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16. KEY

Impact Level (F)	Reason for Transmittal (G)		Disposition (H) & (I)	
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1/2	1	Cog.Eng. S. J. Trent	[signature]	11/20/92	H6-06	K. J. Koegler	[signature]	20 Nov 92	H6-04	1/2	1
1/2	1	Cog. Mgr. M. C. Hagood	[signature]	11/23/92	H6-04	V. J. Rohay	[signature]	11/20/92	H6-06	1/2	1
		QA N/A									
		Safety N/A									
		Env. N/A									
1/2	1	J. W. Green	[signature]	11/23/92	H6-04						

18. S. J. Trent [signature] 11/24/92 Signature of EDT Originator / Date	19. Authorized Representative for Receiving Organization / Date	20. M. C. Hagood [signature] 11/24/92 Cognizant/Project Engineer's Manager / Date	21. DOE APPROVAL (if required) Ltr. No. [] Approved [] Approved w/comments [] Disapproved w/comments

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7. Abstract 12/1/92 N. Solis

WHC, 1992, *200 West Area Carbon Tetrachloride Groundwater Expedited Response Action Planning Proposal*, WHC-SD-EN-PD-012, Rev. 0, prepared by S. J. Trent, Westinghouse Hanford Company, Richland, Washington.

This proposal provides the initial planning and schedule for conducting an expedited response action (ERA) on carbon tetrachloride contamination in the unconfined aquifer underlying the 200 West Area. Estimated costs, preliminary milestones, and supporting documents necessary for conducting the ERA are delineated.

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9. Impact Level 4

10. RELEASE STAMP

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APPENDICES

FIGURES

TABLE

1.0 INTRODUCTION

1.1 PURPOSE

This document provides information for a proposed expedited response action (ERA) for the carbon tetrachloride groundwater contaminant plume beneath the 200 West Area of the Hanford Site, Washington. The carbon tetrachloride groundwater plume is identified as a candidate ERA in the 200 West Groundwater Aggregate Area Management Study Report (DOE-RL 1992). This ERA proposal is the first step in implementing the groundwater carbon tetrachloride ERA recommendation and provides the U.S. Environmental Protection Agency (EPA) and the State of Washington Department of Ecology (Ecology) a general understanding of the proposed project.

If the ERA process is continued, a comprehensive ERA proposal will be prepared in accordance with the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement; Ecology et al. 1990) and Gustafson (1991). This will allow for public involvement and regulatory approval of the ERA prior to actual implementation of the proposed response action.

1.2 BACKGROUND

Carbon tetrachloride is used as an organic diluent in plutonium processing operations at the Plutonium Finishing Plant (PFP; also known as Z-Plant) in the 200 West Area of the Hanford Site (Figure 1). Historically, facilities in the PFP that used large quantities of carbon tetrachloride include the RECUPLEX process line and the Plutonium Refurbishing Facility (PRF). Currently, the PRF is the only facility within PFP that continues to use significant volumes of carbon tetrachloride. The location of PFP and facilities that used carbon tetrachloride are illustrated in Figure 2. From 1955 through 1973, PFP liquid waste streams containing carbon tetrachloride and various other radionuclide and hazardous constituents were disposed to the subsurface. This disposal practice has produced widespread carbon tetrachloride contamination in the vadose zone and unconfined aquifer beneath the 200 West Area.

Liquid waste disposal facilities that received carbon tetrachloride-laden waste streams include the 216-Z-9 Trench, 216-Z-18 Crib, and the 216-Z-1A Tile Field. Approximately 1.42×10^7 L of liquid wastes were disposed to these waste facilities over their active service. The waste streams are estimated to have contained 363,000 to 580,000 L of carbon tetrachloride, representing less than 10% of the total liquid volume disposed to the waste facilities (DOE-RL 1991a; DOE-RL 1991b).

During 1991, an ERA was initiated to extract carbon tetrachloride vapor from the vadose zone in the vicinity of the PFP liquid waste disposal facilities, which received carbon tetrachloride (DOE-RL 1991a). This response action is continuing and is to be expanded during the next year. The next logical step in the treatment and control of carbon tetrachloride contamination in the 200 West Area is initiation of a response action on carbon tetrachloride in the groundwater.

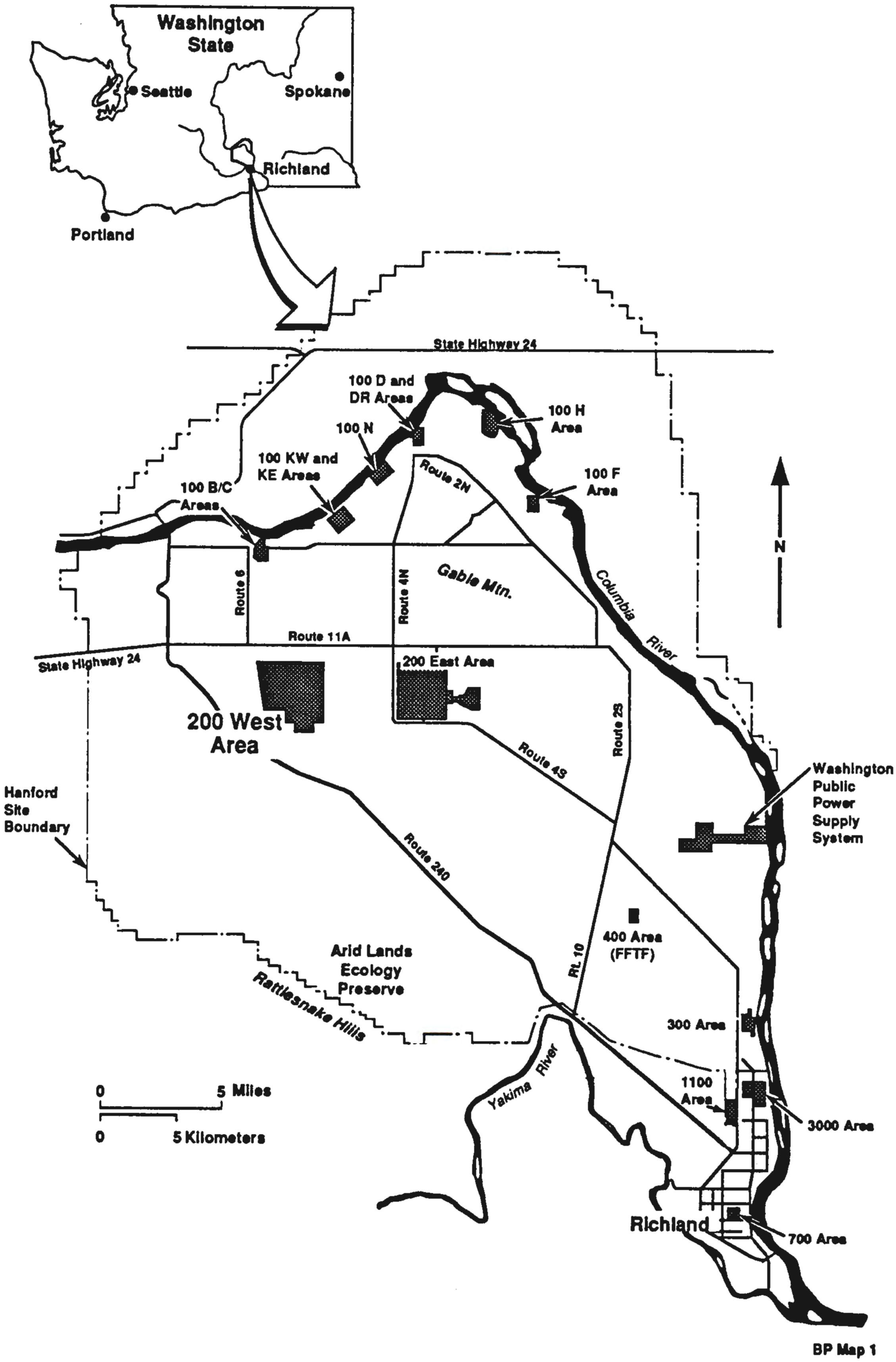

Figure 1. Map of the Hanford Site and Location of the 200 West Area.

