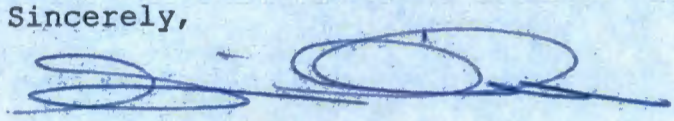
The Nez Perce Tribe (Tribe) has reviewed the Revision 0 of the Proposed Plan. The Tribe had previously reviewed Draft A of this Proposed Plan and had offered comments to the Draft on March 28, 2013 (attached).

In review, the Tribe's response has not changed, as the document had minimal changes, as per the technical review conducted by the Tribe's Environmental Restoration and Waste Management Division (ERWM). Yet, with minimal changes to this document, many of the Tribe's comments were disregarded or not answered directly by a letter of response or by formal "Consultation" with the Tribe. In the March 2013 letter, the Tribe referenced Tribal Resolution NP 05-411, which is the "Nez Perce Tribe Hanford End State Vision and Guidance Document." Additionally, the Tribe offered the DOE and its reviewers an electronic or paper copy to help in review of our policy and guidance, but we had no response.

In addition, to this Proposed Plan Rev. 0, the Tribe maintained its recommendations from the Proposed Plan Draft A. Though the Tribe supports this response action as it would provide minimal impact to future direct Cultural Resource damage by further excavation, the Tribe reminds the DOE of its Natural Resource Injury liability. Together as Trustees, the Natural Resource Injury Assessment will be ongoing and residual wastes will potentially result in long-term injury.

In conclusion, the Tribe appreciates the ongoing efforts of the DOE to include the Tribe in its cleanup efforts. Together, we strive to work towards common goals which are very complex and need much communication and understanding by each party. The Tribe recommends the DOE to Consult or respond formally to our comments. Please contact the Tribe's ERWM Director Gabriel Bohnee with any questions or concerns regarding this letter.

Sincerely,



Silas Whitman
Chairman

Nez Perce

TRIBAL EXECUTIVE COMMITTEE
P.O. BOX 305 • LAPWAI, IDAHO 83540 • (208) 843-2253

March 28, 2013

Jonathan A. Dowell
Assistant Manager for the River and Plateau
Richland Operation Office
Department of Energy
P.O Box 550
Richland, WA 99352

Dennis Faulk
USEPA Region 10
309 Bradley Blvd., Suite 115
Mail Code: HPO
Richland, WA 99352

Jane Hedges
Washington State Department of Ecology
3100 Port of Benton Blvd.
Richland, WA 99354

Re: DRAFT ***Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units; DOE/RL-2012-41, Draft A***

Dear Mr. Dowell, Ms. Hedges, and Mr. Faulk:

The Nez Perce Tribe appreciates the opportunity to provide its preliminary comments to the draft Proposed Plan for Remediation of the*100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units; DOE/RL-2012-41*, Draft A. This is the fourth of six Proposed Plans for remediation of operable units along the River Corridor at Hanford in preparation for issuance of final clean-up Records of Decision under CERCLA.

The Nez Perce Tribe Environmental Restoration and Waste Management (ERWM) Program takes seriously its responsibility to see that these plans are well developed. The attached comments outline significant concerns that ERWM has regarding clean-up and long-term status of the 100-FR and IU-2/6 Decision Unit at the Hanford Site, an area within the lands subject to the Nez Perce Tribe's 1855 Treaty with the United States.

Our comments focus primarily on communications, land use assumptions, and groundwater. Though ERWM does not support this draft in its present form, within the current structure of the DRAFT Proposed Plan, the alternative which best meet our concerns is Alternatives S-2 and GW-2, as it currently appears they will accomplish the remediation in a timely fashion with the least disturbance.

The Nez Perce Tribe will continue to take every opportunity to participate in the remedial decision-making efforts for the River Corridor with the intent to provide for and to protect Nez Perce treaty rights.

If you have any questions, please contact Gabriel Bohnee at (208) 621-3746 (email at gabeb@nezperce.org) or John Stanfill at (208) 621-3748 (email at johns@nezperce.org), of our Environmental Restoration and Waste Management Program.

