PROPOSED PLAN FOR THE 300-FF-5 OPERABLE UNIT

Hanford Site, Richland, Washington

DOE, EPA, AND ECOLOGY ANNOUNCE PROPOSED PLAN

INTRODUCTION

This Proposed Plan identifies the preferred alternative for the remediation of the groundwater at Hanford's 300-FF-5 **Operable Unit** and summarizes the detailed information presented in the ***Remedial Investigation/Feasibility Study (RI/FS) Report for the 300-FF-5 Operable Unit, Hanford Site, Richland, Washington*** (DOE/RL-94-85). This Proposed Plan has been developed in accordance with the *Hanford Federal Facility Agreement and Consent Order* (Tri-Party Agreement) and is issued by the U.S. Environmental Protection Agency (EPA). The Tri-Party Agreement was signed by the U.S. Department of Energy (DOE), the site owner who is conducting investigative and cleanup activities at the site; the EPA, Region 10, the federal regulatory agency governing site activities; and the Washington State Department of Ecology (Ecology), the state regulatory agency for the site. The Tri-Party Agreement ensures that environmental impacts from past and present operations at the Hanford Site are thoroughly investigated and that appropriate actions are taken to protect public health and the environment. The parties of the Tri-Party Agreement may modify the preferred alternative or select another response action based on public comments received. They will document their selection in a **Record of Decision (ROD)** after the public comment period has ended. Therefore, members of the public are encouraged to review and comment on all the alternatives identified here.

The parties of the Tri-Party Agreement are issuing this Proposed Plan as part of their public participation responsibilities under Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** commonly known as the "Superfund Program" and Section 51.110 of the *National Environmental Policy Act of 1969* (NEPA) as amended.

The Proposed Plan summarizes, for public review, the comparative analysis of different cleanup options presented in the RI/FS report. Members of the public are encouraged to review this plan and other documents associated with 300-FF-5 Operable Unit in order to gain a more comprehensive understanding of the site and the environmental activities that have been conducted there.

Copies of the RI/FS report and supporting documents in the administrative record are available for review at the following locations:

- Gonzaga University
  Foley Center
  East 502 Boone
  Spokane, Washington 99258-0001
  (509) 328-4220 Ext. 3844

- University of Washington
  Suzzallo Library
  Government Publications Room
  Seattle, Washington 98195
  (206) 543-4664

- Washington State University, Tri-Cities
  Public Reading Room, Room 130
  100 Sprout Road
  Richland, Washington 99352
  (509) 376-8583

- Portland State University
  Branford Price Miller Library
  Science and Engineering Floor
  Southwest Harrison and Park
  P.O. Box 1151
  Portland, Oregon 97207-1151
  (503) 725-3690

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

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ERA: N/A

APPROVAL PAGE

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Approval: G. E. Van Sickle, 300 Area Manager

for release to public

Signature

1/13/95
Date

The approval signature on this page indicates that this document has been authorized for information release to the public through appropriate channels. No other forms or signatures are required to document this information release.

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TOTAL PAGES: 13

In addition to the information repositories listed above, copies of the RI/FS report and other documents in the administrative record may be reviewed by appointment at the following administrative record locations:

- U.S. Department of Energy
  Richland Operations Office
  Administrative Record Center
  2440 Stevens Center
  Richland, Washington 99352
  (509) 372-3411

- EPA Region 10
  Superfund Record Center
  1200 Sixth Avenue
  Park Place Building
  Mail Stop HW-074
  Seattle, Washington 98101
  (206) 553-1388

- Washington State Department of Ecology
  Administrative Record
  300 Desmond Road
  P.O. Box 47600
  Lacey, Washington 98503-1138
  (206) 407-7097

Members of the public are encouraged to comment on any or all of the alternatives. Comments will be requested at the public meeting scheduled for June 7, 1995. Written comments must be submitted by June 30, 1995.

Submit written comments to:

Dave Einan
U.S. Environmental Protection Agency
712 Swift Boulevard, Suite 5
Richland, Washington 99352
(509) 376-6865

Please note that a glossary and an explanation of the evaluation criteria appear near the end of this document.

SITE BACKGROUND

A History of the 300-FF-5 Operable Unit - The Hanford Site, managed by the DOE, is located in southeastern Washington State. It is a tract of land adjacent to the Columbia River covering 1,450 square kilometers (560 square miles). When constructed in 1943, the primary mission of the Hanford Facility was the production of plutonium for military defense. Three major operating divisions supported the primary mission: fuel assembly, reactor operations, and chemical separations. In later years, nuclear energy research and development activities took place on the site. In 1987, the last operating reactor (N-Reactor) shut down for upgrades, was later placed on indefinite standby, and currently is undergoing deactivation. At that time, the Hanford Site priorities shifted from defense weapons production to environmental restoration.

