Superfund Program
Proposed Plan

U.S. Environmental Protection
Agency, Region II

Pohatcong Valley Groundwater Contamination Site
Operable Unit 1 Study Area
July 2005

EPA ANNOUNCES PROPOSED PLAN

This Proposed Plan identifies the Preferred Alternatives to address groundwater contaminated with trichloroethylene (TCE) and tetrachloroethylene (PCE), and TCE-contaminated soils, within the Pohatcong Valley Groundwater Contamination Superfund Site (PVGCSS) in Warren County, New Jersey, and provides the rationale for those preferences.

The U.S. Environmental Protection Agency (EPA) is addressing the cleanup of the site in two phases, called Operable Units. This Proposed Plan addresses Operable Unit 1 (OU1), which includes the cleanup of contaminated groundwater, and areas of soil contamination in Washington Borough. The extent of OU1 groundwater contamination is about 5 miles in length and less than 2 miles in width, and includes portions of Washington Borough, and Washington and Franklin Townships that lie along Route 57 in the Pohatcong Valley, southwestward to the town of Broadway. The OU1 Study Area contains both the contaminated groundwater and the soil source areas for the contaminants TCE and PCE, in excess of the New Jersey Groundwater Quality Standard (GWQS) cleanup goal of 1 part per billion, or 1 ppb. A Remedial Investigation (RI) for Operable Unit 2 (OU2) is currently in the planning phase for the southwest area of OU1, which includes an adjacent part of Franklin Township and Greenwich Township. The OU2 area is located hydraulically downgradient of OU1, along the direction of groundwater flow in the valley. Figure 1 identifies the location of the site and the OU1 Study Area.

This Proposed Plan includes summaries of all cleanup alternatives evaluated for use at this site. This document is issued by EPA, the lead activity for site activities, and the New Jersey Department of Environmental Protection (NJDEP), the support agency. EPA, in consultation with the NJDEP, will select a final remedy for contaminated soils and groundwater at the site after reviewing and considering all information submitted during a 30-day public comment period. EPA, in consultation with the NJDEP, may modify the Preferred Alternatives or select another response action presented in the Proposed Plan based on new information or public comments. Therefore, the public is encouraged to review and comment on all the alternatives presented in this Proposed Plan.

EPA is issuing this Proposed Plan as part of its community relations program under Section 117(a) of the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA, or Superfund). This Proposed Plan summarizes information that can be found in greater detail in the Remedial Investigation and Feasibility Study (RI/FS) reports and other documents contained in the Administrative Record for this site. EPA and the NJDEP encourage the public to review these documents to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted at the site.

MARK YOUR CALENDAR

PUBLIC COMMENT PERIOD:
July 27, 2005 – August 26, 2005
EPA will accept written comments on the Proposed Plan during the public comment period.

PUBLIC MEETING: August 4, 2005
EPA will hold a public meeting to explain the Proposed Plan and all of the alternatives presented in the Feasibility Study. Oral and written comments will also be accepted at the meeting. The meeting will be held at in the **Warren County Vocational Technical School located on Route 57, at the border of Washington and Franklin Townships,** New Jersey at 7 p.m.

For more information, see the Administrative Record at the following locations:

U.S. EPA Records Center, Region II
290 Broadway, 18th Floor.
New York, New York 10007-1866
(212) 637-4308
Hours: Monday-Friday - 9 am to 5 p.m., by appointment.

Warren County Health Department
315 West Washington Avenue
Washington Boro, New Jersey 07882
908-689-6693

SITE BACKGROUND

The PVGCSS OU1 Study Area encompasses approximately 8.75 square miles (5,600 acres) in Warren County, New Jersey, consisting of rural, industrial, commercial, municipal, and residential land located within the Pohatcong Valley. The Study Area includes portions of Washington Borough, Washington Township, and Franklin Township, in Warren County (see Figure 1). Pohatcong Valley is a northeast-southwest trending valley that is bounded by mountains, is part of the Delaware River watershed, and is drained by Pohatcong Creek and associated tributaries.