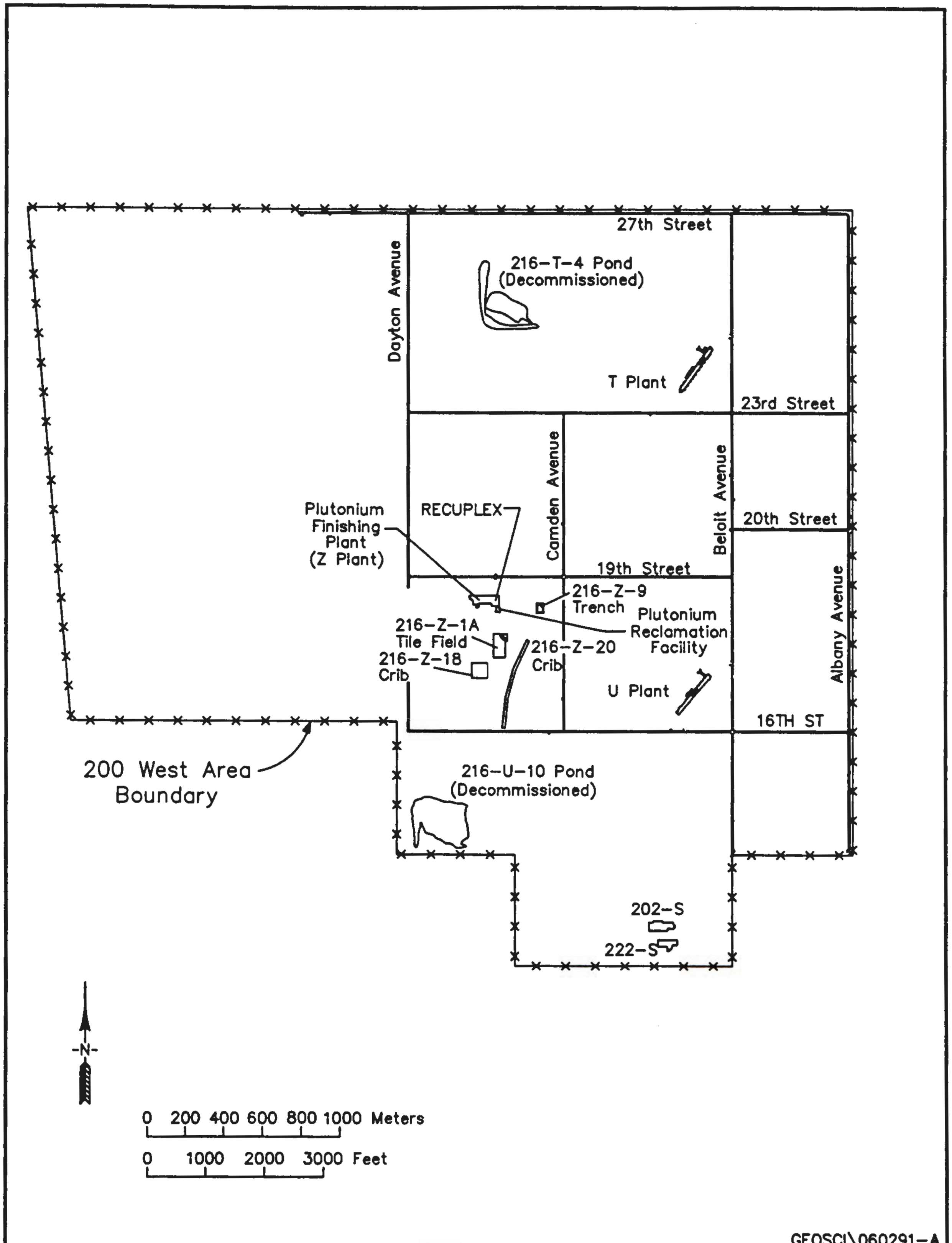

Figure 2. Site Map of the 200 West Area.

2.0 SITE DESCRIPTION

2.1 SITE LOCATION AND SOURCE TERMS

Carbon tetrachloride is detected in the unconfined aquifer throughout most of the 200 West Area. The lateral extent of the carbon tetrachloride groundwater plume is well-known due to the density of groundwater monitoring wells in and surrounding the 200 West Area. Figure 3 is a groundwater plume map illustrating the lateral extent of dissolved carbon tetrachloride and associated concentration isopleths above the carbon tetrachloride maximum contaminant level of 5 ppm. Although the presence of carbon tetrachloride in the groundwater is ubiquitous throughout the 200 West Area, the primary centers of mass for the plume are located beneath and to the west of PFP, and in the general vicinity of the 241-T tank farm (Figure 3). These centers of mass reside within the 200-ZP-1 groundwater operable unit.

Known source terms for carbon tetrachloride include the 216-Z-9 Trench, the 216-Z-18 Crib, and the 216-Z-1A Tile Field; the locations of the facilities are illustrated in Figure 2. Although carbon tetrachloride could have been disposed to the soil column at other localities or in the 200 West Area, no additional carbon tetrachloride source terms have been identified from process records or characterization activities.

The liquid wastes discharged to the 216-Z-9 Trench, the 216-Z-18 Crib, and the 216-Z-1A Tile Field are characterized as acidic high-salt aqueous wastes. The aqueous wastes were primarily acidic (pH - 1.0), sodium nitrate solutions. In addition to the aqueous phase, organic liquids consisting of carbon tetrachloride, tributylphosphate (TBP), and dibutylbutylphosphonate (DBBP) occurred in saturation amounts in the aqueous phase, and were also discharged separately in batches. Actinide-bearing liquid waste from the chemical processes used to purify plutonium was also disposed to the three liquid waste facilities. The primary radionuclide component of this liquid waste was plutonium-239/240 (DOE-RL 1991a; DOE-RL 1991b).

216-Z-9 Trench. The 216-Z-9 Trench operated from July 1955 to June 1962, receiving all organic and aqueous wastes from the RECUPLEX process line. The 216-Z-9 Trench received an estimated volume of 4.05×10^6 L of high salt, acidic aqueous and organic liquid wastes. An estimated 83,000 to 300,000 L of carbon tetrachloride may have been disposed to this liquid waste facility. In addition, an estimated 50-100 kg of plutonium has been discharged to the 216-Z-9 Trench (DOE-RL 1991a; DOE-RL 1991b).

216-Z-18 Crib. The 216-Z-18 Crib operated from April 1969 to May 1973, receiving organic and acidic waste from the PRF. The crib received and estimated 3.86×10^6 L of high salt, acidic, organic liquid wastes. The wastes disposed to the crib included approximately 175,000 kg of carbon tetrachloride, 22,000 kg of TBP, and 15,000 kg of DBBP. An estimated 23 kg of plutonium where disposed to the 216-Z-18 Crib (DOE-RL 1991a; DOE-RL 1991b).

