DOE/RL-2010-05
Draft A

Proposed Plan to Amend the 200-ZP-1 Groundwater Operable Unit Record of Decision to Include the Remedial Actions for the 200-UP-1 Groundwater Operable Unit

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

U.S. DEPARTMENT OF ENERGY
Richland Operations Office

P.O. Box 550
Richland, Washington 99352

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P.O. Box 550
Richland, Washington 99352

J. D. Aardal 09/20/2010
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U.S. Department of Energy, Richland Operations Office
U.S. Environmental Protection Agency
Washington State Department of Ecology

Public Comment Period
Month Day – Month Day, Year

How You Can Participate:

Read this Proposed Plan and review related documents in the Administrative Record.

Comment on this Proposed Plan by mail, e-mail, or fax on or before (Date).

See page 48 for more information about public involvement and contact information.

INSIDE THIS PLAN:

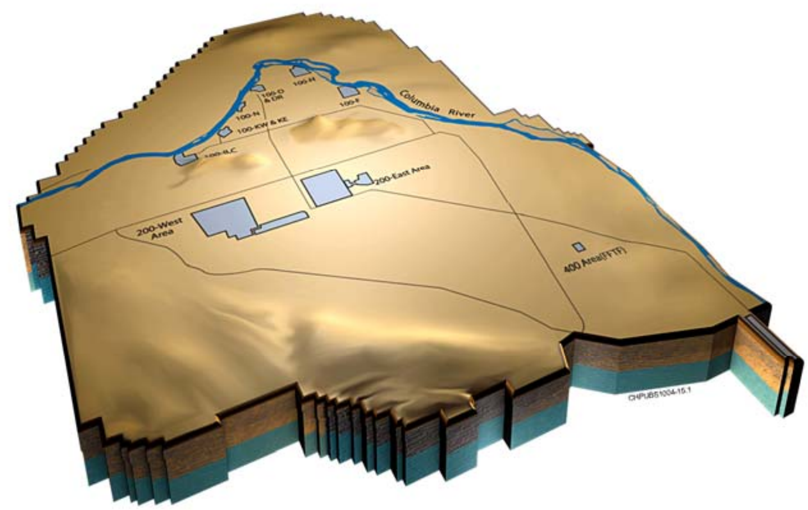

Figure 1. Hanford Site Illustration

INTRODUCTION

This Proposed Plan presents the Preferred Alternative for cleanup of groundwater within the 200-UP-1 Groundwater **Operable Unit (OU)**, referred to hereafter as the 200-UP-1 OU, at the U.S. Department of Energy (DOE) Hanford Site. As shown in **Figure 1**, the 200-UP-1 OU is located in the 200 West portion of the Central Plateau.

The DOE has published the findings from the 200-UP-1 OU **remedial investigation and feasibility study (RI/FS)** in DOE/RL-2009-122, *Remedial Investigation and Feasibility Study Report for the 200-UP-1 Groundwater Operable Unit*, hereafter referred to as the 200-UP-1 OU RI/FS. The 200-UP-1 OU RI/FS concluded that contaminant concentrations in the 200-UP-1 OU groundwater currently exceed federal and state drinking water standards and pose a potential risk to future human health and the environment. Given these findings, remedial action is required to address the contaminants present in the 200-UP-1 OU groundwater.

The DOE and the U.S. Environmental Protection Agency (EPA) propose that remedial actions for the 200-UP-1 OU be implemented by amending the 200-ZP-1 Groundwater OU **Record of Decision (ROD)**, *Hanford 200 Area 200-ZP-1 Superfund Site, Benton County, Washington* (EPA et al., 2008), hereafter referred to as the 200-ZP-1 OU ROD, to include the 200-UP-1 OU Preferred Alternative.

The 200-UP-1 OU is geographically adjacent to and contains the same **contaminants of concern (COCs)** as the 200-ZP-1 Groundwater OU (hereafter referred to as the 200-ZP-1 OU), with the exception that the 200-UP-1 OU has one additional COC (uranium). The Preferred Alternative for 200-UP-1 OU proposes using the same remedial technologies (pump-and-treat, monitored natural attenuation, and flow path control/hydraulic containment) and the same **institutional controls (ICs)** program for the same duration as specified in the 200-ZP-1 OU ROD.

The proposed cleanup levels for the 200-UP-1 OU ROD are the same as those selected in the 200-ZP-1 OU ROD, except that a cleanup level of 30 µg/L for uranium would be added.

The iodine-129 portion of the Preferred Alternative for the 200-UP-1 OU is proposed as an **interim remedial action (IRA)**, while the actions for the other 200-UP-1 OU COCs (uranium, technetium-99, nitrate, and tritium) are proposed as final remedies. The 200-UP-1 OU Preferred Alternative uses groundwater pump-and-treat technology for a period of 25 years, coupled with **monitored natural attenuation (MNA)** for an additional 125 years for the cleanup of the uranium, technetium-99 and nitrate plumes, and MNA for cleanup of the tritium plume. Hydraulic containment would be used to contain the iodine-129 plume in-place (rather than extracting and treating it), while DOE evaluates treatment technologies that can remediate the high concentration iodine-129 plume to the 1 pCi/L drinking water standard. Currently, there is no remedial technology commercially available that is capable of treating iodine-129 contaminated groundwater present in 200-UP-1 OU groundwater to the drinking water standard. The ICs component of the Preferred Alternative would restrict access and use of the groundwater until the cleanup levels for all COCs is achieved.

The 200-ZP-1 OU remedy also uses pump-and-treat technology, which is designed to recover 95 percent of the inventory of carbon tetrachloride (the dominant COC) in 200-ZP-1 OU groundwater in a 25-year operational period.

The MNA component of the 200-ZP-1 OU remedy continues for a period of 100 years after active pump-and-treat operations stop to allow MNA processes to reduce contaminant concentrations to cleanup levels. **Hydraulic containment**, a form of groundwater flow path control, is employed in both the 200-UP-1 OU and 200-ZP-1 OU remedies by injecting treated groundwater back into the aquifer to control groundwater flow and COC migration.

The treatment system which will be used to treat the extracted groundwater from both OUs is the 200 West Area Treatment Facility.

Operable Unit (OU)
An operable unit consists of individual waste sites grouped together within a common area (for example, the Central Plateau) for cleanup purposes.
A groundwater operable unit is established to aid in cleanup decisions to address groundwater contamination from waste disposal sites present in the unconfined aquifer.

Remedial Investigation/Feasibility Study (RI/FS)
The process that the Superfund program has established for characterizing the nature and extent of releases of hazardous substances, assessing risks posed by the release or threat of release, and evaluating alternatives to the extent necessary to select a remedy for the site.

Record of Decision (ROD)
A ROD is a legally binding public document that identifies the remedy that will be used at an operable unit. The Responsiveness Summary within the ROD contains the public comments received on the proposed actions and the Agencies' responses.

Contaminant of Concern (COC)
Radionuclides and chemicals that exceed risk threshold values in the Baseline Risk Assessment, Applicable or Relevant and Appropriate Requirements (ARARs), and/or contaminant-specific cleanup levels.

Institutional Control (IC)
Administrative measures to protect human health from exposure to contamination. Institutional controls are maintained until requirements are met for safe, unrestricted land use.

Interim remedial action (IRA)
An IRA is a remedial action taken prior to the issuance of a final ROD. Interim remedial actions are generally taken to address immediate risks to human health or the environment, but can be taken for many reasons, such as to get remedial action underway while final remedial solutions are being developed. See also 55 FR 8704 March 8, 1990 NCP.)

This facility is currently under construction and will treat the groundwater to the federal and state drinking water standards or to the state groundwater cleanup standards (whichever is more stringent). These standards are the **applicable or relevant and appropriate requirements (ARARs) (**EPA et al., 2008). However, the design treatment goal for the 200 West Area Treatment Facility is to treat groundwater to concentrations less than the drinking water standard.

The design life for the 200 West Area Treatment Facility is estimated to be 25 years. Replacement or rebuilding of equipment and piping during the operating period will need to be performed as part of the normal operations. Depending on the final remedy selected for the 200-UP-1 OU, there may be a need to use the 200 West Area Treatment Facility for treating 200-UP-1 OU groundwater beyond the estimated 25 year design life. Where appropriate, the 200-UP-1 OU remedial alternative cost estimates have included an allowance for replacing equipment and rebuilding and/or expanding the treatment facility.

This Proposed Plan is being issued to fulfill the requirements of Section 117(a) of the ***Comprehensive Environmental Response, Compensation, and Liability Act of 1980*** **(CERCLA)** and Section 300.430(f)(2) of the ***National Oil and Hazardous Substances Pollution Contingency Plan*** (**[NCP]** 40 *Code of Federal Regulations* [CFR] 300). This Proposed Plan also fulfills DOE's policy to consider values identified in the ***National Environmental Policy Act of 1969*** **(NEPA)** when evaluating proposed CERCLA remedial actions.

The following remedial action alternatives were evaluated in the 200-UP-1 OU RI/FS and are summarized in this Proposed Plan. The number of years in parentheses represents the estimated years required to reach cleanup levels for the specified contaminant:

- No Action Alternative
- Alternative 1—MNA and ICs (greater than 1,000 years)
- Alternative 2—Restoration of technetium-99 (30 years) and uranium (150 years) and hydraulic containment of iodine-129 until a final remedy is selected
- Alternative 3—Restoration of technetium-99 (30 years) and uranium (80 years) and hydraulic containment of iodine-129 until a final remedy is selected
- Alternative 4—Restoration of technetium-99 (25 years) and uranium (28 years) and hydraulic containment of iodine-129 until a final remedy is selected

Monitored Natural Attenuation (MNA)
A decrease in the concentration of a contaminant because of natural processes such as radioactive decay, oxidation/reduction, biodegradation, and/or sorption. Natural attenuation is monitored to determine whether additional cleanup activities are warranted.

Hydraulic Containment
Hydraulic containment refers to minimizing the spread of a plume through gradient control, which can be performed using pumping wells, injection wells, or French drains. Slow contaminant removal (through pumping wells or French drains), in combination with natural attenuation, may gradually achieve cleanup levels within the contained area. (EPA/540/G-88/003).

Applicable or Relevant and Appropriate Requirements (ARARs)
The body of federal and state laws, regulations, and standards governing environmental protection and facility siting, deemed either applicable or relevant and appropriate when cleaning up hazardous substances. The selected remedy must comply with ARARs.

Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA)
CERCLA, also known as Superfund, is the federal law that establishes a program to identify, evaluate, and remediate sites where hazardous substances may have been released (for example, leaked, spilled, or dumped) to the environment.

National Contingency Plan (NCP)
The first NCP was developed and published in 1968 to cope with potential spills in U.S. waters. Following the passage of Superfund legislation in 1980, the NCP included addressing releases of hazardous substances, pollutants, or contaminants into the environment from Sites requiring emergency removal actions. In 1994, the NCP was revised to mirror the oil spill provisions of the *Oil Pollution Act of 1990*. (40 CFR 300).

National Environmental Policy Act of 1969 (NEPA)

NEPA is a U.S. Environmental law that requires federal agencies to integrate environmental values into their decision-making processes by considering the environmental impacts of their proposed remedial actions and reasonable alternatives to those actions. While NEPA does not apply to CERCLA actions, DOE has adopted the policy that CERCLA decision documents should "incorporate NEPA values" to the fullest extent practicable. Federal agencies conducting CERCLA actions may rely on the CERCLA process for environmental reviews and are not required to engage in a separate NEPA analysis such as preparation of Environmental Assessments [EAs] and Environmental Impact Statements [EISs]). (40 CFR Part 1500, et seq.; O'Leary, 1994).

Based on this evaluation, the No Action Alternative and Alternative 1 were rejected because they are not protective of human health and the environment and do not achieve cleanup levels within a reasonable timeframe.

Alternatives 2, 3, and 4 were retained because they are protective of human health and the environment, comply with ARARs, and can be readily implemented. These three alternatives were evaluated further to compare their ability to provide short-term and long-term effectiveness and permanence, and reduce the toxicity, mobility, and volume of the 200-UP-1 OU contaminants, as well as their overall cost.

Based on the evaluation performed, Alternative 2 is recommended as the Preferred Alternative. Alternative 2 best compliments the existing 200-ZP-1 OU remedy and provides a cost-effective approach for restoring groundwater in the 200-UP-1 OU that would enable future beneficial use.

Alternative 2 consists of a combination of groundwater extraction and treatment for technetium-99 and uranium, MNA for tritium and nitrate, and hydraulic containment with treatment technology evaluation as an IRA for iodine-129. The extracted groundwater would be sent to the 200 West Area Treatment Facility (via above ground piping) for treatment for technetium-99, uranium, and nitrate. Nitrate will be co-extracted with uranium, but will not reach the cleanup level throughout the aquifer without the use of MNA. The treated effluent from the treatment plant (which will be blended with 200-ZP-1 OU treated groundwater) will meet the ARARs and be injected back into the 200 West Area aquifer.

A component of Alternative 2 includes an evaluation of iodine-129 treatment technologies, the goal of which is to evaluate whether treatment of iodine-129 contaminated groundwater to the 1 pCi/L drinking water standard can be performed within a reasonable time period and for a reasonable cost.

While DOE is completing the iodine-129 technology evaluation, the iodine-129 plume would be held in-place (using groundwater injection instead of extraction) through hydraulic containment. The benefit of injecting treated groundwater within the 200-UP-1 OU aquifer is that it controls migration of the iodine-129 plume so there is no further degradation of the 200-UP-1 OU aquifer from this contaminant. Additionally, by hydraulically containing the plume using injection wells, there is no need for above ground treatment.

The public is encouraged to review this Proposed Plan and the 200-UP-1 OU RI/FS to gain a further understanding of the 200-UP-1 OU and the basis for the Preferred Alternative recommended in this Proposed Plan.

These documents are available online in the Hanford Site Administrative Record and at the public information repositories identified in the Reference and Community Involvement sections of this Proposed Plan. After considering public comments, the DOE, EPA, and the Washington State Department of Ecology (Ecology), referred to as the Tri-Parties, will select a remedial action for the 200-UP-1 OU and prepare an amendment to the 200-ZP-1 OU ROD.

The Tri-Parties will provide a response to public comments in the Responsiveness Summary included with the ROD Amendment. Information on how the public can provide input on the preferred alternative, or any of the other remedial action alternatives identified in this Proposed Plan, is provided in the Community Involvement section.

Scope and Role

All three of the Tri-Parties are involved in groundwater OU investigation, cleanup, and long-term risk management. DOE is the lead agency responsible for performing the investigation and all subsequent remedial actions. EPA is the **lead regulatory agency**, and Ecology is the **non-lead regulatory agency** for this OU.

For the purpose of remedial investigations and cleanup actions, the waste sites that overly the 200-UP-1 OU have been assigned to different source OUs.

The waste sites that received contaminated liquid effluents from U Plant, S Plant, and their associated waste management areas (WMAs) are assigned to approximately seven source OUs. The Tri-Party agencies have agreed to apply the CERCLA RI/FS process to the source OUs separate from the groundwater OUs. As a result, there are independent RI/FS actions underway for both types of OUs at this time.

Alternative 2 uses proven technologies (groundwater pump-and-treat) and groundwater injection/hydraulic containment to address the 200-UP-1 OU contaminants. The alternative aligns with the overall Central Plateau groundwater remedial strategy, which includes restoring groundwater to beneficial use (where practicable), and uses a common treatment system (200 West Area Treatment Facility) to create cost savings.