Soil

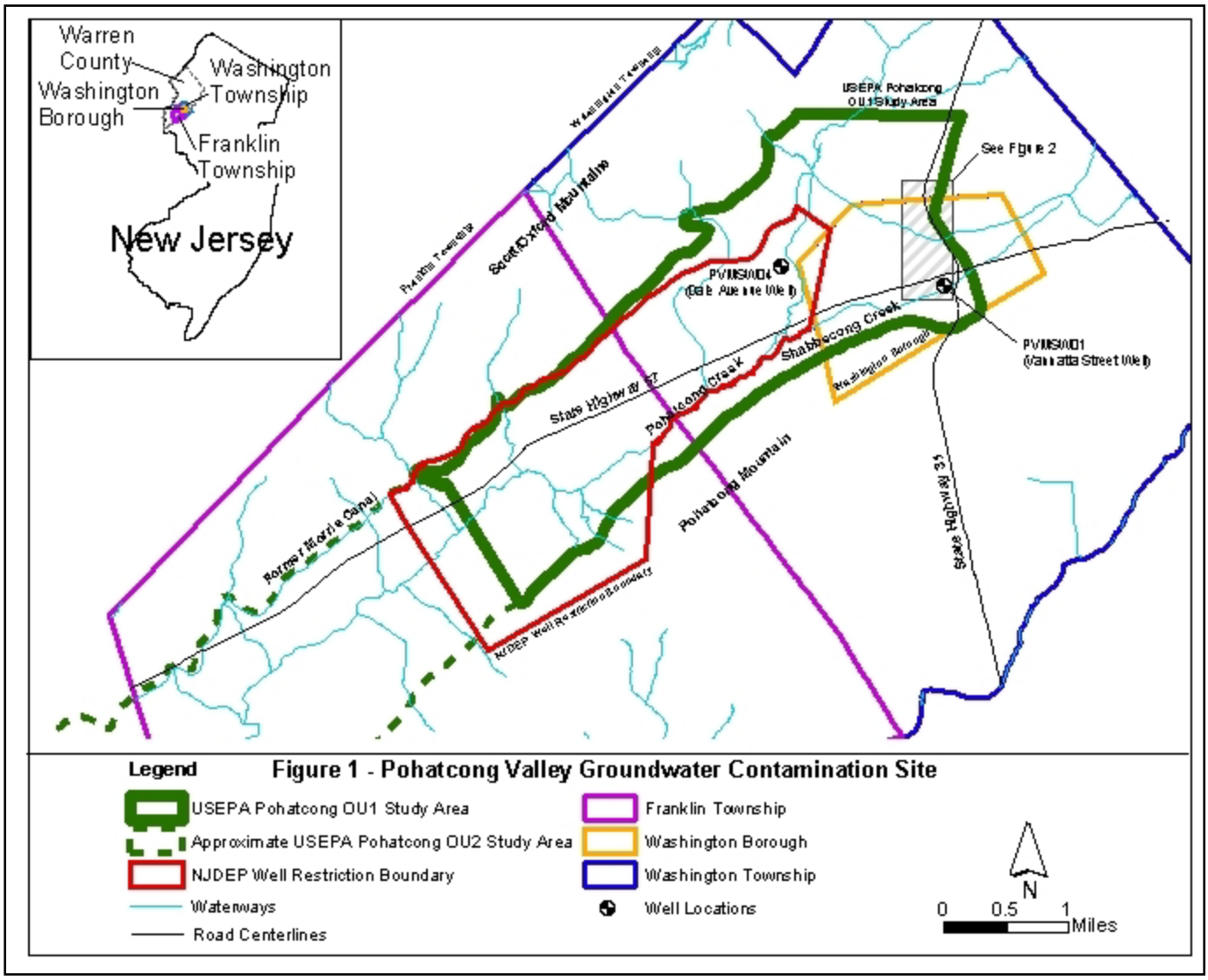
Alternative SO3 is the EPA's and NJDEP's preferred remedial alternative for contaminated TCE soils and includes Dual Phase Extraction (DPE) and limited shallow soils excavation for the TCE source areas. Alternative SO3 minimizes the leaching of contaminants into groundwater, prevents risks from direct contact to contaminated media, and limits erosion of contaminated soils by treating the contaminated soil.

Groundwater

Groundwater Alternative GW2 is the preferred remedial alternative for groundwater. This includes pumping and treatment of the most contaminated portion of the TCE and PCE plumes using a series of extraction wells along the downgradient edge of the source areas. Extracted water will be treated using air stripping (transferring TCE and PCE from liquid to vapor phase) prior to reinjection into the regional aquifer. Natural attenuation with long-term monitoring will be used in the downgradient parts of the TCE and PCE plumes to reduce contamination.

SITE HISTORY

Chlorinated volatile organic compounds (VOCs), specifically TCE and PCE, were detected in groundwater from two public potable-water supply wells in the late 1970s. The two potable-water supply wells are known as the Vannatta Street well and the Dale Avenue well. TCE and PCE were detected in groundwater samples collected from the Vannatta Street well in July 1978 at concentrations of 1.7 ppb and 8.3 ppb, respectively. At the



Dale Avenue well, only TCE was detected in groundwater samples collected in early 1979, at concentrations between 44 ppb and 160 ppb.

After subsequent investigations conducted by the Warren County Department of Health and the NJDEP, the NJDEP installed public water supply connections to the homes and businesses within the contaminated area of in 1989. EPA included the Pohatcong Valley Site on the National Priorities List (NPL) in March 1989.

EPA initiated Preliminary Remedial Investigation (RI) work in the early 1990s, which included reviewing site background information from the Warren County Department of Health and the NJDEP, and developing an initial list of 107 Potential Source Area (PSA) facilities to be evaluated as possible sources of chlorinated VOCs and other contaminants. EPA issued over 100 information request letters to facilities, and conducted site visits.

In 1999, EPA funded a new contract and brought on a new contractor to perform the full range of OU1 RI/FS activities, including the delineation of the nature and extent of contaminated groundwater, and evaluation of the potential human health and ecological risks based on the occurrence and distribution of site-related contaminants detected in the OU1 Study Area. Of the 107 original PSAs identified, EPA selected 37 PSAs and investigated them in three separate phases identified as Phases 1A, 1B, and 2. The investigation was designed to determine if any PSAs were contributing to the regional chlorinated VOC groundwater contamination within the OU1 Study Area. In addition, as the RI progressed, 8 new PSAs were identified and added to the field investigations, for a total of 45 PSAs investigated. After Phases 1A and 1B, 16 PSA facilities were retained and evaluated as part of Phase 2 comprehensive field work.

Based on the results of Phase 2 RI work in 2004, three PSA facilities were issued general notice letters informing them that they were Potentially Responsible Parties (PRPs) for the site contamination. Within the RI, the FS, and this Proposed Plan, these parties are designated as American National Can (ANC), L&L Econowash Cleaners (LNL), and Modern Valet Services (MVS). The locations of these facilities are shown on Figure 2.

