PROPOSED PLAN FOR THE 200-BP-1 OPERABLE UNIT AT HANFORD, RICHLAND, WASHINGTON

JANUARY 1994

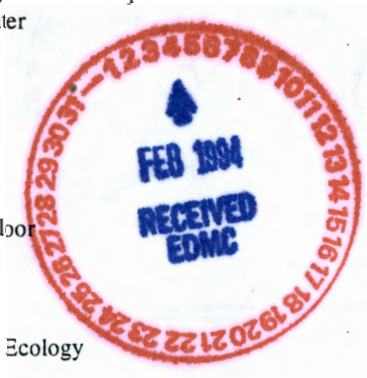
INTRODUCTION

This proposed plan (plan) identifies the preferred remedial action alternative proposed by the U.S. Environmental Protection Agency ([EPA] lead agency), the Washington Department of Ecology ([Ecology] support agency), and the U.S. Department of Energy ([DOE] responsible agency) for the 200-BP-1 Operable Unit. In addition, this plan summarizes the detailed information that can be found in the final *Phase I Remedial Investigation Report for the 200-BP-1 Operable Unit*, DOE/RL-92-70, Rev. O, and *Feasibility Study Report for the 200-BP-1 Operable Unit*, DOE/RL-93-35, Rev. 1. The public is encouraged to review these documents and all information used in the evaluation of the 200-BP-1 Operable Unit. The Administrative Record file, which contains the information on which the selection of the response action will be based, is available at the following locations:

U.S. Department of Energy Richland Operations
Administrative Record Center
2440 Stevens Center Place
Richland, WA 99352

EPA Region 10
Superfund Record Center
1200 Sixth Ave.,
Park Place Building, 7th Floor
Mail Stop: HW-074
Seattle, WA 98101

Washington Department of Ecology
Administrative Record
719 Sleater-Kinney Road SE
Capital Financial Building, Suite 200
Lacey, WA 98503-1138



This plan is provided to facilitate public participation in the final cleanup of the 200-BP-1 Operable Unit and is consistent with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The final remedial alternative will be selected after the public comment period has ended and all comments have been reviewed and considered. It is important for the public to recognize that the preferred remedy is a preliminary recommendation. This alternative may be subject to modification or possible rejection based on public comments. Therefore, the public are encouraged to consider all of the alternatives in the remedial investigation/feasibility study (RI/FS) process for the 200-BP-1 Operable Unit.