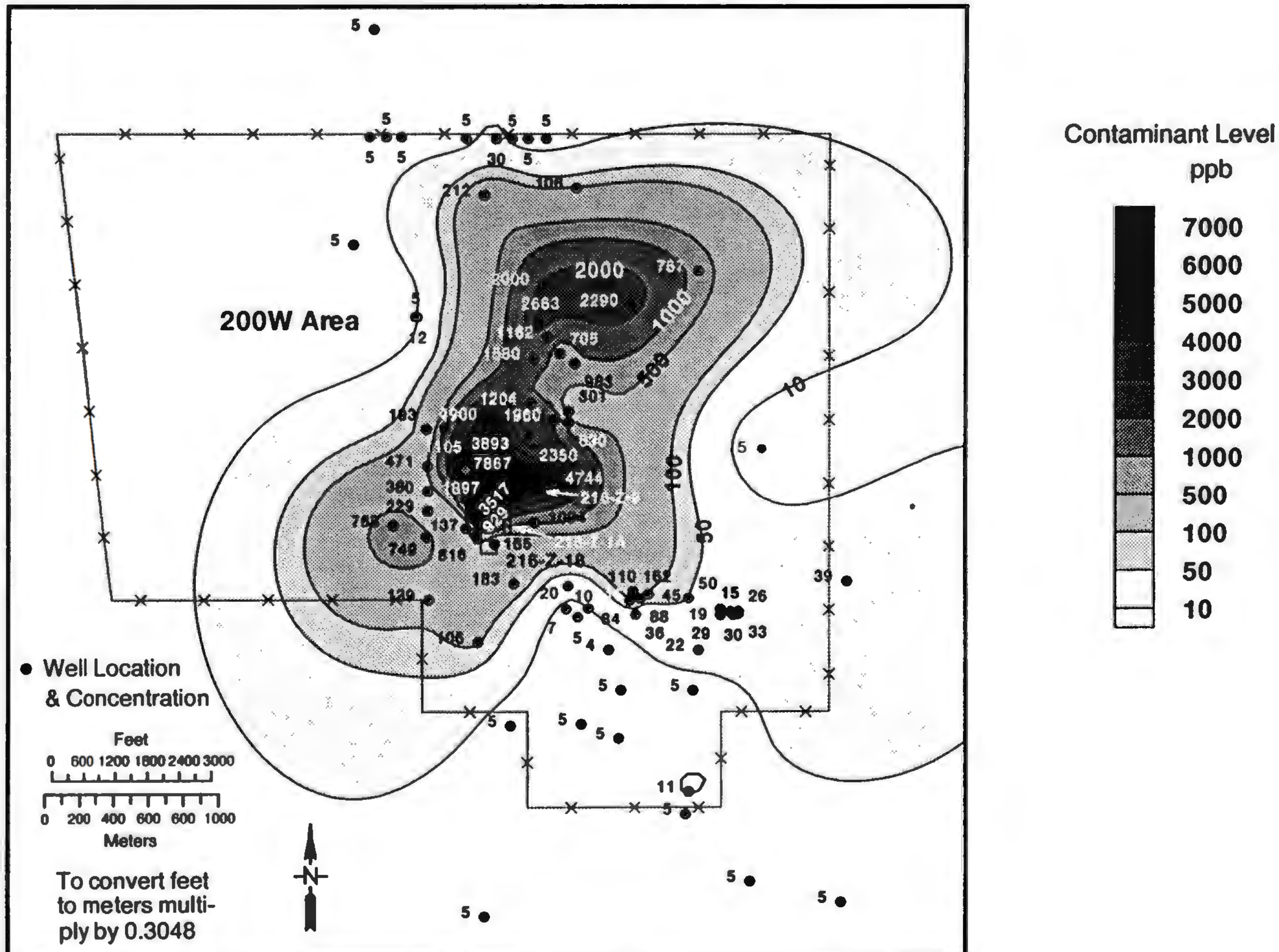

Figure 3. Carbon Tetrachloride Groundwater Plume Map.

216-Z-1A Tile Field. Although the 216-Z-1A Tile Field operated from June 1949 to April 1969, carbon tetrachloride disposal to the facility only occurred from 1964 to 1969. This facility received approximately $6.2x10^6$ L of liquid waste from PRF operations. The waste streams included an estimated 268,000 kg of carbon tetrachloride, 30,000 kg of TBP, and 20,300 kg of DBBP (DOE-RL 1991a; DOE-RL 1991b).

2.2 CONTAMINANT CHARACTERISTICS

Carbon tetrachloride is a halogenated hydrocarbon composed of a carbon co-valently bonded to four surrounding chlorines. Carbon tetrachloride exhibits both acute and chronic toxicity, and is classified as a possible human carcinogen [B2]. As a result, the EPA has determined an MCL of 5 ppb for carbon tetrachloride in drinking water.

Physical and chemical properties for carbon tetrachloride are summarized in Table 1. Data from Table 1 indicate that carbon tetrachloride is a relatively volatile compound due to its high vapor pressure. The low solubility in water and high specific gravity (greater than 1.0) indicates that carbon tetrachloride will behave as a dense nonaqueous phase liquid (DNAPL). Carbon tetrachloride exhibits a high Henry's Law constant and therefore should be susceptible to air stripping or sparging remediation techniques.

Table 1. Physical and Chemical Properties of Carbon Tetrachloride.

Property	Value
Solubility in water	800 mg/L at 20°C
Vapor pressure	90 mm Hg at 20°C
Saturated vapor concentration	754 mg/L at 20°C
Henry's Law constant (K_H; atm-m^3_{water}/m^3_{air})	1300
Specific gravity	1.59 (relative to water at 20°C)
Vapor density	5.5 (relative to air at 20°C
Dielectric constant	2.2
Soil/organic matter adsorption coefficient (K_{oc})	110 mL/g

Groundwater Transport. Conceptually, the transport and spread of carbon tetrachloride in groundwater can occur by three mechanisms; advective transport and dispersion of the dissolved carbon tetrachloride, density flow of DNAPL carbon tetrachloride, and diffusion of carbon tetrachloride vapors into the groundwater as the carbon tetrachloride vapor plume expands in the vadose zone. Any one of these mechanisms or combination thereof, will lead to continued environmental degradation and spread of carbon tetrachloride in the unconfined aquifer. Although carbon tetrachloride exhibits reactive behavior with soil organic matter (see adsorption coefficient data in Table 1), retardation of carbon tetrachloride groundwater transport is expected to be minimal due to the low organic content of Hanford Site soils (DOE-RL 1992).

Vertical movement of DNAPL carbon tetrachloride in the unconfined aquifer may be enhanced due to the low dielectric constant of the compound. Compounds exhibiting low dielectric constants can inhibit swelling or even induce desiccation of clay minerals. Thus, the permeability of fine-grained units containing a significant clay fraction can be increased if exposed to DNAPL carbon tetrachloride due to desiccation of the clays and subsequent formation of cracks and fissures (DOE-RL 1991a).

2.3 DISTRIBUTION OF CONTAMINANTS

Carbon tetrachloride contamination is ubiquitous throughout the vadose and groundwater beneath the 200 West Area. In the vadose zone, carbon tetrachloride vapors are present in concentrations ranging from 1 to 200 ppm near the source terms (Rohay et al. 1992). Far-field detections of volatile carbon tetrachloride during the drilling of groundwater monitoring wells at various 200 West Area RCRA TSD facilities indicate that carbon tetrachloride vapors have migrated several hundred meters from the source terms. Although no DNAPL carbon tetrachloride has been detected in the vadose zone, characterization efforts to determine the presence of DNAPL carbon tetrachloride have only recently been initiated (Rohay et al. 1992).

The extent and concentration of dissolved carbon tetrachloride in the groundwater is depicted by the contaminant plume map illustrated in Figure 3. This plume exhibits three primary centers of mass located beneath the PFP, the 241-T Tank Farm, and to the west of the 218-W4-C Burial Ground. The highest concentrations of dissolved carbon tetrachloride approach 8,000 ppb (monitoring well 299-W15-16) near PFP. The total carbon tetrachloride groundwater plume area exceeds 11 km^2 (based on using the 10 ppb concentration isopleth as a boundary; see Figure 3). The mass of carbon tetrachloride in the groundwater is estimated to range from 5,250 to 15,740 kg assuming a constant concentration to a depth of 10 m in the unconfined aquifer and a porosity ranging from 10 to 20%. This mass represents approximately 2% of the total estimated carbon tetrachloride disposed to the subsurface (DOE-RL 1991a).

