DECLARATION OF THE RECORD OF DECISION

SITE NAME AND LOCATION

USDOE Hanford 200 Area
Hanford Site
Benton County, Washington

STATEMENT OF BASIS AND PURPOSE

This decision document presents the selected interim remedial measure (IRM) for the USDOE Hanford 200-ZP-1 operable unit, 200 Area, Hanford Site, Benton County, Washington. The IRM was chosen in accordance with the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA), as amended by the *Superfund Amendments and Reauthorization Act of 1986* (SARA), the *Hanford Federal Facility Agreement and Consent Order* (also known as the Tri-Party Agreement or TPA), and to the extent practicable, the *National Oil and Hazardous Substances Pollution Contingency Plan* (NCP). This decision is based on the Administrative Record for this site.

The State of Washington concurs with the selected remedy.

ASSESSMENT OF THE SITE

Actual or threatened releases of hazardous substances from this site, if not addressed by implementing the response action selected in this interim Record of Decision (ROD), may present a current or potential threat to the public health, welfare, or the environment.

DESCRIPTION OF THE SELECTED REMEDY

The selected remedy uses groundwater pump and treat and is intended to minimize further migration of carbon tetrachloride, chloroform, and trichloroethylene (TCE) in the groundwater of the 200 West Area. To do this, the IRM is designed to stabilize and reduce contaminant mass in the high concentration portion of the plume. The high concentration portion of the plume corresponds to the area within the 2000 - 3000 parts per billion (ppb) contour of carbon tetrachloride. A more detailed discussion of conceptual design for the IRM is contained in the *Engineering Evaluation/Conceptual Plan for the 200-ZP-1 Operable Unit Interim Remedial Measure* which is available in the Administrative Record (AR). This action will occur in three phases. Pilot scale operations are underway to determine the effectiveness of the system. Initial results indicate that expansion of the system is warranted. The degree of expansion will be based on the amount of groundwater extraction and treated water reinjection that is deemed feasible and necessary to contain the high concentration area. It is estimated that the initial expansion (Phase II) will upgrade the total pump and treat

capacity to about 570 liters per minute (150 gallons per minute). Up to three new wells may need to be installed to support scale-up to 570 liters per minute (150 gallons per minute). This system will be operated to continue gathering data on the effects of pump and treat on plume containment and mass removal. A final expansion (Phase III) will be initiated in fiscal year 1998, resulting in a pumping rate in the range of 570 to 1900 liters per minute (150 to 500 gallons per minute) in order to meet the objectives of mass removal and plume containment. Initial estimates show that up to 19 new wells may need to be installed to support full-scale pumping operations. Pump-and-treat operations would continue until selection of a final remedy, or until such time that DOE demonstrates to EPA that no further interim pump and treat operations would be required to protect human health and the environment. The actual time required will be determined as the interim action progresses. It is anticipated that this action, if successful, would continue until at least the year 2000.

Monitoring will be performed throughout the interim action activities. Additional information will be collected to support the expansion on an as-needed basis.

The treatment train for the Phase II (treatment system upgraded to 570 liters per minute (150 gallons per minute)) and Phase III (treatment system upgraded up to 1,900 liters per minute(500 gallons per minute)) of this interim remedial measure is air stripping with vapor phase activated carbon used to capture stripped contaminants. The treated groundwater will be reinjected into the aquifer through wells located within the area of contamination.

STATUTORY DETERMINATIONS

This interim action is protective of human health and the environment in the short term and is intended to provide adequate protection until a final ROD is signed, complies with federal and state applicable or relevant and appropriate requirements for the three primary contaminants identified in this limited scope action, and is cost effective. Although this interim action is not intended to address fully the statutory mandate for permanence and treatment to the maximum extent practicable, this interim action does utilize treatment and thus is in furtherance of that statutory mandate. This action does not constitute the final remedy for the 200-ZP-1 Operable Unit. However, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element is addressed in this remedy. Subsequent actions are planned to address fully the threats posed by this operable unit. Because this is an interim action ROD, review of this operable unit and of this remedy will be ongoing as the three parties continue to develop and evaluate final remedial alternatives for the 200-ZP-1 Operable Unit.

Signature sheet for the Record of Decision for the USDOE Hanford 200-ZP-1 Operable Unit Interim Remedial Measure between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

R D Gatt for

John D. Wagoner
Manager, Richland Operations
United States Department of Energy

6/5/95
Date

Signature sheet for the Record of Decision for the USDOE Hanford 200-ZP-1 Operable Unit 200 NPL Site Interim Remedial Measure between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Michael A. Wilson

Michael Wilson
Program Manager, Nuclear and Mixed Waste Program
Washington State Department of Ecology

6-5-95
Date

Signature sheet for the Record of Decision for the USDOE Hanford 200 ZP-1 Operable Unit, 200 Area NPL Site Interim Remedial Measure between the United States Department of Energy and the United States Environmental Protection Agency, with concurrence by the Washington State Department of Ecology.

Chuck Clarke

Chuck Clarke
Regional Administrator, Region 10
United States Environmental Protection Agency

MAY 24 1995
Date

DECISION SUMMARY

INTRODUCTION

The U.S. Department of Energy's Hanford Site was listed on the National Priorities List (NPL) in July 1989 under authorities granted by the *Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980*, as amended by the *Superfund Amendments and Reauthorization Act (SARA) of 1986*. The Hanford Site was divided and listed as four NPL Sites: the 1100 Area, the 200 Area, the 300 Area, and the 100 Area.

This action is being taken as an interim action and is expected to become part of a final remedy selection for the 200-ZP-1 operable unit which is part of the 200 Area NPL site.

I. SITE NAME, LOCATION, AND DESCRIPTION

The Hanford Site is a 1,450-square kilometers (560 square miles) Federal facility located along the Columbia River in southeastern Washington, situated north and west of the cities of Richland, Kennewick, and Pasco, an area commonly known as the Tri-Cities (Figure 1). The 200 Area NPL Site is located in the central portion of the Hanford Site, and covers less than 40-square kilometers (15 square miles). The 200-ZP-1 operable unit is located in the 200 West Area of the 200 Area NPL site. Contamination to the groundwater in the 200-ZP-1 Area resulted from historic discharges from the Plutonium Finishing Plant.

The land surrounding the Hanford Site is used primarily for agriculture and livestock grazing. The major population center near the Hanford Site is the Tri-Cities, with a combined population of approximately 100,000.

