

# EPA START

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Program Manager  
Office of Environmental Assurance,  
Permits and Policy  
U.S. Department of Energy  
Richland Operations Office  
P.O. Box 550, A5-19  
Richland, Washington 99352



Re: Action Memorandum: Expedited Response Action Proposal for  
200 West Area Carbon Tetrachloride Plume

Dear Mr. Izatt:

This Action Memorandum constitutes approval of the subject Expedited Response Action. Public comments on the Engineering Evaluation/Cost Analysis (EE/CA) were received and a response has been issued by the Environmental Protection Agency (EPA). None of the public comments influenced the selection of the action to be taken or the implementation of the expedited response action proposal. Therefore, EPA and the Washington State Department of Ecology (Ecology) approve the Department of Energy's (DOE) proposal to conduct the 200 West Area Carbon Tetrachloride Plume Expedited Response Action, as described below.

## I. PURPOSE

The purpose of this action is to mitigate the threat to site workers, public health, and the environment caused by the migration of carbon tetrachloride vapors through the soil column and into the groundwater. The action is an interim action taken to reduce the mass of carbon tetrachloride in the soil column beneath the 200 West Area pending the final cleanup activities associated with the 200-ZP-1 and 200-ZP-2 Operable Units.

## II. BACKGROUND

Pursuant to the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA), the EPA proposed the 200 Areas (the 200 Aggregate Area) at the DOE's Hanford Site for inclusion on the National Priorities List (NPL) on June 24, 1988. In November 1989, the 200 Aggregate Area was included on the NPL.

### A. Site Description

The 200 Aggregate Area is located in the middle of the 570 square mile Hanford Site approximately 20 miles north of the City of Richland, Benton County, Washington. The 200 Aggregate Area contains over 230 Hanford Project Cells.

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engineered waste disposal site and numerous hazardous and radioactive spills or unplanned release sites. For the purpose of cleanup and corrective action, the 200 Aggregate Area has been divided into 43 operable units. Sites were assigned to individual operable units based on geographic location and the source of the waste disposed. The 200 West Area portion of the 200 Aggregate Area contains seventeen operable units including 200-ZP-1 and 200-ZP-2.

Waste sites within the 200-ZP-1 and 200-ZP-2 Operable Units received liquid wastes derived from the Plutonium Finishing Plant operations. One process performed at the Plutonium Finishing Plant was the Recuplex process. This process was used to reclaim plutonium scrap material for purification and recovery. The Recuplex process was a liquid-liquid extraction process utilizing carbon tetrachloride as the primary organic solvent. It is estimated that up to 580,000 liters of carbon tetrachloride were disposed to the 216-Z-1A Tile Field, the 216-Z-9 Trench, and the 216-Z-18 Crib between 1955 and 1973.

B. Site Characterization

A wide range of site characterization activities have been performed at the three carbon tetrachloride disposal locations and throughout the 200 West Area. For the most part, these characterization efforts focused on the migration of radionuclides through the soil column and into the groundwater. These characterization efforts can be categorized as vadose zone characterization and groundwater monitoring activities. A summary of these efforts and a description of previous characterization results is compiled in Appendix B of the ERA Proposal. Additional characterization efforts will also be undertaken as part of the ERA Project. Approval to proceed with those activities was provided in the January 10, 1992, letter from Douglas R. Sherwood to Steven H. Wisness. Other characterization activities will be undertaken as part of the DOE Technology Development Program's Volatile Organic Compounds - Arid Site Integrated Demonstration Project. EPA and Ecology expect that the Characterization Plan for this project will be provided as soon as it is available.

Results of these various site characterization efforts indicate that several contaminants of concern are present at the 216-Z-1A, 216-Z-9, 216-Z-18 disposal sites. All known carbon tetrachloride disposal sites have been designated as Transuranic Waste Sites under the DOE classification system. This classification is given to waste sites containing in excess of 100

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nanoCuries (100 nCi/g) of transuranic radionuclides. Some characterization efforts have been undertaken to determine the distribution of plutonium beneath these disposal sites. Results of these investigations have confirmed that the majority of the plutonium is deposited very near the bottom of the waste site approximately 20 to 30 feet beneath the ground surface. This is well above the water table which is at approximately 200 feet.

Organic contamination on the other hand is ubiquitous throughout most of the 200 West Area. Chlorinated hydrocarbon vapors, principally carbon tetrachloride, were detected in 35 boreholes located within the three disposal sites evaluated during early 1991. The concentration of carbon tetrachloride vapor present in these boreholes ranged from less than 1 ppm to greater than 170 ppm during static (NO pumping) testing. Results obtained during static testing were influenced dramatically by changes in barometric pressure. High barometric pressure conditions appeared to reduce the concentration of carbon tetrachloride vapors present in the boreholes, while low pressure conditions enhanced natural exhalation of soil gas out through the borehole, thus increasing the level of carbon tetrachloride detected. To limit the influence of barometric pressure on the carbon tetrachloride concentrations, a pumping test was performed in two boreholes at the 216-Z-1A disposal sites. Results of these tests suggest that the ambient concentration of carbon tetrachloride in the soil were significantly higher than those measured during the static tests. Carbon tetrachloride concentrations measured during the pumping tests ranged from 180 ppm to 915 ppm. Other organic vapors identified during the soil gas analysis were chloroform and 2 butanone.