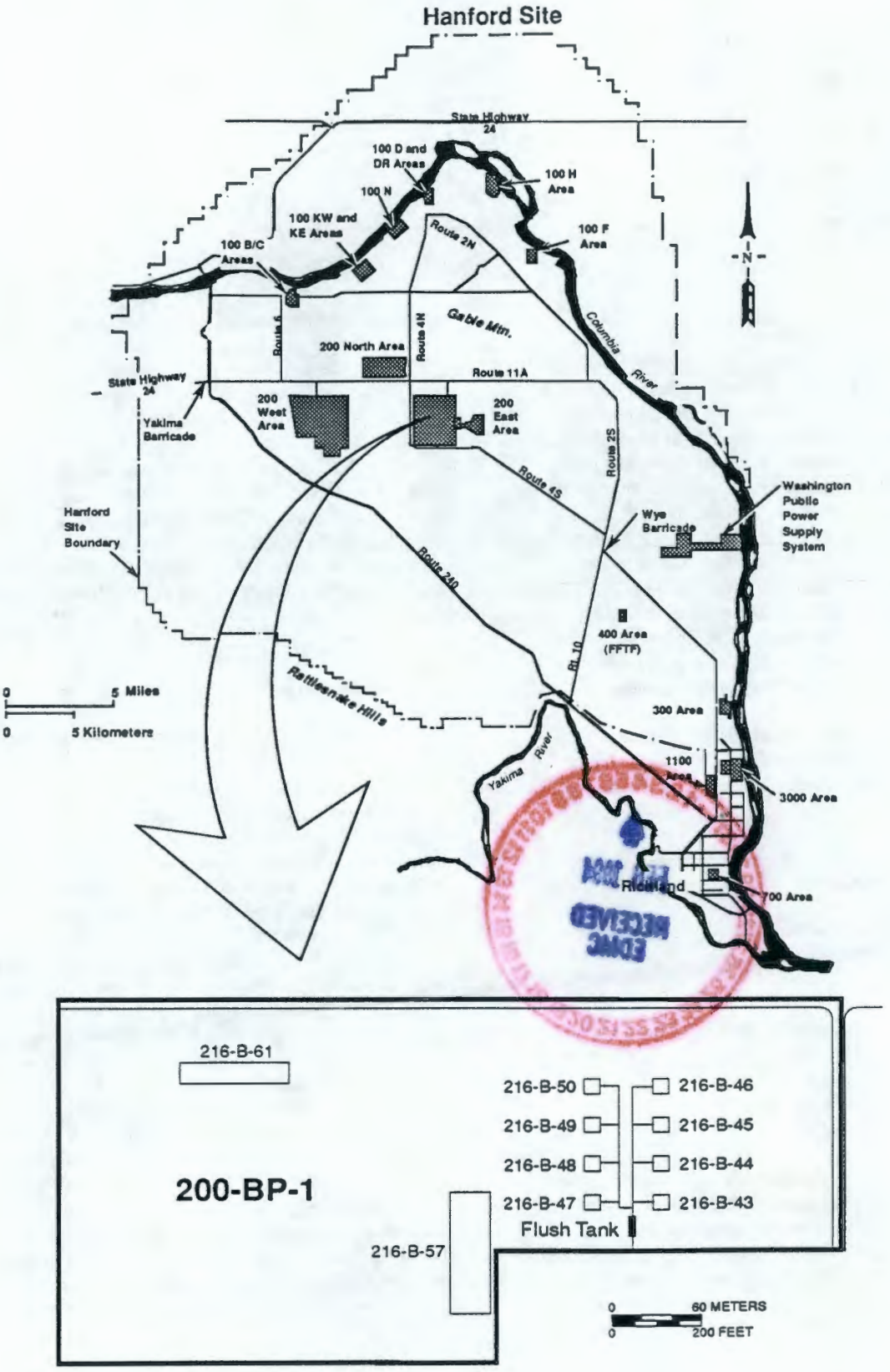
The DOE has independently evaluated activities associated with the preferred alternative under the National Environmental Policy Act (NEPA) and determined that those activities are eligible for categorical exclusion. However, nothing in this plan, or other documents to be prepared, is intended to present a statement on the legal applicability of NEPA to remedial action at CERCLA sites.

SITE BACKGROUND

The 200 Area of the Hanford Site was place on the National Priority List in November of 1989 under CERCLA. The 200 Area is divided into eight waste area groups largely corresponding to major processing plants (e.g., B Plant). Each waste area group is further subdivided into one or more operable units based on waste disposal information, location, facility type, and other site characteristics. The 200-BP-1 Operable Unit is one specific site located within the 200 East Area (Figure 1).

The 200-BP-1 is a source operable unit with contaminated soils associated primarily with 10 inactive cribs (known as the 216-B cribs). These cribs were used for disposal of low level radioactive liquid waste from U Plant uranium recovery operations and waste storage tank condensate from the adjacent 241-BY Tank Farm. The cribs used for disposal of U Plant waste were in operation from 1955 to 1956, and the cribs used for disposal of tank condensate were in operation from 1965 to 1975. One crib (216-B-61) was constructed, but there was no evidence that the crib was ever used or received waste. This historical information was verified through sampling. In addition to the cribs, four unplanned releases of radioactive materials have occurred within the operable unit. Contaminated surface soils associated with the unplanned releases have been consolidated over the cribs and covered with clean soil to reduce contaminant migration and exposure.

Figure 1. 200-BP-1 Operable Unit.



SUMMARY OF SITE RISKS

During the RI/FS, an analysis was conducted to estimate the health or environmental problems that could result if contaminated soils at the 200-BP-1 Operable Unit were not cleaned up. This analysis is commonly referred to as a baseline risk assessment. For carcinogens, the risk is presented as the possible (upper-bound) risk of contracting some form of cancer given a lifetime exposure to a chemical or radionuclide. State and federal guidelines for acceptable upper-bound cancer risk normally range from a chance of 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000) of developing cancer due to exposure to a carcinogen.