The Hanford Site is organized into numerically designated operational areas that include the 100, 200, 300, 400, 600, 700, 1100, and 3000 Areas (Figure 1). The 300 Area is north of the Richland city limits. Initially, the 300 Area was constructed as the fuel fabrication and laboratory complex. Many facilities were involved in the fabrication of reactor fuel elements. Technical support and research and development activities related to reactor fuels and chemical separations operations were carried out in the laboratories. As the production reactors shut down, fuel fabrication activities decreased, and laboratory activities increased. Currently, laboratory research and development activities focus on commercial reactor fuels development, life science research, and environmental restoration technology development. Over the years, fuel fabrication facilities and laboratories located in the 300 Area have introduced varied amounts and types of contaminants to the surface soils, **vadose zone** (the soil layer below the surface and above the **groundwater**), and groundwater.

In November 1989, the EPA placed the 300 Area on the **National Priorities List**. In order to organize cleanup efforts, the 300 Area was divided into sections called "operable units" (Figure 2). The 300-FF-5 Operable Unit was investigated for contamination of groundwater, **saturated soils**, river sediments, and river water in the immediate vicinity of Hanford's 300 Area. The 300-FF-1 Operable Unit covers waste and contaminated vadose zone soils for the major liquid waste disposal units in the 300 Area. The 300-FF-2 Operable Unit covers waste and contaminated vadose soils in the remainder of the 300 Area, in all of the 400 Area, and in select portions of the 600 Area. The 300-FF-2 Operable Unit also covers groundwater not covered by the 300-FF-5 Operable Unit.

Figure 1. The Hanford Site.