Sincerely,

Silas Whitman
Chairman

cc: Matt McCormack, DOE-RL
Larry Gadbois, EPA
Jack Bell, Chairman, HNRTC
Stuart Harris, CTUIR
Russell Jim, Yakama Nation
Ken Niles, Oregon
Jill Conrad, DOE-Indian Nations Program

February 2013

Formal comments on draft DOE/**RL-2012-41, Draft A**

Proposed Plan for Remediation of the 100-FR-1, 100-FR-2, 100-FR-3, 100-IU-2, and 100-IU-6 Operable Units

Below are comments representing the initial response of the Nez Perce Tribe to the DRAFT Proposed Plan for the 100-FR and IU_2/6 Decision Areas. Our Environmental Restoration and Waste Management Program has been practicing oversight of remedial objectives and actions in the area since the early 1990's. It is the intent of the Nez Perce Tribe Environmental Restoration and Waste Management (ERWM) Program to assist the Tri-Party Agencies in planning for and remediation of these critical locations along the banks of the Columbia River. As noted in the accompanying letter, ERWM takes earnestly the role of the Nez Perce Tribe in the responsibility that these plans be well developed.

Communication

Regarding Tribal Nations participation in the remedial decision process, The Proposed Plan notes, page 10, lines 8-11 that: "The Hanford Site is located on land ceded to the United States under separate treaties with the Confederated Tribes and Bands of the Yakama Nation and the Confederated Tribes of the Umatilla Indian Reservation (CTUIR). The Nez Perce Tribe has treaty rights on the Columbia River. In addition, DOE consults with the Wanapum Band of Indians, who once resided on Hanford lands."

The Nez Perce Tribe objects to DOE's above characterization of the nature and scope of its 1855 Treaty. The Tribe requests that this language be deleted and replaced with the following: "The Hanford Site is also subject to rights secured in the Nez Perce Tribe's 1855 Treaty with the United States (Treaty of June 9, 1855 with the Nez Perces), 12 Stat. 957 (June 9, 1855)."

In the past five years, DOE appeared to be seeking values, principles and issues as input from the Tribal Nations through a risk communication effort with Consortium for Risk Evaluation with Stakeholder Participation (CRESP) from mid-2007 until mid-2009. Tribal input, responses and suggestions specifically included the following issues, which were clearly conveyed to the workshop participants on April 14, 2009:

- Tribal treaties need to be considered as ARARS in CERCLA actions (an issue ERWM was told by CRESP was receiving attention at the Headquarters level in Washington, D.C.).
- The Nez Perce Tribe is interested in having an active role in Institutional Controls and Long Term Stewardship development.
- The Nez Perce Tribe is concerned that DOE oversight of risk and remediation is limited to managing the contracts, and that technical oversight to the contractors is lacking.
- The Nez Perce Tribe does not recognize the Comprehensive Land Use Plan (CLUP) as the risk scenario defining mechanism or as long term resolution of land use.
- The Nez Perce Tribe wants the areas cleaned to a status compatible with Tribal Hanford vision statement.
- The Nez Perce Tribe wants a baseline risk assessment conducted without the benefit of institutional controls or other land use constraints; the Nez Perce Tribe does not understand the need for a restricted use scenario.

- The Nez Perce Tribe wants a tribal scenario protective of treaty rights-based land use, and to have that memorialized such that it cannot altered with changes in land administration.

DOE said its goal with respect to the Tribes was to understand how Tribal members might use the site if non-residential use opportunities are expanded. But, the subsequent actions of the DOE suggest that even such an understanding would not affect the decision-making. Note the following from page 6-21, lines 17-23 in DOE/RL-2010-98, DRAFT A: "The results from the RCBRA (DOE/RL-2007-21) for remediated waste sites and the results from the groundwater risk assessment can be summed to obtain a cumulative estimate of risk for all exposure pathways included in the CTUIR and Yakama Nation exposure scenarios. These tribal scenarios have been evaluated and presented in Hanford Site risk assessments to assist interested parties in providing input on remedial alternatives (*Feasibility Study Report for the 22 200-ZP-1 Groundwater Operable Unit* [DOE/RL-2007-28]), and have not been used for development of PRGs as part of alternatives analyses in FS."

The Nez Perce Tribe distinctly noted at these workshops and meetings that the Tribe will not endorse a restricted use scenario.

Additionally, the Nez Perce Tribe has produced a Hanford Guidance document in support of the Nez Perce Hanford End-State Vision [NPT Resolution NP-05-411], which has been made available to the Tri-Party agencies. Additional electronic and hard copies are available upon request to John Stanfill of the ERWM at the Nez Perce Tribe (johns@nezperce.org).