The total **net present value (NPV)** cost for implementation of the preferred alternative is estimated at $137 million. This cost does not include implementation of a final selected remedy for iodine-129, which would be evaluated within this alternative.

Lead Regulatory Agency

The lead regulatory agency is the agency assigned regulatory oversight responsibility with respect to actions under the Tri-Party Agreement regarding a particular OU; treatment, storage or disposal unit; or milestone pursuant to Section 5.6 of the Tri-Party Agreement Action Plan. EPA is the lead regulatory agency for the 200-UP-1 OU.

Non-Lead Regulatory Agency

The non-lead regulatory agency provides the lead regulatory agency with technical support associated with review of Tri-Party Agreement primary documents. The non-lead regulatory agency also provides concurrence on decision documents. Ecology is the non-lead regulatory agency for the 200-UP-1 OU.

The Tri Parties are seeking public input on the remedial action alternatives considered and the Preferred Alternative recommended for implementation in this Proposed Plan.

Net Present Value (NPV)

Net present value is used in discounted cash flow analysis and is a standard method for using the time value of money to appraise long-term projects. It compares the value of a dollar today with the value of that same dollar in the future after taking returns and inflation into account.

National Priorities List (NPL)

The NPL is a formal list of release/priority hazardous waste sites in the U.S. that are eligible for investigation and possible remediation (cleanup) under Superfund (40 CFR 300, Appendix B). Sites are included on the list because of their potential risk to human health and the environment.

Tri-Party Agreement

The DOE, EPA, and Ecology signed the *Hanford Federal Facility Agreement and Consent Order*, or Tri-Party Agreement, on May 15, 1989. The Tri-Party Agreement, as updated and modified through formal change control, is a comprehensive cleanup and compliance agreement for achieving compliance with the CERCLA remedial action provisions and with the *Resource Conservation and Recovery Act* (RCRA) treatment, storage, and disposal unit regulations and corrective action provisions. More specifically, the Tri-Party Agreement: (1) defines and prioritizes CERCLA and RCRA cleanup commitments, (2) establishes responsibilities, (3) provides a basis for budgeting, and (4) reflects a concerted goal of achieving full regulatory compliance and remediation with enforceable milestones.

The cost estimate does, however, include the cost associated with the iodine-129 treatment technology evaluation. Based on the outcome of the technology evaluation effort, a final iodine-129 remedy will be selected and the ROD will be amended.

The preferred remedial alternative presented in this Proposed Plan is the lowest cost alternative; it is protective of the environment, complies with ARARs, and can be implemented in a reasonable timeframe.

In summary, the preferred alternative would provide the best balance of the evaluation criteria and uses the common features and attributes associated within both the 200-ZP-1 OU and 200-UP-1 OU remedial strategies.

SITE BACKGROUND

The Hanford Site, managed by DOE, encompasses approximately 1,517 square kilometers (km^2) (586 square miles [mi^2]) in the Columbia Basin of south-central Washington State, as shown in **Figure 2**. The area, originally designated as the "Hanford Engineer Works" and later renamed "The Hanford Nuclear Reservation," is located north of Richland, Washington.

From 1944 until the 1980s, the primary mission for the Site was plutonium production for national defense, as part of the Manhattan Project. The Site had an abundance of water available from the Columbia River and electricity available from the Bonneville and Grand Coulee Dams. In July 1989, EPA placed the 100, 200, 300, and 1100 Areas of the Site on EPA's **National Priorities List (NPL)** (40 CFR 300, Appendix B). Since the late 1990s, the Site's mission has focused on environmental restoration. The industrial production facilities, process areas, and waste disposal sites are now being addressed as part of this Site's restoration mission. The complete strategy regarding remediation of Site can be found in the *Hanford Federal Facility Agreement and Consent Order* (Ecology et al., 1989a), commonly referred to as the **Tri-Party Agreement**.

The 200-UP-1 OU is located on the Central Plateau, which is elevated approximately 61 to 67 m (200-250 ft) above the Columbia River shoreline. The Central Plateau includes the 200 West and 200 East Areas, which together contain over 1,000 waste disposal sites, four groundwater OUs, six tank farms/WMAs, and non-operational or inactive irradiated nuclear-fuel reprocessing facilities. The 200 West Area spans about 13 km^2 (5 mi^2) and is located 13 km (8 mi) from the Columbia River.

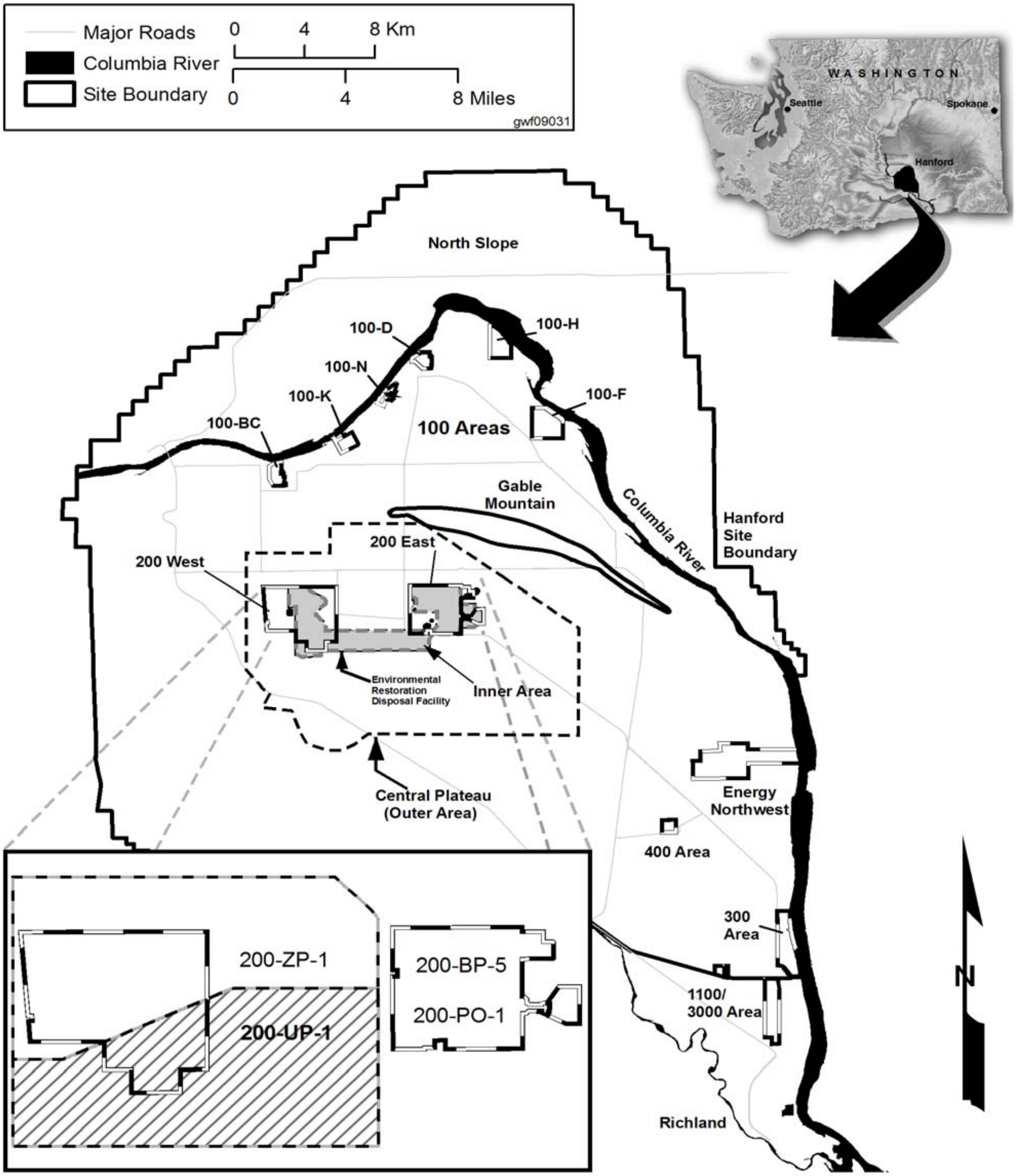

Figure 2. Location of the 200-UP-1 Operable Unit

Vadose Zone

The vadose zone, also termed the unsaturated zone, is the portion of Earth between the land surface and the phreatic zone or zone of saturation ("vadose" is Latin for "shallow"). It extends from the top of the ground surface to the water table. Water in the vadose zone has a pressure head less than atmospheric pressure, and is retained by a combination of adhesion (funicular groundwater) and capillary action (capillary groundwater). If the vadose zone envelops soil, the water contained therein is termed soil moisture. The vadose zone beneath the 200-UP-1 OU Area of the Central Plateau is approximately 60 m (200 ft) from ground surface to the top of groundwater.

What caused the current contamination in the operable unit?

The primary source of groundwater contamination in the 200-UP-1 OU was the historical operation of the U Plant and the Reduction-Oxidation (REDOX) or S Plant, as well as their associated ancillary facilities, which disposed process liquids to the ground via waste disposal sites. These facilities, as well as the associated WMAs, including U Tank Farm and S-SX Tank Farm and liquid effluent disposal units (trenches, ditches, cribs, reverse wells, French drains and ponds), operated from about 1944 to 1967. **Figure 3** shows the location of the primary waste disposal sites above the 200-UP-1 OU.

U Plant Source Areas

The major historical U Plant structures include the 221-U Building (U Plant) and 224-U Building (UO_3 Plant), which were used for production of uranium oxide from reactor fuel reprocessing.

When the Site mission transitioned from plutonium production to environmental restoration, many of the historical structures became obsolete and are now being decommissioned.

Cribs were excavations (about 6.1 m [20 ft] below ground surface) that were either backfilled with permeable materials or held open by large wooden beams. Liquid effluent was discharged into the cribs and percolated into the soil column (**vadose zone**) below the cribs. The major cribs used in the U Plant Area included 216-U-1 and 216-U-2, 216-U-8, 216-U-12, 216-U-16, and 216-U-17.

French drains were generally constructed of steel or concrete pipes and were either open-topped or filled with gravel. The major French drains in the U Plant include 216-U-3, 216-U-4A, 216-U-4B, and 216-U-7.

A reverse well was a vertical steel casing perforated along its lower-most section to allow liquid to discharge from the casing. Reverse wells were designed to dispose of relatively smaller volumes of liquid wastes. There was one reverse well in the U Plant Area, identified as 216-U-4.

Ponds, ditches, and trenches were also designed to dispose of large quantities of liquid wastes into the ground. The 216-U-10 Pond System (a series of ponds, ditches, and trenches) was constructed in 1944 to receive low-level liquid effluent from the plutonium processing facilities. The pond system was active until 1985 and received a total of 1.65×10^{11} L (4.3×10^{10} gal) of contaminated liquid.

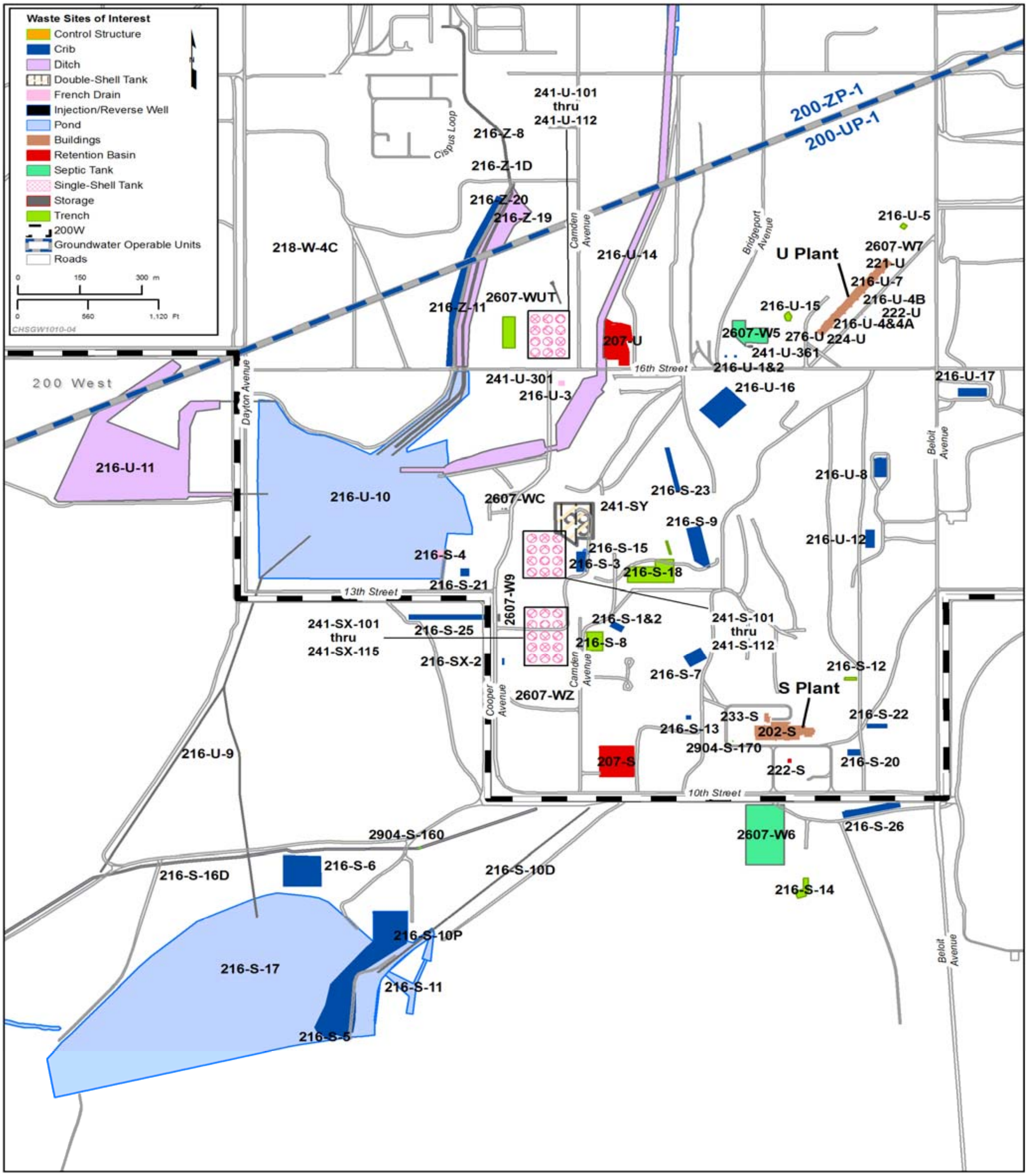

Figure 3. Potential 200-UP-1 OU Contaminant Sources

The 216-U-10 Pond itself was located in the southwest corner of the 200 West Area and, at its maximum extent, covered approximately 12.2 ha (30 acres). The 216-U-10 Pond was deactivated in 1985. Other parts of the pond system included the 216-U-14 Ditch**,** which began operation in 1944 and was originally known as the "laundry ditch" because it received wastes from the 2724-W Laundry Building.

The 216-U-11 Trench (a.k.a., U-Swamp Ditch [RHO-CD-673]) received the 216-U-10 Pond overflow until the trench was retired in 1957. The 216-U-15 Trench was used for a short period in 1957 and backfilled.