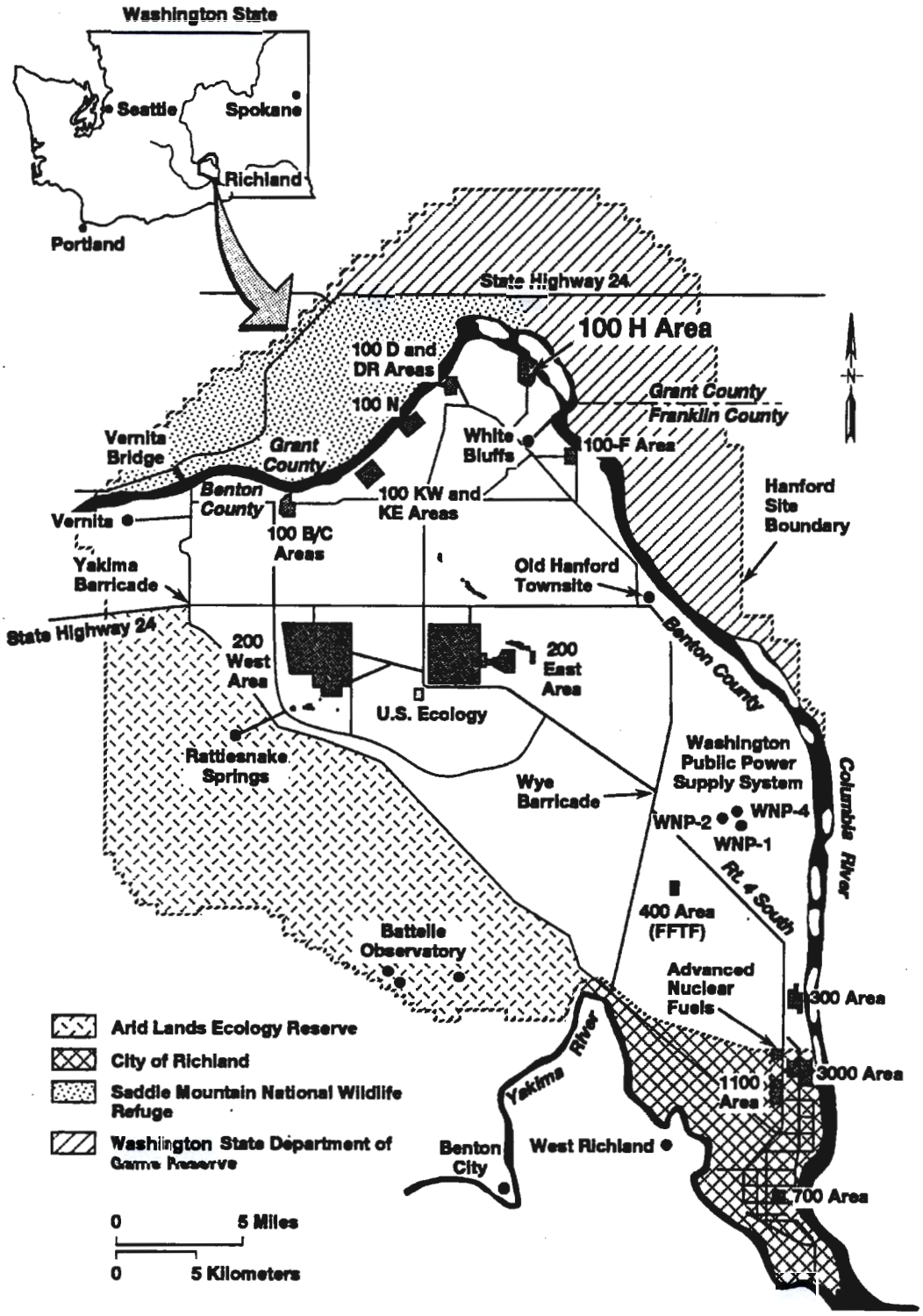
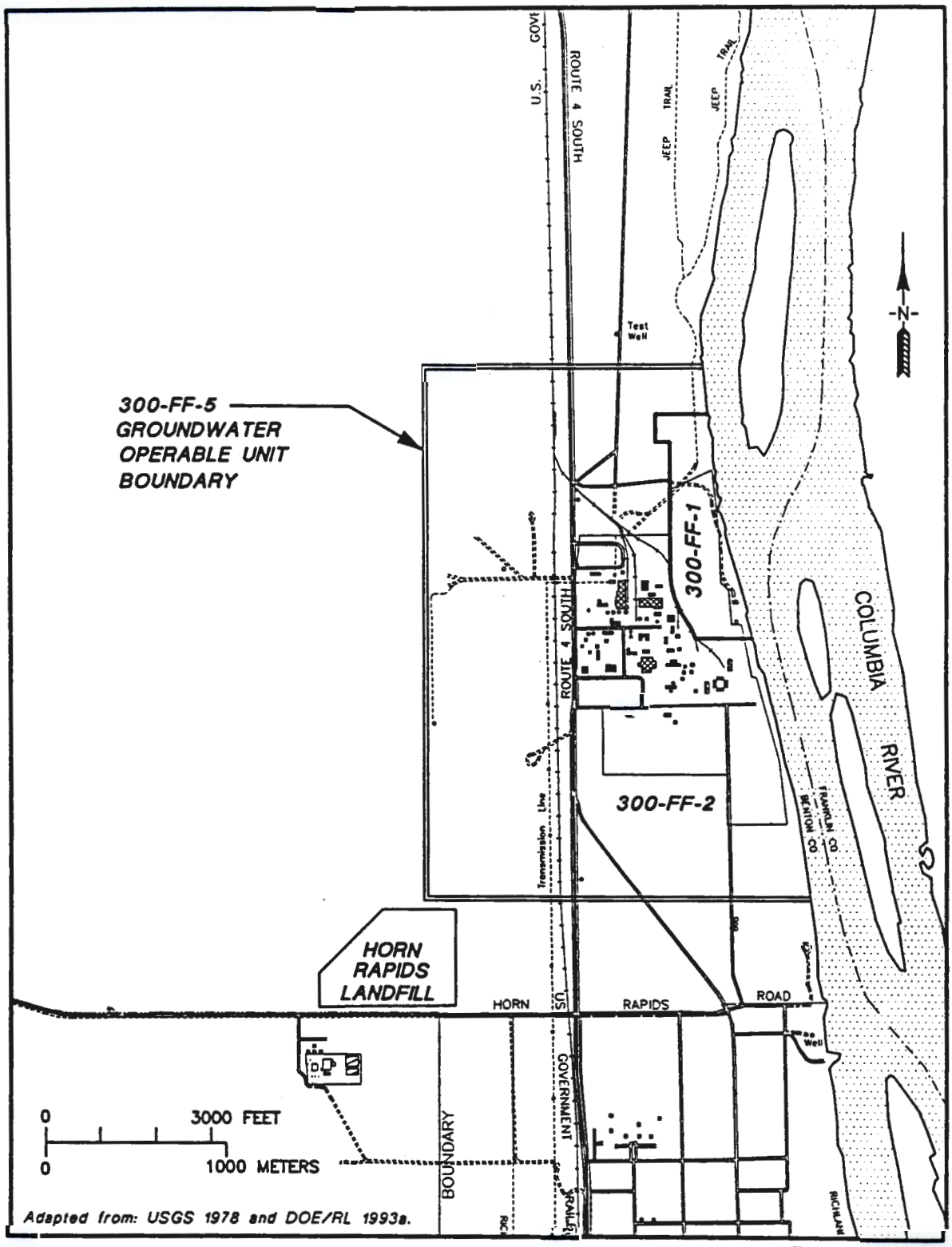


Figure 2. The Three Operable Units of the 300 Area.



The *300-FF-5 Operable Unit RI/FS Work Plan* (DOE/RL-89-14) outlines the activities that were conducted. Data generated from this study are presented in the *Phase I RI Report for the 300-FF-5 Operable Unit* (DOE/RL-93-21), the RI/FS report (DOE/RL-94-85), and include investigation of the following:

- Sources
- Surface water and sediments
- Soils
- Groundwater
- Meteorology
- Ecology
- Cultural Resources.

Groundwater in the 300-FF-5 Operable Unit was found to contain elevated levels of **organic compounds** (dichloroethene and trichloroethene), nickel, and uranium. **Maximum contaminant levels (MCL)** for drinking water have been established by EPA and Ecology to protect any user of a public water system. A comparison of the MCL and the maximum detected concentration in groundwater of the 300-FF-5 Operable Unit is shown in Table 1.