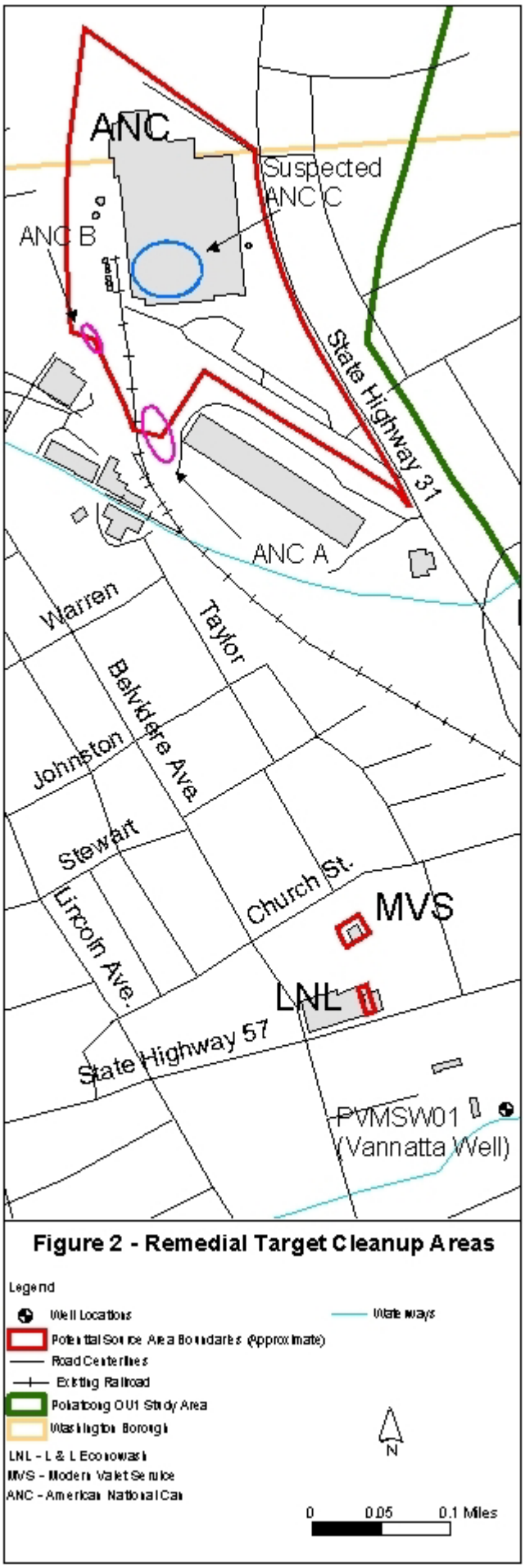


Figure 2 - Remedial Target Cleanup Areas

SITE CHARACTERISTICS

The site encompasses a broad range of demographics. The northern portion of the OU1 Study Area is within the commercial, industrial and residential portion of Washington Borough. The southern part of the OU1

Study Area is generally rural, with intermittent residences and housing developments. The valley is surrounded by heavily wooded areas and two parallel opposing topographic ridges. The site lies within the elongated valley between the ridges. The geology of the Pohatcong Valley consists of unconsolidated sedimentary deposits of glacial origin overlaying weathered bedrock. The unconsolidated sediments vary in thickness, but are generally between 50 and 100 feet thick within the OU1 Study Area, with the deeper portion in the Washington Borough area. The primary drinking water aquifer underlying the site is the competent bedrock, and is generally composed of fractured and karstic limestone and dolomite.

Groundwater in the Pohatcong Valley is found in perched aquifers within the unconsolidated deposits and in the deeper regional aquifer in the deep overburden and bedrock. Perched aquifers do exist in areas, however they are not considered to represent a significant source of groundwater for the region and are not considered significant conduits for the migration of contaminated groundwater. Groundwater in the regional aquifer is generally encountered at a depth of approximately 100 feet below ground surface (bgs) in the northern part of the OU1 Study Area, and at a depth of approximately 40 feet bgs in the downgradient, southernmost portion of the OU1 Study Area. Groundwater in the regional aquifer generally flows to the southwest, along the length of the Pohatcong Valley.

The groundwater in Pohatcong Valley is used as a source of potable drinking water, for industrial cooling and process water, and for irrigation purposes. New Jersey American Water Company (NJAWC) owns and operates the Dale Avenue and Vannatta Street public supply wells in which TCE and PCE were originally detected. As per state law, groundwater extracted by these wells is treated to meet all NJ drinking water standards. About 65 and 124 million gallons of water are produced annually by the Dale and Vannatta wells, respectively. The residences within the impacted portion of the OU1 Study Area were connected to the public-water supply pipeline by the NJDEP in 1989, and were required to abandon their residential wells, but several residential wells are currently believed to have remained open and may be in use, even though the residences are connected to a public water supply.

As part of EPA's comprehensive RI investigation, 107 PSA facilities were screened, and a total of 45 underwent intrusive field work. As part of the RI, a total of 45 monitoring wells were installed; 59 temporary wells were installed; 35 domestic wells were sampled; 286 groundwater samples were collected; 152 soil borings were completed; 399 soil samples were collected; 21 sediment samples were collected; 43 surface water samples were collected; over four miles of seismic survey and 2 miles of borehole geophysics were conducted; 320,000 gallons of waste water were treated on-site; and 550 drums of investigation derived wastes were disposed of off-site.

Soil Contamination

The highest concentrations of TCE detected in soil were found at American National Can (ANC), and an area immediately adjacent to ANC, known as AC1. These PSAs were identified as potentially significant source areas based on a comparison of the TCE soil concentrations to the New Jersey Impact to Groundwater Soil Cleanup Criteria (IGWSCC) of 1 part per million (ppm). The areas of contamination requiring soils cleanup, referred to as areas "ANC A" and "ANC B", contained maximum concentrations of 52 ppm and 3 ppm of TCE, respectively. The estimated surficial aerial extent of ANC A is approximately 28,000 square feet, and for ANC B, approximately 2,000 square feet. ANC B exhibits impacts at shallow depths (less than 5 feet), while it has been assumed based on soil sample data that ANC A contains contamination in the unconsolidated zone to a depth of bedrock at 100 feet. These estimations are based on limited sampling; the exact extent of soil contamination at the source areas will be delineated during the Remedial Design phase of the project.