Several types of tanks are present in the U Plant Area, including two catch tanks, one settling tank, one receiver tank, two vaults, four septic tanks, and sixteen single-shell tanks (SSTs). The sixteen SSTs are contained in WMA 241-U Tank Farm. The 241-U Tank Farm tanks were constructed from 1943 to 1944. The tanks are all underground, constructed of reinforced concrete with a carbon steel liner on the bottom and sides.

Carbon tetrachloride is also present in 200-UP-1 OU groundwater, but the chemical was never used there. It was used in the Plutonium Finishing Plant (PFP) facility, located due north of the 200-UP-1 OU, where plutonium separation was performed. Wastewater associated with PFP operations was disposed into cribs, ditches, and trenches similar to those described above. The waste sites located near PFP are in the 200-PW-1 OU and include 216-Z-1A, 216-Z-9, and 216-Z-18. These sites are located above the 200-ZP-1 OU. The remedial actions associated with the cleanup of carbon tetrachloride are contained in the 200-ZP-1 OU ROD and are not proposed to be changed by this Proposed Plan.

S Plant Source Areas

The S Plant (also called REDOX) was built in 1950 and shut down in 1967. It employed the first process to recover both plutonium and uranium from irradiated fuel and was built to improve Hanford's plutonium and uranium recovery processes over the initial bismuth phosphate plutonium separations process. The REDOX process used a continuously operating hexone solvent extraction process to extract plutonium and uranium from acidic fission product rich solutions in which fuel pellets had been dissolved.

The S-Plant complex consists of the main 202-S REDOX Canyon Building, the 222-S Laboratory, 233-S Concentration Facility, and a series of support buildings and waste handling and storage facilities.

An evaporator (242-S) was added at the S-SX and SY WMA (Tank Farm) complex in 1973 to aid in tank volume waste reduction. The 241-S-SX and -SY Tank Farms contain 30 tanks constructed between 1950 and 1976. Of these, 27 SSTs received high level waste from the S Plant, and 3 double shell tanks received waste concentrate and salt well liquor from the SSTs, as well as high level wastes from all operating facilities in the 200 West Area. The 202-S Building and the 222-S Laboratory were the primary generators of liquid waste that was discharged to ponds, cribs, and ditches. The ponds and ditches (216-S-16 and 216-S-17) received the highest volume of cooling water and steam condensates from the major 202-S process vessels used to heat and cool chemical solutions. More radioactive (and chemical rich), but less voluminous quantities of condensed process vapors and cell drainage were sent to the cribs.

The primary cribs in the S Plant include 216-S-1 and -S-2, 216-S-5, 216-S-6, 216-S-7, 216-S-9, 216-S-13, 216-S-20, 216-S-21, 216-S-25, and 216-S-26. The nonradioactive, low volume chemical sewer wastes were generally sent to ponds and ditches. The major ditches included 216-S-10D and 216-S-16D; the major ponds included 216-S-10P, 216-S-11, 216-S-15, 216-S-16P, and 216-S-17.

The 216-S-10P Pond covered approximately 2 ha (5 acres) and was designed to percolate approximately 567,000 L (150,000 gal) of effluent per day. The pond operated from 1954 to 1984 and received chemical sewer waste from the S Plant Complex.

What previous investigations have occurred and what were the results?

Previous investigations date back to 1993. The following subsections provide a summary of three key investigations. A timeline of key 200-UP-1 OU activities is provided in **Figure 4**.

Field Investigation for the S-SX Tank Farm Area

The S and SX Tank Farms comprise WMA S-SX. The *Field Investigation Report for Waste Management Area S-SX* (RPP-7884), issued in 2002, presented a comprehensive assessment of historic and recent field investigation findings to clarify the current understanding of the nature and extent of past releases in WMA S-SX. The report described groundwater impacts associated with leaks from the S and SX SSTs. Computer simulation results of future groundwater impacts from past releases, as well as a risk assessment, were also prepared. The report concluded that groundwater impacts most likely result from the downward migration of vadose zone contaminants underlying the tanks. The fine grained sediments associated with the undifferentiated Hanford formation/Plio-Pleistocene unit also appear to have slowed the vertical migration of many contaminants through vadose soils.

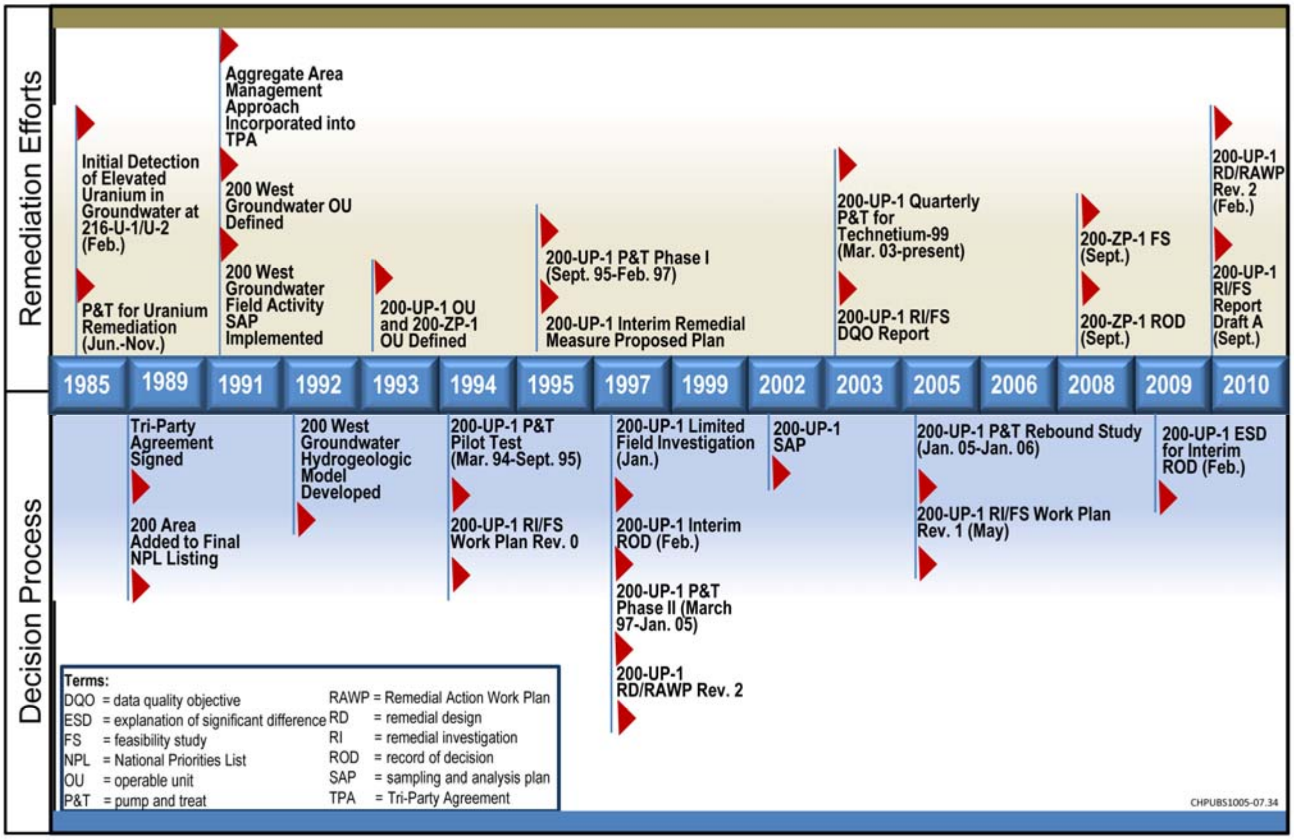

Figure 4. Timeline of Major Activities for the 200-UP-1 OU

Based on the report's conclusions, the following IRAs were taken to eliminate potential process water sources and structures that potentially accelerated contaminant transport:

- Approximately 1,930 m (6,300 ft) of active water lines were abandoned.
- Monitoring wells that were deemed unfit for use due to their construction were decommissioned.
- Surface water run-on control measures were implemented in upland areas.

200 West Groundwater Aggregate Area Management Study Report

The *200 West Groundwater Aggregate Area Management Study Report* ([AAMSR] DOE/RL-92-16) summarized information about groundwater contaminants beneath the 200 West Area and provided recommendations for prioritizing, investigating, and remediating various contaminant plumes.

This report provided a detailed description of the uranium, technetium-99, and nitrate plumes in the 200-UP-1 OU, and recommended that the three contaminant plumes in the U Plant Area containing the highest concentrations of uranium, technetium-99, and nitrate be addressed under an IRA.

Limited Field Investigation

The **Limited Field Investigation (LFI)** *for the 200-UP-1 Groundwater Operable Unit* (DOE/RL-96-33) was conducted in accordance with DOE/RL-92-76. The LFI focused on the evaluation of contaminated aquifer soils and groundwater, with the exception of the uranium and technetium-99 plumes, which were being addressed through an IRA involving pump-and-treat. The nature and extent of contamination was assessed through sampling of 105 monitoring wells between 1990 and 1996.

The LFI also included a qualitative risk assessment that assumed a future residential exposure scenario. The risk assessment determined that the majority of the potential risks could be attributed to carbon tetrachloride originating from the 200-ZP-1 OU.

What has been done to remediate the contamination?

Three IRAs are underway or currently being designed and constructed in the 200-UP-1 OU. The first IRA, also referred to as the U Plant IRA (Interim ROD signed in 1997; EPA/541/R-97/048, as amended by Ecology et al., 2009), consists of a pump-and-treat system to remove uranium and technetium-99 from groundwater in the U Plant vicinity (221-U Building Canyon). This system has been in operation since 1994, and was initially operated as a pilot treatability test (Ecology et al., 2009). This IRA requires that pumping from existing and new 200-UP-1 OU extraction wells be conducted in accordance with the remedial design/remedial action work plan (DOE/RL-97-36) until concentrations of both uranium and technetium-99 are less than or equal to 10 times the drinking water standard for four consecutive quarters. The extracted groundwater is being piped to the Effluent Treatment Facility for treatment. Once the 200 West Area Treatment Facility is built and operational, the extracted groundwater will be diverted there for treatment. The U Plant IRA will continue until the IRA goals are met or the IRA is replaced by the final remedial action being proposed herein. As of December 2008, this IRA has pumped 869 million L (230 million gal) of groundwater, removing 124 g (0.27 lb) of technetium-99, 216 kg (476 lbs) of uranium, 37 kg (82 lbs) of carbon tetrachloride, and 41 kg (90 lbs) of nitrate from the aquifer.

Limited Field Investigation (LFI)
A field study targeted or focused on acquiring specific information needed to complete the study of the nature and extent of contamination so that a feasibility study can be prepared.

Explanation of Significant Differences (ESD)

Explanations of significant differences describe to the public the nature of significant changes to a remedy selected in a CERCLA Record of Decision, summarize the information that led to making the changes, and affirm that the revised remedy complies with CERCLA.

Community Relations Plan (Hanford Community Relations Plan)

The Tri-Parties developed the first Community Relations Plan (Ecology et al., 2002) in 1990 as part of the overall Hanford Site restoration effort. The Community Relations Plan and its subsequent revisions were used as the basis for public involvement efforts for this proposed plan.

The second IRA (DOE/RL-97-36) consists of extended purging of a single monitoring well, located in the southern portion of WMA S-SX, during quarterly sampling events to accelerate removal of technetium-99. Following each technetium-99 sampling event, the well is purged until an additional 3,800 L (1,000 gal) of groundwater is removed. This IRA will continue until the IRA goals of achieving a groundwater concentration of 10 times the technetium-99 drinking water standard are met for four consecutive quarters or the IRA is replaced by the final remedial action being proposed herein.

The third IRA (DOE/RL-97-36) is a planned pump-and-treat system to address two separate technetium-99 plumes located down-gradient of the WMA S-SX Area. This system will include the installation of extraction wells to remove high concentrations of technetium-99 and a conveyance system to transport the water to the 200 West Area Treatment Facility. This IRA is scheduled to begin operation in December 2011, when the 200 West Area Treatment Facility becomes operational. The system will be operated until either the IRA remedial goal of 10 times the technetium-99 drinking water standard (9,000 pCi/L) is met or the final 200-UP-1 OU remedy is in place.

What is the status of the five-year review action items?

The Second CERCLA Five-Year Review Report for the Hanford Site (DOE/RL-2006-20) identified one primary action item for the 200-UP-1 OU related to the cleanup standard for uranium. When the interim action ROD was issued in 1997, the cleanup standard for uranium was 48 µg/L. Since then, EPA has established a drinking water standard of 30 µg/L for uranium. Therefore, the five-year review recommended that an **Explanation of Significant Differences** (**ESD**) be prepared to revise the IRA uranium cleanup level from 480 µg/L to 300 µg/L. The *Explanation of Significant Differences for the Interim Action Record of Decision for the 200-UP-1 Groundwater Operable Unit Hanford Site Benton County, Washington* (Ecology et al., 2009) was issued in February 2009.

What previous efforts have been made by the Tri-Parties to involve the public in matters related to site cleanup?

The Tri-Parties developed the first *Hanford Site Tri-Party Agreement Public Involvement Community Relations Plan* (Ecology et al., 2002) in 1990 as part of the overall Site restoration effort. The **Community Relations Plan** and its subsequent revisions were used as the basis for public involvement efforts associated with the 200-UP-1 OU. The Proposed Plan that led to the development of the interim action ROD for the 200-UP-1 OU in 1997 was provided for public review and comment in 1996. The Proposed Plan that led to the development of the final selected remedy for the 200-ZP-1 OU was provided for public review and comment in 2008. The actions in this Proposed Plan will be the latest to involve the public regarding 200-UP-1 OU remedial actions.

SITE CHARACTERISTICS

What are the physical characteristics of the site?

The Central Plateau is composed of thick sedimentary deposits (predominantly sand and gravel) overlying basalt bedrock.

Figure 5 illustrates the vertical extent of the various hydrostratigraphic units (HSU) that comprise the subsurface sedimentary sequence above the basalt. Six HSUs are defined above the basalt, as illustrated in the figure.

The uppermost aquifer within the 200-UP-1 OU is the unconfined aquifer that occurs primarily within Ringold Formation Unit E (HSU 5); a thick sequence of semi-consolidated alluvial materials composed of a silt, sand, and gravel mixture.

Near the eastern OU boundary, a hydrogeologic transition occurs where older Ringold Formation Unit E (HSU 5) sediment was removed and reworked by cataclysmic flooding. The subsequent deposition of material from these flood events left younger, and more permeable, Hanford (HSU 1) and Cold Creek (HSU 2) materials comprised predominantly of unconsolidated sand and gravel mixtures deposited adjacent to HSU 5. Again, **Figure 5** presents an illustration of the Hanford/Ringold Contact boundary and these deposits.

Groundwater in the 200 West Area unconfined aquifer generally flows from west to east at a rate of 0.0001 to 0.5 m/day (0.00033 to 1.64 ft/day). The depth from ground surface to the top of the water table in the 200 West Area varies from 50 m (164 ft) in the southwest corner near the 216-U-10 Pond to greater than 100 m (328 ft) in the north. The aquifer’s saturated thickness ranges between 49 and 122 m (160 and 400 ft).

Liquid effluent disposal to the various waste sites stopped in the mid-1990s. Since then, the water table elevation has been declining, and will continue to decline until it attains an elevation comparable to pre-Hanford conditions. This will have an impact on the vertical placement of all future extraction wells, injection wells, and monitoring wells for any pump-and-treat remedial alternative selected for the 200-UP-1 OU.