SUMMARY OF SITE RISKS

An analysis known as a **baseline risk assessment** is conducted in the CERCLA process to estimate the human health or environmental risks that could result if groundwater contamination is not remediated.

This assessment considers the risk that could result from exposure to contaminants under several land use scenarios. Four scenarios evaluated include industrial, residential, recreational, and agricultural land uses. The potential risks from 300 Area groundwater contamination were reviewed at three separate exposure locations: the 300 Area, onsite Hanford, and offsite Hanford. Current and future conditions were evaluated.

Two types of potential human health effects from exposure to site contaminants were evaluated. The first was the potential increase of cancer risk over a lifetime. These statistics are expressed as a ratio; for example, one in ten thousand is written as 1×10^{-4}. This means that if no remediation occurred, a worker's long-term exposure to contamination would increase that worker's risk of contracting cancer by a factor of one in ten thousand. Remedial actions generally are not required by CERCLA guidance when risk levels are below 1×10^{-4} unless other considerations exist, such as adverse environmental impacts, potential for future migration, or uncertainty regarding future land use. State regulations (WAC 173-340-745) mandate that risk cannot exceed 1×10^{-5} (one in one hundred thousand).

The risk assessment included analyses of all contaminants listed in Table 1. Using the industrial scenario in the 300 Area at current conditions, the maximum values for increase in cancer risk levels are as follows:

- Total Uranium (5×10^{-6}) from surface water ingestion. (Risk represents a conservative value from surface water ingestion along the 300 Area shoreline at low river stages.)

- Trichloroethene (1×10^{-6}) from inhalation. (Exposure estimated from one well not used for drinking water.)

The future risk to groundwater exposure (inhalation and ingestion) would increase to 3×10^{-6}. This increase is based on the conservative assumptions that present trichlorethene concentrations remain the same and that the groundwater source could be anywhere within the operable unit.

All other present and future risk scenarios examined show risk at acceptable levels. For example, the current risk to the public downstream from the 300 Area adjacent to the Columbia River is 4×10^{-7}.

Table 1. Maximum Contaminant Concentrations in the Groundwater.

Contaminant	Drinking Water Maximum Concentration Level (milligrams contaminant per liter of water)	Maximum Concentration Detected in Groundwater (milligrams contaminant per liter of water)
Dichloroethene	0.10	0.18
Nickel	0.10	0.14
Trichloroethene	0.005	0.014
Uranium	0.020[a]	0.27

[a]This is a proposed MCL.

The second health effect evaluated includes noncancer causing effects ranging from a simple rash to a life-threatening condition. No adverse noncancer causing effects are anticipated under any exposure scenario.

An **ecological risk assessment** was also performed to evaluate potential adverse effects of contaminants on the plants and animals in the 300 Area ecosystems, including shoreline and river ecosystems, at current conditions. Risk to river organisms from contaminants was estimated following the guidance provided in the *Hanford Site Risk Assessment Methodology* (DOE/RL-91-45). Several animals were identified that could receive doses of contaminants. These animals are river organisms, crustaceans, fish, plant-eating ducks, fish-eating ducks, and herons. No animal was estimated to have received a significant dose from radionuclide contaminants. Similarly, no animal was estimated to have received an exposure to hazardous contaminants at levels exceeding background or chronic **lowest observable effects levels (LOEL)** from surface water and/or river sediments. No evidence exists to indicate any observable problems for riparian and aquatic organisms.

SCOPE AND ROLE OF ACTION

This Proposed Plan addresses contaminated groundwater, saturated soils, river sediments, and surface water in the immediate vicinity of the 300 Area. All surface soil contamination is addressed in the Operable Unit 300-FF-1 (Proposed Plan, currently issued) and the 300-FF-2 (Limited Field Investigation, in progress). The current and near-term (3 to 23 years) future land use of the 300 Area is industrial. The long-term (after 2018) land use for this area is industrial. Industrial use of the 300 Area in the future is consistent with the recommendations of the Hanford Site Future Uses Working Group.

The cleanup objective is to prevent current and future environmental exposure to groundwater contaminants. Remedial goals are generally established for each contaminant of concern. These goals are specified as a numeric chemical-specific, **applicable or relevant and appropriate requirement (ARAR)** or risk-based concentration. The major contaminants of concern for the 300-FF-5 Operable Unit include uranium, nickel, trichloroethene, and dichloroethene. The MCLs from drinking water standards are proposed as remediation goals for each contaminant (see Table 1). Uranium is by far the most extensive contaminant. Nickel, trichloroethene, and dichloroethene are above MCLs at only one groundwater well cluster location, and only traces of trichloroethene, which were below MCLs, were detected in river water.