Groundwater contamination is also present throughout the 200 West Area. Carbon tetrachloride, chloroform, tetrachloroethylene and trichloroethylene have been detected in the area around the 216-Z-1A, 216-Z-9, and 216-Z-18 disposal sites. The highest observed carbon tetrachloride concentration was 7,430 ppb as compared to a Maximum Contaminant Level (MCL) of 5 ppb. The extent of carbon tetrachloride contamination beneath the 200 West Area which exceeds the MCL is approximately 6.8 square miles. Although the extent of groundwater contamination is fairly large, it appears that only about 2 percent of the total inventory of carbon tetrachloride is present in the groundwater. The remainder is thought to be in the unsaturated zone where it is migrating, both laterally and vertically.

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### III. THREAT TO PUBLIC HEALTH OR WELFARE OR THE ENVIRONMENT

#### A. Present Conditions

At present, carbon tetrachloride vapors are a health concern to well drillers and field sampling personnel working in the 200 West Area. Currently, these workers are required to wear supplied air systems to minimize exposure to carbon tetrachloride vapors while drilling and sampling. For most Resource Conservation and Recovery Act (RCRA) well drilling projects and future CERCLA investigation, this hazard will translate into significant cost increases and will slow completion of these projects. In addition, the migration of carbon tetrachloride vapors through the soil column represents a threat to off-site groundwater quality due to the ability of these vapors to move independent of groundwater flow direction. Several upgradient wells located approximately ten miles west of these disposal sites supply irrigation to local vineyards may also be threatened by potential carbon tetrachloride contamination if early actions are not taken.

#### B. Types of Substances Present

Although the primary contaminants of concern are carbon tetrachloride and transuranic radionuclides (plutonium and americium) many other substances were disposed to these disposal sites. Other organic substances include tributyl phosphate, dibutyl butyl phosphonate, lubricating oils, chloroform, methylene chloride, trichloroethylene, monobutyl phosphate, and butyl alcohol. Inorganic co-contaminants include aluminum, magnesium, calcium, sodium, cadmium, chromium, fluoride, chloride, iron, iodine, nickel, nitrate, sulfate, rubidium, and radionuclides, including cesium -137 uranium, ruthenium -106, and strontium -90.

#### C. Applicable or Relevant and Appropriate Requirements

The Remedial Investigation/Feasibility Study (RI/FS) process for the 200-ZP-1 and 200-ZP-2 Operable Units will identify the final cleanup standards and applicable or relevant and appropriate requirements (ARARs) that will be applied during remediation.

This ERA will be conducted in accordance with 40 CFR 300, Subpart E; the Hanford Federal Facility Agreement and Consent Order (Part 3, Article XIII, Paragraph 38); and the State of Washington Model Toxics Control Act (Chapter 173-40 WAC).

This ERA is being conducted prior to the final cleanup actions for the 200-ZP-1 and 200-ZP-2 Operable Units and, therefore, it is not required to meet final cleanup standards or ARARs, although this action is

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required to be consistent with the anticipated final remedy for the effected operable units.

#### IV. PROPOSED ACTION AND ESTIMATED COSTS

Westinghouse Hanford Company (WHC), as the DOE contractor, prepared an EE/CA concerning technologies that were applicable for controlling the spread of carbon tetrachloride contamination in the soil column and the unconfined aquifer. An initial screening of alternatives was performed prior to the EE/CA to eliminate technologies that were not considered appropriate. The initial screening of alternatives eliminated excavation, containment, and in-situ treatment as feasible alternatives. This evaluation also identified vapor extraction as the preferred remedial technology. Prior to preparation of the EE/CA, a demonstration test of soil vapor extraction was performed in the 200 West Area to determine if this technology was effective. This technology was highly effective in recovery of carbon tetrachloride from contaminated soil. Based upon this test and the initial screening of alternatives, vapor extraction was chosen as the appropriate carbon tetrachloride recovery technology for the unsaturated zone. The EE/CA focused on the appropriate treatment technology for the recovery of carbon tetrachloride. The proposal was submitted to the EPA and Ecology by DOE for review and was amended to reflect the recommendations of the regulatory agencies. The proposal was then made available for a 30-day public comment period. Several comments were received, however, none of these comments influenced the approach or implementation of the expedited response action.

After the initial remedial alternative selection process, 19 potential alternatives were evaluated as listed in the EE/CA. The following lists those alternatives into five general groups.