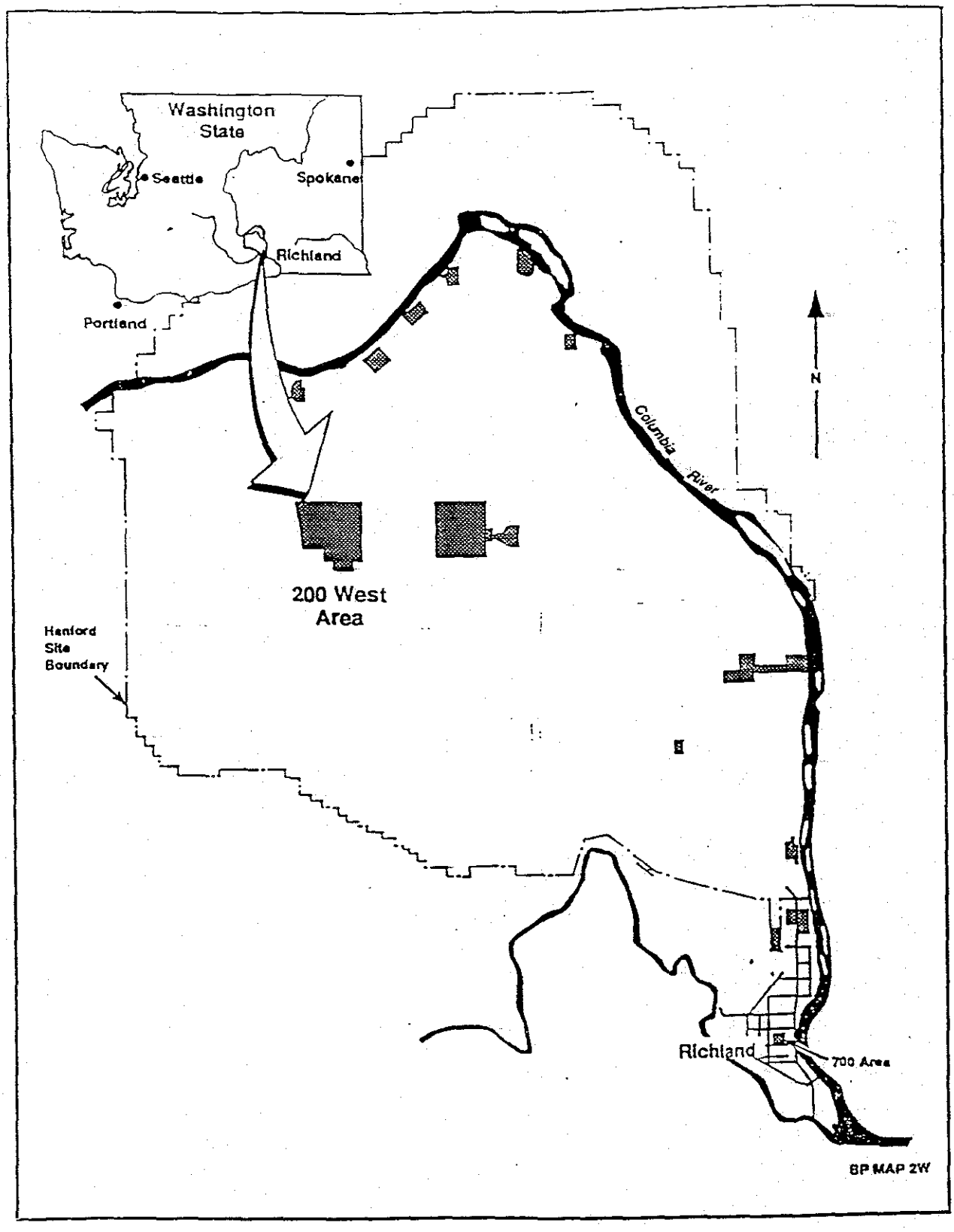
The land is semi-arid with a sparse covering of cold desert shrubs and drought resistant grasses. Forty percent of the area's annual six and one quarter inches of rain occurs between November and January. In part due to the semi-arid conditions, no wetlands are contained within the boundary of 200-ZP-1.

The Columbia River is located approximately ten miles east of the 200 West Area. The 200 West Area is not within the 100 year floodplain of the river.

II. SITE HISTORY AND ENFORCEMENT ACTIONS

The Hanford Site was established during World War II as part of the Army's "Manhattan Project" to produce plutonium for nuclear weapons. Hanford Site operations began in 1943, and DOE facilities are located throughout the Site and the City of Richland. The land occupied by the Hanford Site was ceded to the United States by various Native American tribes in treaties signed in 1855. The treaties reserve certain rights to fisheries and to the use of open and unclaimed land. Certain portions of the Site are known to have cultural

Figure 1. Location of Hanford Site and 200 West Area.



significance and may be eligible for listing in the National Register of Historical Places.

In 1988, the Hanford Site was scored using EPA's Hazard Ranking System. As a result of the scoring, the Hanford Site was added to the NPL in July 1989 as four sites (the 1100 Area, the 200 Area, the 300 Area, and the 100 Area). Each of these areas was further divided into operable units (a grouping of individual waste units based primarily on geographic area and common waste sources).

In anticipation of the NPL listing, DOE, EPA, and Ecology entered into a Federal Facility Agreement in May 1989. This agreement established a procedural framework and schedule for developing, implementing, and monitoring remedial response actions at the Hanford Site. The agreement also addresses Resource Conservation and Recovery Act (RCRA) compliance and permitting.

The 200-ZP-1 operable unit is one of two groundwater operable units located in the 200 West Area and is shown in figure 2. Contamination in the 200-ZP-1 operable unit resulted from historic discharges to three primary liquid waste disposal sites. These sites are the 216-Z-9 trench, the 216-Z-1A tile field, and the 216-Z-18 crib. The predominant contaminants in the waste stream were carbon tetrachloride and plutonium. Monitoring data indicates that almost all of the plutonium has bound to the soil column and little has reached the groundwater. It is estimated that 600 to 1,000 metric tons of carbon tetrachloride was discharged to the soil from 1955 to 1973.

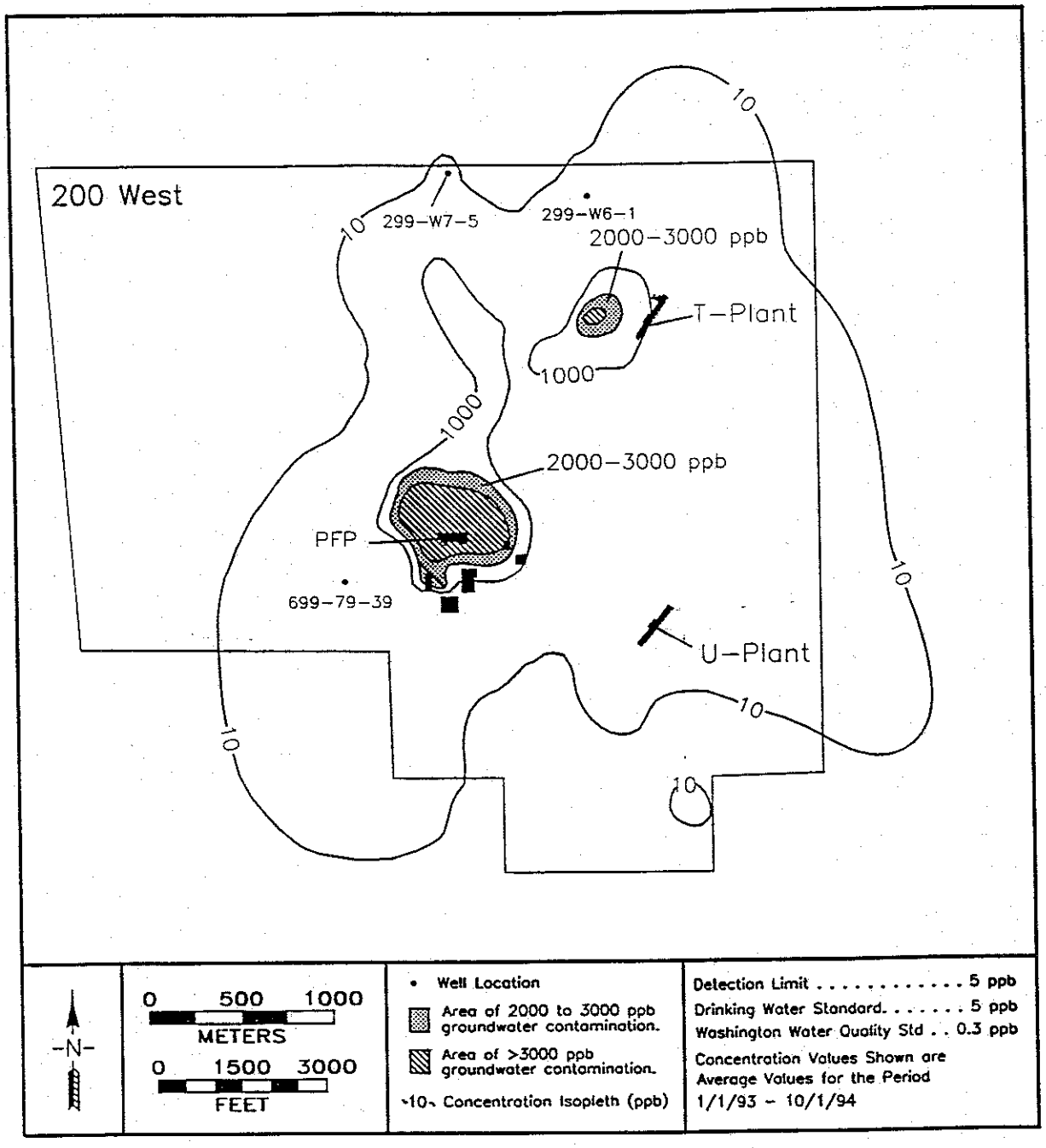
In 1991 a CERCLA removal action was initiated utilizing vapor extraction systems to (1) remove the carbon tetrachloride from the vadose zone; and (2) prevent further migration to the groundwater. To date, over 45,360 kilograms (100,000 pounds) of carbon tetrachloride have been removed from the soil column. It is anticipated that the removal action and this groundwater interim remedial action will continue until at least the year 2000.