SUMMARY OF REMEDIATION ALTERNATIVES

The alternatives analyzed for the 300-FF-5 Operable Unit are as follows:

- Alternative A: No Action
- Alternative B: Institutional Controls
- Alternative C: Selective Hydraulic Containment
- Alternative D: Extensive Hydraulic Containment
- Alternative E: Selective Slurry Wall Containment
- Alternative F: Extensive Slurry Wall Containment

Common Elements - There are only two elements common to all six alternatives: a need to monitor groundwater and no need to remediate for trichloroethene, dichloroethene, and nickel. Groundwater **monitoring** accomplishes the following: (1) ensures that there are no adverse offsite effects from remediation, (2) evaluates performance of the remedy, and (3) provides quality control for the remedy and criteria for meeting remedial goals. Remediation for trichloroethene, dichloroethene, and nickel is considered unnecessary because concentrations are very localized and do not exceed MCLs in the river. Remediation of these contaminants can occur through natural flushing.

Alternatives A, B, C, and D would accomplish the remedial objectives in 3 to 10 years. Alternatives E and F would take an estimated 100 years to accomplish the remedial objectives because these alternatives stop natural flushing.

Alternatives C, D, E, and F all share some measure of groundwater control to prevent contaminated groundwater from entering the Columbia River. Alternatives C, D, E, and F would accomplish groundwater control by pumping and treating contaminated groundwater from wells before it could enter the river. Alternatives E and F would add additional control by installing a slurry wall between the contaminated groundwater and the river. A slurry wall would be installed by excavating a trench to a depth of approximately 36 m (120 ft) to the Ringold lower mud unit and filling the excavation with a thick slurry or "mud." This slurry is more restrictive to groundwater flow than the natural soils and essentially creates an "inground dam" that prohibits flow of the groundwater into the river.

Alternatives C, D, E, and F all share similar treatment methods to remove contamination. Treatment methods proposed for extracted groundwater from Alternatives C, D, E, and F include sand filters and ion exchange. Sand filters would be used to remove solids, and the ion exchange unit would be designed to remove uranium and

other metals. Ion exchange units vary in design but generally consist of beds or towers filled with resins. The resins provide for an exchange of ions so that the uranium and other metals leave the water solution and bond to the resins. Once removed, the resins could be regenerated or disposed of as mixed waste to eliminate all contaminants. Discharge of the treated water would be to the Columbia River. All waste disposal or discharges would be required to meet federal and state disposal regulations or surface water discharge regulations, respectively.

Alternative A - No Action Alternative

- Capital Cost: $ 0
- Total Operation and Maintenance Costs: $ 900,000
- Total Estimated Cost: $ 900,000
- Years to Remediate: 3 to 10

The CERCLA process requires evaluation of a "no action alternative" to establish a baseline for comparison. This alternative assumes that the institutional controls currently in place would be eliminated with selection of this option and that no remedial actions would be performed other than continued monitoring of the groundwater contaminant levels. Continued monitoring would be used to verify the expected decrease in contaminants with time.

Alternative B - Institutional Controls

- Capital Cost: $ 100,000
- Total Operation and Maintenance Costs: $ 1,300,000
- Total Estimated Cost: $ 1,400,000
- Years to Remediate: 3 to 10

Current institutional controls would be continued to prevent human exposure to groundwater contamination. Deed restrictions on groundwater withdrawal and use and restrictions on exposure to near-shore river water would be instituted. Additional access restrictions beyond those already in place would be implemented if necessary. Monitoring of groundwater and surface water would be continued.

With this alternative, it is estimated that natural flushing which is presently occurring would decrease uranium concentrations in groundwater to below remediation goals in approximately 3 to 10 years. Nickel, trichloroethene, and dichloroethene could remain in a very small region of the water table aquifer at concentrations around the MCL for a longer time. Because of flushing nickel, trichloroethene, and dichloroethene would not reach the Columbia River in concentrations exceeding the MCLs. Monitoring would continue as long as groundwater contaminant concentrations exceed remediation goals.

Alternative C - Selective Hydraulic Containment

- Capital Cost: $ 7,900,000
- Total Operation and Maintenance Costs: $ 5,300,000
- Total Estimated Cost: $13,000,000
- Years to Remediate: 3 to 10

The objective of this alternative is to meet remediation goals by combining extraction and treatment of localized portions of groundwater containing the highest levels of contamination (Figure 3) with natural flushing of the remainder of the aquifer. To accomplish this objective, groundwater would be extracted through groundwater wells at approximately 1,135 L/min (300 gal/min). Captured water would be treated using a sand filter and an ion exchange unit. The treated water would then be discharged to the river. All treated water would meet **National Pollution Discharge Elimination System (NPDES)** permitted discharge standards.

Treatment sludges would be disposed at the **Environmental Restoration and Disposal Facility** when construction is completed, or other Hanford disposal facility.