It should be noted that a greater amount of TCE contamination has been detected in groundwater than could be accounted for entirely from the two ANC soil source areas identified. Based on best professional judgment and historic information, additional contamination is believed to exist in soils in the vicinity of the ANC building. Thus; a third suspected source area called "ANC C" has been included as part of the Feasibility Study (FS) and is included in the evaluation of alternatives. For the purpose of the evaluation of alternatives, ANC C is estimated to be located adjacent to the existing ANC potential source areas identified during the RI, in the vicinity of the southwest corner of the present ANC manufacturing building. Previous studies and remediation activities conducted by ANC under oversight of the NJDEP have detected TCE concentrations of up to 400 ppm in shallow soils in this area. Moreover, no studies to date have been conducted underneath the large, active manufacturing facility. The source areas will undergo further delineation in the remedial design to accurately determine the amount of contaminated material that needs to be remediated.

The highest concentrations of PCE in soil were detected at the L&L Dry Cleaners (LNL), Modern Valet Service (MVS), and Tung Sol Tubing/Pohatcong Hosiery (TVN).

Although PCE was detected at these locations in shallow soils, all soil concentrations were lower than the New Jersey IGWSCC of 1 ppm, and therefore will not require remedial action. The RI determined that PCE is not present in the soils at significant concentrations. The total mass of PCE in soil at each of the three PCE PSAs is approximately 0.5 pounds. Based on these results, soils are no longer a significant source of PCE groundwater contamination.

Groundwater Contamination

Groundwater samples collected throughout the OU1 Study Area indicate that TCE and PCE have migrated down through unconsolidated soils into the regional aquifer, contributing to two separate plumes. The TCE plume has migrated in the regional aquifer several miles downgradient from its original sources, whereas, the PCE plume has remained primarily within Washington Borough. TCE is by far the main groundwater contaminant within the OU1 Study Area. The highest TCE concentrations detected during the RI in groundwater, up to 2,100 ppb, are located immediately downgradient of the ANC PSA facility. The lateral extent of the TCE plume appears to be confined to near the center of the Pohatcong Valley.

The highest PCE concentration detected in groundwater during the RI was 54 ppb at the Vannatta Street public supply well, near the LNL Econowash Dry Cleaners and Modern Valet Service facilities. The extent of the PCE plume is much smaller than the TCE plume and is localized in the Borough of Washington.

SCOPE AND ROLE OF THE ACTION

For the purposes of planning response actions, EPA has addressed the cleanup of the site in two discrete phases, or Operable Units (OUs). Operable Unit 1 (OU1), which is the subject of this Proposed Plan, will provide for implementation of a remedy to address the TCE-contaminated soils contributing to the TCE groundwater contaminant plume, as well as a remedy to address both TCE- and PCE-contaminated groundwater within the OU1 Study Area.

The investigation of OU2 within the southwestern portion of the Pohatcong Valley will be initiated later in 2005 to determine the nature and extent of contaminated groundwater in the OU2 Study Area, and to select an appropriate remedy for the OU2 Study Area.

"What is a Principal Threat"?

The NCP establishes an expectation that EPA will use treatment to address the principal threats posed by a site wherever practicable (NCP Section 300.430(a)(1)(iii)). The "principal threat concept is applied to the characterization of "source materials" at a Superfund site. A source material is material that includes or contains hazardous substances, pollutants or contaminants that act as a reservoir for migration of contaminants to groundwater, surface water or air, or acts as a source of direct exposure. Contaminated groundwater generally is not considered to be a source material; however, contaminant hot spot areas in groundwater may be viewed as source material. Principal threat wastes are those source materials considered to be highly toxic or highly mobile that generally cannot be reliably contained, or would present a significant risk to human health or the environment should exposure occur. The decision to treat these wastes is made on a site-specific basis through a detailed analysis of the alternatives using nine remedy selection criteria. This analysis provides a basis for making a statutory finding that the remedy for soils and groundwater employs treatment as the principal element. In addition, NJDEP has recommended that soils contaminated with VOCs in excess of 1 ppm may also be a source of groundwater contamination, so soils in excess of that criterion are also considered principal threat waste.

SUMMARY OF SITE RISKS

Human Health Risks

Screening-level risk evaluations were performed for the 45 Potential Source Areas (PSAs), and the 80 groundwater monitoring and water supply wells investigated during the OU1 RI. Based on the screening-level risk evaluations, EPA identified 8 PSAs, 3 wells, and the TCE and PCE groundwater plumes to undergo a full baseline human health risk assessment (HHRA).

The HHRA was conducted to evaluate the potential human health risks associated with exposure to the chlorinated VOCs, and other constituents such as metals, semi-volatile organic compounds (SVOCs), non-chlorinated VOCs detected during the RI.

The HHRA characterized the current and potential future human health risks based on the conservative assumption that no remediation would be implemented and the chemical concentrations would not decrease over time. Health risks are based on a conservative estimate of the potential carcinogenic (cancer-causing) risk or the potential to cause other health effects not related to cancer (noncarcinogenic risk). A Hazard Quotient (HQ) is calculated for each noncarcinogenic chemical contaminant of potential concern (COPC), and the total noncarcinogenic risk is calculated as the sum of all HQs, called a Hazard Index (HI). Likewise, the total

carcinogenic risk is calculated as the sum of the carcinogenic risks from each individual carcinogenic COPC.

Regarding the risks for exposure to TCE and PCE in the regional groundwater aquifer, and for TCE if consumed in domestic residential wells, risks or hazards are above EPA acceptable risk levels.