This Interim Remedial Measure addresses the carbon tetrachloride dissolved in the groundwater, and assists in identifying the location of the unaccounted carbon tetrachloride disposed in the 200 West Area.

III. HIGHLIGHTS OF COMMUNITY PARTICIPATION

DOE, Ecology, and EPA (the Parties) developed a *Community Relations Plan* (CRP) in April 1990 as part of the overall Hanford Site restoration. The CRP was designed to promote public awareness of the investigations, and promote public involvement in the decision-making process. The CRP summarizes concerns that the Parties are aware of based on community interviews. Since that time, the Parties have held several public meetings and sent out numerous fact sheets in an effort to keep the public informed about Hanford Site cleanup issues. The CRP was updated in 1993 to enhance public involvement.

fig 2


200 West
299-W7-5
299-W6-1
2000-3000 ppb
T-Plant
1000
1000
2000-3000 ppb
PFP
699-79-39
U-Plant
10
10
10
10
10
10
-N-
0 500 1000
METERS
0 1500 3000
FEET
Well Location
Area of 2000 to 3000 ppb groundwater contamination.
Area of >3000 ppb groundwater contamination.
-10- Concentration Isopleth (ppb)
Detection Limit . . . . . 5 ppb
Drinking Water Standard. . . . . 5 ppb
Washington Water Quality Std . . 0.3 ppb
Concentration Values Shown are Average Values for the Period 1/1/93 - 10/1/94

The *200 West Groundwater Aggregate Area Management Study Report*, the *Interim Remedial Measure Proposed Plan for the 200-ZP-1 Operable Unit, Hanford, Washington*, and the *Engineering Evaluation/Conceptual Plan for the 200-ZP-1 Operable Unit Interim Remedial Measure* were made available on October 17, 1994 to the public in both the Administrative Record and the Information Repositories maintained at the locations listed below:

A fact sheet, which explained the proposed action, was mailed to approximately 2,000 people. In addition, an article appeared in the bi-monthly newsletter, the *Hanford Update*, detailing the start of public comment. The *Hanford Update* is mailed to over 5,000 people. The Proposed Plan was mailed to all people on the Hanford Advisory Board mailing list.

ADMINISTRATIVE RECORD (contains all project documents)

U.S. Department of Energy
Richland Field Office
Administrative Record Center
740 Stevens Center
Richland, Washington 99352

EPA Region 10
Superfund Record Center
1200 Sixth Avenue
Park Place Building, 7th Floor
Seattle, Washington 98101

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

INFORMATION REPOSITORIES (contains limited documentation)

University of Washington
Suzzallo Library
Government Publications Room
Mail Stop FM-25
Seattle, Washington 98195

Gonzaga University
Foley Center
E. 502 Boone
Spokane, Washington 99258

Portland State University
Branford Price Millar Library
Science and Engineering Floor
SW Harrison and Park
P.O. Box 1151
Portland, Oregon 97207

DOE Richland Public Reading Room
Washington State University, Tri-Cities
100 Sprout Road, Room 130
Richland, Washington 99352

The notice of the availability of these documents was published in the *Seattle PI/Times*, the *Spokesman Review-Chronicle*, the *Tri-City Herald*, and the *Oregonian* on October 16, 1994. The public comment period was held from October 17, 1994, through November 30, 1994. This decision document presents the selected interim remedial measure for the 200 ZP-1 operable unit at the Hanford Site, Richland, Washington, chosen in accordance with CERCLA, as amended by SARA, and to the extent practicable, the NCP. The decision for this site is based on the Administrative Record. As part of the Proposed Plan a public meeting was offered to be held if requested. No such requests were received by EPA. In addition, the Proposed Plan was discussed at the Hanford Advisory Board's November meeting. This meeting is advertised and is open to the public. The public is encouraged to comment during these meetings. No members of the public, outside the advisory board, commented on the Proposed Plan at the meeting.

IV. SCOPE AND ROLE OF RESPONSE ACTION WITHIN SITE STRATEGY

This action is being taken in an effort to address one of the most serious groundwater problems on the Hanford Site. It is believed that, by reducing the mass of contaminants within the high concentration plume, the potential for spread to an offsite receptor above a risk threshold can be reduced or eliminated. This action will facilitate investigation of 200-ZP-1 Operable Unit by providing information about aquifer parameters based on data from the groundwater extraction and monitoring wells. In addition, this interim action will provide site specific performance information that can be used to evaluate alternative technologies, determine optimum process sizing, and estimate costs. This interim remedial action is expected to be consistent with planned future actions. Because this interim action is not the final remedy for the 200-ZP-1 Operable Unit, additional action may be necessary to address the potential threats posed by this site.

V. SITE CHARACTERISTICS

A. Site Geology and Hydrology

1. Geology

The Hanford Site is located in the Pasco Basin, which is a topographic and structural basin situated in the northern portion of the Columbia Plateau. The plateau is divided into three general structural subprovinces: the Blue Mountains; the Palouse; and, the Yakima Fold Belt. The Hanford Site is located near the junction of the Yakima Fold Belt and the Palouse subprovinces as shown in Figure 3.

The 200 Area is located in the center of the Hanford Site. The geologic structure beneath the 200 Area is similar to much of the rest of the Hanford Site, which consists of three distinct levels of soil formations. The deepest level is a thick series of basalt flows that have been warped and folded, resulting in protrusions that crop out as rock ridges in some places. Layers of silt, gravel, and sand (known as the Ringold Formation) form the middle level. The uppermost level is known as the Hanford formation and consists of gravel and sands deposited by catastrophic floods during glacial retreat. A geologic cross section for the 200 West Area is shown in Figure 4. Both confined and unconfined aquifers can be found beneath the Hanford Site.