The vertical distribution of carbon tetrachloride in the unconfined aquifer is uncertain due to the limited number of groundwater sample analyses from deeper depths in the aquifer. Vertical distribution of carbon tetrachloride can be significantly increased due to the presence of slowly dissolving DNAPL carbon tetrachloride at the base of the aquifer, downward advective transport of dissolved carbon tetrachloride due to the presence of downward vertical hydraulic gradients, or man-made intrusions into the aquifer permitting the development of preferential transport pathways (i.e., unsealed well casings). Although the concentration gradient used for the carbon tetrachloride mass estimate calculation assumes that concentrations below a depth of 10 m are insignificant, vertical sampling of a deep groundwater monitoring well (299-W15-6) near the 216-Z-9 Trench indicated detectable levels of dissolved carbon tetrachloride to a depth of 52 m in the aquifer (Rohay et al. 1992). However, vertical sampling at deep groundwater monitoring wells 299-W15-17 and 299-W18-22 to the northwest and southeast (respectively) of the 216-Z-9 Trench did not indicate dissolved carbon tetrachloride present at deep depths in the unconfined aquifer. Although no DNAPL carbon tetrachloride has been detected in the unconfined aquifer, characterization efforts to determine the presence of DNAPL carbon tetrachloride have only recently been initiated (Rohay et al. 1992).

Other volatile organic contaminants found in the groundwater beneath the 200 West Area at concentrations greater than their respective MCLs include chloroform and trichloroethylene (TCE). Chloroform concentrations and areal extent is illustrated by the plume map in Figure 4. Chloroform is intimately associated with carbon tetrachloride and is suspected to be a byproduct of carbon tetrachloride degradation (DOE-RL 1992a). The TCE plume is shown in Figure 5. The primary centers of mass for TCE are located north and southeast of the PFP facilities. Although 200 West Area liquid waste stream inventories do not indicate that TCE was a waste stream constituent, TCE was used as a cleaning solvent in various 200 West Area facilities (DOE-RL 1992).

In addition to carbon tetrachloride, chloroform, and TCE, several other hazardous and radionuclide contaminants related to 200 West Area liquid waste disposal practices are found co-mingled in the groundwater beneath the 200 West Area at levels above their respective MCLs. These contaminants include arsenic, chromium, cyanide, fluoride, nitrate, TCE, undifferentiated alpha and beta particle emitters, tritium, technetium-99, iodine-129, uranium, and plutonium 239/240. The areal extent of these contaminants and degree of co-mingling in the groundwater are illustrated in Figures 6 and 7.

3.0 BENEFIT OF THE ERA

In the Tri-Party Agreement (Ecology et al. 1990) the DOE, EPA, and Ecology have recognized that ERAs are appropriate when they can accelerate environmental clean-up of the Hanford Site while contributing to the efficient performance of final remedial actions.

Since carbon tetrachloride represents the most serious groundwater contamination problem in the 200 West Area, the proposed ERA will provide immediate benefit through rapid response to control and remove carbon tetrachloride from the groundwater. In addition, the proposed ERA will facilitate any final remedial action by reducing the mass of carbon tetrachloride in the groundwater beneath the 200 West Area. Finally, the proposed ERA will benefit all parties concerned (regulatory agencies, the public, and DOE) by demonstrating the DOE's bias for action with respect to environmental clean-up of the Hanford Site.

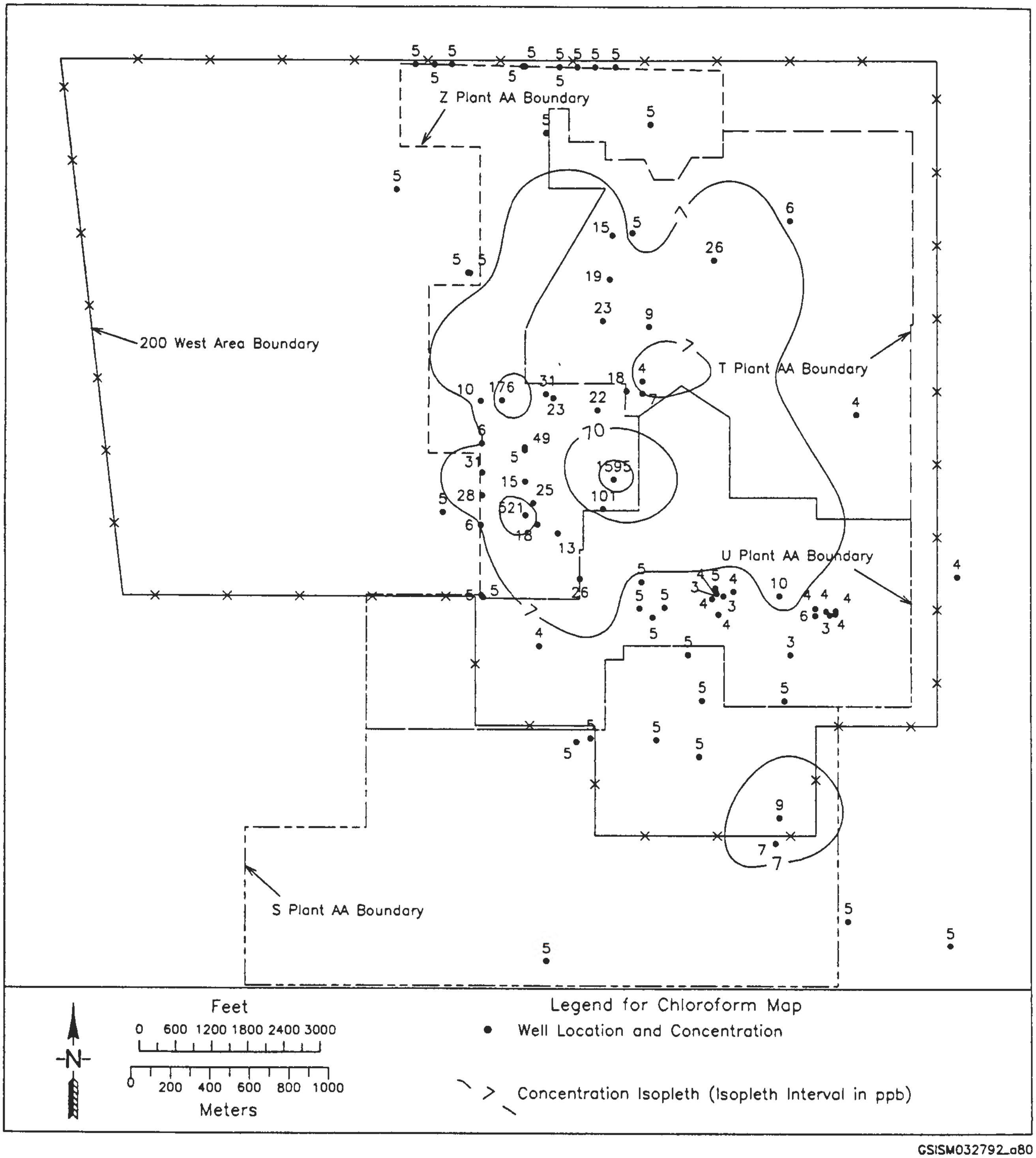

Figure 4. Chloroform Groundwater Plume Map (WHC 1992).