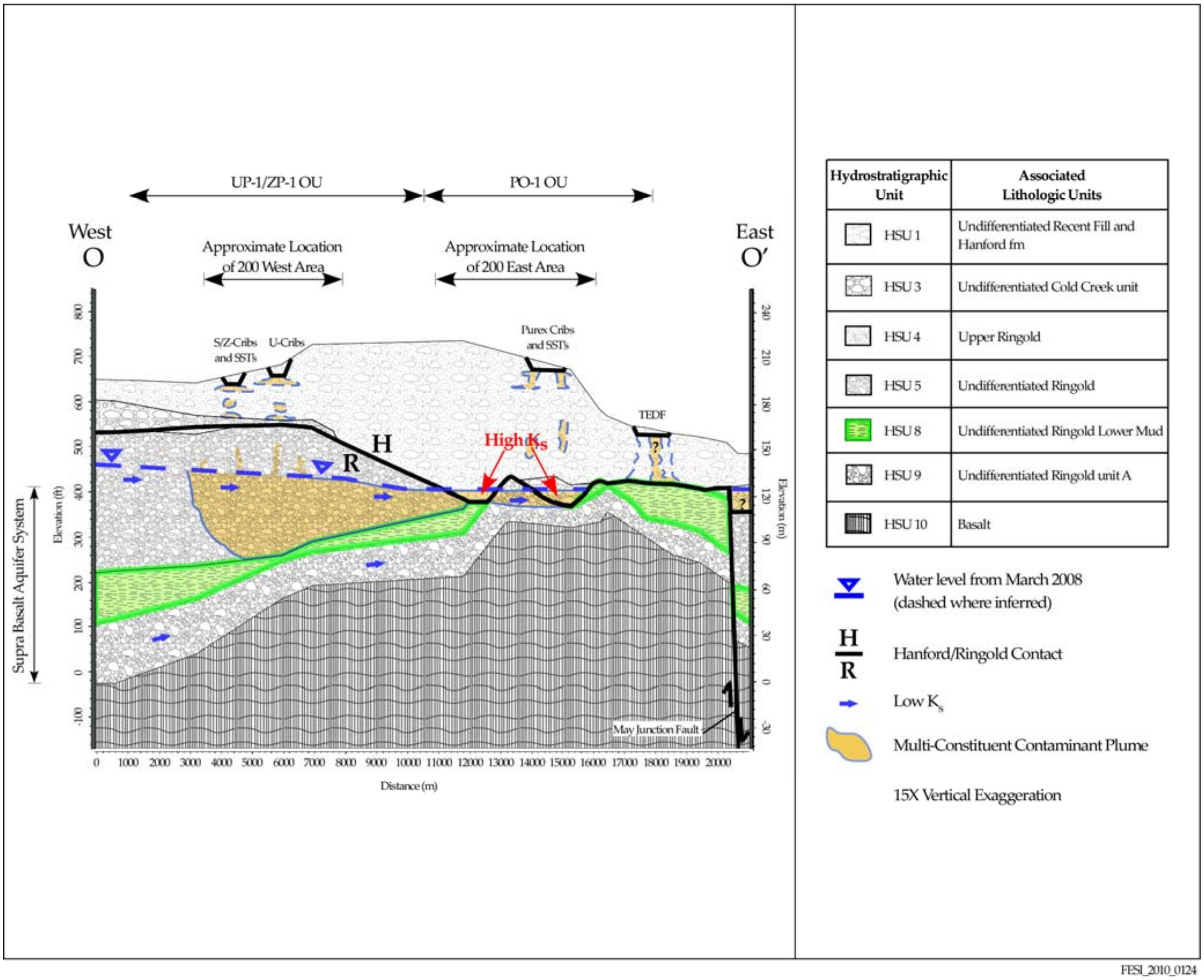

Figure 5. Geologic Cross-Section of Hanford Central Plateau

Environmental Restoration Disposal Facility (ERDF)

ERDF is the Hanford Site's state and federally approved disposal facility for hazardous wastes (radioactive and nonradioactive) and contaminated environmental media generated under a CERCLA response action for wastes that meet the waste disposal acceptance criteria.

What roads, buildings, and land uses are present on the site?

Man-made features visible on the ground surface primarily include industrial structures associated with historical nuclear material production activities and the active **Environmental Restoration Disposal Facility (ERDF)**. Access to the entire Site is controlled and is expected to remain so to ensure public health and safety. Anticipated land use plays a key role in CERCLA cleanup decisions, and DOE is responsible for designating the land use for the Site. As the lead agency for CERCLA cleanup action on the Site, DOE is also responsible for identifying future land uses that will guide CERCLA risk assessment and cleanup decisions. The Hanford Comprehensive Land-Use Plan ROD (64 FR 61615) and 2008 amended Hanford Comprehensive Land-Use Plan ROD (73 FR 55824) designated land uses for the Site. The land use designation for the Central Plateau is generally Industrial Exclusive.

This means the area is suitable for treatment, storage, and disposal of hazardous and/or radioactive wastes under federal control.

Hanford lands are expected to remain under federal ownership and control for the foreseeable future. Access to these areas will be controlled, as necessary, to protect human health and safety as long as active waste management and remedial action operations are being conducted.

What geographic, topographic, or other factors had a major impact on remedy selection?

CERCLA cleanup decisions for groundwater must consider the intended use of the groundwater resource and must return the groundwater to beneficial use whenever practicable within a timeframe that is reasonable, given the particular circumstances of the site. For the Central Plateau, DOE has established a goal to restore the aquifer to a level that achieves drinking water standards, unless this goal is determined to be technically impracticable. In instances where drinking-water based cleanup levels are not achievable in a reasonable time frame, ICs and hydraulic containment are often used to prevent exposure to contaminated groundwater and to control further contaminant plume migration until new technologies become available.

Within the Central Plateau Area, the depth and size of the contaminant plumes pose significant challenges for many in situ treatment technologies. Additionally, the ERDF facility prevents direct access to large portions of several contaminant plumes. Groundwater pump-and-treat and hydraulic containment are mature remedial technologies that are well suited for the conditions present within the Central Plateau area.

Another factor that played an important role in the development and recommendation of a Preferred Alternative for the 200-UP-1 OU was the iodine-129 plume. Currently, there are no commercially available technologies that are capable of removing iodine-129 from groundwater to the 1 pCi/L drinking water standard. Therefore, additional technology evaluation is needed as a component of the Preferred Alternative to assess the feasibility of remediating the iodine-129 plume.

How much and what type of contamination is present in the 200 West Area?

Figure 6 presents a combined contaminant “plume map” of the 200-ZP-1 OU COCs and the 200-UP-1 OU COCs. This figure shows the footprint for the COC plumes, as defined by their corresponding federal and state drinking water standards.

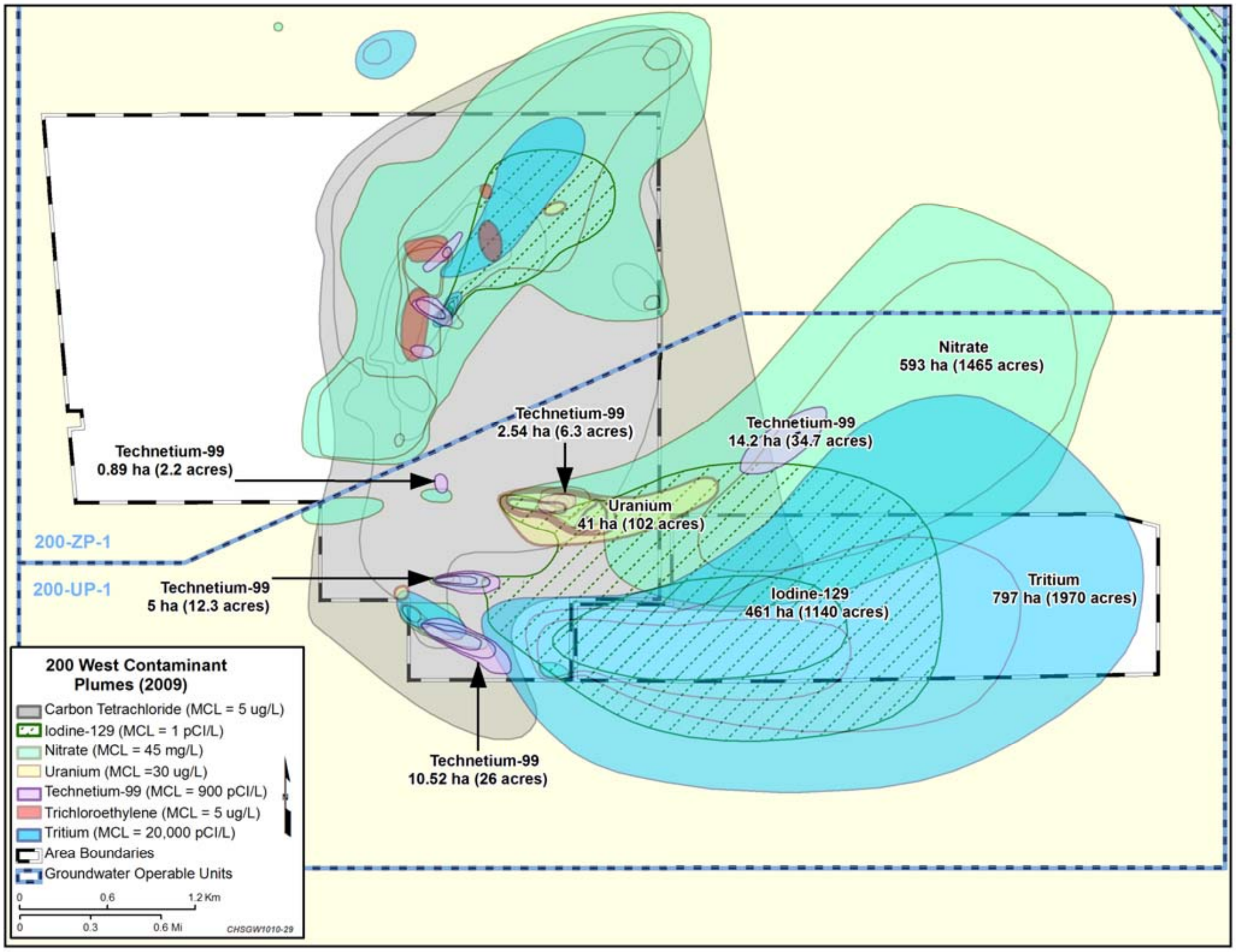

Figure 6. 200 West Groundwater Plume Map Highlighting 200-UP-1 OU COCs

Baseline Risk Assessment (BRA)
A BRA is an assessment conducted before cleanup activities begin at a site to identify and evaluate the threat to human health and the environment. Information from this risk assessment can also be used to help establish the site-specific cleanup goals.

SUMMARY OF SITE RISKS

The results of the **baseline risk assessment** (**[BRA]** DOE/RL-2009-122) indicate that concentrations of radiological contaminants in the 200-UP-1 OU exceed federal drinking water standards and that concentrations of non-radiological contaminants exceed acceptable exposure levels developed for cancer and non-cancer effects.

Contaminants in the 200-UP-1 OU have the potential to pose an unacceptable risk to human health if the groundwater is used as a drinking water source.

Under CERCLA, the BRA assists the Tri-Party decision makers in identifying where remedial actions should be applied. These assessments are intended to support the decision making process over the life of the remedy in the following ways:

- Developing exposure scenarios that represent the range of potential or likely circumstances where populations may be exposed to contaminants.
- Determining whether there is a need for a cleanup action.
- Supporting the development and evaluation of remedial alternatives.

EPA guidance provided in OSWER Directive 9355.0-30 (Clay, 1991) describes how the BRA is used to make risk management decisions, such as determining whether remedial action under CERCLA Section 104 or Section 106 is necessary.

The directive also describes the following conditions, when a CERCLA action is generally warranted:

- The BRA indicates that a cumulative site risk to individual using reasonable maximum exposure assumptions for either current or future land use exceeds the 1×10^{-4} **excess lifetime cancer risk (ELCR)**.
- For groundwater actions, drinking water standards will generally be used to gauge whether remedial action is warranted.
- Chemical-specific standards that define acceptable risk levels also may be used to determine whether an exposure is associated with an unacceptable risk to human health and the environment and whether remedial action is warranted.

The need for a cleanup action at the 200-UP-1 OU was determined by comparing groundwater **exposure point concentrations (EPC)** to existing drinking water standards. For the purpose of the BRA, the **90th percentile groundwater concentration** is the EPC for the 200-UP-1 OU. An EPC groundwater concentration was calculated for each contaminant identified as a COC in the 200-UP-1 OU.

The WAC 173-340-720 groundwater cleanup levels were used to determine whether exposure to multiple contaminants in groundwater is associated with an unacceptable risk to human health and the environment. If the EPC exceeded either the drinking water standards or the WAC 173-340-720 groundwater cleanup level, then further review of possible remedial actions is warranted.

The EPC was calculated using analytical data collected from 93 monitoring wells screened in the unconfined aquifer over the last 5 years (approximately 44,000 results). The comparison to WAC 173-340-720 groundwater cleanup levels considers two types of health effects: cancer risk and non-cancer hazard. The calculated cancer risk estimates the probability that additional cases of cancer may develop within a population if individuals are exposed to the contaminated groundwater over the course of a human lifetime.

Excess Lifetime Cancer Risk (ELCR)

A numerical estimate of the incremental probability of an individual developing cancer over a lifetime as a result of a reasonable maximum site-related exposure to a potential carcinogen. EPA has defined an acceptable risk range for cumulative cancer risks at hazardous waste sites of 10^{-6} to 10^{-4}. Ecology has established an acceptable cumulative cancer risk of 10^{-5}.

Exposure Point Concentrations (EPC)

An EPC is an estimate of the chemical concentration in an environmental medium to which a receptor could be exposed.

90th Percentile Groundwater Concentration

The 90th percentile value was calculated from the measured monitoring well data in the 200-UP-1 OU and represents the average groundwater concentration across the OU. The average concentration represents a reasonable estimate of the contaminant concentration likely to be contacted over time, and was used to calculate the cancer risks and non-cancer hazards in the base-line risk assessment.

Hazard Quotient
A numerical expression that indicates whether the concentration of a chemical is likely to result in specific adverse effects.

This risk estimate is known as the CERCLA incremental lifetime cancer risk. For non-cancer effects, the **hazard quotient,** which is a numerical expression that indicates whether the concentration of a chemical is likely to result in specific adverse health effects, is calculated. Several contaminants (such as carbon tetrachloride and tetrachloroethene) can present both cancer and non-cancer health risks.

The EPA has developed acceptable exposure levels under CERCLA to evaluate the potential for health risks. For contaminants that are known or suspected to cause cancer, acceptable exposure levels are generally concentration levels that represent an incremental lifetime cancer risk range to an individual of 1 in 1,000,000 (referred to as 10^{-6}) to 1 in 10,000 (referred to as 10^{-4}). For the State of Washington, acceptable exposure levels are generally concentration levels that represent a total excess cancer risk to an individual of 1 in 100,000 (referred to as 10^{-5}).

For non-cancer health effects, EPA and the State of Washington have established an acceptable threshold level defined as a hazard quotient of 1 for an individual contaminant. Non-cancer adverse health effects are not expected to occur below this threshold.

Current drinking water standards set acceptable exposure levels for radiological contaminants at 4 mrem/yr (annual dose) equivalent to the total body or any internal organ for beta particle and photon emitters. A mass concentration of 30 µg/L was established as the drinking water standard for uranium.