2. Hydrology

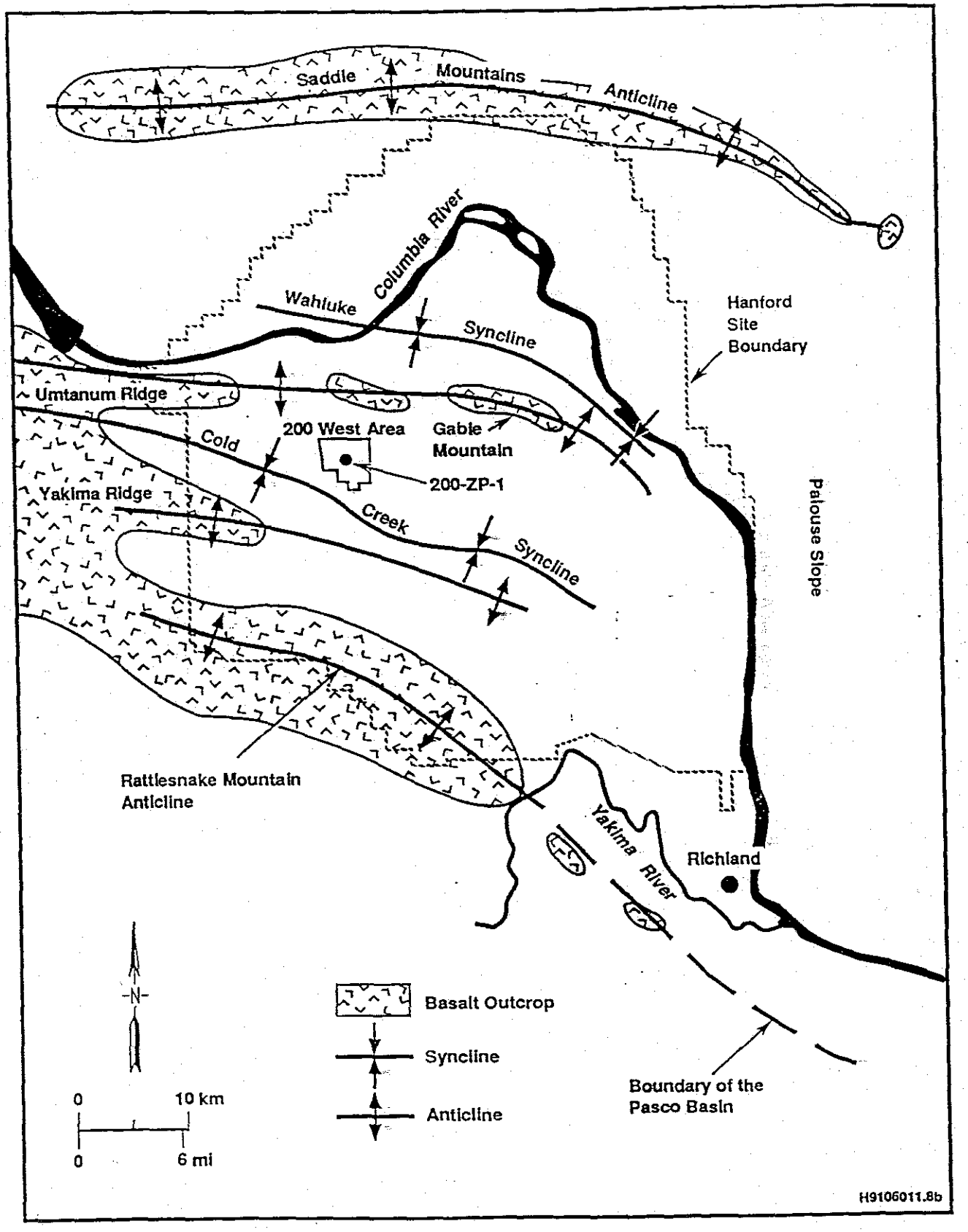
In the 200 West Area, the uppermost aquifer is located in the Ringold Formation and displays unconfined to locally-confined or semi-confined conditions. The depth to groundwater ranges from approximately 58 meters to 82 meters in the 200 West Area. In the area near the carbon tetrachloride disposal sites the depth to groundwater is from 60 to 66 meters. The saturated thickness of the unconfined aquifer around the Plutonium Finishing Plant is approximately 67 meters. Groundwater recharge to the aquifer below the 200 Area has been primarily from process effluents. The hydraulic conductivity for the Ringold Formation varies widely. It is estimated that the hydraulic conductivity ranges from 0.03 to 183 meters/day. The Ringold Formation is made up of a series of alluvial sands and gravels. Groundwater flow direction is thought to be from the southwest.

B. Nature and Extent of Contamination

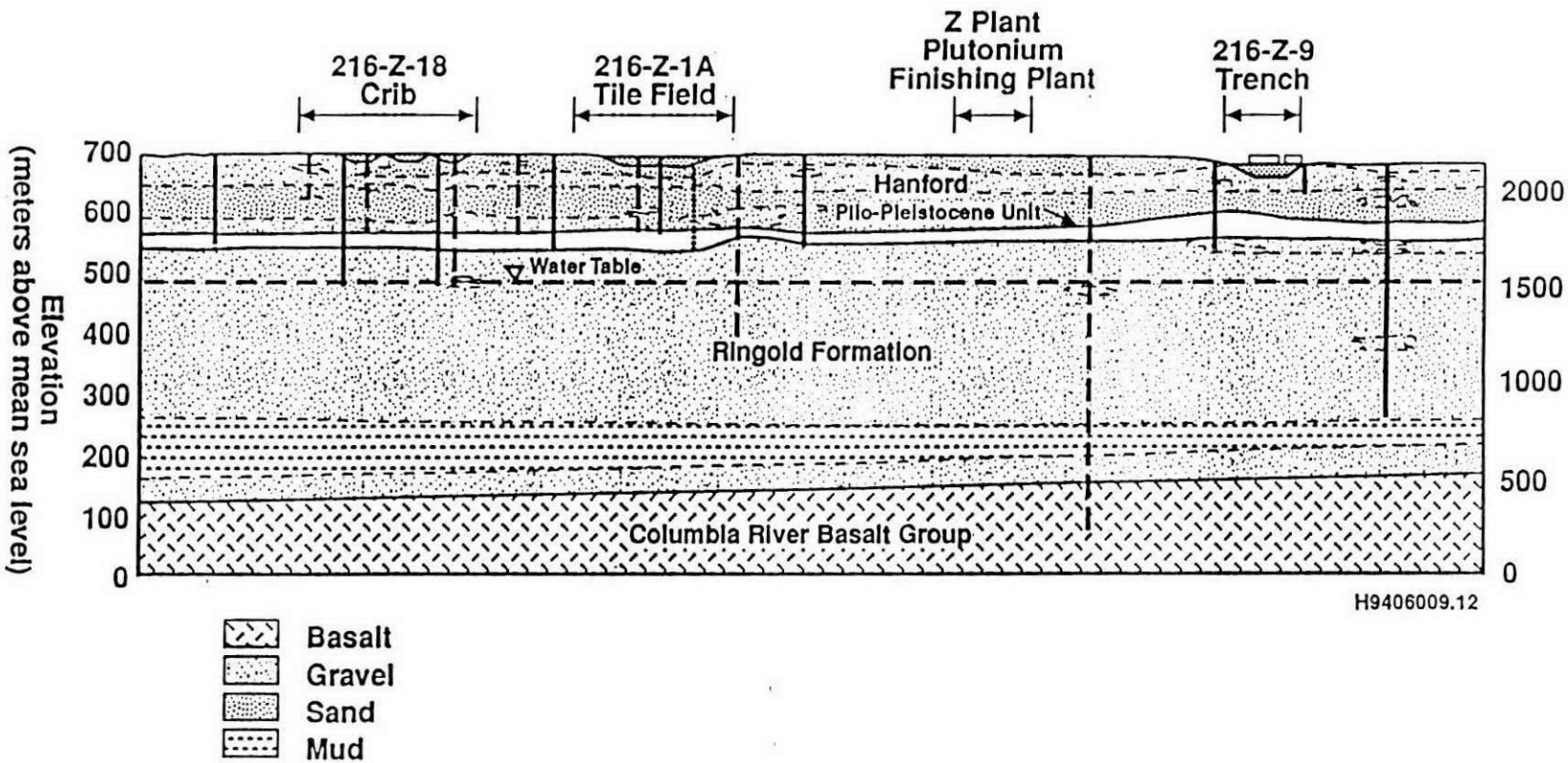
The 200 West Area is an operational area of approximately 5.1 square kilometers where spent nuclear fuel was processed in four main facilities: U Plant (primarily uranium recovery); Plutonium Finishing Plant (PFP) (primarily plutonium separation and recovery); and S and T Plants (primarily uranium and plutonium separation from irradiated fuel rods).