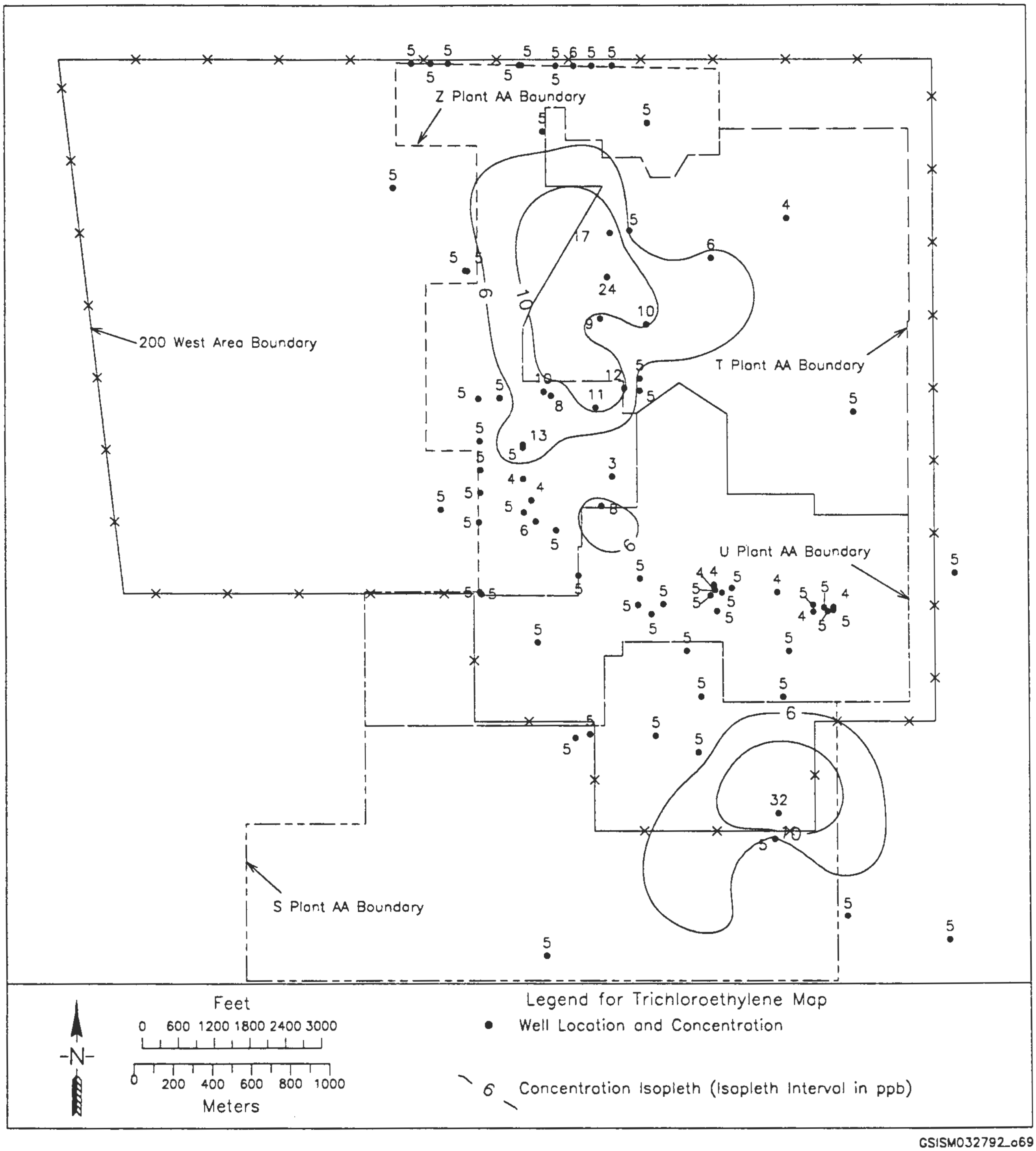

Figure 5. Trichloroethylene Groundwater Plume Map (WHC 1992).

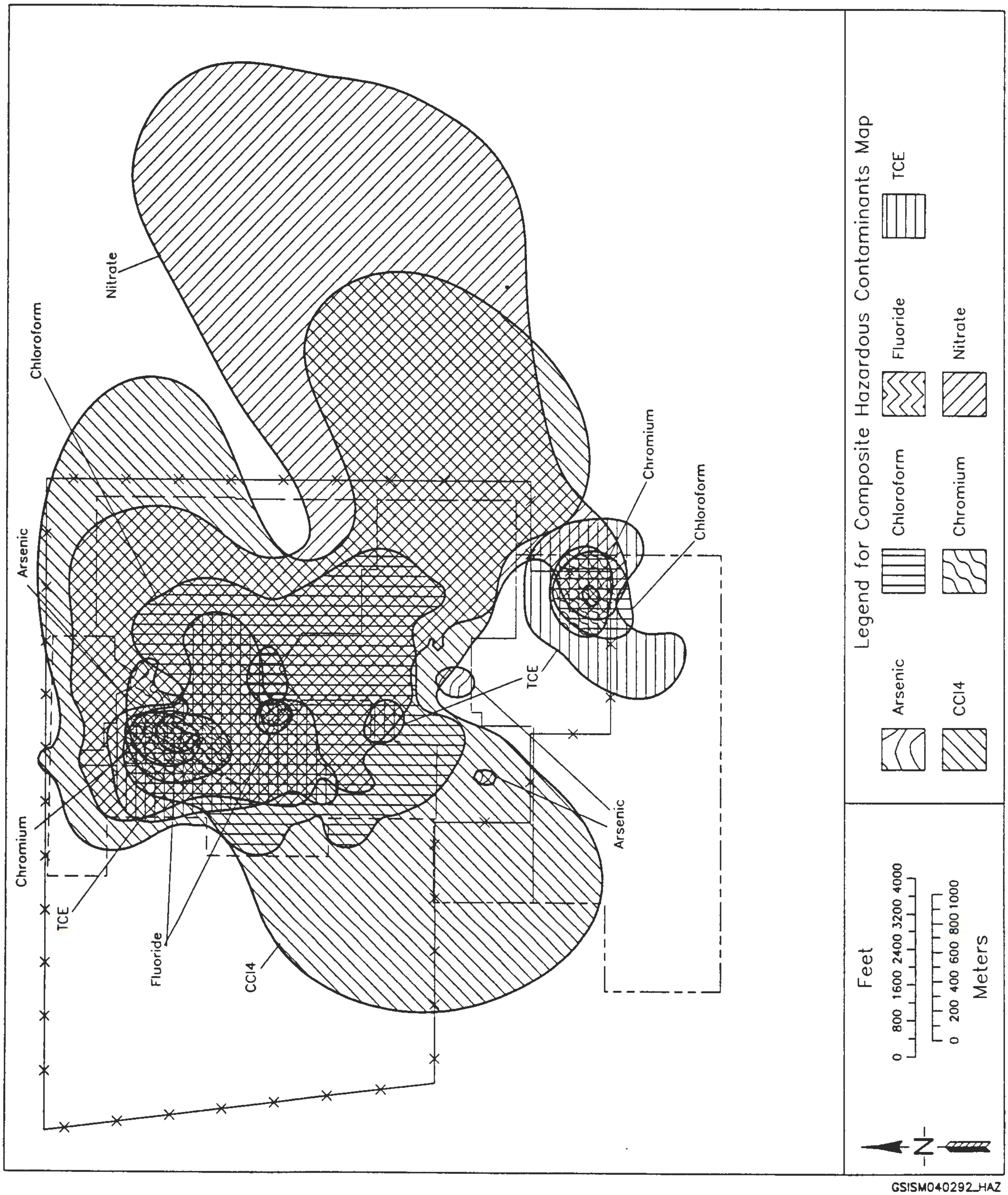

Figure 6. Composite Hazardous Contaminant Groundwater Plume Map (WHC 1992).