Applicable or Relevant Appropriate Requirements

ERWM understands that remedial alternatives designed for an individual site in the Superfund process are evaluated according to the nine CERCLA Evaluation Criteria. In addition, the preferred alternative(s) must meet the first two of the criteria ("Threshold Criteria"): 1) Overall protection of human health and the environment; and compliance with Applicable or Relevant and appropriate Requirements (ARARs).

As should be apparent when reviewing the other comments below, the Applicable, Relevant, and Appropriate Requirements (ARARs) presented by DOE for the remediation of the 100-FR/IU2-6 Decision Areas lack coverage of a critical component to Tribal nations: Treaty Rights. Within the Proposed Plan – page 40, **Potential Location-specific ARARS** – Tribal cultural resource/archeological/human remains interests are considered (*Native American Graves Protection and Repatriation Act of 1990; Archeological and Historic Preservation Act of 1974; and National Historic Preservation Act of 1966).* The interests of the Nez Perce Tribe in the Hanford area go far beyond the preservation of cultural resources.

It would seem logical that tribally retained rights to practice traditional cultural lifestyle would be covered either under the first of the two Threshold Criteria [Overall Protection of Human Health and the Environment], or through the Treaty of 1855 if it were to be considered as an ARAR [the second of the Threshold Criteria]. However, tribal practices are recognized but not supported. And no ARAR status has been awarded the Treaty of 1855, though it is supported with numerous executive orders, Cooperative Agreements, Memorandums of Understanding, and various versions of Federal agency American Indian policies.

This Proposed Plan is among many DOE documents which suggests that the modern tribal voice is to be heard primarily at the level of the ninth Criteria [Community Acceptance], a "Modifying Criteria" one of the least powerful of the nine CERCLA criterion in Alternative Selection. **Until Treaty Rights are clearly addressed, and discussed through consultation with the Nez Perce tribal government, the Nez Perce Tribe considers the Proposed Plan severely lacking with respect to the role of the Nez Perce Tribe in the Hanford area.**

An additional concern is the failure of this plan to include as an ARAR *The Migratory Bird Treaty Act of 1918,* which is being considered in the 300 Area Proposed Plan. The migratory bird issue along the entire River Corridor is of concern for all natural resource proponents. (It is considered in the RI/FS for the 100-FR/IU2-6 Decision Areas.) Consideration of that treaty should not be limited to just the 300 Area.

Land Use Assumptions

Discussion above of the potential for treaties as ARARs, and of language in the Proposed Plan describing tribal participation in the CERLCA process are indicative of differences of assumptions between the DOE and the Nez Perce Tribe relative to land use. Page 25, lines 1-6: "Tribal fishing rights are recognized on rivers within the ceded lands, including the Columbia River, which flows through the Hanford Site. In addition to fishing rights, the Tribal Nations retain the privilege to hunt, gather roots and berries, and pasture horses and cattle on open and unclaimed lands. It is the position of DOE that Hanford is not open and unclaimed land. While reserving all rights to assert their respective positions, the Tribal Nations are participants in DOE's land use planning process, and DOE considers Tribal Nation concerns in that process."

The Nez Perce Tribe objects to the DOE's above characterization of the nature and scope of the Tribe's 1855 Treaty. The Tribe recommends that DOE remove the following assertion: "It is the position of DOE that Hanford is not open and unclaimed land," and replace it with the following: "DOE and the Nez Perce Tribe disagree concerning whether Hanford constitutes "open and unclaimed land" for purposed of the 1855 Treaty. DOE and the Tribe will continue to address this disagreement through consultation in accordance with applicable executive orders and DOE policy."

The two reasonably anticipated future land uses noted by DOE in the Proposed Plan (page 26, lines 24 and 30) are *Resident Monument Worker Scenario,* and *Casual Recreational User Scenario* – both with institutional controls, such as those stating that drinking water shall be obtained from offsite. Tribal Treaty land use considerations are specifically extinguished by the use of less conservative risk scenarios, and by language as noted in the above paragraph. In addition, applicable institutional controls for such Tribal restrictions are not in evidence.

DOE's proposals interfere with Tribal Treaty Rights on two fronts: through self-designating Hanford lands as "not open and unclaimed", and by failing to remediate lands to a level consistent with the exercise of Tribal Treaty rights (and/or providing description of specific institutional controls). **The Nez Perce Tribe does not believe DOE has been responsive to Tribal values and input in the remedial action decision-making process.**

The toxic threats of Hanford are of such a nature that, left in place, will remain threats into the far distant future. **For DOE to assume that its stated designated land use will apply in the**

distant future belies all the historical societal land use change which has occurred throughout human history, a history of which the Nez Perce Tribe has been an integral part and will continue to be into the future.