fig 3

Geologic Structure of the Hanford Site



Generalized Southwest-Northeast Geologic Cross Section



Mixtures of carbon tetrachloride containing other organics were used at PFP to recover plutonium from the processing waste streams. Spent carbon tetrachloride mixtures were discharged to the ground at the 200 West Area. Approximately 600 to 1,000 metric tons of carbon tetrachloride waste were discharged to the ground between 1955 and 1973, resulting in extensive contamination of the soil and groundwater beneath the 200 West Area. Elevated concentrations of chloroform and TCE are also found generally coincident with the carbon tetrachloride in the groundwater. Although these chemicals are not known to have been used in plutonium recovery processing, the association of the three chemicals suggest some linkage. Chloroform may be a degradation product of carbon tetrachloride, while TCE may have been used as a maintenance chemical. It has been determined that a portion of the carbon tetrachloride was used as a degreaser and if removed, this waste may be classified as a listed dangerous waste. However, as long as substantial reduction of concentration of hazardous substances is accomplished prior to reinjection into the aquifer, and such reinjection is protective of human health and the environment , reinjection of such treated effluent classified as dangerous waste is allowed under RCRA Section 3020 (b).

Groundwater occurs about 64 meters below the ground surface and generally flows from west to east beneath the 200 West Area. However, historic discharges of large volumes of waste water have created an artificial groundwater mound that causes groundwater contaminated with carbon tetrachloride, chloroform, and TCE to flow towards the north and northeast of 200-ZP-1.

Monitoring programs have been in place for many years at the Hanford Site. Information from these monitoring programs was used to determine that an action was needed at 200-ZP-1. Carbon tetrachloride is distributed in a plume that extends under most of the 200 West Area, although the highest concentration areas of the plume are located within 200-ZP-1. The maximum average concentration of carbon tetrachloride found in one well in 200-ZP-1 groundwater is approximately 7,000 parts per billion (ppb). Some of the carbon tetrachloride may be present in the aquifer as dense non-aqueous phase liquids (DNAPL). Chloroform is generally associated with the carbon tetrachloride in its areal distribution; its greatest measured average concentration in the groundwater is currently about 170 ppb. TCE is distributed in three smaller plumes that are not as clearly associated with the carbon tetrachloride plume, TCE is found in the groundwater at concentrations up to about 25 ppb.

Plutonium was also discharged to the soil column as part of the waste stream. However, monitoring indicates that almost all of the plutonium has bound to the soil column and little has reached the groundwater.

Since late 1990, DOE has been conducting a removal action in the 200 West Area to remove carbon tetrachloride from the unsaturated soils between the ground surface and water table so as to minimize further movement of the carbon tetrachloride to uncontaminated areas. The removal action is being taken to ensure that the environment and public health are adequately protected, and to reduce the threat of further groundwater contamination. This action has contributed significant information regarding the origin, nature, and extent of carbon

tetrachloride, as well as other site characteristics needed for evaluating remedial alternatives for both source and groundwater operable units in the 200 West Area.

VI. SUMMARY OF SITE RISKS

During the assessment and information gathering phase, DOE performed an initial risk-based screening, as well as a comparison of known contaminant concentrations in 200-ZP-1 groundwater against pertinent federal and state groundwater standards. The risk-based screening was qualitative in nature and was designed to prioritize contaminant plumes. The screening concluded that carbon tetrachloride, chloroform, and TCE present a high potential risk due to their carcinogenic characteristics, and that these contaminants had been consistently detected in the groundwater at concentrations that significantly exceeded drinking water standards. It should be noted that the contaminated groundwater in 200-ZP-1 is not currently used as a drinking water source.

Carbon tetrachloride is acutely toxic and has been reported in toxicological literature to cause nerve and liver damage in humans; animal studies indicate that carbon tetrachloride can cause liver tumors. Carbon tetrachloride has been found to exceed the Maximum Contaminant Level (MCL) for drinking water of 5 ppb by more than 1,000 times in 200-ZP-1 groundwater. Chloroform is acutely toxic, has been reported in toxicological literature to be a possible mutagen and teratogen, and is a suspected carcinogen. Chloroform has been found to exceed the MCL of 100 ppb in 200-ZP-1 groundwater. TCE is moderately toxic, has been reported in toxicological literature to damage the liver and other organs, and is a suspected carcinogen. TCE has been found to exceed the MCL of 5 ppb by almost 5 times in 200-ZP-1 groundwater.

VII. REMEDIAL ACTION OBJECTIVES

Interim remedial actions conducted during this action will focus on removing the contaminant mass from the unconfined aquifer and controlling movement of these contaminants in the groundwater out of the 200 West Area. Specific objectives of the interim action include the following:

- Reducing contamination in the area of highest concentrations of carbon tetrachloride.
- Preventing further movement of these contaminants from the highest concentration area.
- Providing information that will lead to development of a final remedy that will be protective of human health and the environment.

Major applicable or relevant and appropriate requirements (ARARs) include drinking water standards, state effluent discharge standards, solid and hazardous waste designation and management standards, and air emission standards (e.g., for venting releases from tanks or piping). An IRM is an interim action designed to reduce risk through contaminant mass reduction. This action is an interim measure which will become part of a total remedial action that will attain all applicable or relevant and appropriate requirements as provided for in Section 121 of CERCLA.

The treated groundwater will be re-introduced into the aquifer via wells located within the plume boundary. The goal of this action, as detailed in the Proposed Plan, is to remove the three primary contaminants from the effluent stream to meet the established MCLs. It should be noted that there is a potential for nitrate levels in the treated groundwater to be above the drinking water standard. However, because the scope of this action is for removal of carbon tetrachloride, chloroform, and TCE, discharges of nitrates and radionuclides are not addressed in this interim action.

VIII. DESCRIPTION OF ALTERNATIVES

Alternative 1: No Action

This alternative would consist of allowing contaminants to migrate, dissipate, and naturally degrade over time until a final remedy is selected and implemented.

Alternative 2: Groundwater Pump and Treat

This alternative will consist of extracting groundwater; treating it to remove carbon tetrachloride, TCE, and chloroform; and then returning the treated water to the aquifer. Treated groundwater would be returned through wells that are situated to help control migration of contaminants from the high concentration portion of the plume. This alternative would occur in the following phases:

- The first phase consists of pilot-scale operations (up to a capacity of about 190 liters per minute ((50 gallons per minute) and focused data collection activities (i.e., refinement of the hydraulic properties of the aquifer) to support remedial design. Pilot-scale treatment operations are underway to evaluate liquid-phase granular activated carbon. Design studies are underway to evaluate the effectiveness of air stripping and vapor-phase granular activated carbon.Pilot-scale treatment operations will provide system and engineering data in three key areas: process effectiveness; operating parameters; and resource requirements. Information on these areas will allow optimization of the treatment system(s) and will support phased expansion of the pump and treat system (discussed below). It should be noted that a pilot scale treatability test began August 29, 1994. The pilot-scale system will continue to operate as Phase I of this IRM until October 1995 when the next system will be

available to begin Phase II. Phase I of this action will not meet the standard for secondary containment for tank systems. However, because Phase I is a continuation of the treatability test system and operation is short in duration, the current treatability test system will be allowed to continue without secondary containment for tank systems. Therefore, an interim action waiver for secondary containment is invoked for Phase I operations. This interim action waiver will cease to exist when Phase II operations is initiated as Phase II operations will meet the secondary containment standards for tanks.