Summary of Human Health Risks

Table 1 presents non-radiological risk estimates for the 200-UP-1 OU based on comparison of groundwater EPC values to the WAC 173-340-720 groundwater cleanup levels. The potential cumulative ELCR from all non-radiological carcinogenic contaminants is 5.8×10^{-4}, which is greater than the WAC 173-340-720 acceptable risk threshold of 1×10^{-5} for multiple hazardous substances and the upper NCP threshold of 1×10^{-4}, as shown on Table 1.

Contributors to the non-radiological ELCR include the following:

- Carbon tetrachloride (5.6×10^{-4} or 95.6 percent contribution)
- Chloroform (5.1×10^{-6} or 0.9 percent contribution)
- 1,4-dioxane (1.5×10^{-6} or 0.3 percent contribution)
- Tetrachloroethene (1.2×10^{-5} or 2.1 percent contribution)
- Trichloroethene (6.7×10^{-6} or 1.2 percent contribution)

Table 1. Summary of EPC and Associated Cancer Risk and Non-Cancer Hazard Index for Non-Radioactive Groundwater Constituents

Contaminant	90th Percentile Value or EPC Concentration (µg/L)	WAC 173-340-720 Non-Carcinogen Groundwater Cleanup Level[a] (µg/L)	Hazard Quotient[b]	WAC 173-340-720 Carcinogen Groundwater Cleanup Level[c] (µg/L)	ELCR
Carbon Tetrachloride	189	5.6	34	0.34	5.6×10^{-4}
Chloroform	7.2	80	0.09	1.4	5.1×10^{-6}
1,4-Dioxane	6.0	800	<0.01	4.0	1.5×10^{-6}
Tetrachloroethene	1.0	80	0.01	0.081	1.2×10^{-5}
Trichloroethene	3.3	-	-	0.49	6.7×10^{-6}
Total ELCR				-	$\mathbf{5.8 \times 10^{-4}}$
Chromium	99	24,000	<0.01	-	-
Fluoride	470	480	0.98	-	-
Hexavalent Chromium	52	48	1.1	-	-
Nitrate	133,000	25,600	5.2	-	-
Uranium	206	48	4.3	-	-
Hazard Index[b]			**45**		

a. Cleanup level corresponds to a hazard quotient of 1 when using WAC 173-340-720, Equation 720-1.

b. Hazard quotients and hazard index are unitless values.

c. Cleanup level corresponds to an acceptable cancer risk level of 1 in 1,000,000 when using WAC 173-340-720, Equation 720-1.

ELCR = excess lifetime cancer risk (unitless)

As shown in Table 1, the **hazard index** from all non-carcinogenic contaminants is 45, which is greater than the EPA and State of Washington target hazard index of 1. The following are primary contributors to the non-cancer hazard index:

- Carbon tetrachloride (hazard quotient = 34 or 74 percent contribution)
- Nitrate (hazard quotient = 5.2 or 11 percent contribution)
- Uranium (hazard quotient = 4.3 or 9.4 percent contribution)
- Hexavalent chromium (hazard quotient = 1.1 or 2.4 percent contribution)

Table 2 presents the radiological annual dose, and the radiological risk estimates calculated using the 90th percentile concentrations and a default EPA residential exposure scenario. Most federal drinking water standards represent an adult resident exposure scenario, while

Hazard Index

The sum of hazard quotients for all chemicals and all exposure pathways for a receptor, and represents the cumulative non-cancer risks for that receptor. Both EPA and Ecology have established a hazard index of 1 as an acceptable risk level for non-carcinogens. If the hazard index is equal to or greater than 1, there may be a concern that potential adverse health effects will be observed in the exposed populations. A hazard index of less than 1 is unlikely to have adverse health effects.

the WAC groundwater cleanup levels represent an age-adjusted resident exposure scenario. The individual dose rate and the cumulative annual dose rate associated with exposure to the radiological contaminants is 43 mrem/yr. This is greater than the acceptable dose limit of 4 mrem/yr annual dose rate, in accordance with existing drinking water standards. **Table 2** also presents a summation of the total cumulative risk associated with exposure to the non-radiological and radiological constituents. Presentation of the total cumulative non-radiological and radiological risk is consistent with EPA guidance (EPA/540/R/99/006).

Table 2. Summary of 90th Percentile Current Conditions Groundwater Contaminant Concentrations, Associated Cancer Risk, and Associated Annual Dose Rates for Radiological Constituents

Contaminant	90th Percentile Value (pCi/L)	Drinking Water Standard (pCi/L)	ELCR at Drinking Water Standard	Annual Dose Rate (mrem/year)	ELCR
Iodine-129	3.5	1	2.8×10^{-6}	14	9.8×10^{-6}
Strontium-90	0.66	8	8.5×10^{-6}	0.33	6.8×10^{-7}
Technetium-99	4,150	900	4.7×10^{-5}	18	2.2×10^{-4}
Tritium	51,150	20,000	1.9×10^{-5}*	10	4.9×10^{-5}
Cumulative Annual Dose (mrem)				43	-
Cumulative ELCR for Radioactive Constituents				-	**2.8×10^{-4}**
Total ELCR for Non-Radioactive Constituents (from Table 1)					**5.8×10^{-4}**
Total Cumulative Radionuclide and Non-Radioactive Constituent ELCR					**8.6×10^{-4}**

* An ELCR for tritium which includes the ingestion and inhalation exposure routes would be 1.3×10^{-4}. The ELCR for tritium would be 1.9×10^{-5} for the ingestion exposure route only.

The potential cumulative ELCR from all radiological contaminants is 2.8×10^{-4}, which is greater than the upper NCP threshold of 1×10^{-4}. The primary contributors to the radiological ELCR include:

- Iodine-129 (9.8×10^{-6} or 3.6 percent contribution)
- Tritium (4.9×10^{-5} or 18 percent contribution)
- Technetium-99 (2.2×10^{-4} or 78 percent contribution)

At the request of the Yakama Nation and the Confederated Tribes of the Umatilla Indian Reservation, two risk exposure scenarios provided by the Tribal Nations were also evaluated and presented in the BRA.

Summary of Ecological Risks

Given the lack of direct or indirect exposure by ecological receptors to groundwater now or in the future, ecological risk is not expected within the 200-UP-1 OU. The actions that are necessary to mitigate human health risk and restore the aquifer for beneficial use will also prevent contaminants from reaching the Columbia River, which will therefore mitigate potential future ecological risks associated with the groundwater pathway and its connection to the river. Therefore, no baseline quantitative ecological risk evaluation was done in support of the need to take action.

As shown in Figure 2, the 200-UP-1 OU is located west of the Columbia River. The groundwater in the 200-UP-1 OU flows predominantly east for about 26 km (16 mi) before reaching the Columbia River. Groundwater has been estimated to require approximately 150 years to travel from the 200-UP-1 OU Area of the Central Plateau to the Columbia River, immediately east of the 200 East Area.

Selection of Chemicals of Concern (COCs)

The list of contaminants provided in Tables 1 and 2 were further evaluated to develop a list of COCs to guide the remedial technology screening and alternative development process.

Based on the results of this evaluation, the list of COCs for the 200-UP-1 OU includes uranium, nitrate, technetium-99, tritium, and iodine-129. With the exception of uranium, the COCs identified for the 200-UP-1 OU is a subset of the COCs identified in the 200-ZP-1 OU ROD.

Carbon tetrachloride was not identified as a COC because the source of carbon tetrachloride originates in the 200-ZP-1 OU and a remedy has been selected for it in the 200-ZP-1 OU ROD.

Chloroform, 1, 4-dioxane, tetrachloroethene, trichloroethene, chromium, and hexavalent chromium were not identified as COCs. These contaminants were not identified as COCs because the 90th percentile groundwater concentration is less than the WAC 173-340-720 groundwater cleanup level that corresponds to a 1×10^{-5} acceptable target risk level for carcinogens or a hazard quotient of 1 for non-carcinogens.

The contaminants that were not carried forward as COCs have been eliminated from the evaluation of the specific remedial action alternatives. However, these contaminants may be included in the scope of a future performance monitoring program for the selected remedial action alternative.

Remedial Action Objective (RAO)
Media specific or operable unit specific goals for protecting human health and the environment. Remedial action objectives specify the contaminant(s) of concern, the exposure route(s) and receptor(s), and a preliminary remediation goal for each exposure route.

Based on the need to restore groundwater to its beneficial use and the calculated dose and risks, the Tri-Parties believe that an action is necessary to protect human health and the environment from releases of radiological and hazardous substances in the 200-UP-1 OU.

REMEDIAL ACTION OBJECTIVES

The **remedial action objectives (RAOs)** developed in the 200-UP-1 OU RI/FS ***are identical to those presented in the 200-ZP-1 OU ROD***, with the exception that the 200-UP-1 OU has one additional COC (**uranium**) that will be included in the 200-UP-1 OU remedy.

The RAOs are listed below.

- RAO 1: Return the 200-UP-1 OU groundwater to beneficial use by achieving the cleanup levels presented in **Table 3**.
- RAO 2: Apply ICs to prevent the use of groundwater until the cleanup levels are achieved.
- RAO 3: Protect the Columbia River and its ecological resources from degradation and unacceptable impact caused by contaminants originating from the 200-UP-1 OU.

Table 3. 200-UP-1 OU COCs and Cleanup Levels

COC	Units	90th Percentile	Federal Drinking Water Standard	State Drinking Water Standard	WAC 173-340-705, "Model Toxics Control Act (MTCA)—Cleanup," "Use of Method B," Cleanup Levels: Non–Carcinogens	WAC 173-340-705 Cleanup Levels: Carcinogens at 10^{-5} Risk Level	Cleanup Level
Uranium	µg/L	206	30	–	–	–	30
Nitrate –(NO_3)[a]	µg/L	133,000	45,000	45,000	25,600	–	45,000
Iodine–129	pCi/L	3.5	1	–	–	–	1[b]
Technetium–99	pCi/L	4,150	900	–	–	–	900
Tritium	pCi/L	51,150	20,000	–	–	–	20,000

Notes: Federal Drinking Water values from 40 CFR 141, with iodine–129 and technetium–99 values from EPA 816–F–00–002.

State Drinking Water values from WAC 246–290.

a. Nitrate may be expressed as nitrate (NO_3) or as nitrate-nitrogen (NO_3-N). The drinking water standard for nitrate as NO_3 is 45,000 µg/L and the concentration expressed as NO_3-N is 10,000 µg/L.

b. Current technology may not enable this level of treatment to be achieved. Feasibility of treatment will be evaluated during the technology evaluation period.

Table 3 also provides a comparison of the 200-UP-1 OU 90th percentile COC concentrations to Washington State drinking water standards and Model Toxics Control Act (MTCA) method B cleanup levels.

Table 4 provides a comparison of the 90th percentile COC concentrations to Washington State drinking water standards and MTCA Method B cleanup levels for both the 200-ZP-1 OU and 200-UP-1 OU COCs combined.

Table 4. 200-ZP-1 OU COCs and Cleanup Levels

COC	Units	90th Percentile	Federal Drinking Water Standard	State Drinking Water Standard	WAC 173-340-705, "Model Toxics Control Act (MTCA)—Cleanup," "Use of Method B," Cleanup Levels		Cleanup Level
					Non–Carcinogens	Carcinogens at 10^{-5} Risk Level	
Carbon Tetrachloride	µg/L	2,900	5	5	5.6	3.4	3.4
Chromium (total)	µg/L	130	100	100	24,000	-	100
Hexavalent Chromium	µg/L	203	NA	NA	48	-	48
Trichloroethylene	µg/L	10.9	5	5	2.4	1	1[a]
Uranium	***µg/L***	***206***	***30***	**–**	**–**	**–**	***30[b]***
Nitrate –(NO_3)[c]	µg/L	133,000	45,000	45,000	25,600	–	45,000
Iodine–129	pCi/L	3.5	1	–	–	–	1[d]
Technetium–99	pCi/L	4,150	900	–	–	–	900
Tritium	pCi/L	51,150	20,000	–	–	–	20,000

Notes: Federal Drinking Water values from 40 CFR 141, with iodine–129 and technetium–99 values from EPA 816–F–00–002.

State Drinking Water values from WAC 246–290.

a. The DOE will cleanup COCs for the 200-ZP-1 OU subject to WAC 173-340 (carbon tetrachloride and TCE) so the incremental lifetime cancer risk does not exceed 1×10^{-5} at the conclusion of the remedy.

b. Proposed cleanup level for 200-UP-1 OU. The remaining cleanup levels from the 200-ZP-1 OU ROD are unchanged.

c. Nitrate may be expressed as nitrate (NO_3) or as nitrate-nitrogen (NO_3-N). The drinking water standard for nitrate as NO_3 is 45,000 µg/L. The concentration expressed as NO_3-N is 10,000 µg/L.

d. Due to influent concentrations projected to be less than 1 pCi/L, the 200-ZP-1 OU remedial design determined that iodine-129 treatment for 200-ZP-1 OU groundwater is not required.

SUMMARY OF ALTERNATIVES

As part of the FS process, the remedial technologies retained from the 200-UP-1 OU FS technology screening step were assembled into an array of remedial alternatives. Innovative and implementable technologies for iodine-129 were also evaluated during the technology screening step, but none were found to be capable of achieving the 1 pCi/L cleanup level.

It was also found that there is no commercially available technology to treat the high concentrations of iodine-129 in the extracted groundwater from the 200-UP-1 OU and that requires further evaluation before a final remedy can be selected.

The following remedial action alternatives were assembled for evaluation in the FS; **the alternatives in bold** were retained for detailed and comparative evaluation. Alternative 1 was not retained for detailed and comparative evaluation based on its inability to achieve cleanup levels within a reasonable time period.

- **No Action Alternative**
- Alternative 1—MNA and ICs
- **Alternative 2—Restoration of technetium-99 (30 years) and uranium (150 years) and hydraulic containment of iodine-129 until a final remedy is selected**
- **Alternative 3—Restoration of technetium-99 (30 years) and uranium (80 years) and hydraulic containment of iodine-129 until a final remedy is selected**
- **Alternative 4—Restoration of technetium-99 (25 years) and uranium (28 years) and hydraulic containment of iodine-129 until a final remedy is selected**

The remedial alternatives are summarized in **Table 5**. Tritium and nitrate were not specifically included in a pump-and-treat remedial alternative, but rather are addressed through MNA. This is because there is no current treatment technology for tritium and because nitrate is addressed as a co-extracted contaminant with the other COCs. Nitrate will be treated when it is co-extracted with the technetium-99 or uranium extraction systems, but will not specifically be targeted for extraction.

Common Elements to Each Remedial Alternative

Alternatives 2 through 4 share several common elements, including ICs and MNA, groundwater extraction, treatment of the extracted groundwater, and injection of treated groundwater back into the aquifer.