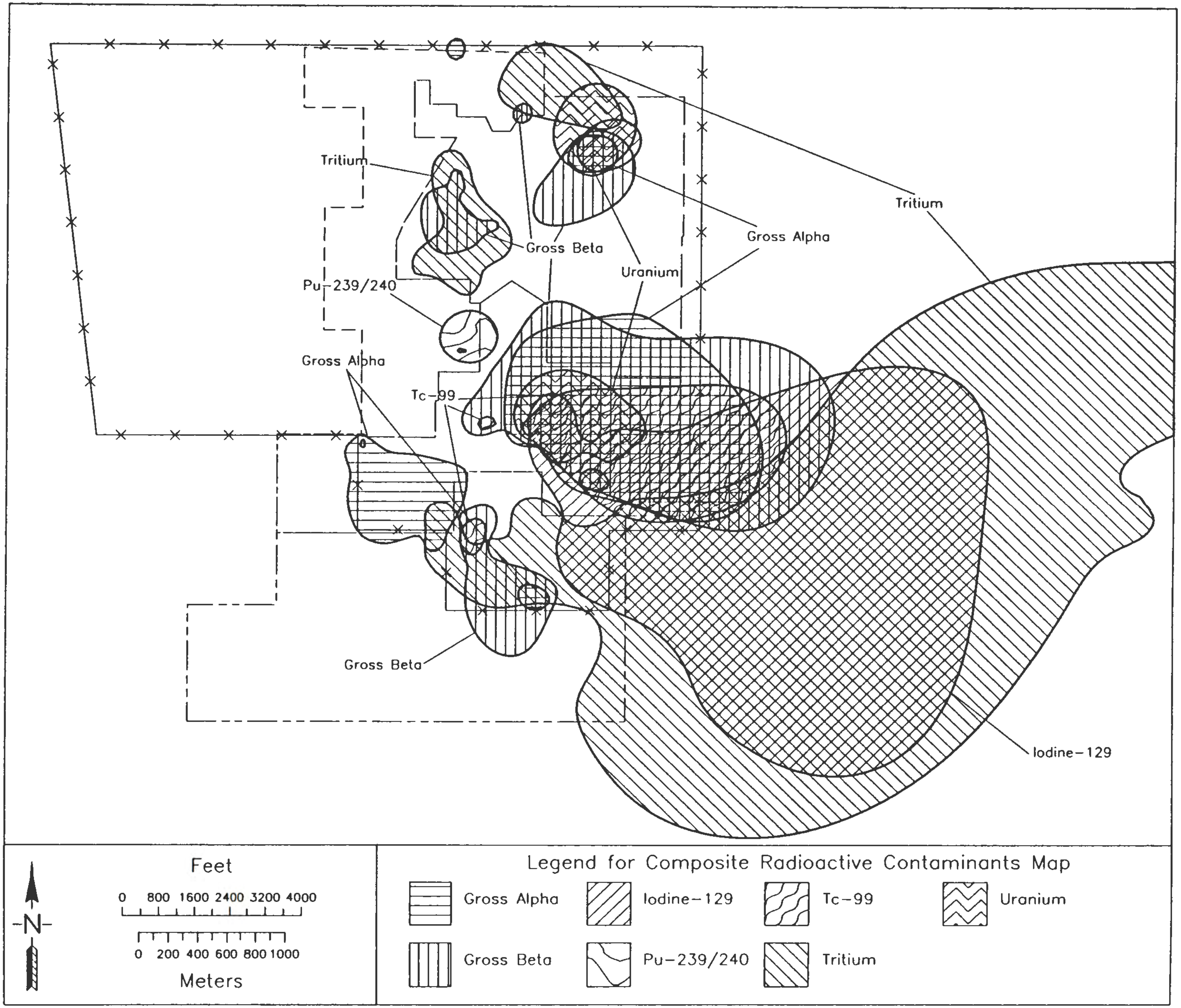

Figure 7. Composite Radioactive Contaminant Groundwater Plume Map (WHC 1992).

4.0 CONCEPT OF THE ERA

4.1 GOAL

The goal of the 200 West Area carbon tetrachloride groundwater ERA is to significantly reduce the concentration of dissolved carbon tetrachloride at locations in the groundwater where high levels of carbon tetrachloride contamination exist. Areas of high carbon tetrachloride contamination will likely be considered those areas inclusive of the 1,000 ppb isopleth contour on the carbon tetrachloride plume map (Figure 3). This ERA would be conducted until a final record of decision is issued for the 200-ZP-1 groundwater operable unit. At that time, it will be either incorporated into the final remedial action or discontinued, as determined in the record of decision.

4.2 MEASURE OF SUCCESS

Success of the ERA will be measured in terms of removal of carbon tetrachloride from the groundwater underlying the 200 West Area. Implementation of the action would result in the immediate reduction in the quantity of carbon tetrachloride that may cause further contamination of the groundwater. The response action would strive to reduce dissolved carbon tetrachloride concentrations by an order of magnitude or greater in those areas of high carbon tetrachloride contamination. Actual reduction levels, however, will depend on the efficiency and effectiveness of the remediation technology employed, and the potential for continued carbon tetrachloride flux into the unconfined aquifer from various sources (i.e., DNAPL dissolution).

4.3 IMPLEMENTATION

The process for implementing the ERA will follow the format outlined in Gustafson (1991). While is it desirable for the ERA to proceed expeditiously, the ERA is considered to be non-time critical, in the sense that a planning period of at least 6 months could occur prior to initiating the activity. Implementation of a non-time critical ERA requires an engineering evaluation/cost assessment (EE/CA) be conducted and results submitted to the lead regulatory agency.

The EE/CA will be contained in an ERA proposal that will provide additional details necessary for implementing the response action alternative chosen by the EE/CA. It is also anticipated that the EE/CA will serve as an environmental assessment (EA) under the National Environmental Policy Act (NEPA) for the proposed ERA. The outline of the ERA implementation process is briefly described in the following sections.

4.3.1 ERA Project Plan

An ERA project plan will be prepared that outlines how the ERA will be implemented (Appendix A provides an outline for the project plan). This plan is a secondary document as defined by the Tri-Party Agreement.

The project plan will identify response action alternatives that have application to the preferential removal of volatile organic contamination from the groundwater. Response action alternatives involving in-situ separation of carbon tetrachloride and other volatile organics from the groundwater combined with surface containments/treatment of the organic vapors are likely to be the preferred technologies to employ. In-situ separation of volatile organic contaminants from the groundwater is preferred since certain technical and regulatory concerns associated with extraction and surface containment/ treatment of groundwater contaminated with other radiological and hazardous constituents most likely cannot be resolved within the time frame of an ERA. Technologies for in-situ separation of volatile organics from groundwater also have an added benefit in that the separation system can be designed to permit vadose zone vapor extraction to be performed concurrently with the groundwater treatment.

Implementability, cost, and effectiveness of response action alternatives identified in the project plan will be evaluated in the EE/CA. In addition to delineation of potentially applicable response action alternatives, the project plan also identifies the site evaluation tasks necessary to evaluate the alternatives in the EE/CA.

4.3.2 Site Evaluation

The purpose of site evaluation is to improve the knowledge base relative to the nature and extent of carbon tetrachloride contamination in the subsurface, refine the conceptual model of the hydrogeologic regime, and collect hydrogeologic data on the physical system (vadose zone and unconfined aquifer) to properly identify and design the remediation method/technique. In addition, chemical field screening data will be collected for baseline purposes and to identify potential impacts to worker health and safety.

The data and information obtained by the site evaluation is essential for completing the EE/CA in which the response action alternative is selected. This data will also be useful in assessing worker health and safety requirements while implementing the ERA. The results of all site evaluation activities will be documented in the ERA proposal.

4.3.3 ERA Proposal and Action Memorandum

The ERA proposal includes the results of the EE/CA, which evaluates the various response action alternatives considered with recommendations based on that evaluation. The EE/CA provides refinement and specification of the alternatives, followed by a detailed analysis based on: (1) public health and welfare, and environmental impacts, (2) technical feasibility, (3) institutional considerations, and (4) cost. An essential facet of the EE/CA will be a pilot test of one or more response actin alternatives. Information collected during the pilot test will provide site-specific performance data on the response action alternative feasibility and effectiveness.