- Subsequent phases will expand the pump and treat system, additional wells will be installed, and the effects of the pump and treat will be monitored. The degree of expansion will be based on the amount of groundwater extraction and treated water reinjection that is deemed necessary to contain the high concentration area. It is estimated that the first phase of this expansion (Phase II) will upgrade the total pump and treat capacity to about 570 liters per minute (150 gallons per minute). This system will be operated to continue gathering data on the effects of pump and treat on plume containment and mass removal. Monitoring will be performed during Phase II operations to determine optimal groundwater withdrawal and return rates; a refined knowledge of contaminant distribution within the aquifer; knowledge of spacing requirements for the network of wells to support the pump and treat; and whether or not ongoing sources of contaminants exist that might not be addressed by pump and treat.

  A final phase of expansion (Phase III) will be initiated in fiscal year 1998, resulting in a pumping rate in the range of 570 to 1,900 liters per minute (150 to 500 gallons per minute) to meet the objectives of this interim action. Pump-and-treat operations will continue until selection of a final remedy, or until DOE demonstrates to EPA that further interim action pump and treat is no longer required to protect human health and the environment. It is anticipated that this action will continue until at least the year 2000. Additional wells will be installed for extraction and return, and for monitoring progress of the pump-and-treat activities. Up to 19 wells may need to be installed to support this action. In addition to the focused monitoring that will be performed during the data collection activities, ongoing monitoring will occur throughout the interim action activities. Additional information will be collected to support the expansion on an as-needed basis.

  The water will be discharged through wells located at 200-ZP-1. The contaminant levels remaining in the effluent will meet the drinking water standards of the three contaminants addressed by this IRM.

  All other waste generated during this action will be handled per DOE and EPA approved waste management practices. Spent carbon canisters will be either regenerated or disposed of at an approved facility. Contaminated clothing, equipment, and other waste material will either be shipped to an appropriate

facility or if the material exceeds the disposal facility acceptance criteria it will be stored at the waste site accumulation area until the material is treated to meet acceptance criteria or DOE requests a treatability variance from EPA and it is approved.

IX. SUMMARY OF COMPARATIVE ANALYSIS OF ALTERNATIVES

A. Threshold Criteria

1. Overall Protection of Human Health

The no-action alternative does not change the overall protection of human health and the environment. Alternative 2 would remove contaminant mass from the aquifer and contain the high concentration area of the plumes. Therefore, it will improve overall protection of human health and the environment.

2. Compliance with ARARs

Major applicable or relevant and appropriate requirements (ARARs) include drinking water standards, state effluent discharge standards, solid and hazardous waste designation and management standards, and air emission standards (e.g., for venting releases from tanks or piping). An IRM is an interim action designed to reduce risk through contaminant mass reduction. This action is an interim measure which will become part of a total remedial action that will attain all applicable or relevant and appropriate requirements as provided for in Section 121 of CERCLA.

The no-action alternative would not invoke any ARARs that would need to be satisfied.

Alternative 2 is intended to meet the drinking water standards, state effluent discharge standards, and RCRA hazardous waste management standards of the three primary contaminants. By reducing the mass of the three primary contaminants it will reduce the further degradation of groundwater in the 200 West Area. Secondary waste and other materials generated during implementation of Alternative 2, as well as potential air releases, would be managed to satisfy ARARs.

B. Primary Balancing Criteria

3. Long-Term Effectiveness and Permanence. The no-action alternative provides no long-term effectiveness or permanence. Alternative 2 would not, by itself, achieve long-term effectiveness and permanence. However, contaminant removal and containment through

pump-and-treat would provide a long-term and permanent reduction in risk and in contaminant migration. At the same time, Alternative 2 would improve the potential for future final remedies to be implemented that will achieve long-term effectiveness and permanence.

4. Reduction of Toxicity, Mobility, or Volume. The no-action alternative provides no reduction of toxicity, mobility, or volume through treatment. Alternative 2 would provide treatment of the groundwater contaminants, thereby reducing the volume of contaminants that may migrate and reducing the overall toxicity risk of the groundwater.

5. Short-term Effectiveness. The no-action alternative has no short-term effect on the contamination. Alternative 2 would offer short-term effectiveness by limiting the migration of the contamination and by reducing contamination in the areas of highest concentration.

6. Implementability. The no-action alternative is easily implemented, because no changes would be made to the site. Alternative 2 could be implemented using available technology. It would be necessary to demonstrate and optimize both the pumping and treatment aspects of Alternative 2 in order to accomplish an efficient and effective implementation.

7. Cost. The no-action alternative has essentially no added cost. The cost estimates for Alternative 2 are presented in Table 2. These estimates are based on various assumptions, including (among others), the following:

- Procurement of three air stripping/vapor phase activated carbon adsorption treatment systems, operating at a total capacity of 1,900 liters pre minute (500 gallons per minute)
- Installation of a total of 10 new extraction, 5 injection, and 4 monitoring wells
- Focused data collection and monitoring activities as detailed in Section VIII.

8. State Acceptance. The State of Washington supports Alternative 2.

9. Community Acceptance. This action was first proposed as part of the fourth amendment to the Tri-Party Agreement and received favorable public comments. Final community acceptance of the alternatives was evaluated during the public comment period. There appears to be community support for this action. A summary of public comments on the Interim Remedial Measure is provided in the Responsiveness Summary attached to this Interim Action ROD.

X. SELECTED REMEDY

The selected remedy uses groundwater pump and treat and is intended to minimize further migration of carbon tetrachloride, chloroform, and trichloroethylene (TCE) in groundwater at the 200 West Area. To do this, the IRM is designed to stabilize and reduce contaminant mass in the high concentration portion of the plume. The high concentration portion of the plume corresponds to the area within the 2000 - 3000 parts per billion (ppb) contour of carbon tetrachloride.

This interim action will be implemented in a phased approach. Phase I operations will be to continue the operation of the treatability test system. Phase I of this action will not meet the RCRA standard for secondary containment. However, because Phase I is a continuation of the treatability test system and operation is short in duration, the current treatability test system will be allowed to continue without secondary containment for tank systems. Therefore, an interim action waiver for secondary containment is invoked for phase I operations. This interim action waiver will cease to exist when Phase II operations is initiated as Phase II operations will meet secondary containment standards for tank systems. Subsequent phases will expand the pump and treat system, additional wells will be installed, and the effects of the pump and treat will be monitored. The degree of expansion will be based on the amount of groundwater extraction and treated water reinjection that is deemed necessary to contain the high concentration area. It is estimated that the first phase of this expansion (Phase II) will upgrade the total pump and treat capacity to about 570 liters per minute (150 gallons per minute). Up to three new wells may need to be installed to support scale up to 570 liters per minute (150 gallons per minute). This system will be operated to continue gathering data on the effects of pump and treat on plume containment and mass removal. Pumping efforts will be increased if outward migration of the plume is observed.

In fiscal year 1998, phase III will be completed, resulting in a pumping rate in the range of 570 to 1,900 liters per minute (150 to 500 gallons per minute) as needed to meet the objectives of this interim action. Initial estimates show that up to 19 new wells may need to be installed to support full-scale pumping operations. Pump-and-treat operations will continue until selection of a final remedy, or until DOE demonstrates to EPA that further interim pump and treat operations will no longer be required to protect human health and the environment. It is anticipated that this action, if successful, will continue until at least the year 2000.

In addition to the focused monitoring that will be performed during the data collection activities, ongoing monitoring will occur throughout the interim action activities. Additional information will be collected to support the expansion , on an as-needed basis.

The treatment train for Phase II (treatment system upgraded to 570 liters per minute (150 gallons per minute)) and Phase III (treatment system upgraded up to 1,900 liters per minute (500 gallons per minute)) of this interim remedial measure is air stripping with vapor phase activated carbon used to capture stripped contaminants. The treated groundwater will be

reinjected into the aquifer through wells located within the area of contamination and will meet the discharge criteria for the three primary contaminants.