Table 5. 200-UP-1 OU Remedial Alternatives Summary

Remedial Alternative Elements	COCs Addressed	Alternative 1—MNA and ICs	Alternative 2—Restoration of Tc-99 (30 yrs) and Uranium (150 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected Treatment in 200 West Area – As designed and constructed	Alternative 3—Restoration of Tc-99 (30 yrs) and Uranium (80 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected Treatment in 200 West Area – Expanded for 200-UP-1 OU	Alternative 4— Restoration of Tc-99 (25 yrs) and Uranium (28 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected Treatment in 200 West Area– Expanded for 200-UP-1 OU
Approximate Groundwater Extraction and Injection					
Extraction/ Injection for Restoration to Cleanup Levels	Tc-99 (S-SX Area)	2 extraction wells pumping at 115 L/min (30 gpm) each and 1 extraction well pumping at 76 L/min (20 gpm) for 25 years	2 extraction wells pumping at 115 L/min (30 gpm) each and 1 extraction well pumping at 76 L/min (20 gpm) for 25 years	Same as Alternative 2	5 extraction wells pumping at 115 L/min (30 gpm) each for 25 years
	Uranium		2 extraction wells and 2 injection wells operating at 380 L/min (100 gpm) each for 25 years	3 extraction wells and 3 injection wells operating at 380 L/min (100 gpm) each for 25 years	4 extraction wells and 4 injection wells operating at 380 L/min (100 gpm) each for 28 years
Hydraulic Containment	I-129		3 injection wells operating at 190 L/min (50 gpm) each, 570 L/min (150 gpm) total	Same as Alternative 2	Same as Alternative 2
Approximate Time to Reach Cleanup Levels					
Time to Cleanup Levels (MNA)[a]	Tc-99	30 years (25 years pumping, then 5 years MNA)	30 years (25 years pumping, then 5 years MNA)	30 years (25 years pumping, then 5 years MNA)	25 years (MNA not required)
	Uranium	Greater than 1,000 years	150 years (25 years pumping, then 125 years MNA)	80 years (25 years pumping, then 55 years MNA)	28 years (MNA not required)
	I-129	Greater than 1,000 years	To be determined pending final remedy selection	To be determined pending final remedy selection.	To be determined pending final remedy selection
	Nitrate[b]	175 years	150 years	150 years	150 years
	Tritium	50 years	50 years	50 years	50 years

Table 5. 200-UP-1 OU Remedial Alternatives Summary

Remedial Alternative Elements	COCs Addressed	Alternative 1—MNA and ICs	Alternative 2—Restoration of Tc-99 (30 yrs) and Uranium (150 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected	Alternative 3—Restoration of Tc-99 (30 yrs) and Uranium (80 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected	Alternative 4— Restoration of Tc-99 (25 yrs) and Uranium (28 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected
			Treatment in 200 West Area – As designed and constructed	**Treatment in 200 West Area – Expanded for 200-UP-1 OU**	**Treatment in 200 West Area– Expanded for 200-UP-1 OU**
Groundwater Treatment					
Total Extraction Rate (nominal)		300 L/min (80 gpm)	1,060 L/min (280 gpm)	1,440 L/min (380 gpm)	2,080 L/min (550 gpm)
Extraction - Injection Duration		25 years (Tc-99)	25 years (Tc-99, uranium, and 1-129)	25 years (Tc-99, uranium, and I-129)	25 years (Tc-99), 28 years (uranium), and 25 years (I-129)
Physical Treatment – Air Stripping	Volatile organics (if present)	200 West Area groundwater treatment facility (existing Train 1/Train 2)		200 West Area groundwater treatment facility with addition of Train 3 in reserve floor space	
Ion Exchange	Uranium, Tc-99				
Blending	Tritium				
Chemical Treatment	pH adjustment				
Biological Treatment	Nitrate, volatile organic compounds, and chromium (if present)				

Table 5. 200-UP-1 OU Remedial Alternatives Summary

Remedial Alternative Elements	COCs Addressed	Alternative 1—MNA and ICs	Alternative 2—Restoration of Tc-99 (30 yrs) and Uranium (150 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected	Alternative 3—Restoration of Tc-99 (30 yrs) and Uranium (80 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected	Alternative 4— Restoration of Tc-99 (25 yrs) and Uranium (28 yrs), and Hydraulic Containment of I-129 Until Final Remedy is Selected
			Treatment in 200 West Area – As designed and constructed	**Treatment in 200 West Area – Expanded for 200-UP-1 OU**	**Treatment in 200 West Area– Expanded for 200-UP-1 OU**

a. The time to reach cleanup levels includes the duration of monitored natural attenuation. The duration of ICs established by the 200-ZP-1 OU ROD is 150 years. 200-UP-1 OU will use the same duration for ICs.

b. Through a fate and transport model simulation, nitrate has been estimated to require 175 years to naturally attenuate. It is estimated that this time period can be reduced to 150 years through co-extraction of nitrate present within the uranium plume and through the remedial process optimization and five-year review process.

COC = contaminant of concern
I-129 = iodine-129
IC = institutional control
MNA = monitored natural attenuation
OU = operable unit
P&T = pump-and-treat
Tc-99 = technetium-99

Radiological Half-life

The half-life is the period of time it takes for a substance undergoing radiological decay to decrease by half.

The ICs protect against exposure to contaminated groundwater until cleanup levels are achieved. DOE is responsible for implementing, maintaining, reporting on, and enforcing ICs. The current implementation, maintenance, and periodic inspection requirements for the ICs at the Site are described in DOE/RL-2001-41, Rev. 4, which was prepared by DOE and approved by EPA and Ecology in 2009. Existing ICs in use at the Site could include entry restrictions (security), escorts and badging of site visitors, excavation permits, surveillance, and posted signs that restrict land and groundwater use.

MNA is an important component of all of the alternatives because MNA is the only viable approach for addressing tritium in groundwater. Except for natural radioactive decay, no available treatment technology exists for tritium. The estimated time to naturally attenuate tritium in the 200-UP-1 OU is 50 years. This is shorter than many other radioactive COCs, due to the relatively short 12 year **radiological half-life**.

Additionally, Alternatives 2 and 3 employ MNA in association with groundwater pump-and-treat to complete the cleanup during the latter stages of remediation, when pump-and-treat becomes less effective in removing contaminant mass from the aquifer. Natural attenuation processes include sorption of COCs to solids in the aquifer system, dispersion of COCs, and radioactive decay.

Like tritium, nitrate is addressed primarily through MNA and is not specifically included in any of the pump-and-treat remedial alternatives. However, because nitrate is comingled with the other COCs in the 200-UP-1 OU, the extraction and treatment component of the alternatives will extract nitrate from the aquifer. When extracted, nitrate will be treated to the cleanup level using the treatment system associated with the alternatives before being returned to the aquifer.

The time for reaching the cleanup level for any alternative for nitrate has been estimated using fate and transport modeling at approximately 175 years. It is estimated, however, that through co-extraction of nitrate present within the uranium plume and remedial process optimization, the time period can be reduced to 150 years. This time period is consistent with that used in the existing 200-ZP-1 OU ROD.

Alternatives 2 through 4 assume treatment of the extracted groundwater will occur at the 200 West Area Treatment Facility, which is currently being constructed for the 200-ZP-1 OU. The 200-UP-1 OU FS process considered building a stand-alone treatment facility to treat the extracted groundwater, but due to the associated costs and related inefficiencies of designing, constructing and operating two separate treatment facilities in the 200 West Area, this option was rejected early in the screening process in favor of using one common treatment facility.

Construction of the 200 West Area Treatment Facility will be completed and ready for use in September 2011. Upon construction, the facility will have a capacity to process 9,450 L (2,500 gal) per minute of groundwater flow. The design also allows for facility expansion in the future, if additional capacity for treating 200-UP-1 OU groundwater is needed. The overall capacity of the 200 West Area Treatment Facility design is 14,175 L (3,750 gal) per minute. The design has 1,323 L (350 gal) per minute allotted for treatment of 200-UP-1 OU groundwater from the U Plant Area and the WMA S-SX. Any additional groundwater treatment needs beyond the 1,323 L (350 gal) per minute flow rate would likely require expansion of the facility.

All 200-UP-1 OU extracted groundwater will be blended with 200-ZP-1 OU extracted groundwater at a combined influent location to the treatment plant for flow balancing purposes. Once the treated groundwater meets cleanup levels, the water will be injected back into the 200 West Area unconfined aquifer, through an array of injection wells which will be located both up-gradient and down-gradient of the main COC plumes.

Iodine-129 is presented in this Proposed Plan as an IRA since there is no current technology available that can effectively treat the concentrations of iodine-129 present in the 200-UP-1 OU groundwater to the 1 pCi/L drinking water standard.

The interim remedy would contain the iodine-129 plume in place (in-situ) using hydraulic containment, while DOE evaluates potential iodine-129 treatment technologies. Hydraulic containment would be performed by injecting treated groundwater near the plume’s leading edge.

In the technology evaluation phase, DOE would undertake a site-specific technology review to evaluate iodine-129 groundwater treatment technologies that might be capable of treating the groundwater to the 1pCi/L drinking water standard. Detailed information on the overall approach and schedule for the iodine-129 technology evaluation process will be presented in the 200-UP-1 OU Remedial Design/Remedial Action work plan. Once this evaluation process is complete, a final remedy will be selected.

The remedial alternatives below present a defined number of extraction and injection wells for the pump-and-treat systems described, as well as defined flow rates for each. The number of wells and the flow rates per well are estimated on the basis of hydraulic capture zone analysis and fate and transport modeling. The final number of wells and their flow rates will be optimized during the design process and are herein listed as estimated values for presentation and cost estimating.

No Action Alternative

Under 40 CFR 300.430(e)(6), a 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 COCs present.

While radioactive decay and other naturally occurring processes would reduce COC concentrations in groundwater over time, no monitoring would be conducted to track concentration changes or plume migration.

Alternative 1—Monitored Natural Attenuation and Institutional Controls

Based on the alternative screening process used, with respect to the CERCLA criteria of effectiveness, implementability, and cost, Alternative 1 (MNA and ICs) was eliminated as a viable alternative.

The length of time necessary for COCs to reach cleanup levels under Alternative 1 was simulated with the fate and transport model to be over 1,000 years, indicating that the alternative would be unable to achieve RAOs within a reasonable timeframe.

Alternative 2—Restoration of Technetium-99 (30 years) and Uranium (150 years) and Hydraulic Containment of Iodine-129 Until a Final Remedy is Selected

Alternative 2 restores the technetium-99 and uranium plumes to cleanup levels primarily through pump-and-treat. This alternative also includes MNA and ICs.

The technetium-99 pump-and-treat system would include three groundwater extraction wells placed within the two S-SX plumes. Two of the wells would be pumped at rates of 114 L (30 gal) per minute each and the third at a rate of 76 L (20 gal) per minute. The total nominal pumping rate would be 303 L (80 gal) per minute. The total pumping duration would be 25 years, which would be followed by 5 years of MNA for a technetium-99 total restoration timeframe of 30 years.

The uranium pump-and-treat system would include two groundwater extraction and two injection wells operating at rates of 380 L (100 gal) per minute each for 25 years. Following termination of the pump-and-treat, MNA would be required for an additional 125 years before the uranium cleanup level is achieved. Therefore, a total of 150 years would be required to restore uranium to the cleanup level.

Since there is no treatment technology available for tritium, this alternative would rely on natural attenuation to reach cleanup levels. The natural attenuation period has been simulated using fate and transport modeling to require 50 years. MNA is also being used for that portion of the nitrate plume that is not captured and treated by the uranium groundwater extraction and treatment system. The MNA period for nitrate is estimated at 150 years.

The total nominal system pumping rate for these five extraction wells would be 1,135 L (280 gal) per minute. The groundwater from these wells would be pumped to a transfer building and then onto the 200 West Area Treatment Facility.

The 200 West Area Treatment Facility being constructed at this time would be capable of treating the 200-UP-1 OU COCs to their appropriate cleanup levels. The treated groundwater would then be injected back into the 200 West Area unconfined aquifer.

As stated in the Common Elements Section regarding iodine-129, currently there is no commercially available technology that can treat the high concentration groundwater from the 200-UP-1 OU to the cleanup level. In this alternative, the plume would be hydraulically contained in place (in-situ) using three injection wells operating at 190 L (50 gal) per minute each, while DOE evaluates technologies for treatment of the high concentration 200-UP-1 OU groundwater to 1 pCi/L. The three injection wells would be placed along the leading edge of the iodine-129 plume. Treated water from the 200 West Area Treatment Facility would be pumped to the 200-UP-1 OU so that the water would be injected near the leading edge of the iodine-129 plume to create hydraulic control of the plume through groundwater mounding. This mounding would impede groundwater flow and prevent expansion of the plume until a final remedy is selected.

Periodic groundwater monitoring would be performed at 50 existing and 15 new monitoring well locations for up to 150 years to confirm that COC concentrations are stable and the remedy is progressing as expected. The monitoring and remedy effectiveness would be documented in periodic progress reports.

Many of the technical and procedural elements contained within this alternative—including pump-and-treat, ICs, and groundwater monitoring—have already been implemented within the 200-ZP-1 OU ROD. Therefore, this alternative could be implemented in a very short timeframe.

Maintenance of ICs would be required for 150 years to control land and groundwater use until the RAOs are achieved, as is presented in the 200-ZP-1 OU ROD. This alternative is consistent with the current IC program within the 200-ZP-1 OU ROD.

The total NPV cost to implement Alternative 2 is estimated at $137 million, including a capital cost of $23 million. The total non-discounted cost is estimated at $367 million.

This cost includes the iodine-129 treatment technology evaluation, but not the cost of designing, constructing, or operating a final remedy for iodine-129.

Alternative 3—Restoration of Technetium-99 (30 years) and Uranium (80 years) and Hydraulic Containment of Iodine-129 Until a Final Remedy is Selected

Under Alternative 3, three groundwater extraction wells would be used to capture the technetium-99 plumes in WMA S-SX, with treatment performed at the 200 West Area Treatment Facility. Two of the extraction wells would be pumped at rates of 114 L (30 gal) per minute each and the third at a rate of 76 L (20 gal) per minute. The total pumping duration would be 25 years, which would be followed by 5 years of MNA for a technetium-99 total restoration timeframe of 30 years.

The uranium pump-and-treat system would include three groundwater extraction and injection wells operating at rates of 380 L (100 gal) per minute each for 25 years. The total nominal system pumping rate would be 1,135 L (380 gal) per minute. Following shutdown of the pump-and-treat system, MNA would be required for 55 years before the uranium cleanup level is achieved. Therefore, a total restoration timeframe of 80 years would be required to achieve the cleanup level.

Since there is no treatment technology available for tritium, this alternative would rely on 50 years of natural attenuation to reach the cleanup level.

Groundwater from all six extraction wells would be pumped to a transfer building and then onto the 200 West Area Treatment Facility. The treatment system being constructed at this time will not have the capacity to treat all groundwater flow from the 200-UP-1 OU without modifying the facility to increase the hydraulic capacity. Therefore, additional treatment capacity may be required for this alternative, and the cost of such has been included in the cost estimate. The treated groundwater would be injected back into the 200 West Area aquifer.

DOE would also undertake the site-specific technology evaluation, as described in the Common Elements Section, to evaluate iodine-129 treatment technologies. While the evaluation process is occurring, the iodine-129 plume would be hydraulically contained through injection of treated water from the 200 West Area Treatment Facility.

As in Alternative 2, this approach to hydraulic containment using injection wells has been simulated as part of the alternative development process. The simulations indicate that hydraulic containment can be successful for 25 years, using three injection wells operating at about 190 L (50 gal) per minute each.

Because many of the components of this remedy (pump-and-treat, ICs, and groundwater monitoring) have already been implemented in conjunction with the 200-ZP-1 OU ROD, this alternative could likely be implemented within a reasonable timeframe.

This alternative presents the mid-timeframe (neither the shortest nor the longest) to achieve cleanup levels for technetium-99 and uranium. The overall timeframe for restoration of the aquifer to beneficial use is estimated at 150 years, which is based on the time required to achieve the nitrate cleanup level.