Alternative D - Extensive Hydraulic Containment

- Capital Cost: $41,000,000
- Total Operation and Maintenance Costs: $19,000,000
- Total Estimated Cost: $60,000,000
- Years to Remediate: 3 to 10

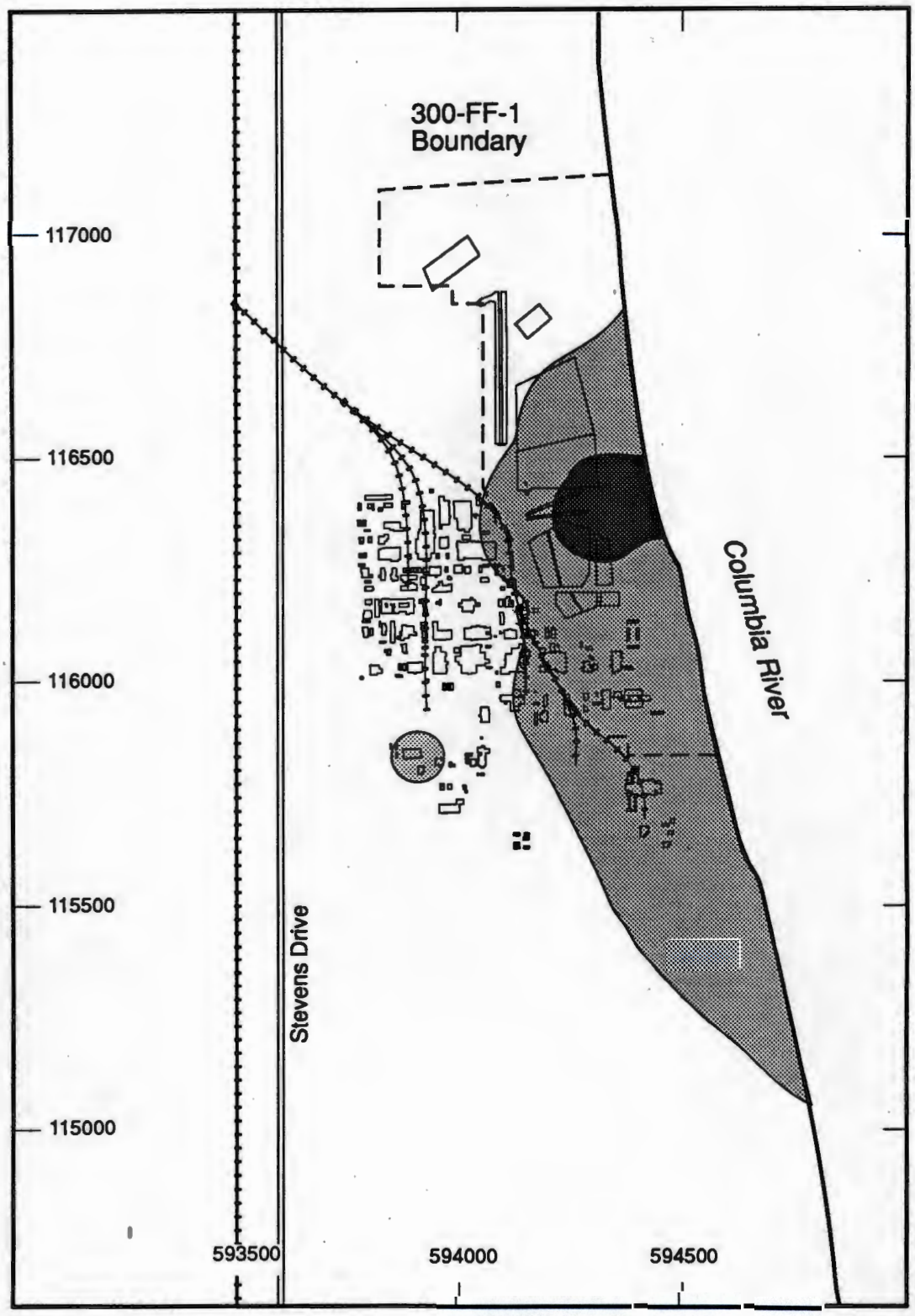
This alternative is similar to Alternative C except that the entire plume above MCLs would be extracted and treated. Groundwater would be extracted through groundwater wells at approximately 14,760 L/min (3,900 gal/min). Captured water would be treated using a sand filter and an ion exchange unit. A larger treatment unit would be required to handle the volume of water from this option.

The extracted water and sludge would be treated and discharged in the same type of system as described in Alternative C.

Alternative E - Selective Slurry Wall Containment

- Capital Cost: $17,000,000
- Total Operation and Maintenance Costs: $17,000,000
- Total Estimated Cost: $34,000,000
- Years to Remediate: Up to 100

Figure 3. 300-FF-5 Contamination Plume Boundary.



Higher Concentration Selective Remediation Area

Lower Concentration Extensive Remediation Area

Note: Coordinates are in meters and conform to the Lambert Coordinate System (NAD83).

The objective of this alternative is to meet remediation goals by combining containment of the highest levels of contamination (to prevent discharge to the Columbia River) with natural flushing of the remainder of the aquifer. Contaminated groundwater would be contained by installation of a slurry wall between the **contamination plume** and the river, thereby preventing groundwater from reaching the river. Groundwater would also be extracted at an estimated rate of 26 L/min (7 gal/min) to ensure that the contaminated groundwater does not flow around the outer edges of the slurry wall. The extracted water and sludge would be treated and discharged in the same type of system described in Alternative C.