All other waste generated during this action will be handled per DOE and EPA approved waste management practices. Spent carbon canisters will be either regenerated or disposed of at an approved facility. Contaminated clothing, equipment, and other waste material will either be shipped to an appropriate facility or if material exceeds the disposal facilities waste acceptance criteria the material will be stored at the waste site accumulation area until the material is treated to meet the acceptance criteria or DOE requests a treatability variance from EPA and it is approved.

In addition to the pump and treat action, a DNAPL investigation will occur at the 216-Z-9 trench area. If DNAPL's are found, appropriate response actions will be determined and this ROD will be modified as necessary.

XI. STATUTORY DETERMINATIONS

Under CERCLA Section 121, selected remedies must be protective of human health and the environment, comply with ARARs, be cost effective, and utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, CERCLA includes a preference for remedies that employ treatment that significantly and permanently reduces the volume, toxicity, or mobility of hazardous wastes as their principal element. The following sections discuss how the selected remedy meets these statutory requirements.

A. Protection of Human Health and the Environment

The selected interim remedy helps protect human health and the environment by removal and treatment of contaminated groundwater. Implementation of this remedial action will not pose unacceptable short-term risks to site workers. The selected remedy is the best alternative as it uses proven technology and, if successful, will remove significant amounts of contaminants from the aquifer.

B. Compliance with ARAR's

The following state and federal ARARs have been identified for this interim remedial measure:

Chemical-Specific ARARs

- *Safe Drinking Water Act* (SDWA), 40 CFR Part 141, Maximum Contaminant Levels (MCLs) for public drinking water supplies are relevant and appropriate for

setting groundwater cleanup levels and evaluating the effectiveness of the treatment train. The treatment train will be designed to meet MCLs for carbon tetrachloride, chloroform and TCE.

Action-Specific ARARs

- *RCRA Land Disposal Restrictions* (40 CFR 268) are applicable for secondary waste (protective clothing, sampling equipment etc..) which comes in contact with the contaminated water.

- *Minimum Standards for Construction and Maintenance of Wells* (Chapter 173-160 and 162 WAC) Applicable regulations for the location, design, construction, and abandonment of water supply and resource protection wells.

- *RCRA Subtitle C* (40 CFR 262) establishes standards for generators of hazardous wastes for the treating, storage, and shipping of wastes. Applicable to the transportation of hazardous wastes.

- *RCRA Subtitle C* (40 CFR 264) Hazardous waste treatment, storage, and disposal applicable to design and operation of treatment system.

  Phase I of this action will not meet the standard for secondary containment for tank systems. However, because Phase I is a continuation of the treatability test system and operation is short in duration, the current treatability test system will be allowed to continue without secondary containment for tank systems. Therefore, an interim action waiver for secondary containment is invoked for Phase I operations. This interim action waiver will cease to exist when Phase II operations is initiated as Phase II operations will meet secondary containment standards for tank systems.

- *RCRA Section 3020* governs the reinjection of hazardous waste into an aquifer. Applicable. This interim action will meet the requirements of RCRA Section 3020. Therefore, reinjection of this listed waste into the aquifer is allowed.

- *Washington Administrative Code* (WAC 173-303), state dangerous waste regulations, applicable for the handling of all secondary waste.

- *Washington Administrative Code* (WAC 173-218), state underground injection standards. Relevant and appropriate for the reinjection of water back into the aquifer.

- *Radioactive Airborne Emissions* (40 CFR Part 264, Subpart H); would be applicable if radionuclides are encountered in the groundwater. To date, no radionuclides have been detected in the groundwater plume.

- *Washington Administrative Code* (WAC 173-460), establishes acceptable source impact levels for carcinogenic and acutely toxic air pollutants. This is applicable and this action will achieve discharge criteria by absorbing the contaminants on granulated activated carbon.

Location-Specific ARARs

- *National Historic Preservation Act* (16 CFR 470, et. seq.) Applicable for any intrusive work.

- *Endangered Species Act* (16 U.S.C. 1531 et.seq.) Applicable for any work which may impact a listed species.

Other Criteria, Advisories, or Guidance to be Considered for this Remedial Action (TBCs)

- EPA OSWER 9234.1-06, *Applicability of Land Disposal Restrictions to RCRA and CERCLA Ground Water Treatment Reinjection Superfund Management Review: Recommendation No. 26. dated December 27, 1989.* This directive provides guidance on issues regarding whether land disposal restrictions apply to reinjection of groundwater. In general, this guidance states that EPA construes the provisions of RCRA Section 3020 to be applicable instead of LDR provisions contained in RCRA Sections 3004 (f), (g), and (m), to reinjection of contaminated groundwater into an underground source of drinking water which is part of a CERCLA response action.

- *The Future For Hanford: Uses and Cleanup, The Final Report of the Hanford Future Site Uses Working Group*, December 1992.

C. Cost Effectiveness

The selected remedy provides overall effectiveness proportional to its cost. Estimated costs are summarized on Table 1.

D. Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

Because this action does not constitute the final remedy for this operable unit, the statutory preference for remedies that employ treatment that reduces toxicity, mobility, or volume as a principal element, although partially addressed in this remedy, will be addressed by the final response action. Subsequent actions are planned to address fully the threats posed by conditions at this operable unit.

Table 1 200-ZP-1 IRM Cost Estimate.

	FY 1995	FY 1996	FY 1997	FY 1998	FY 1999	FY 2000
Capital	860,000	750,000	750,000	0	0	0
Well Installation	900,000	2,700,000	2,700,000	0	0	0
Operations & Maintenance	1,140,000	980,000	980,000	980,000	980,000	980,000
Sampling, Analysis and Monitoring	1,970,000	910,000	910,000	910,000	910,000	910,000
DNAPL Investigation[2]	690,000	300,000	0	0	0	0
Escalation	0	120,000	250,000	130,000	170,000	220,000
Total[1]	5,560,000	5,760,000	5,590,000	2,020,000	2,060,000	2,110,000

[1]No contingency included

[2]Includes deepening two existing wells for use as IRM monitoring wells.

E. Preference for Treatment as a Principal Element

The selected remedy utilizes an effective treatment process for the removal of carbon tetrachloride, TCE, and chloroform from groundwater.

XII. DOCUMENTATION OF SIGNIFICANT CHANGES

EPA reviewed all written and verbal comments submitted during the public comment period. Upon review of these comments, it was determined that no significant changes to the selected remedy, as originally identified in the Proposed Plan, were necessary.

USDOE HANFORD 200 WEST AREA 200-ZP-1 OPERABLE UNIT

RESPONSIVENESS SUMMARY

The U.S. Department of Energy, the U.S. Environmental Protection Agency, and the Washington State Department of Ecology held a public comment period from October 17, 1994 through November 30, 1994 for interested parties to comment on the 200-ZP-1 Proposed Plan. The plan presents the preferred alternative for the groundwater located in the 200-ZP-1 operable unit of the Hanford Site 200 West Area. The primary support documents for this action are the *200 West Groundwater Aggregate Area Management Report* and the *Engineering Evaluation/Conceptual Plan for the 200-ZP-1 Operable Unit Interim Remedial Measure*.

This action was presented and discussed at the November and December Hanford Advisory Board meetings. These meetings were open to the public and the public was encouraged to comment on issues. No individual public meeting was held for this operable unit. However, the public was informed of the opportunity to comment on the Proposed Plan by publication in the Seattle Post-Intelligencer/Seattle Times, the Spokane Spokesman Review-Chronicle, the Tri-City Herald, and the Oregonian on October 16, 1994, and by mailing a fact sheet to approximately 2,000 people. No member of the public requested a public meeting.