Groundwater exposure pathways in the regional aquifer include the operation of residential, industrial, or commercial production wells. Risks associated with groundwater were evaluated for use as potable water, for limited irrigation, and for other domestic uses. The risks evaluated from the TCE and PCE contaminated groundwater plumes are associated with ingestion, dermal contact, and inhalation of vapors while showering. Use of groundwater from domestic wells within the OU1 Study Area as a potable-water supply would result in non-carcinogenic hazards and carcinogenic risks above the EPA's target risk levels due to the presence of TCE. While EPA calculated these risks, it should be noted that the use of residential wells as potable water sources in the OU1 Study Area has been reduced or eliminated through implementation of the NJDEP Well Restriction Area and provision of public potable water supply. Groundwater is presently being supplied to commercial and residential users through the operation of public water supply wells by New Jersey American Water Company. Because groundwater pumped at the Dale Avenue and Vannatta Street water supply wells is treated before entry into the distribution system, TCE and PCE contaminants above risk levels do not reach consumers through use of the public water supply.

Regarding the risks for exposure at the targeted remedial soils cleanup areas, risks or hazards for both residential and industrial worker scenarios are above EPA acceptable risk levels for soils contaminated with TCE, some metals, and polycyclic aromatic hydrocarbons (PAHs). The hazards and risks associated with these areas are primarily from inhalation of TCE vapors, and metals within the dust that could be released from the contaminated soils. TCE detected in the surface and subsurface soil within the targeted remedial cleanup areas may pose carcinogenic risks and/or non-carcinogenic hazards above EPA acceptable risk levels to child residents, lifetime residents, industrial workers, and construction workers. The primary human exposure pathways for TCE in soil are direct contact with soils, or inhalation of vapors from the unsaturated zone soils. These vapors can migrate to the surface where they are released into the atmosphere or into subsurface structures (e.g., basements or excavations).
Exposure to very high concentrations of PCE can cause dizziness, headaches, sleepiness, confusion, nausea, difficulty in speaking and walking, unconsciousness, and death. Irritation may result from repeated or extended skin contact with it. These symptoms occur almost entirely in work (or hobby) environments when people have been accidentally exposed to high concentrations. In industry, most workers are exposed to levels lower than those causing obvious nervous system effects. The health effects of breathing in air or drinking water with low levels of PCE are not known.

Results of animal studies, conducted with amounts much higher than those detected at the site, show that PCE can cause liver and kidney damage. PCE has been shown to cause liver tumors in mice and kidney tumors in male rats. Exposure to very high levels of PCE can be toxic to the unborn pups of pregnant rats and mice. Changes in behavior were observed in the offspring of rats that breathed high levels of the chemical while they were pregnant.

Breathing small amounts of TCE may cause headaches, lung irritation, dizziness, poor coordination, and difficulty concentrating. Breathing large amounts of TCE may cause impaired heart function, unconsciousness, and death. Breathing it for long periods may cause nerve, kidney, and liver damage.

Drinking water with large amounts of TCE (greater than what has been detected at the site) may cause nausea, liver damage, unconsciousness, impaired heart function, or death. Drinking small amounts of TCE for long periods may cause liver and kidney damage, impaired immune system function, and impaired fetal development in pregnant women, although the extent of some of these effects is not yet clear. Skin contact with TCE for short periods may cause skin rashes.

Some studies with mice and rats have suggested that high levels of TCE may cause liver, kidney, or lung cancer. Some studies of people exposed over long periods to high levels of TCE in drinking water or in workplace air have found evidence of increased cancer. Although there are some ongoing questions about the accuracy of the studies of people who were exposed to TCE, some of the effects found in people were similar to effects in animals.

Ecological Risks

An Ecological Risk Assessment (ERA) was also conducted to evaluate risks to the environment associated with chlorinated VOCs detected in soil and groundwater. The ERA evaluated the occurrence of ecologically important terrestrial habitat and surface water and wetland resources using direct site observations; the assessment of potential pathways between contamination and the

habitats; the identification of ecological screening values; and the estimation of exposure concentrations based on site data. Following the estimation of exposure concentrations, the exposure concentrations were compared with the corresponding screening values to derive risk estimates.

The ERA concluded that complete exposure pathways exist for terrestrial plants/soil invertebrates, benthic macroinvertebrates and aquatic life within the OU1 Study Area. There is the potential for adverse effects to terrestrial plants/soil invertebrates from the presence of TCE in source soils, but the limited frequency and wide variance of exceedances suggest a localized area of potential adverse affect. Therefore, there is a limited overall potential for chlorinated VOCs to adversely affect the terrestrial plant/soil invertebrate community.

REMEDIAL ACTION OBJECTIVES

Remedial action objectives (RAOs) were developed for contaminated soil and groundwater that are goals for protecting human health and the environment within the OU1 Study Area. These RAOs are used to develop the overall remediation goals to define the extent of cleanup necessary to protect human health and the environment. For purposes of the FS, it was estimated that approximately 163,000 cubic yards of contaminated soils would have to be treated to achieve RAOs.

Soil Remedial Action Objectives

- Prevention of human exposure, through contact, ingestion, or inhalation to contaminated soil that presents an unacceptable risk to human health.
- Prevention of erosion and off-site transport of soils contaminated at concentrations posing unacceptable risk.
- Remediation of contaminated soils, as necessary, to prevent further leaching of contaminants to groundwater.

WHAT IS RISK AND HOW IS IT CALCULATED?

A Superfund baseline human health risk assessment is an analysis of the potential adverse health effects caused by hazardous substance releases from a site in the absence of any actions to control or mitigate these under current- and future-land uses. A four-step process is utilized for assessing site-related human health risks for reasonable maximum exposure scenarios.

Hazard Identification: In this step, the contaminants of concern at the site in various media (i.e., soil, groundwater, surface water, and air) are identified based on such factors as toxicity, frequency of occurrence, and fate and transport of the contaminants in the environment, concentrations of the contaminants in specific media, mobility, persistence, and bioaccumulation.