An EA will be performed concurrently with the EE/CA in accordance with NEPA and DOE orders. The EA will provide brief discussions concerning the need for the ERA proposal, the response action alternatives considered, and the environmental impacts associated with each alternative.

Also included in the ERA proposal is a tentative schedule for implementation of the recommended response action alternative as well as a project management/implementation plan. Appendix B provides an annotated outline suggested for the ERA proposal.

The ERA proposal will undergo a DOE, EPA, and Ecology review. The public will also be allowed to review the document. As specified in the Tri-Party Agreement (Ecology et al. 1990), the EPA will ultimately be responsible for issuing an ERA Action Memorandum, providing the direction to proceed with the activities proposed in the ERA proposal.

4.3.4 Project Implementation

Following approval of the ERA proposal and issuance of the ERA Action Memorandum, the selected response action alternative will be implemented.

4.3.5 Reporting

A final report assessing and evaluating the ERA will be prepared for distribution when completed. This report will provide information to support the record of decision for the operable unit.

4.4 ERA SITE SELECTION WORKSHEET

A site selection worksheet (Gustafson 1991) has been completed for the 200 West Area carbon tetrachloride groundwater ERA and is provided in Appendix C.

4.5 COST AND SCHEDULE SUMMARY

A preliminary cost estimate and schedule for implementing the 200 West Area carbon tetrachloride groundwater ERA is provided in Appendix D. A revised cost estimate based on the results of the site evaluation tasks will be issued in the ERA proposal.

5.0 REFERENCES

DOE-RL, 1991a, *Expedited Response Action Proposal (EE/CA & EA) for 200 West Area Carbon Tetrachloride Plume*, DOE/RL-91-32, Draft B, U.S. Department of Energy, Richland-Field Office, Richland, Washington.

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WHC, 1992, *Hydrogeologic Model for the 200 West Groundwater Aggregate Area*, WHC-SD-EN-TI-014, Revision 0, Westinghouse Hanford Company, Richland, Washington.

APPENDIX A

PROJECT PLAN OUTLINE

CONTENTS

ATTACHMENTS

APPENDIX B

ANNOTATED ERA PROPOSAL OUTLINE

1.0 INTRODUCTION

The introduction defines the purpose and scope of the ERA proposal. The discussion includes the various reasons and requirements for performing the ERA. The relationship between the 200 West Area carbon tetrachloride groundwater ERA, the 200 West Area vadose zone carbon tetrachloride vapor extraction ERA, and ongoing remedial investigation/feasibility study activities will also be described.

2.0 SITE DESCRIPTION

This section provides a brief description of the site(s) being considered for an ERA. A summary of the information pertinent to the selection of the preferred alternative is included.

3.0 SITE EVALUATION ACTIVITIES

This section describes the activities conducted for characterization of the site. Information gathered during those activities are also included, evaluated, and summarized.

4.0 APPLICABLE OR RELEVANT AND APPROPRIATE REQUIREMENTS

This section identifies the requirements to be considered in the engineering evaluation/cost analysis.

5.0 IDENTIFICATION OF RESPONSE TECHNOLOGIES

Response technologies that could achieve the objectives of the ERA are evaluated. A summary of the evaluation process is provided.

6.0 ANALYSIS OF RESPONSE ACTION ALTERNATIVES

Various response action alternatives are assembled and evaluated. Those alternatives warranting further evaluation are summarized.

7.0 ENGINEERING EVALUATION/COST ANALYSIS

Each criterion to be used to evaluate the ERA alternatives are summarized in Section 6.0 and identified in this section. The method of scoring the alternatives against these criteria is also explained.

8.0 IMPLEMENTATION OF PREFERRED ERA ALTERNATIVE

This section provides a discussion detailing the implementation of the preferred ERA alternative chose in Section 7.0. All procedures that will be used or that need development will be identified. All permits, such as excavation permits and hazardous waste operators permits will also be identified and discussed.

9.0 PROJECT MANAGEMENT PLAN

Each of the organizations that will participate in the implementation of the ERA and their roles are identified in this section. A flow chart illustrating the management structure, a detailed schedule for implementation, and cost estimates for implementing the ERA activity are provided.

APPENDIX C

ERA SITE SELECTION WORKSHEET

Project Name: 200 West Area Carbon Tetrachloride Groundwater ERA

Project Description: The scope of this project is to evaluate the extent of carbon tetrachloride contamination in the groundwater and remove or contain the plume to prevent further contamination of the unconfined aquifer by carbon tetrachloride.

ERA Category: Time Critical __ Non-Time Critical X

Evaluation Checklist

Time Critical ERAs:

Actual Exposure/Release Yes__ No X

Imminent Exposure/Release Yes__ No X

Rationale:

Non-Time Critical ERAs:

1. Potential Exposure: Yes X No __

   Rationale: Carbon tetrachloride in the groundwater represents the most significant health risk in the groundwater beneath the 200 West Area. The groundwater is a transport medium for carbon tetrachloride to the Columbia River. In addition, long-term volatilization of carbon tetrachloride from the groundwater may contaminate pristine areas of the vadose zone in areas hydraulically down gradient from the 200 West Area. Potential exposure pathways include ingestion of dissolved carbon tetrachloride and inhalation of vapors.

2. Potential Increased Degradation: Yes X No __

   Rationale: Degradation of the subsurface environment will continue as the carbon tetrachloride groundwater plume is allowed to spread. Contamination will spread laterally as well as vertically in the aquifer system, due to dispersion and advective transport effects.

3. Implementability: Yes X No __

   Rationale: Implementation of this project is highly feasible given the use of in-situ "off the shelf" volatile organic compound removal technologies and adequate funding.

4. Short-Term Effectiveness: Yes X No __

   Rationale: Since implementation of this project would result in the removal or reduction in the environmental threats posed, the project would be effective in the short-term.

5. Reduction of Toxicity, Volume, Migration: Yes X No __

Rationale: Implementation of this project would minimize any toxicological and migratory hazards that may be present due to carbon tetrachloride in the groundwater.

6. Cost Effectiveness: Yes X No __

Rationale: Implementation of this project could occur at a relatively minimal cost and likely facilitate the remediation of other volatile organics (i.e., TCE and chloroform) in the groundwater. It would be more advantageous to investigate and mitigate the environmental hazards relative to carbon tetrachloride at this time as opposed to allowing for the possible exposure of personnel as well as further degradation of the environment.

7. Long-Term Effectiveness: Yes X No __

Rationale: The project would potentially be effective in the long term as it is currently proposed to remove and properly dispose of the dissolved carbon tetrachloride in the groundwater.

8. Consistent with Final Remedy: Yes X No __

Rationale: Removal of the environmental hazards is consistent with final remediation goals. Actions taken will integrate well with final remedial efforts needed in the area. By reducing the concentration of carbon tetrachloride in the groundwater, the ERA would facilitate any conceivable final remedy for both carbon tetrachloride and other contaminants of concern.

9. Compliance with ARARs: Yes X No __

Rationale: Since the project would result in removal of environmental threats, it would strive to be consistent with final ARARs applicable for remediation of the area, and worker health and safety.

10. Information for RI/FS or Remedial Design: Yes X No __

Rationale: If significant environmental hazards are encountered, the data obtained from implementing the ERA would provide useful information to future RI/FS activities within the operable unit as well as other restoration/remediation projects conducted both on and off the Hanford Reservation.

11. Demonstrate Technologies: Yes X No __

Rationale: Removal of volatile organics from the groundwater beneath the 200 West Area will likely require the demonstration and use of technologies recently developed for treatment of volatile organic contaminants in groundwater. Although these technologies are relatively new, they will be "off the shelf" readily available technologies that are modified to operate in the Hanford environment.

12. Community Acceptance: Yes X No __

Rationale: Positive acceptance of this project by the community is anticipate since the ERA would expedite the removal of environmental hazards. In addition, this project will support the final record of decision of the 200-ZP-1 groundwater operable unit.