Clean-up Levels –

ERWM understands that the Proposed Plan is attempting to address the standards used in the Interim RODs, and that Ecology plans to assure that current MTCA standards are applied and met on sites that were formerly cleaned to interim standards. ERWM would encourage Ecology to maintain this as a strong priority. Though addressed, it is unclear in the Proposed Plan if Ecology's concerns are being met.

ERWM would remind the regulators and the DOE that the Hanford Guidance, developed by the Nez Perce ERWM in support of the Nez Perce Hanford End-State Vision [Resolution NP-05-411], contains groundwater standards more stringent that current EPA Drinking Water Standards where research and public policy elsewhere support more stringent values. This is in keeping with reducing risk to an acceptable level for tribal members to be able to practice treaty rights. See below.

(from NPT Hanford Guidance, Version 1, 2010)

Constituents	Standard	Notes
Arsenic	0.01 mg/l	[EPA changed nat'l std to 0.01 mg/l in 1/06]
Beryllium	0.001 mg/l	[California Public Health Goal (CA PHG)]
Carbon Tetrachloride	0.0001 mg/l	[CA PHG]
Chromium	0.01 mg/l	[WA State ambient water quality std for aquatic organisms, which is 5 x lower than WA State DWS; this is important issue at Hanford Reach re: Salmon redds]
Fluoride	1.0 mg/l	[CA PHG; World Health Organization (WHO)has DWS set at 1.5 mg/l value]
Lead	0.002 mg/l	[CA PHG]
Mercury	0.0012 mg/l	[CA PHG]
Radium-226	0.05 pCi/l	[CA PHG]
Radium-228	0.019 pCi/l	[CA PHG]
Radon	300 pCi/l	[EPA, 1996
Strontium-90	0.34 pCi/l	[CA PHG]

Tritium	**400 pCi/l**	**[CA PHG]**
Trichloroethylene (TCE)	**0.0008 mg/l**	**[CA PHG]**
Vinyl Chloride	**0.00005 mg/l**	**[CA PHG]**
Uranium	**2.6 µg/l**	**[EPA Tier II ecological screening value (1993) because NAWQC not available; WHO, 2006, set a DWS at 15 µg/l; 12/03 EPA determined a DWS of 30 µg/l ; ERWM supports the most conservative, which is that which EPA determines appropriate for aquatic organisms, Tier II ecological screening (in this case, at the Hanford Reach).**

Most significantly for 100-FR/IU2-6 Decision Areas, a new drinking water public health goal has been established for Cr6+ in July 2011, at 0.02 ppb (or 0.02 ug/L). The table above will reflect this change when Hanford Guidance updates occur. (See *PUBLIC HEALTH GOALS FOR CHEMICALS IN DRINKING WATER: HEXAVALENT CHROMIUM (Cr VI)*; Office of Environmental Health Hazard Assessment; California EPA; July 2011.)

As noted above, copies of the NPT Hanford Guidance have been distributed to the Tri-Party agencies, and are available electronically or in hard copy upon request to John Stanfill of ERWM (johns@nezperce.org).

Groundwater

Some differences appear in the documents regarding the designation of groundwater use. On page 8-31 in DOE/RL-2010-98, Draft A (the RI/FS document for 100-FR and IU-2/6) is this statement: "The groundwater within the100-FR-3 OU does not meet the exclusion criteria; therefore, it is classified as potable and must be restored to beneficial use wherever practicable and within a time frame that is reasonably consistent with NCP (40 CFR 300) requirements. The state of Washington has further determined that the highest beneficial use for potable groundwater at most of the cleanup sites within the state, including the Hanford site, is as a potential source of domestic drinking water (MTCA, 'Groundwater Cleanup Standards' [WAC 173-340-720(1)(a)])." [Underlining is ours.]

In addition, DOE/RL-2002-59 use (*Hanford Site Groundwater Strategy – Protection, Monitoring, and Remediation)* states that the highest beneficial use for Hanford groundwater is as a potential future drinking water source. [Underlining is ours.]