Exposure Assessment: In this step, the different exposure pathways through which people might be exposed to the contaminants identified in the previous step are evaluated. Examples of exposure pathways include incidental ingestion of and dermal contact with contaminated soil. Factors relating to the exposure assessment include, but are not limited to, the concentrations that people might be exposed to and the potential frequency and duration of exposure. Using these factors, a “reasonable maximum exposure” scenario, which portrays the highest level of human exposure that could reasonably be expected to occur, is calculated.

Toxicity Assessment: In this step, the types of adverse health effects associated with chemical exposures, and the relationship between magnitude of exposure (dose) and severity of adverse effects (response) are determined. Potential health effects are chemical-specific and may include the risk of developing cancer over a lifetime or other non-cancer health effects, such as changes in the normal functions of organs within the body (e.g., changes in the effectiveness of the immune system). Some chemicals are capable of causing both cancer and non-cancer health effects.

Risk Characterization: This step summarizes and combines exposure information and toxicity assessments to provide a quantitative assessment of site risks. Exposures are evaluated based on the potential risk of developing cancer and the potential for non-cancer health hazards. The likelihood of an individual developing cancer is expressed as a probability. For example, a 10^{-4} cancer risk means a “one-in-ten-thousand excess cancer risk”; or one additional cancer may be seen in a population of 10,000 people as a result of exposure to site contaminants under the conditions explained in the Exposure Assessment. Current Superfund guidelines for acceptable exposures are an individual lifetime excess cancer risk in the range of 10^{-4} to 10^{-6} (corresponding to a one-in-ten-thousand to a one-in-a-million excess cancer risk). For non-cancer health effects, a “hazard index” (HI) is calculated. An HI represents the sum of the individual exposure levels compared to their corresponding reference doses. The key concept for a non-cancer HI is that a “threshold level” (measured as an HI of less than 1) exists below which non-cancer health effects are not expected to occur.

Groundwater Remedial Action Objectives

- Overall restoration of the aquifer to drinking water quality within a reasonable timeframe.
- Remediation of the most contaminated areas of groundwater.
- Minimize further migration of contaminants in groundwater and the persistence of the downgradient plume.
- Prevent the ingestion of contaminated groundwater which may pose an unacceptable risk to existing and potential groundwater users within the OU1 Study Area.

To achieve these RAOs, cleanup goals for both soil and groundwater within the OU1 Study Area were identified. The remedial goal for soil is the New Jersey Impact to Groundwater Soil Cleanup Criteria (IGWSCC) of 1 ppm for both TCE and PCE. The remedial goal for groundwater is the New Jersey Groundwater Quality Standard (GWQS) of 1 ppb for both TCE and PCE.

INITIAL SCREENING OF ALTERNATIVES

In accordance with the Superfund program, a preliminary screening evaluation of the soil and groundwater remedial alternatives was completed to assess whether alternatives could be screened out prior to a detailed evaluation. The alternatives that were screened out were removed from consideration and not evaluated as part of the detailed analysis of alternatives. For example, some of the types of technologies that have been evaluated and screened out for soils remediation include several types of physical/chemical reduction, physical stabilization, soils vitrification, physical/chemical oxidation, soil washing, thermal steam stripping, incineration, low temperature desorption, and landfilling. Some of the technologies that have been evaluated and screened out for groundwater remediation include in-situ oxidation, in-situ reduction, steam injection, steam stripping, ion exchange, reverse osmosis, both permeable and impermeable barrier treatments, and various biological treatments. Additional details on the rationale for screening out technologies are mentioned in the FS.

SUMMARY OF REMEDIAL ALTERNATIVES

CERCLA requires that if a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining above levels that do not allow for unlimited use and unrestricted exposure, EPA must review the action no less often than every five years after the initiation of the action. Institutional controls (deed restrictions for contaminated soil, and a Well Restriction Area already in place for groundwater) are included for alternatives to limit the use of portions of the property during the remedial actions. The remedial alternatives for contaminated soil and groundwater within the OU1 Study Area are summarized below. Four remedial alternatives were developed for soil, and four remedial alternatives were developed for groundwater. The alternatives will address the extent of TCE contamination above the New Jersey remediation goal of 1 ppm for soils, and for TCE and PCE above the cleanup goal of 1 ppb for groundwater. These alternatives are selected from the alternatives that were evaluated in detail in the Feasibility Study for this site. It should be noted that soils alternatives were developed only to address TCE contamination, as no detections of PCE were found above the remedial goal of 1 ppm.

For the three active groundwater pump and treatment alternatives, GW2, GW3 and GW4, if, during implementation, any residences or businesses within the aerial extent of the OU1 plume are found to have not yet been connected to public water, EPA would offer to connect them, and seal their wells. Industrial and irrigation water wells in the area would also be evaluated, and a determination will be made regarding their continued use, including the possibility of either closure or treatment prior to use.

Regarding the targeted TCE soils areas, remedial alternatives have been developed which evaluate the areas referred to as ANC A, ANC B, and ANC C (see Figure 2). During the RI, two areas of TCE soil contamination above the remediation goal of 1 ppm were identified that will require remedial action to remove TCE that may be a continuing source of groundwater contamination. A third source area known as ANC C has been included and is presumed to exist because the currently-identified source areas are not believed to contain enough contaminant mass to account for the persistence of the high levels of locally-identified hot spot groundwater contamination. For the purpose of this evaluation, ANC C has been included in this remedy and is believed to be located in the vicinity of the southwest corner of the existing manufacturing building, and may include areas underneath the building as well. This is because previous studies and remediation activities conducted by ANC had detected TCE at concentrations of up to 400 ppm in shallow soils in this area, and because the area is adjacent to existing ANC potential source areas identified during the RI, and because no previous investigations have focused on the large area under the facility.