The risk associated with the 200-BP-1 Operable Unit while maintaining current institutional controls is $< 10^{-6}$. However, discharge of wastes to the cribs has resulted in additional risk associated with the subsurface soil contamination, if exposed to the surface. Contaminated soils at the site can be categorized by the types of contaminants, their distribution in the soil column, and the risk posed by the various potential exposure pathways. Below the clean soil cover (2 to 15 ft), the near-surface soils contain low levels of contamination with ^{137}Cs, ^{226}Ra, ^{90}Sr, ^{228}Th, and total uranium. The volume of contaminated soils in the near surface is estimated at 62,000 yd^3. The lifetime incremental cancer risk associated with these soils, if exposed to the surface, is 9×10^{-5}.

The majority of the high activity contaminated soils is located between 15 and 50 ft below ground surface. The volume of high activity contaminated soils is estimated at 191,000 yd^3. The most significant contaminants in this zone include ^{90}Sr, ^{137}Cs, $^{238,239,240}Pu$, and total uranium. Most of the radioactivity is attributable to ^{90}Sr and ^{137}Cs. These radionuclides have relatively short half- lives (29 and 30 yr, respectively) and are highly immobile in the soils. If exposed at the ground surface through human or biotic intrusion, these soils pose an unacceptable risk ($> 10^{-2}$ life-time incremental cancer risk). However, due to the relatively short half-lives and immobility of ^{90}Sr and ^{137}Cs, they due not pose a risk to groundwater. Plutonium isotopes are highly immobile, however $^{239,240}Pu$ are extremely long lived (half-life $>$ 10,000 yr). Uranium is relatively mobile and extremely long lived (half-life $>$ 100 million yr) and poses the most significant future risk for groundwater contamination. Vadose modeling indicates that, if no action was taken to remediate the contaminated soils, uranium will reach the groundwater at concentrations that exceed the proposed drinking water standard (30 pCi/L) in about 700 yr.

Contaminants of concern present in soils below 50 ft include nitrate, ^{60}Co, ^{99}Tc, and total uranium. Volume of contaminated soils in this region is estimated at 250,000 yd^3. Soils below 50 ft pose a potential risk associated with the groundwater pathway only. Nitrate, ^{60}Co, and ^{99}Tc are highly mobile and reached groundwater very soon after being discharged to the cribs. Peak groundwater concentrations associated with these contaminants are located more than a mile downgradient of the 200-BP-1 Operable Unit. Concentrations currently entering groundwater from the soil at 200-BP-1 are declining and only nitrate is in excess of a drinking water standard (45 mg/L). Concentrations of ^{60}Co and ^{99}Tc entering groundwater from contaminated soils are below both current and propose drinking water standards, however, they exceed Washington Model Toxics Control Act Cleanup Regulations Method B standards. Contamination of groundwater beneath the 200-BP-1 Operable Unit is being addressed in the 200-BP-5 Groundwater Operable Unit.

SCOPE AND ROLE OF ACTION

This proposed plan addresses contaminated soils at the 200-BP-1 Operable Unit. Based on the remedial action objectives presented below, this plan summarizes a range of remedial alternatives and presents a preferred alternative. The remedial action objectives include:

- Limit human receptor exposure to near-surface and subsurface high-activity soils to maintain a risk in the range of 10^{-4} to 10^{-6}.
- Limit biotic intrusion into high activity contaminated soils that could result in exposing contaminants at the surface.
- Limit future impacts to groundwater by taking measures that will minimize infiltration and downward migration of contaminants (primarily uranium).
- Consider the proximity and potential remedial action at the adjacent 241-BY Tank Farm in evaluation of alternatives and remedy selection.

SUMMARY OF ALTERNATIVES

The alternatives analyzed for the 200-BP-1 Operable Unit are presented below. These numbers correspond with the numbers in the RI/FS reports. Alternatives for the soil cleanup are:

- Alternative A: No Action
- Alternative B: Institutional Controls
- Alternative C: Biointrusion
- Alternative D: RCRA Barrier
- Alternative E: Hanford Barrier
- Alternative F: Excavation and Soil Washing
- Alternative G: Excavation and Soil Washing with Vitrification
- Alternative H: Excavation and Fixation
- Alternative I: Landfill Disposal
- Alternative J: In-Situ Fixation.