A responsive summary is required by the *Comprehensive Response Compensation and Liability Act* (CERCLA), for the purpose of providing the agencies and the public with a summary of citizens' comments and concerns about the site, as raised during the public comment period, and the agencies' response to those comments and concerns.

I. RESPONSIVENESS SUMMARY OVERVIEW. This section briefly describes the background of the Hanford Site 200 West Area and outlines the preferred alternative for the 200-ZP-1 Operable Unit.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS. This section provides a brief history of community interest and concerns regarding the 200-ZP-1 Operable Unit.

III. SUMMARY OF MAJOR QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND THE AGENCIES RESPONSE TO THOSE COMMENTS. This section summarizes the written comments submitted to the agencies and the agencies responses to those comments.

IV. REMAINING CONCERNS. This section discusses community concerns that the agencies should be aware of as they prepare to undertake remedial design and remedial action in the 200-ZP-1 Operable Unit.

I. RESPONSIVENESS SUMMARY OVERVIEW

The Hanford Site was established in 1943 to produce plutonium for nuclear weapons using nuclear reactors and chemical processing plants. Operations at the Hanford Site are now focused on environmental restoration and waste management.

The 200 West Area is an operational area of approximately 8 square kilometer (3.2 square miles) where spent nuclear fuel was processed in four main facilities: U Plant (primarily uranium recovery); Plutonium Finishing Plant (primarily plutonium separation and recovery); and S and T Plants (primarily uranium and plutonium separation from irradiated fuel rods). The 200-ZP-1 Operable Unit is located within the 200 West Area of the Hanford Site, and was included on the National Priorities List in July 1989.

Mixtures of carbon tetrachloride containing other organics were used at the Plutonium Finishing Plant to recover plutonium from the processing waste streams. Spent carbon tetrachloride mixtures were discharged to the ground at the 200-ZP-2 Source operable unit in the 200 West Area. Approximately 600 to 1,000 metric tons of carbon tetrachloride waste were discharged to the ground between 1955 and 1973, resulting in extensive contamination of the soil and groundwater beneath the 200 West Area. Elevated concentrations of chloroform and TCE were also found generally coincident with the carbon tetrachloride. Although these chemicals are not known to have been used in plutonium recovery processing, the association of the three chemicals suggest some linkage. Chloroform may be a degradation product of carbon tetrachloride, while TCE may have been used as a maintenance chemical.

Some of the carbon tetrachloride, chloroform, and TCE have migrated through the soil column and contaminated the groundwater underlying the 200 West Area. Groundwater occurs about 64 meters below the ground surface and generally flows from west to east beneath the 200 West Area. However, historic discharges of large volumes of waste water have created an artificial groundwater mound that causes groundwater contaminated with carbon tetrachloride, chloroform, and TCE to flow toward the north and northeast in 200-ZP-1. Carbon tetrachloride is distributed in a plume that extends under most of the 200 West Area, although the highest concentration areas of the plume are located within the 200 - ZP-1. The maximum average concentration of carbon tetrachloride found at a well in 200-ZP-1 groundwater is approximately 7,000 parts per billion (ppb). Some of the carbon tetrachloride may be present in the aquifer as dense non-aqueous phase liquids (DNAPL). Chloroform is generally associated with the carbon tetrachloride in its areal distribution; its greatest measured average concentration in the groundwater is currently about 170 ppb. TCE is distributed in three smaller plumes that are not as clearly associated with the carbon tetrachloride plume; TCE is found in the groundwater at concentrations up to about 25 ppb.

Since late 1990, DOE has been conducting a removal action at the 200 West Area, removing carbon tetrachloride from the unsaturated soils between the ground surface and water table so

as to minimize or stabilize further movement of the carbon tetrachloride contaminant to uncontaminated areas. The removal action is being taken to ensure that the environmental and public health are adequately protected, and to reduce the threat of further groundwater contamination. This action has contributed significant information regarding the origin, nature, and extent of carbon tetrachloride, and other site characteristics needed for evaluating remedial alternatives for both source and groundwater operable units in the 200 West Area.

During 1993, DOE completed an Aggregate Area Management process to compile and evaluate available information about contamination in the 200 West Area. This was done to effectively address both the source and the groundwater contamination in the 200 West Area. Recommendations generated from the aggregate area process included using interim actions associated with interim measures and removals to accelerate cleanup and limit the potential spread of contamination where enough information is known.

In early 1994, EPA, Ecology, and DOE determined that the information and data gained through the 200 West Groundwater aggregate report and the carbon tetrachloride removal were sufficient to propose an interim pump and treat remedial action for 200-ZP-1.

II. BACKGROUND ON COMMUNITY INVOLVEMENT AND CONCERNS

The public has been involved in the cleanup of the Hanford Site since the *Hanford Federal Facility Agreement and Consent Order* was signed in 1989. Over the past several years a number of stakeholder work groups and task forces have been used to enhance decision making at the Hanford Site. In January 1994 the Hanford Advisory Board was established to provide informed advice to the U.S. Department of Energy, U.S. Environmental Protection Agency, and the Washington State Department of Ecology.

A consistent message delivered by interested citizens and affected Indian Nations is to take early action on groundwater contamination and protect the Columbia River. Taking this action will help support these desires.

III. SUMMARY OF MAJOR QUESTIONS AND COMMENTS RECEIVED DURING THE PUBLIC COMMENT PERIOD AND THE AGENCIES RESPONSE TO THOSE COMMENTS

Comments received during the public comment period are presented in this section. Responses to the comments follow each comment. Copies of all comment letters received are attached to this responsiveness summary as Appendix A.

COMMENT 1. The Hanford Advisory Board endorses continuation of the 200-ZP-1 pump and treat action.

RESPONSE: The agencies agree that this action should proceed.

COMMENT 2. All returned effluent should meet the drinking water standard.

RESPONSE: The drinking water standards will be met for the three primary contaminants under this interim remedial action. Other contaminants that may be in the returned effluent are outside the scope of this action.

COMMENT 3. Pumping efforts should be increased if outward migration continues. This requires the use of sufficient monitoring wells to measure conditions in both the groundwater plume as well as the vadose zone cloud. All monitoring wells must be sealed to prevent the downward movement of contaminants.

RESPONSE: The agencies agree and if outward migration is seen, pumping volumes will be increased. All wells will be sealed in accordance with applicable Washington State regulations.

COMMENT 4: A DNAPL investigation must occur at the Z-9 crib. If DNAPLS are encountered the agencies should take appropriate actions to mitigate the DNAPL source.

RESPONSE: A DNAPL investigation will occur at the 216-Z-9 crib and if DNAPL's are found appropriate response actions will be evaluated. If DNAPL's are found a revision to this ROD may be required.

COMMENT 5: The use of innovative technologies should be employed if any prove out. Included as innovative technologies are in situ bioremediation and in well vapor stripping.

RESPONSE: The agencies agree and will incorporate proven innovative technologies as part of the final remedy selection process.

COMMENT 6: The Proposed Plan should have called out the in situ bioremediation and in well vapor stripping as part of the interim remedial measures.

RESPONSE: The above mentioned innovative technologies were excluded from the Proposed Plan and interim measures because there is not enough information available on these technologies. This may have led to confusion by the public. Information gained during technology development testing of these technologies may be used in making the final remedy selection for this operable unit.

COMMENT 7: Alternative two, groundwater pump and treat should be addressed and activated immediately.

RESPONSE: The agencies agree and this action is proceeding as planned.

IV. REMAINING CONCERNS

The main concern expressed by the public is in regards to the use of innovative technology in the final cleanup of the 200-ZP-1 groundwater. The public expects the agencies to continue to explore and develop new technologies.