It should be noted that the source areas will undergo further delineation in the remedial design to more accurately determine the amount and depths of contaminated material, and to define specific locations

that need to be remediated.

Consistent with expectations set out in the Superfund regulations, with the exception of the No Action alternative, none of the alternatives presented rely exclusively on institutional controls to achieve protectiveness. The time frames presented for construction do not include the time for pre-design investigations, remedial design, or contract procurements. The environmental restoration time frames provided are only approximate, and were used to generate estimated present worth costs.

SOIL ALTERNATIVES

Soil Alternative SO1: No Action

Estimated Capital Cost: $0
Estimated Annual O&M Cost: $0
Estimated Present Worth Cost: $0
Estimated Construction Time frame: None
Estimated Time of Environmental Restoration: 50 years

Regulations governing the Superfund program generally require that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action to address contaminated soils within the OU1 Study Area to prevent human exposure or continuing impacts to groundwater. Because contaminated soil would be left in place under this alternative, a review of the remedy every five years would be required.

Soil Alternative SO2: Capping and Institutional Controls

Estimated Capital Cost: $1,100,000
Estimated Annual O&M Cost: $4,900
Estimated Present Worth Cost: $1,240,000
Estimated Construction Time frame: 6 Months
Estimated Time of Environmental Restoration: 50 years

Soil Alternative SO2 includes the installation of an impermeable multi-layer cap at ANC A, the use of the existing concrete cap at ANC C, and the excavation and off-site disposal of soils at ANC B. Capping prevents risks from direct contact to contaminated media, limits erosion of contaminated soils, and minimizes leaching of TCE to groundwater. ANC C is already capped by the concrete foundation of the existing building. Because of the limited extent of contamination at ANC B, soil in this area would be excavated and disposed off-site. Limited excavation may also be conducted at ANC A or elsewhere, depending on the results of the pre-design investigations. Excavations would be backfilled with certified clean fill material. Because contaminated soil would be left in place under this alternative, deed restrictions and a review of the remedy every five years would be required.

Soil Alternative SO3: Dual-Phase Extraction and Shallow Soil Mixing

Estimated Capital Cost: $3,700,000
Estimated Annual O&M Cost (2 years): $160,000*
Estimated Present Worth Cost: $4,400,000
Estimated Construction Time frame: 3 Months
**Estimated Time of Environmental Restoration: 2 years*

Soil Alternative SO3 includes Dual Phase Extraction (DPE) for ANC A and C to meet the soil remedial objectives through active treatment. DPE involves the extraction of groundwater and air from the soil under a vacuum to create a negative pressure induced flow, with subsequent treatment to remove contaminants. Prior to installation of the DPE system at ANC A, soils to a depth of approximately 20 feet would be mixed to homogenize the soil and increase air permeability. Mixing methods would be decided upon in the remedial design phase and may include the use of rotating augers or standard exactor buckets working the soil until adequately homogenized. Pneumatic fracturing may be performed at deeper depths to increase air permeability and TCE removal effectiveness. Soil at ANC C would not be mixed because of the technical difficulties associated with assessing the soils the existing building. Because of the limited extent of contamination at ANC B, soil would be excavated and disposed of off-site. In addition, limited excavation may be conducted at ANC A, depending on the results of the pre-design investigations and conditions encountered during mixing. The excavations would be backfilled with certified clean fill material. Soil sampling would be conducted to verify the effectiveness of the remedy.

This alternative minimizes leaching of contaminants to groundwater, prevents risks from direct contact to contaminated media, and limits erosion of contaminated soils by treating subsurface soils to below the remedial goal of 1 ppm. This alternative will eliminate the need for long-term monitoring or institutional controls after treatment and will allow unlimited exposure and unrestricted use.

Soil Alternative SO4: Excavation and Off-Site Disposal

Estimated Capital Cost: $10,000,000
Estimated Present Worth Cost: $10,400,000
Estimated Construction Time frame: 8 Months
Estimated Time of Environmental Restoration: 2 years

Soil Alternative SO4 includes the removal of shallow soils from ANC A and ANC B with TCE concentrations greater

than the remediation goals for disposal off-site. Excavated soils would be replaced with clean fill material. Excavated soils would be treated, if necessary, in order to meet the requirements of the landfill that is to receive the waste. Soils remaining below the excavation depth (i.e., soils more than 20 feet bgs) would be treated by a DPE system similar to that described in Soil Alternative SO3. Excavation is limited to approximately 20 feet bgs as deeper depths would require extensive structural stabilization during an excavation. Soil sampling would be conducted to verify the effectiveness of the remedy.

This alternative minimizes leaching of contaminants to groundwater, prevents risks from direct contact to contaminated media, and limits erosion of contaminated soils by treating contaminated subsurface soils contamination to below the remedial goal of 1 ppm. This alternative will eliminate the need for long-term monitoring or institutional controls after treatment and will allow unlimited and unrestricted use.

GROUNDWATER ALTERNATIVES

Groundwater Alternative GW1: No Action

Estimated Capital Cost: *$0*
Estimated Annual O&M Cost: *$0*
Estimated Present Worth Cost: *$0*
Estimated Construction Time frame: *None*
Estimated Time of Environmental Restoration: greater than 60 years

As with the soils alternatives, regulations governing the Superfund program generally require that the "no action" alternative be evaluated to establish a baseline for comparison. Under this alternative, EPA would take no action to address contaminated groundwater within the OU1 Study Area to prevent human exposure. Review of the remedy every five years would also be required.