Except for the "no action" alternative, all of the alternatives now being considered for the site would include a number of common components. All of the alternatives would require some form of institutional control to provide long-term effectiveness. All barrier designs and in-situ fixation would leave waste in place. Excavation alternatives assume a maximum excavation depth of

50 ft. Excavation below 50 ft would compromise the integrity of the adjacent 241-BY Tank Farm. All waste removed from the site would be placed in a permanent landfill on the Hanford Site that is presently in the conceptual design stage. A Resource Conservation and Recovery Act (RCRA) barrier would be required to prevent groundwater contamination for all excavation alternatives due to soil contamination below 50 ft.

Alternative A: No Action

The National Contingency Plan requires that a "no action" alternative be included in remediation alternatives to provide a baseline for comparison to other alternatives. Under this alternative, no further action would be taken to prevent exposure to the soil contamination. The total cost of this alternative is $1,140,000.

Alternative B: Institutional Control

This alternative assumes that the current administrative and maintenance of the existing clean soil cover remain in effect. Institutional controls consist of fencing, warning marker and signs, site use restrictions, and groundwater use restrictions. These controls are consistent with current plans for dedication of the 200 East Area as a permanent waste management and disposal area. The total cost of this alternative is $1,240,000.

Alternative C: Biointrusion Barrier

Contaminated soils would be left in place and covered with a 3-ft biointrusion barrier. The multi-layered barrier would be designed to prevent contact with contaminated soils and to prevent plant or burrowing animals from bringing contaminated soils to the surface. The total cost of this alternative is $3,470,000.

Alternative D: RCRA Barrier

Contaminated soils would be left in place and covered with a 5-ft RCRA barrier. The barrier would be designed to meet applicable or relevant and appropriate requirements (ARAR) of RCRA landfill closure in 40 CFR 264.310. The total cost of this alternative is $5,650,000.

Alternative E: Hanford Barrier

Contaminated soils would be left in place and covered with a 15-ft Hanford barrier. The barrier is designed to minimize water infiltration, prevent biological intrusion, and resist erosion for a design life 1,000 yr. The total cost of this alternative is $8,470,0000.

Alternative F: Excavation and Soil Washing

The purpose of this alternative is to minimize the volume of soil requiring disposal. Soil washing is used to physically or chemically separate the size of the soil particles. Higher contaminated soils are generally found in the fine soil particles and would be disposed of in an approved landfill. The total cost of this alternative is $182,000,000.

Alternative G: Excavation and Soil Washing with Vitrification

This alternative is essentially the same as alternative F with the addition of vitrifying the highly contaminated soils once separated. The vitrification process would immobilize the contaminants in a glass matrix. The total cost of this alternative is $268,000,000.

Alternative H: Excavation and Fixation

Contaminated soils would be removed, mixed into a grout matrix, and returned to the excavation. The grout matrix would reduce the mobility of the contaminants. The total cost of this alternative is $81,000,000.

Alternative I: Landfill Disposal

Contaminated soils would be removed and disposed of in an approved landfill on the Hanford Site. The total cost of this alternative is $82,000,000.

Alternative J: In Situ Fixation

This alternative would involve treating most of the highly contaminated soils in place with fixation. Deep soil mixing would be accomplished by drilling with large augers to mix the soil in place while grout or other fixation agents are injected. The total cost of this alternative is $53,000,000.

EVALUATION OF ALTERNATIVES

The preferred alternative for the 200-BP-1 Operable Unit is alternative D, "RCRA Barrier". Based on current information, this alternative would appear to provide the best balance of tradeoffs among the alternatives with respect to nine criteria that EPA uses to evaluate alternatives. EPA has also concluded that remediation of the adjacent BY Tank Farm would not impact the barrier constructed at the 200-BP-1 Operable. This section profiles the performance of the preferred alternative against the nine criteria, noting how it compares to the other options under consideration. A glossary of the evaluation criteria is provided.

Glossary of Evaluation Criteria

Overall Protection of Human Health and the Environment addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Compliance with ARARs addresses whether a remedy will meet all of the ARARs of other Federal and State environmental laws and/or justifies a waiver.