- A. No Action - This alternative would not mitigate the potential threat to site workers, public health, and the environment.
- B. Vapor extraction with direct discharge of carbon tetrachloride. This action involves installation of the vapor extraction system and direct discharge of contaminated vapors to the atmosphere. At the projected recovery efficiency, approximately 1,000 pounds per day of carbon tetrachloride would be released to the atmosphere. This action is not protective of worker health and safety concerns and would result in increased exposure to personnel in the 200 West Area.

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- C. Vapor extraction with granular activated carbon recovery and off-site regeneration. This action utilizes three vapor extraction systems to remove carbon tetrachloride vapors from the soils and exhausts the vapors through canisters of activated carbon that absorb and retain carbon tetrachloride prior to release of the treated air to the atmosphere. The canisters loaded with carbon tetrachloride would then be shipped off-site for regeneration. This alternative allows for early implementation with the final treatment of the carbon tetrachloride occurring off-site at a RCRA permitted treatment facility.

The estimated cost for start up, operation, secondary waste handling and disposal for three years of operation is \$3,625,000. This option minimizes the release of carbon tetrachloride vapors in the 200 West Area. This alternative is the preferred alternative.

- D. Vapor extraction with on-site treatment of carbon tetrachloride vapors. This alternative utilized the same basic vapor extraction system as described in Option C, but instead of recovering the carbon tetrachloride vapors for off-site treatment, a treatment system would be installed on-site to destroy carbon tetrachloride. Several on-site treatment systems were evaluated for their potential applicability. Catalytic oxidation, incineration, and ultraviolet oxidation were evaluated as potential carbon tetrachloride destruction processes. All of these processes convert carbon tetrachloride to hydrochloric acid vapors. These processes result in the release of nearly 1,000 pounds per day of hydrochloric acid to the atmosphere. These emissions represent a potential threat to site workers, public health, and the environment. In addition, an eight to eleven month delay in implementation would be required to obtain on-site treatment capability. Costs for these alternatives ranged from \$2,420,000 to \$5,681,000 for start up, operation, secondary waste handling and disposal for three years of operation.
- E. Vapor extraction with on-site treatment of carbon tetrachloride vapors and secondary treatment of hydrochloric acid. This alternative utilized the basic vapor extraction recovery system and catalytic oxidation, incineration, or ultraviolet oxidation for carbon tetrachloride destruction. In addition, this alternative would provide on-site neutralization of hydrochloric acid vapors through either a dry acid scrubber system or a wet acid scrubber system. The dry scrubber system would create approximately 1,900 pounds per day of calcium chloride as a secondary waste.

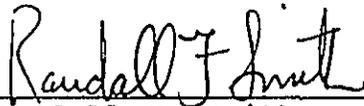
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Assuming this secondary waste is nonhazardous this material could be disposed to a nonradioactive nonhazardous waste landfill. If a wet scrubber were used, an evaporation pond or other liquid discharge location would be required. These alternatives would generate approximately 350 tons of secondary waste or 20,000,000 gallons of dilute brine solution per year. In addition, a delay of 8 months to five years may be required to implement this alternative. Costs of these alternatives for the three year period range from \$3,174,000, assuming the secondary waste is nonhazardous, to in excess of \$20,000,000 for construction of a new liquid waste disposal system.

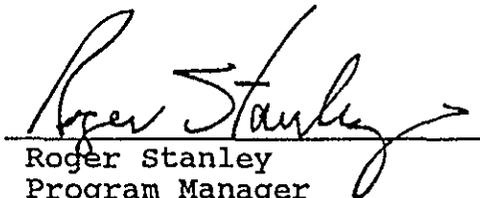
V. RECOMMENDATION

The EPA and Ecology have selected the preferred alternative as outlined in Option C of Section IV, vapor extraction with granular activated carbon recovery and off-site regeneration at a RCRA permitted facility as the approved expedited response action for the 200 West Area carbon tetrachloride plume. This action will be taken in accordance with CERCLA as amended by Superfund Reauthorization Act (SARA), and to the extent practicable, the National Contingency Plan (NCP). This decision is based on the administrative records for this project and the 200-ZP-1 Operable Unit. Implementation of the vapor extraction and granular activated carbon recovery should be initiated at 216-Z-1A immediately. Implementation of this alternative at 216-Z-18 and 216-Z-9 is to begin as soon as practicable, but no later than April 1992 at 216-Z-18. Additional Tri-Party Agreement interim milestones will be established to ensure that the second and third vapor extraction systems, as described in the EE/CA, are procured and in operation by October 1992 and November 1992, respectively.

Sincerely,



Randall F. Smith  
Acting Director  
Hazardous Waste Division  
EPA Region 10



Roger Stanley  
Program Manager  
Nuclear and Mixed  
Waste Management Program  
Washington State  
Department of Ecology

cc: Administrative Record: 200-ZP-1 Operable Unit  
Tim\_Veneziano, WHC

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