APPENDIX D

200 WEST AREA CARBON TETRACHLORIDE GROUNDWATER ERA COST ESTIMATE AND SCHEDULE

The following cost and schedule information is provided for conducting an ERA on the 200 West Area carbon tetrachloride groundwater plume. The cost and schedule estimate for the proposed ERA is preliminary and should be considered rough order-of-magnitude.

Estimation of cost is based primarily on assumptions relative to the level of effort required for project technical and administrative support, well drilling/installation costs, test plan and work plan writing, laboratory support, and long term support and maintenance of the response action. It is assumed that most of the ERA costs will be related to drilling/installation of several testing wells, in-situ volatile organic separation (remediation) wells, and monitoring wells. To estimate the costs associated with the well drilling/installation tasks, the following assumptions were made:

- Well drilling/installation costs of approximately $230,000 per well
- Remediation will be limited to plume "hot spots" or areas of high carbon tetrachloride contamination
- 24 (total) wells to be installed for the ERA; two test wells, six monitoring wells, and 16 remediation wells.

In addition, a 25% contingency cost factor is included in the estimate. A more definitive cost and schedule will be provided in the ERA proposal for the selected remediation alternative. The cost breakdown is as follows:

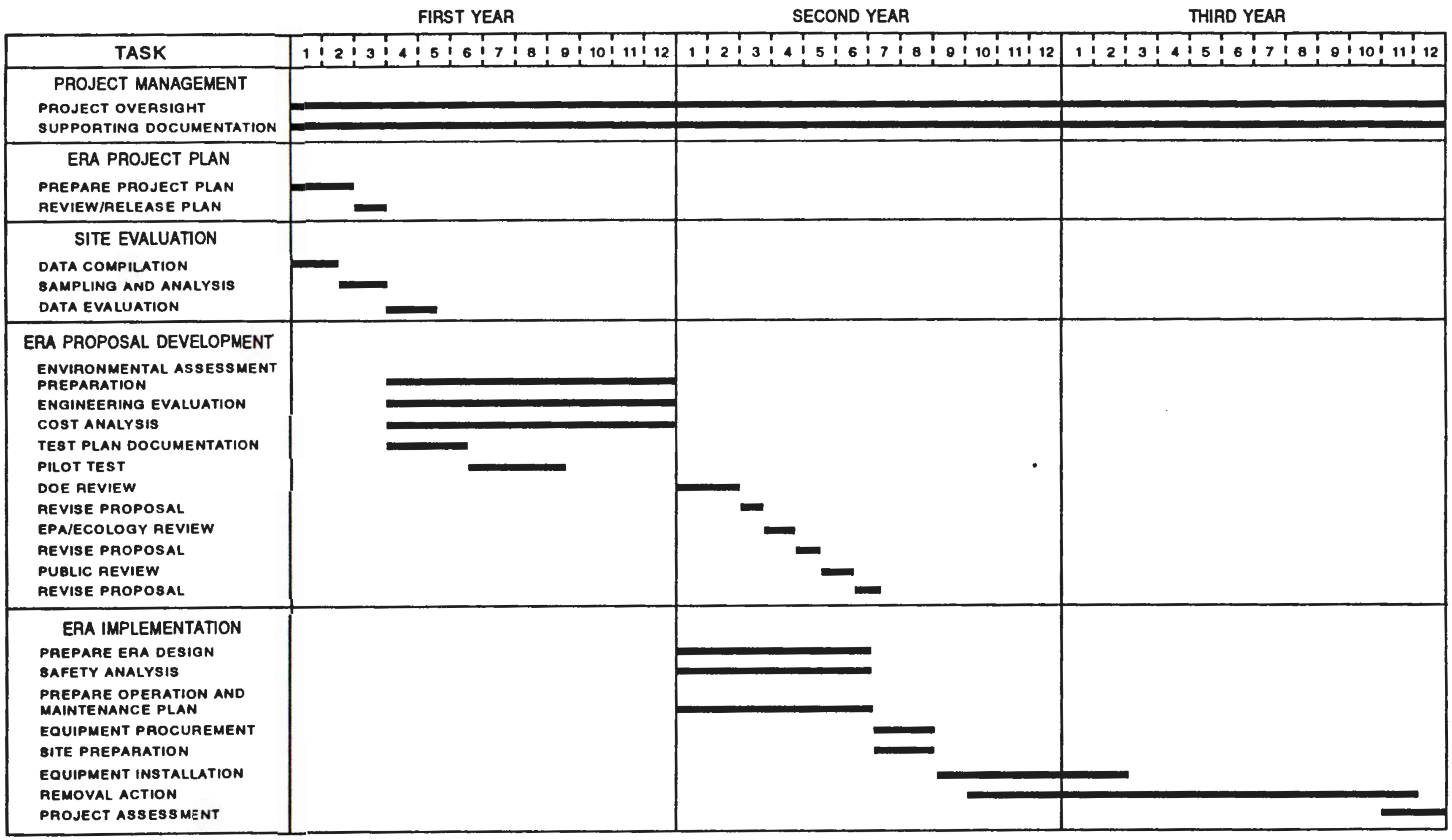
PROJECT MANAGEMENT COSTS:		
Project Manager	0.1 FTE/yr @ 2 yr	20,000
Project Engineer/Scientist	1.0 FTE/yr @ 2 yr	200,000
Clerk/Typist	0.1 FTE/yr @ 2 yr	20,000
Quality Assurance	0.125 FTE/yr @ 2 yr	25,000
Health and Safety	0.25 FTE/yr @ 2 yr	50,000
Facility Safety	0.5 FTE/yr @ 1 yr	50,000
Permits	0.125 FTE/yr @ 0.5 yr	7,000
Community Relations	0.125 FTE/yr @ 2 yr	25,000
PROJECT PLAN DEVELOPMENT COSTS:		25,000
SITE EVALUATION COSTS:		
Data Compilation		5,000
Sampling and Analysis		50,000
Data Evaluation		20,000
ERA PROPOSAL DEVELOPMENT COSTS:		
ERA Proposal Development		100,000
Test Plan Development		25,000
Pilot Test of Response Action Technology		750,000
Sampling and Analysis		100,000

ERA IMPLEMENTATION COSTS:

ERA Design	150,000	
ERA Implementation	3,500,000	(1st year)
	3,500,000	(2nd year)
Project Assessment/Evaluation	25,000	
SUBTOTAL =	$8,597,000	
Contingency (25%)=	2,149,250	
TOTAL =	$10,746,2500	

The attached proposed ERA schedule (Table D.1) is preliminary. Additional information and data concerning site conditions, response action technologies to be employed, and health and safety requirements are necessary to produce an accurate schedule. A final schedule will be provided in the ERA proposal.

Table D.1. 200 West Area Carbon Tetrachloride Groundwater ERA Planning and Implementation Schedule.



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Title 200 West Area Carbon Tetrachloride Groundwater Expedited Response Action Planning Proposal	Unclassified Category UC- n/a	Impact Level 4

New or novel (patentable) subject matter? [X] No [] Yes
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Author/Requestor (Printed/Signature) Date

S. J. Trent S. J. Trent 11/17/92

Intended Audience

[] Internal [] Sponsor [X] External

Responsible Manager (Printed/Signature) Date

M. C. Hagood M. C. Hagood 11/17/92

INFORMATION RELEASE ADMINISTRATION APPROVAL STAMP

Stamp is required before release. Release is contingent upon resolution of mandatory comments.

APPROVED FOR RELEASE NS 12/1/92

Date Cancelled	Date Disapproved

BD-7600-062 (08/91) WEF074

Part 1

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R. A. Carlson	H6-03	X		
H. D. Downey	H6-27	X		
J. W. Green	H6-04	X		
M. C. Hagood	H6-04	X (3)		
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C. D. Wittreich	H6-03	X		
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EDMC	H4-22	X (2)		