Long-Term Effectiveness and Performance refers to the magnitude of residual risk and the ability of a remedy to maintain reliable protection of human health and the environment over time once cleanup goals have been meet.

Reduction of Toxicity, Mobility, or Volume through treatment is the anticipated performance of the treatment technologies that may be employed in a remedy.

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

Implementability is the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement the solution.

Cost includes capital and operation and maintenance costs.

State Acceptance indicates whether, based on its review of the final RI/FS report and proposed plan, the State concurs with, opposes, or has no comment on the preferred alternative.

Community Acceptance will be assessed in the record of decision (ROD) following a review of the public comments received on the RI/FS report and the proposed plan.

Overall Protection

All alternatives, with the exception of the "No Action" alternative, would provide adequate protection of human health and the environment by reducing or controlling the risk through engineering or institutional controls. The preferred alternative provides long-term protection from direct contact exposure and biointrusion, and will reduce infiltration significantly, thereby decreasing the potential for soil contaminants to migrate to the groundwater.

Because the "No Action" alternative is not protective of human health and the environment, it is not considered further in this analysis as an option for this site.

Compliance with ARARs

All of the alternatives would meet their respective ARARs of Federal and State environmental laws. The preferred alternative provides long-term protection (design life 1,000 yr) of the groundwater due to uranium discharges in the 1,000-yr period of concern. The RCRA barrier is also designed to meet all the requirements of 40 CFR 264.310 and WAC 173-303-665 for landfill cover designs.

Long-Term Effectiveness and Permanence

The design life of the preferred alternative is 1,000 yr, which would provide adequate long-term protection of the groundwater, contact exposure, and biointrusion.

Reduction of Toxicity, Mobility, or Volume of the Contaminants Through Treatment

None of the alternatives under consideration reduces the toxicity of the contaminated soils, since radionuclides cannot be destroyed or transformed into a less hazardous substance. Only alternatives with soil washing are capable of reducing the volume of contaminated soils. The remaining alternatives, with the exception of the biointrusion barrier, will reduce the mobility of the contaminated soils.

Short-Term Effectiveness

All excavation alternatives result in a very high risk to the workers due to high levels of radioactivity. Offsite exposure could be eliminated with the construction of containment structures over the excavation site. Offsite and worker exposure to radiation is not a concern for the preferred alternative. Contaminated soils are overlain by 15 ft of soil which would shield workers from radiation during construction of the barrier.

Implementability

All excavation alternatives would be difficult to implement due to the use of shielding and robotics to protect workers from radiation exposure. The preferred alternative uses materials located on the Hanford Site and is constructed with standard earthmoving equipment. This alternative can be readily implemented.

State Acceptance

Ecology believes that the RCRA Barrier would provide the best alternative for permanent remediation of the 200-BP-1 Operable Unit.

Community Acceptance

Community acceptance of the preferred alternative will be evaluated after the public comment period ends and will be described in the ROD for the 200-BP-1 Operable Unit.

Costs

The following is a list of the estimated cost of each alternative.

Alternative	Cost, $
A No Action	1,140,000
B Institutional Controls	1,240,000
C Biointrusion Barrier	3,470,000
D RCRA Barrier	5,650,000
E Hanford Barrier	8,470,000
F Excavation and Soil Washing	182,000,000
G Excavation and Soil Washing with Vitrification	268,000,000
H Excavation and Fixation	81,000,000
I Landfill Disposal	82,000,000
J In Situ Fixation	53,000,000

SUMMARY OF THE PREFERRED ALTERNATIVE

In summary, alternative D, "RCRA Barrier" is the preferred alternative for the 200-BP-1 Operable Unit. This alternative is believed to provide the best tradeoffs among alternatives with respect to the evaluation criteria. Based on the information available at this time, EPA and Ecology believe the preferred alternative would be protective of human health and the environment, would comply with ARAR, would be cost effective, and would utilize a permanent solution without additional risks due to the implementation of the alternative.

It is important for the public to recognize that this recommendation is only preliminary and will only be finalized once all public comments have been adequately addressed. Therefore, the public are encouraged to provide comments on this plan and examine all the alternatives considered during the RI/FS for the 200-BP-1 Operable Unit.