Alternative F - Extensive Slurry Wall Containment

- Capital Cost: $ 77,000,000
- Total Operation and Maintenance Costs: $ 23,000,000
- Total Estimated Cost: $100,000,000
- Years to Remediate: Up to 100

This alternative is similar to Alternative E except that the entire plume would be contained within the slurry wall. In this alternative, the overall length of the slurry wall is increased so that the entire plume would be intercepted, and groundwater extraction and treatment rates would be increased to approximately 189 L/min (50 gal/min). The extracted water and sludge would be treated and discharged in the same type of system described in Alternative C.

EVALUATION OF ALTERNATIVES

The preferred alternative, Alternative B "Institutional Controls," provides the best balance of options among the alternatives with respect to the evaluation criteria established by CERCLA to evaluate remedies. This section profiles the performance of the preferred alternative against the seven criteria, noting how it compares to the other options under consideration.

Overall Protection - The No-Action alternative does not meet the statutory requirements for protection of human health and the environment and therefore is not discussed further. All of the other alternatives meet this threshold criterion. Current risks are below acceptable limits, and remediation goals would be achieved by either natural flushing of the aquifer or a combination of natural flushing and treatment.

Compliance with ARARs - All remaining alternatives meet this threshold criterion. Institutional controls (Alternative B) meets this criterion because exposure to groundwater with contaminant concentrations above MCLs would be prevented. Groundwater is not currently used for drinking water, and such use would be prevented until remediation goals are achieved. All other alternatives achieve compliance through treatment.

Long-Term Effectiveness and Permanence - All remaining alternatives provide long-term effectiveness. Uranium groundwater concentrations would be reduced to below MCLs via natural flushing of the aquifer, achieving remediation goals for these contaminants in an estimated 3 to 10 years. Institutional controls, selective hydraulic containment, and selective slurry wall alternatives result in concentrations of nickel, trichloroethene, and dichloroethene that have slightly exceeded MCLs in a limited area. Institutional controls (Alternative B) would prevent exposure until remedial goals are met and thereby achieve remedial action objectives.

Reduction of Toxicity, Mobility, and Volume through Treatment - Four alternatives (C, D, E, and F) reduce toxicity, mobility, and volume through treatment. However, these options do produce sludge which must be disposed of in a Hanford disposal facility. The institutional controls alternative (Alternative B) does not provide treatment, relying instead on natural flushing to reduce contaminant levels below MCLs. The extensive remediation alternatives (D and F) contain all groundwater, further reducing mobility. The selective remediation alternatives (C and E) provide the next best mobility reduction by containing the most contaminated portions of the plume.

Short-Term Effectiveness - Four alternatives protect human health and the environment during the 3- to 10-year implementation period and for Alternatives E and F 100 year operation. Institutional controls would limit exposure to contaminated groundwater through groundwater restrictions. All other alternatives would require construction lead time to be fully implemented. Groundwater and river monitoring would continue for all alternatives until remediation goals are achieved. Institutional controls (Alternative B) also cause the least potential for worker exposure and injury. Institutional controls (Alternative B) would have the least disturbance to the habitat and artifacts in the operable unit.

Implementability - The institutional controls alternative (Alternative B) is readily implementable and presently used throughout the Hanford Site, including the 300-FF-5 Operable Unit. Alternatives C and D require extensive design, construction, and careful operation of the groundwater pumping system. Alternative D is additionally difficult because approximately 50 wells must

be installed. Alternatives E and F are more difficult to implement than Alternatives C and D because of the density of buildings, buried utilities, potential to disturb Native American artifacts, and the extensive excavation that must be completed.

Cost - The cost estimates for all alternatives are summarized in Table 2. The cost of implementing the institutional controls alternative (Alternative B) is very low. Most of the cost is associated with monitoring; therefore, this alternative is only slightly more expensive than no action. The remaining alternatives are significantly more expensive. Removing and treating all of the groundwater to levels below MCLs would be expensive (about $60 million), and would take up to 10 years to complete.

PREFERRED ALTERNATIVE

The preferred alternative selected for the 300-FF-5 Operable Unit is the application of "Institutional Controls" (Alternative B). Its implementation will limit human access to groundwater and continue monitoring activities until natural flushing reduces contamination levels below human health or environmental concern. This alternative meets the cleanup unit objectives by the following methods.

- It reduces the risk to human health or the environment by limiting direct exposure to contaminated groundwater.
- It reduces risk to cleanup workers compared to other alternatives because less work would be done around heavy equipment.
- It reaches acceptable levels of contaminants in groundwater before 2018, which is within the bounds of planned DOE site jurisdiction, thus meeting ARARs and long-term goals.
- It is only slightly less effective than installing and operating an active remediation system, but far less costly. (Cost savings can be applied to other operable units where active remediation shows greater benefits.)
- It ensures minimal disturbance to artifacts and habitats.
- It allows for additional remedial action if groundwater monitoring results do not show decreasing levels of contamination in a timely manner.
- It does not generate waste sludge that will have to be disposed.