Page 40, lines 23-26, the Proposed Plan for 100-FR and IU-2/6 reads: "Alternative S-2 complies with soil cleanup chemical-specific ARARs and meets this threshold criterion. The groundwater remedies included in Alternatives GW-2, GW-3, and GW-4 will be designed to achieve DWSs in groundwater and AWQC and state water quality standards at the groundwater/surface water interface in a reasonable time period." [Underlining is ours.]

Therefore, ERWM finds the following statement on page 24, lines 41-42 of the Proposed Plan as inadequate: "The Tri Party Agencies' goal for Hanford groundwater is to restore it to beneficial use to

protect human health, the environment, and the Columbia River." It is our position that the future integrity of the groundwater must be maintained with consistent reference to the goals of reaching the *highest beneficial use*, which the State of Washington has defined *as potential drinking water source*.

Finally, ERWM understands that the sources for groundwater contamination in IU-2/6 reside outside the boundaries of those Operational Units and are being addressed within the CERCLA actions for the areas which encompass the sources of the plumes. However, risk definitions in the Proposed Plan for 100-FR and IU-2/6 must define the risk inherited from the offsite-sourced plumes to give a clear view of the condition of the 100-FR, IU-2/6 areas. It is not sufficient to simply indicate that the issue will be handled elsewhere.

Cultural Resources

Page 31, lines 17-20 in the Proposed Plan note the following: "If during design or implementation of the RTD remedy, culturally sensitive sites are identified for which mitigation activities to protect cultural resources would be inadequate, DOE and EPA will work with the Tribal Nations to identify an alternative remediation strategy. This alternative remediation strategy would be implemented through a ROD change." The Nez Perce Tribe is currently engaged in the efforts of DOE and EPA at the 100-K Area regarding planning for remediation of culturally sensitive areas. ERWM is comfortable with those efforts; and assumes EPA will participate in a similar positive manner should such effort be necessary in the 100-FR/IU-2-6 Decision Areas.

ERWM would also remind the Tri Parties, in addition, that the Gable Mountain-Gable Butte archeological district, within IU-2/6 Decision Area, has undergone review in the 1990's and has been declared eligible through the State of Washington Office of Archeology and Historic Preservation for listing in the National Register of Historic Places as a traditional and cultural property.

7. Letter Approve the letter to the U.S. Department of Energy regarding the Proposed Plan for remediation of the 100-FR-1, 100-FR-2, 100-FR-., 100-IU-2, and 100-IU-6 Operable Units, DOE/RL-2012-41, revision 1.

8. Path C Early Settlement Process Approve the proposed Portland Harbor Natural Resources Damage Assessment Path C early settlement process.

9. Letter Authorize the Chairman's signature on a letter to Will Stelle, Director, National Marine Fisheries Service, Northwest Regional Office, including the 2014-2015 harvest plan for Snake River Basin steelhead/fall chinook treaty fisheries for consultation purposes once the annual plan is complete.

10. Domestic Water Supply Authorize funding in the amount of $755,000.00 for North Lapwai Wastewater Treatment Facility Headworks Project from the Snake River Basin Adjudication - Domestic Water Supply fund.

BUDGET & FINANCE/CREDIT SUBCOMMITTEE - AUGUST 6, 2014

11. Funding Request Refer the funding request from the Nez Perce Warriors Gourd Dance, with recommendation from the Executive Director, to the August 12, 2014 NPTEC Meeting. REFERRED

12. Fall 2014 General Council Leave Authorize administrative leave on September 25-27, 2014 for enrolled tribal member employees, with supervisor approval to attend the Fall 2014 General Council meeting at the Pi-Nee-Waus Community Center, Lapwai, ID.

13. June 2014 NPTEC Treasurer's Report Accept the June 2014 NPTEC Treasurer's Report of the Nez Perce Tribe.

LAW & ORDER/INTERGOVERNMENTAL SUBCOMMITTEE-AUGUST 4, 2014

14. Wildfire Disaster Funding Aid Act Authorize the request from Kootenai Tribe for tribal support of its effort to have ATNI issue a resolution promoting passage of the Wildfire Disaster Funding Aid Act.

15. Request Form Approve the submission of the Nez Perce Tribe Child Support Enforcement Program's Account Request Form to GrantSolutions and authorize the Chairman's signature on the request form as the authorized official.

LAND ENTERPRISE COMMISSION SUBCOMMITTEE-AUGUST 5, 2014

16. Trespass Refer trespass issue on 1414 C to Land Services Director for preparation for purchase by willing sellers' list. REFERRED