The total NPV cost to implement Alternative 3 is estimated at $225 million, including $81 million in capital costs.

The total non-discounted cost, including operations and maintenance (O&M) and period costs, is estimated at $485 million. This cost includes the activities discussed regarding the iodine-129 treatment technology evaluation, but not the cost of designing, constructing, or operating a final remedy for iodine-129.

Alternative 4—Restoration of Technetium-99 (25 years) and Uranium (28 years) and Hydraulic Containment of iodine-129 Until a Final Remedy is Selected

Under this alternative, five wells would be placed within the two technetium-99 plumes at WMA S-SX and pumped at rates of 115 L (30 gal) per minute each or 575 L (150 gal) per minute total for 25 years.

Four extraction and four injection wells would be placed within the uranium plume, and each well pumped at a rate of 380 L (100 gal) per minute for 28 years. The total nominal pumping rate for all nine wells under this alternative would be 2,080 L (550 gal) per minute. These wells and the associated pumping rate would restore the two COCs to cleanup levels with no MNA required.

Under Alternative 4, all groundwater would be pumped from the extraction wells to a transfer building and then to the 200 West Area Treatment Facility for treatment.

As is the case with Alternative 3, the treatment system being constructed at this time does not have the hydraulic capacity to treat all of the 200-UP-1 OU groundwater flow and will likely require modification. The cost for this alternative has included an allowance for such a modification. The treated groundwater would be injected back into the 200 West Area aquifer.

Balancing Criteria

Long-term Effectiveness and Permanence—considers the ability of an alternative to maintain protection of human health and the environment over time.

Reduction of Toxicity, Mobility, or Volume through Treatment—evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

Short-term Effectiveness—considers the length of time needed to implement an alternative and the risks the alternative poses to workers, residents, and the environment during implementation.

Implementability—considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

Cost—includes capital and annual operations and maintenance costs, as well as NPV cost. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

Modifying Criteria

State Acceptance—considers whether the State agrees with the analyses and preferred alternative recommendation presented in the Proposed Plan.

Community Acceptance—considers whether the local community agrees with the analyses and preferred alternative recommendation presented in the Proposed Plan.

CERCLA Evaluation Criteria

CERCLA Threshold Criteria

Overall Protectiveness of Human Health and the Environment—determines whether an alternative eliminates, reduces, or controls threats to public health and the environment.

Compliance with ARARs—evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

DOE would also undertake the site-specific technology evaluation to evaluate treatment technologies for iodine-129. While the technology evaluation process is occurring, the iodine-129 plume would be hydraulically contained through injection of treated water from the 200 West Area Treatment Facility.

Because many of the components of this remedy (pump-and-treat, ICs, and groundwater monitoring) have already been implemented in conjunction with the 200-ZP-1 OU ROD, this alternative could likely be implemented within a reasonable timeframe, with no change to the 200-ZP-1 OU ICs for IC timeframes.

This alternative presents the shortest timeframe to achieve cleanup levels for technetium-99 and uranium by using an aggressive pump-and-treat approach at a cost that is two times greater than the other alternatives with no substantial reduction in the overall aquifer restoration timeframe (150 years) due to the nitrate MNA cleanup time.

The total NPV cost to implement Alternative 4 is estimated at $317 million, including $94 million in capital costs. The total non-discounted cost, including O&M and period costs, is estimated at $641 million. This cost includes the activities discussed regarding the iodine-129 treatment technology evaluation, but not the cost of designing, constructing, or operating a final remedy for iodine-129.

EVALUATION OF ALTERNATIVES

CERCLA requires evaluation of remedial alternatives against nine criteria to identify a preferred alternative. During the evaluation process, each alternative is assessed individually against the CERCLA criteria, and then a comparative analysis is performed to assess the overall performance of each alternative relative to the others.

The first two evaluation criteria are threshold criteria. An alternative must meet the threshold criteria or it cannot be selected. The next five criteria are **balancing criteria**, which are used to weigh major advantages and disadvantages between the alternatives. Each alternative is assessed in terms of how well it satisfies these criteria.

The final two criteria are **modifying criteria** that factor in State acceptance and community acceptance.

Although not called out as a specific **CERCLA evaluation criteria**, there is increasing emphasis on considering the complete life cycle impacts of a remedial alternate during the development and detailed evaluation phase.

These considerations may include one or more of the following evaluation factors:

- Minimize total energy use and maximize use of renewable energy sources.
- Minimize air pollutants and green house gas emissions.
- Minimize water use and adverse impacts to water resources.
- Reduce, reuse, and recycle material and waste.
- Protect land and ecosystems.

The following section summarizes the comparative evaluation of alternatives presented in the 200-UP-1 OU RI/FS Report.

Table 6 presents the results of this evaluation.

Overall Protection of Human Health and the Environment

All of the alternatives, except the No Action Alternative, protect current and future human health by preventing exposure to contaminated groundwater through the use of ICs until RAOs are achieved.

Alternative 4 is expected to provide a higher level of protection for the environment, because a majority of the technetium-99 and uranium are removed from the aquifer using aggressive pump-and-treat without reliance on MNA.

Alternatives 2 and 3 also provide a high level of protection for the environment. However, under these two alternatives, MNA plays a greater role in achieving technetium-99 and uranium cleanup levels.

Under all three alternatives, nitrate and tritium are addressed through MNA, although pumping of the uranium plume results in some co-extraction of nitrate contaminated groundwater. The iodine-129 plume is hydraulically contained until a final remedy is selected. Each alternative includes an evaluation of potential technologies for treatment of iodine-129, because one does not exist today that, on its own, can treat groundwater to the drinking water standard.

The 200-ZP-1 OU ROD and related treatment system design indicate that partial removal of iodine-129 may be realized through the use of ion exchange media. However, since the facility is neither constructed nor operating at this time, there is no certainty that the facility can treat the higher iodine-129 concentrations in the 200-UP-1 OU groundwater to the drinking water standard.

Table 6. Comparative Evaluation of Alternatives for 200-UP-1 OU

CERCLA Criteria	Remedial Alternatives				
	No Action	**1[a]**	**2**	**3**	**4**
Threshold Criteria					
Protection of human health/environment	No	Not retained	Yes	Yes	Yes
Compliance with ARARs	No		Yes[b]	Yes[b]	Yes[b]
Balancing Criteria					
Long-term effectiveness and permanence	●		◐	◐	○
Reduction of toxicity, mobility, or volume through treatment	●		◐	◐	○
Short-term effectiveness and time to achieve RAOs	●		◐	◐	◐
Implementability	●		○	◐	◐
NPV Cost (million)[c]	$0		$137	$225	$316
Modifying Criteria					
State acceptance	To be determined				
Community acceptance	To be determined				
Other Evaluation Factors					
Sustainable Elements	○		○	◐	◐

Notes:

Although the remedial alternatives developed for evaluation do not have specific provisions for sustainable elements, those values can be incorporated during the remedial design phase.

○ = Performs very well against the criterion with no apparent disadvantages or uncertainty.

◐ = Performs moderately well against the criterion but with some disadvantages or uncertainty.

● = Performs less well against the criterion and may have disadvantages or uncertainty.

Alternatives

1. Not retained.

2. Restoration of technetium-99 (30 years) and uranium (150 years) and hydraulic containment of iodine-129 until a final remedy is selected.

3. Restoration of technetium-99 (30 years) and uranium (80 years) and hydraulic containment of iodine-129 until a final remedy is selected.

4. Restoration of technetium-99 (25 years) and uranium (28 years) and hydraulic containment of iodine-129 until a final remedy is selected.

a. None of the alternatives include costs associated with design, installation, or operation of the final iodine-129 remedial action and therefore this evaluation does not consider this element. The technology evaluation costs are included.

b. Alternatives may require an ARAR waiver for tritium in the future following selection of a final remedy for iodine-129.

c. Table 7 presents cost details.

Compliance with ARARs

All of the alternatives, except the No Action Alternative, comply with chemical-specific ARARs in the defined aquifer attainment areas within about 150 years.

Because a large portion of the tritium plume lies within the iodine-129 plume, Alternatives 2, 3, and 4 may require an ARARs waiver to allow for the injection of tritium contaminated groundwater if the final remedy for iodine-129 employs pump-and-treat technology.

Each of the alternatives would comply with action- and location-specific ARARs if remedial action activities are conducted in accordance with existing **Hanford Site work processes**.

Long-term Effectiveness and Permanence

Although Alternatives 2, 3, and 4 all achieve RAOs in a similar timeframe, with nitrate being the limiting COC, Alternative 4 provides a higher degree of long-term effectiveness and permanence because the majority of the technetium-99 and uranium treatment occurs in an above ground treatment system with very little reliance on MNA.

Alternatives 2 and 3 provide less long-term effectiveness and permanence because MNA plays a greater role in achieving cleanup levels for technetium-99 and uranium. All three alternatives provide comparable levels of long-term effectiveness and permanence for iodine-129, nitrate, and tritium because the remedial alternative components addressing these COCs are the same.

The No Action Alternative provides the lowest degree of long-term effectiveness and permanence because uranium and iodine-129 will persist at concentrations above cleanup levels for extended periods of time.

Reduction of Toxicity, Mobility, or Volume (TMV) Through Treatment

Alternative 4 provides the highest degree of technetium-99 and uranium TMV reduction because a majority of the COC high concentration plumes are removed from the aquifer using above ground treatment, and the treatment residuals are immobilized and disposed at a secure long-term management facility (ERDF).

Alternatives 2 and 3 have less technetium-99 and uranium TMV reduction because MNA plays a greater role in achieving cleanup levels. MNA reduces toxicity and volume, but is less effective for mobility reduction. All three alternatives have comparable levels of TMV reduction for iodine-129, nitrate, and tritium because the approach for addressing these three COCs is the same.

Hanford Site work processes
The Site process that controls all work through an *Integrated Environment, Safety and Health Management System* (ISMS) program. It establishes a single, defined environment, safety, and health management system that integrates requirements into the work planning and execution processes to effectively protect workers, the public, and the environment.

The No Action Alternative provides the lowest degree of toxicity and volume reduction because natural attenuation is the only form of treatment that occurs. There is no mobility reduction under the No Action Alternative.

Short-term Effectiveness

Alternatives 2, 3, and 4 provide similar levels of short-term effectiveness because the work required under these alternatives can be performed safely with minimal risk to workers and the environment by conducting the work per existing Site work processes. However, as the scope of a remedial alternative grows, the potential for worker risk increases. Therefore, Alternative 2 would pose the least short-term risk to site workers, followed by Alternative 3 and Alternative 4, respectively. Given the remote location of the 200-UP-1 OU, there is no risk to the community associated with implementation of this group of alternatives. At 150 years, the timeframe required to achieve RAOs is comparable amongst the three alternatives.

The No Action Alternative poses no apparent risk to workers and the community during implementation. However, because the timeframe required to achieve RAOs is much greater, this alternative is ranked lowest.

Implementability

Alternatives 2, 3, and 4 are readily implemented using existing Site work procedures. However, as the scope of an alternative increases, the degree of difficulty associated with its implementation grows.

Alternatives 3 and 4 will require expansion of the 200 West Area Treatment Facility to accommodate the increased flow rates for these alternatives. This would make these alternatives more complicated and therefore more difficult to implement. Therefore, under this criterion, Alternative 2 would be the most implementable, followed by Alternative 3 and Alternative 4, respectively.

The No Action Alternative may not be implementable, based on Tri-Party regulatory agency and public acceptance.

Cost

Table 7 presents a summary of the costs for comparison of the remedial alternatives. For the purpose of cost estimating, it is assumed that all three alternatives will continue to operate for 150 years.

Table 7. Remedial Alternative Cost Summary Comparison for 200-UP-1 OU

Description	Alternative Number[a]		
	2	3	4
Nominal Pumping Rate (gpm)	280	380	550
Total Project Duration (years)	150	150	150
Capital Cost (million)	$23.4	$81.5	$93.6
Total Non-Discounted O&M Cost (million)	$244	$276	$368
Total Non-Discounted Periodic Cost (million)	$99.7	$128	$180
Total Non-Discounted Cost (million)	$367	$485	$641
Total NPV (million)	**$137** [b]	**$225** [b]	**$316** [b]

Notes:

NPV calculation uses a discount rate of 2.7 percent, in accordance with OMB Circular A-94.

General Alternatives Description:

a. The No Action Alternative and Alternative 1 – Institutional Controls and Monitored Natural Attenuation, were not retained.

Alternative 2 - Restoration of technetium-99 (30 years) and uranium (150 years), and hydraulic containment of iodine-129 until a final remedy is selected.

Alternative 3 - Restoration of technetium-99 (30 years) and uranium (80 years), and hydraulic containment of iodine-129 until a final remedy is selected.

Alternative 4 - Restoration of technetium-99 (25 years) and uranium (28 years), and hydraulic containment of iodine-129 until a final remedy is selected.

b. None of the alternatives include costs associated with design, construction, or operation of the final selected remedy for iodine-129. The technology evaluation costs are included.

At $0, the No Action Alternative has the lowest NPV cost, followed by Alternative 2 at a NPV cost of $137,267,000, Alternative 3 at a NPV cost of $225,078,000, and Alternative 4 with a NPV cost of $316,363,000. The costs include the activities associated with evaluating treatment technologies for iodine-129, but do not include the cost of designing, constructing, or operating an iodine-129 final remedy.

State Acceptance

State acceptance will be determined during the regulatory review process for Draft A.

Community Acceptance

Community acceptance is determined during the public involvement process and resultant Responsiveness Summary, which will be provided in the amendment to the 200-ZP-1 OU ROD. Additional information on this is provided in the Community Involvement Section.

Sustainable Elements

Except for the No Action Alternative, all of the alternatives require hydroelectric-generated power to operate groundwater extraction and treatment system equipment, as well as fossil fuels to provide transportation for construction, O&M, and decontamination and decommissioning activities. Although the remedial alternatives developed for evaluation do not have specific provisions for sustainable remediation, the values (shown in Table 6) can be incorporated during the remedial design phase.

PREFERRED ALTERNATIVE

On the basis of the comparative evaluation, **Alternative 2—Restoration of Technetium-99 (30 years), Uranium (150 years), and Hydraulic Containment of Iodine-129 Until a Final Remedy is Selected**, is recommended as the Preferred Alternative. This alternative meets the CERCLA threshold criteria and provides the best balance with respect to the CERCLA balancing criteria.

Alternative 2 is protective because it uses proven treatment technologies (pump-and-treat) for technetium-99 and uranium with injection of treated groundwater to hydraulically contain the iodine-129 plume to prevent down-gradient migration until a final remedy is selected.

Alternative 2 aligns well with the overall Central Plateau groundwater remedial strategy (which includes restoring groundwater to beneficial use). It also uses a common treatment system (200 West Area groundwater treatment) that does not require expansion, thereby creating cost savings and added value by consolidating all equipment and resources into a 25-year common operating period, which is the design life of the 200 West Area Treatment Facility. It also aligns well with the 200-ZP-1 OU remedy, which also uses pump-and-treat for 25 years, and MNA and ICs for 125 additional years until cleanup levels are achieved.

Alternative 2 is the lowest cost alternative that is protective of human health and the environment, and is compliant with ARARs, while achieving full restoration of the aquifer in the same time period as the more costly alternatives.