SCHEDULE FOR FUTURE ACTIVITIES

The following activities for remedial action are planned for the 300-FF-5 Operable Unit.

- During the period of May 16, 1995, to June 30, 1995, the public will have the opportunity to comment and question both in writing and during an open public meeting on the proposed plan for the 300-FF-5 Operable Unit. Concurrently, the 300-FF-1 Proposed Plan and the 300 Area Process Trench Closure Plan have been issued for public review.
- The ROD for final action, including public comments and responses, is expected to be issued on August 7, 1995. The ROD will be finalized by September 29, 1995.

Table 2. Remediation Alternative Cost Estimates.

Alternative		Capital[a] ($)	Operating[a,b] ($)	Total[a] ($)
A	No Action	0.0	0.9	0.9
B	Institutional Controls	0.1	1.3	1.4
C	Selective Hydraulic Containment	7.9	5.3	13.0
D	Extensive Hydraulic Containment	41.0	19.0	60.0
E	Selective Slurry Wall Containment	17.0	17.0	34.0
F	Extensive Slurry Wall Containment	77.0	23.0	100.0

[a]Costs in millions of dollars, estimated for mid-1994.
[b]Total Costs, net present value of operating and monitoring costs assumes 5% interest (net of inflation); time period varies between alternatives.

EXPLANATION OF EVALUATION CRITERIA

The nine criteria fall into three categories: The first two are considered threshold criteria, which must be met unless waivers are granted. The next five are considered balancing criteria and compare the technical and cost aspects of alternatives. The final two are considered modifying criteria. Modifications to remedial actions are usually based on state and local comments and concerns. The first seven criteria have been used to evaluate the alternatives in the RI/FS process. The remaining criteria, state and community acceptance, would be evaluated following comment on this proposed plan for the operable unit. The nine criteria are summarized as follows:

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

Compliance with ARARs - Addresses whether or not a remedial action will meet all of the ARARs or provides grounds for invoking a waiver of the requirements.

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

Short-Term Effectiveness - Refers to the speed with which the remedial action achieves protection and any adverse impacts on human health and the environment that may result during the construction and implementation period.

Implementability - Refers to the technical and administrative feasibility of the remedial action, including the availability of materials and services needed to implement the selected solution.

Cost - Evaluates capital, operational, and maintenance costs for each alternative by performing present worth cost analyses.

Reduction of Toxicity, Mobility, and Volume through Treatment - Evaluates the anticipated performance of the treatment technologies that may be employed.

State Acceptance - Indicates whether the state concurs, opposes, or has no comment on the preferred alternative based on its review of the RI/FS reports and the proposed plan.

Community Acceptance - An assessment of the general public response to the proposed plan received during the public comment period.

GLOSSARY

Applicable or Relevant and Appropriate Requirement (ARAR) - The federal and state requirements that a selected remedy will attain. These requirements may vary among sites and alternatives.

Baseline Risk Assessment - This assessment considers the risk that could result from direct public exposure to contaminants under several future land use scenarios.

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

Contamination Plume - A column of contamination with measurable horizontal and vertical dimensions that is dissolved and moves with groundwater.

Ecological Risk Assessment - An assessment evaluates potential adverse effects of contaminants on plants and animals in a particular ecosystem.

Environmental Restoration Disposal Facility - A proposed disposal facility for soils and solid waste that is assumed to be available at the Hanford Site to support interim remedial measures.

Feasibility Study (FS) - The step in the CERCLA process in which alternatives for a remedial action system are investigated and screened.

Groundwater - Underground water that fills pores in soils or openings in rocks to the point of saturation.

Lowest Observable Effects Level (LOEL) - The lowest exposure concentration at which there are demonstrated adverse effects to animals.

Maximum Contaminant Levels (MCL) - The levels established by the EPA and Ecology to protect any user of a public water system.

Monitoring - Ongoing collection of information about the environment that helps gauge the effectiveness of a cleanup action.

National Pollution Discharge Elimination System (NPDES) - A provision of the *Clean Water Act* prohibits discharge of pollutants into waters of the United States unless a special permit is issued by EPA, a state, or (where delegated) a tribal government on an Indian Reservation.

National Priorities List - EPA's list of waste sites targeted for priority cleanup under the Superfund.

Operable Unit - Groupings of individual waste sites based on common waste sources and geographic location. The 300 Area has been divided into three operable units.

Organic Compounds - Carbon compounds, such as solvents, oils, and pesticides, few of which tend to dissolve readily in water. Some organic compounds can cause cancer.

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

Remedial Investigation (RI) - The CERCLA process of determining the extent of hazardous substance contamination and, as appropriate, conducting treatability investigations. The RI is done in conjunction with the Feasibility Study.

Saturated Soils - Soils which are below the groundwater elevation.

Vadose Zone - The soil layer below the surface and above the groundwater.