The total NPV cost of the preferred alternative is estimated at $137 million or 57 percent less ($180 million) than the more aggressive Alternative 4, and 39 percent less ($88 million) than Alternative 3. This cost does not include implementation of a final selected remedy for iodine-129. The estimate does, however, include the costs associated with completing an iodine-129 treatment technology evaluation. Based on the outcome of the iodine-129 treatment technology evaluation, DOE will select a final remedy for iodine-129 and the ROD will be amended.

The proposed preferred remedial alternative is technically robust and expandable for changing conditions, can be optimized for efficiency, is reliable over the long term and uses a proven array of remedial technologies.

While the preferred alternative may be modified or even changed in response to public comment, it satisfies CERCLA 121(b) statutory requirements that the preferred alternative (1) be cost-effective, (2) comply with ARARs (or justify a waiver), (3) use permanent solutions and alternative treatment technologies to the maximum extent practicable, and (4) satisfy the preference for treatment as a principal element.

In summary, Alternative 2 provides the best balance against the CERCLA evaluation criteria.

UNCERTAINTIES AND TECHNICAL PRACTICABILITY CONSIDERATIONS WITH THE PREFERRED ALTERNATIVE

Because of the scale and complexity of the Preferred Alternative, and the conditions it is designed to address, there is some uncertainty associated with the Preferred Alternative's expected performance. The following discussion identifies these uncertainties and the *potential* need for ARARs waivers in the future, if the drinking water standards cannot be achieved for one or more COCs.

Extensive groundwater contamination has resulted from past waste discharges to the soil of approximately 450 billion gallons of liquid waste and cooling waters in the Central Plateau. Due to the plume sizes and the nature and extent of COCs present in the 200-UP-1 OU aquifer, restoration to an unrestricted beneficial use will be one of the more extensive and technically challenging groundwater cleanups undertaken by DOE on the Site.

The overall Central Plateau cleanup approach is defined in DOE/RL-2009-81. As stated in DOE/RL-2009-10:

> *...For areas of groundwater contamination in the Central Plateau, the goal is to restore the aquifer to achieve drinking water standards. In those instances where remediation goals are not achievable in a reasonable time frame, programs will be implemented to contain the plumes, prevent exposure to contaminated groundwater, and evaluate further risk reduction opportunities as new technologies become available. Near-term actions will be taken to control plume migration until remediation goals are achieved.*

Technical Impracticability

A determination that a specified groundwater cleanup level may not be attainable due to limitations of available technologies, based on an evaluation of site-specific hydrogeologic factors, contaminant-related factors, and remediation system design and operation information.

One area requiring technology development is the treatment of iodine-129. The iodine-129 plume in the 200-UP-1 OU is 1,140 acres in size and 28 billion L (7.4 billion gal) in volume, with an average concentration of 3.5 pCi/L. The maximum detected concentration of 39 pCi/L is nearly 40 times the federal drinking water standard of 1 pCi/L. There is currently no proven treatment technology for removal of iodine-129 to the 1 pCi/L drinking water standard. As a part of the Preferred Alternative, DOE will perform a technology evaluation to support selection of a final remedy for iodine-129.

An additional uncertainty pertains to future contributions to groundwater contamination from the source area waste sites. The Central Plateau cleanup strategy includes groundwater remedial actions that are being implemented in advance of final remedial actions for source OUs to accelerate the cleanup of existing groundwater contamination and contaminant plumes within the footprint of the Central Plateau. However, the RI/FS processes for source OUs are underway with milestones, as defined in the Tri-Party Agreement.

The 200-UP-1 OU RI/FS and associated risk assessment, fate and transport modeling, and alternatives analysis only address existing groundwater contamination in the dissolved phase; they do not address potential future impacts from waste site and vadose zone contamination.

Potential impacts from waste site or vadose zone contamination are being assessed as part of the RI/FS process for the associated source operable units. This includes the development and application of deep vadose zone remedial technologies. As the source OU RI/FS process is completed, the need for appropriate remedial actions to mitigate future groundwater source impacts will be defined.

The monitoring program associated with each of the defined remedial alternatives has a robust groundwater monitoring program. This program will be used to assess impacts from the deep vadose and the need for further action.

Given the difficulties of restoring groundwater to beneficial use status, the goal of the DOE's Preferred Alternative is to return the unconfined aquifer groundwater to a beneficial use status, wherever practicable, within a reasonable timeframe.

The following section highlights **technical impracticability** considerations accompanying the Preferred Alternative and the specific steps that will be implemented in the future, as necessary, if the drinking water beneficial use expectation cannot be met or the restoration timeframe becomes sufficiently unreasonable to justify a technical impracticality waiver.

Potential Technical Impracticability Waiver

The NCP requires that the Proposed Plan include a summary explanation of any proposed waivers. The use of the technical impracticability waiver, and the circumstances for which it is appropriate, is provided in the NCP (40 CFR 300.430[f][1][ii][c]).

As described in the NCP, a technical impracticability waiver can occur when compliance with an ARAR requirement is technically impractical from an engineering perspective.

Under the preferred alternative, an ARARs waiver may be necessary to allow injection of tritium contaminated groundwater (exiting the 200 West Area Treatment Facility) if it is co-extracted with other 200-UP-1 OU pump-and-treat systems.

As described previously, at this time, there are no treatment technologies available for tritium that can achieve the current drinking water standard, but there are also no groundwater extraction wells to be located within the tritium plume.

A second technical impracticability waiver for not restoring the groundwater to drinking water standards may be justified in the future if iodine-129 treatment is determined to be impracticable from an engineering or cost-effectiveness perspective.

If a ARARs waiver is warranted, as justified by a technical impracticability evaluation, a ROD amendment would be required, as an ARAR waiver is generally construed as a fundamental change to the selected remedy.

NATIONAL ENVIRONMENTAL POLICY ACT

CERCLA documents incorporate *National Environmental Policy Act of 1969* values. This is consistent with DOE O 451.1B Chg 1, which requires CERCLA actions to address and incorporate NEPA values such as socioeconomic, ecological, offsite, and cumulative impacts in CERCLA documents to the extent practicable.

Alternatives to address the release or threatened release of hazardous substances have been identified and analyzed.

The No Action Alternative would not mitigate the environmental impacts from the hazardous substances. All other alternatives could mitigate the impacts associated with the release or threatened release, as well as provide for the remediation of the hazardous substances. Specifically, the application of the substantive environmental protection standards identified as ARARs would reduce impacts of the hazardous substances on air, surface waters, soil, groundwater, plants, and animals to levels that have been identified by regulation.

Resource Conservation and Recovery Act (RCRA)

A federal waste management law. Its guidelines regulate transportation, treatment, storage, and disposal of waste. RCRA waste includes material that is listed on one of EPA's hazardous waste lists or meets one or more of EPA's four characteristics of ignitability, corrosivity, reactivity, or toxicity.

The application of a "sliding scale" of NEPA analysis to the 200-UP-1 OU using DOE's NEPA guidance (DOE, 2004), and consideration of the ARARs, shows that the principle resource areas of concern include contaminated groundwater, liquid and solid radioactive and hazardous waste treatment residuals, air emissions, potential adverse effects to historic and cultural resources, ecological resources, socioeconomics (including environmental justice concerns), and transportation associated with implementation of the remedial action. For purposes of implementing the remedial action alternatives, when groundwater in the 200-UP-1 OU is found to be contaminated with hazardous substances in concentrations presenting unacceptable risk to human health and the environment, that threat will be mitigated by meeting the applicable ARAR standards or the alternative standard approved as part of an ARAR waiver, as well as by following current DOE policy and guidance.

The net anticipated effect should be an overall positive contribution to cumulative environmental effects at the Site through reductions of COC concentrations and transfer of all aboveground treatment residuals into a facility that has been designed and legally authorized to safely contain such contaminants.

DOE expects that the onsite landfill will be the primary facility to receive treatment residuals. NEPA values specifically associated with the onsite landfill were addressed in DOE/RL-94-41.

This proposed Preferred Alternative is within the scope of DOE/EIS-0391. DOE expects that this final action will support the eventual final Tank Closure and Waste Management Environmental Impact Statement preferred alternative.

RESOURCE CONSERVATION AND RECOVERY ACT (RCRA) CORRECTIVE ACTION

The final remedy will contain requirements from current promulgated environmental regulations addressing all contaminants. This expectation is grounded in the identification of, and compliance with, ARARs as required under CERCLA, where the requirements of the **Resource Conservation and Recovery Act (RCRA)** dealing with hazardous waste substances) can be ARARs.

Under RCRA, the State of Washington has received authorization to carry out a portion of the *Hazardous and Solid Waste Amendments of 1984* to RCRA. This authority includes corrective action, under the framework of the state Hazardous Waste Management Act (*Revised Code of Washington* [RCW] 70.105). In WAC 173-303-64620, Washington identifies its requirements for a corrective action program, requiring that corrective actions must be consistent with the requirements as identified in portions of Chapter 173-340 of the WAC, which are the regulations implementing MTCA.

Ecology currently uses the MTCA regulations as amended in 2007. The Hanford Facility Dangerous Waste Permit (the Hanford Site-Wide Permit) incorporates these corrective action requirements as applicable to corrective actions at the Hanford RCRA facility (Permit Condition II.Y.1, *WA789000967*), but allows for work undertaken under other authorities, including the Tri-Party Agreement, to satisfy the requirements, so long as the work "protects human health and the environment." (Permit Condition II.Y.2, *WA789000967*).

Permit Condition II.Y.2.a.ii provides that "(f) or any unit identified in Appendix C of the HFFACO (Tri-Party Agreement) as a CPP (CERCLA past practice) unit, in the case of an interim (ROD), a final decision about satisfaction of corrective action requirements will be made in the context of issuance of a final ROD." Ecology will evaluate the protection of human health and the environment in the amended ROD by considering how the selected remedy will address state corrective action requirements.

Finally, the Tri-Parties have committed to coordinating their separate requirements for environmental cleanup under CERCLA, RCRA, and the Atomic Energy Act through the Tri-Party Agreement. Although this commitment is expressed in multiple places throughout the Tri-Party Agreement, it is captured concisely in Tri-Party Agreement Action Plan Section 5.4: "The corrective action process selected for each operable unit shall be sufficiently comprehensive to satisfy the technical requirements of both statutory authorities (CERCLA and RCRA/Hazardous Waste Management Act [HWMA] corrective action) and the respective regulations."

The Tri-Party Agreement also states the intent of the Parties that CERCLA remediation at the Site will also fulfill the corrective action requirements for the Site. Key language specific to past-practice unit cleanup includes the following:

- Article IV, Paragraph 17, which cites the Tri-Parties' intent "to integrate DOE's CERCLA response obligations and RCRA corrective action obligations which relate to the release(s) of hazardous substances, hazardous wastes, pollutants and contaminants" covered by Ecology et al., 1989a.
- Article XIV, which applies to the performance of both CERCLA remedial action and RCRA corrective action.
- Article XXIII, which acknowledges the potential for overlap between CERCLA and RCRA cleanup.
- Article XXIV, which specifies the approach for regulatory oversight, and Section 5.4 of Ecology et al., 1989b, which addresses the rationale and approach for past-practice cleanup.

- The two key objectives of these Articles are to "ensure that only one past-practice program will be applied at each operable unit" and that the "process selected be sufficiently comprehensive to satisfy the technical requirements of both statutory authorities and the respective regulations."

In accordance with the Tri-Party Agreement, Parts Three and Four, and the Action Plan, Sections 5.4, 5.6, and 7.0, past-practice cleanup (remediation) is intended to satisfy both CERCLA remedial action and RCRA corrective action requirements. In addition to fulfilling CERCLA requirements, the 200-UP-1 OU preferred alternative is intended to fulfill DOE's corrective action obligations under RCW 70.105 for the units identified herein.

The Tri-Parties will work together to ensure that the remedy selected in the ROD is sufficiently comprehensive to satisfy the technical requirements of both statutory authorities and the respective regulations.[1]

DOE's corrective action obligation for work performed under CERCLA remedial action for this OU is addressed in the RCRA Hanford Facility Permit (Condition II.Y.2.a, *WA7890008967*).

Specifically, Condition II.Y.2.a provides that DOE corrective action obligations are met through adherence to the Tri-Party Agreement and the resulting ROD, subject to the reservations and requirements of Condition II.Y.a.i through Condition II.Y.2.a.iv.

COMMUNITY INVOLVEMENT

Public input is a key element in the decision-making process. The public and Tribal Nations are encouraged to read and provide comments on any of the alternatives presented in this Proposed Plan and the 200-UP-1 OU RI/FS. The public comment period for this Proposed Plan extends from MMMM DD, 2010 through MMMM DD, 2010. Comments on the Preferred Alternative, other alternatives, or any element of this Proposed Plan will be accepted through MMMM DD, 2010. Comments may be sent to:

Briant Charboneau
U.S. Department of Energy, Richland Operation
Mail: P.O. Box 550 Mail Stop A6-38
Richland, WA 99352
Phone: (509) 373-6137
Fax: (509) 372-1926
Email: briant.charboneau@rl.doe.gov

[1] The 200-UP-1 Groundwater OU final remedial action will be selected in an amendment to the 200-ZP-1 Groundwater OU ROD.

Emy Laija

U.S. Environmental Protection Agency
Mail: 309 Bradley Blvd., Suite 115
Richland, WA 99352
Phone: (509)376-4919
Fax: (509) 376-2396
Email: laija.emerald@epa.gov

John Price

Washington State Department of Ecology
Mail: 3100 Pob Boulevard
Richland, WA. 99352
Phone: (509) 372-7921
Fax: (509)372-7971
Email: jpri461@ecy.wa.gov

At this time, no public meeting has been scheduled. To request a meeting in your area, please contact Briant Charboneau no later than MMMM DD, 2010.

Following the public comment period, comments on the Proposed Plan will be considered and a decision will be made. The preferred alternative may be modified or another alternative selected based on the comments and information gathered during the comment period. DOE and EPA will then prepare a CERCLA ROD.

This ROD will identify the selected remedy and include agency responses to the comments received during the public comment period as a responsiveness summary.

A 30-day public comment period will be held from xx to xx.

TBD 2010 Public Comment Period

SUN	MON	TUE	WED	THU	FRI	SAT
	1	2	3	4	5	6
7	8	9	10	11	12	13
14	15	16	17	18	19	20
21	22	23	24	25	26	27
28	28	30	31			

Location of Public Information Repositories

Hanford Public Information Repository Locations

Administrative Record and Public Information Repository:

Address: 2440 Stevens Center Place, Room 1101, Richland, WA

Phone: (509) 376-2530

Web site address: http://www2.hanford.gov/arpir/

Portland

Portland State University
Bradford Price and Millar Library
1975 SW Park Avenue
Portland, OR 97201

Attn: Claudia Weston (503) 725-4542

Map: http://www.pdx.edu/map.html

Seattle

University of Washington
Suzallo Library
Government Publications Division
Seattle, WA 98195

Attn: David Maack (206) 543-0242

Map: http://tinyurl.com/m8ebj

Richland

U.S. Department of Energy Public Reading Room
Washington State University, Tri-Cities
Consolidated Information Center,
Room 101-L
2770 University Drive
Richland, WA 99354

Attn: Janice Parthree (509) 372-7443

Map: http://tinyurl.com/2axam2

Spokane

Gonzaga University Foley Center
East 502 Boone
Spokane, WA 99258

Attn: Linda Pierce (800) 986-9585

Map: http://tinyurl.com/2c6bpm

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