Groundwater Alternative GW2: Source Treatment and Natural Attenuation

Estimated Capital Cost: *$2,552,000*
Estimated Annual O&M Cost: *$606,000*
Estimated Present Worth Cost: *$8,060,000*
Estimated Construction Time frame: *1 Year*
Estimated Time of Environmental Restoration: 55 years

The objective of Groundwater Alternative GW2 is to extract and treat the most contaminated part of the TCE plume (concentrations that exceed 500 ppb) using a series of extraction wells along the downgradient edge of this source area. The TCE treatment system would consist of three high yield extraction wells, each pumping at approximately 140 gallons per minute (gpm). The PCE system would consist of one extraction well, placed within the PCE source areas, pumping at approximately 100 gpm. Total generated groundwater for both systems would be approximately 520 gpm, for a total of approximately 749,000 gallons per day (gpd). Extracted groundwater would be treated using air stripping (transferring TCE and PCE from liquid to vapor phase, with off-gas treatment) prior to reinjection into the regional aquifer. Natural attenuation with long-term monitoring will be used in the downgradient parts of the TCE and PCE plumes to reduce contamination to below the remedial goals of 1 ppb.

This alternative will actively reduce the concentrations of TCE and PCE in groundwater in the area having the highest contamination. Further, potential residential groundwater users that are not connected to the public water supply will be given the opportunity to be connected.

Similar to Alternative GW1, institutional controls would be required to prevent the installation of wells in the contaminated groundwater plume, at least while the remedy is being implemented, and a review of the remedy every five years would also be required.

Groundwater Alternative GW3: Expanded Source Treatment and Natural Attenuation

Estimated Capital Cost: *$3,399,000*
Estimated Annual O&M Cost: *$996,000*
Estimated Present Worth Cost: *$25,760,000*
Estimated Construction Time frame: *1.5 Years*
Estimated Time of Environmental Restoration: 47 years

This alternative is similar to and modifies the Groundwater Alternative GW2 by installing additional extraction wells and increasing the pumping rate to capture a larger area of groundwater that exceeds 100 ppb of TCE. The TCE treatment system would include five high yield extraction wells, each pumping at approximately 280 gpm. The PCE system would consist of two extraction wells placed within the PCE source areas. Total generated groundwater for both systems would be approximately 1,610 gpm, for a total of approximately 2,318,400 gallons per day. Extracted water would be treated in the same manner as Groundwater Alternative GW2 via air stripping, prior to reinjection into the regional aquifer, and natural attenuation with long-term monitoring will be used in the downgradient portions of the TCE and PCE plumes to reduce contamination to below the remedial goals of 1 ppb for each of these contaminants. This alternative meets the remedial objectives by extracting and treating the areas of areas of groundwater contamination containing the highest

THE NINE SUPERFUND EVALUATION CRITERIA

1. Overall Protectiveness of Human Health and the Environment evaluates whether and how an alternative eliminates, reduces, or controls threats to public health and the environment through institutional controls, engineering controls, or treatment.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) evaluates whether the alternative meets federal and state environmental statutes, regulations, and other requirements that pertain to the site, or whether a waiver is justified.

3. Long-term Effectiveness and Permanence considers the ability of an alternative to maintain protection of human health and the environment over time.

4. Reduction of Toxicity, Mobility, or Volume (TMV) of Contaminants through Treatment evaluates an alternative's use of treatment to reduce the harmful effects of principal contaminants, their ability to move in the environment, and the amount of contamination present.

5. Short-term Effectiveness considers the length of time needed to implement an alternative and the risks the alternative poses to workers, the community, and the environment during implementation.

6. Implementability considers the technical and administrative feasibility of implementing the alternative, including factors such as the relative availability of goods and services.

7. Cost includes estimated capital and annual operations and maintenance costs, as well as present worth cost. Present worth cost is the total cost of an alternative over time in terms of today's dollar value. Cost estimates are expected to be accurate within a range of +50 to -30 percent.

8. State/Support Agency Acceptance considers whether the State agrees with the EPA's analyses and recommendations, as described in the RI/FS and Proposed Plan.

9. Community Acceptance considers whether the local community agrees with EPA's analyses and preferred alternative. Comments received on the Proposed Plan are an important indicator of community acceptance.

concentrations of TCE and PCE.
Institutional controls would be required to prevent the installation of wells in the contaminated groundwater plume, at least while the remedy is being implemented, and a review of the remedy every five years would also be required.

Groundwater Alternative GW4: Entire Plume Capture and Treatment

Estimated Capital Cost: *$10,811,000*
Estimated Annual O&M Cost: *$2,373,000*
Estimated Present Worth Cost: *$46,840,000*
Estimated Construction Time frame: *3 Years*
Estimated Time of Environmental Restoration: 22 years

Groundwater Alternative GW4 meets the groundwater cleanup standards through the capture and treatment of the entire groundwater plume that exceeds a concentration of 1 ppb of both TCE and PCE, within the OU1 Study Area. This alternative protects human health and the environment within the OU1 Study Area and downgradient of the plume by removing the greatest amount of contaminated groundwater from the regional aquifer, as this alternative includes entire plume capture and treatment. It would require six sets of five extraction wells (30 wells total) oriented perpendicular to the migration of the plume, with each set spaced approximately 4,000 feet along the longitudinal extent of the OU1 plume. To completely capture the TCE plume, an estimated minimum of 1,500 gpm would need to be pumped at each set of extraction wells. This extraction system would produce a total of 9,000 gpm, for nearly 13 million gallons per day. The groundwater treatment system is assumed to be similar in process to that presented for Groundwater Alternatives GW2 and GW3, although significantly larger in scale to allow for treatment of higher volumes of groundwater (e.g., approximately six treatment plants may be needed to treat the amount of water extracted under this alternative). Under this alternative, groundwater remediation goals would be met in approximately 22 years.

The alternative meets remedial action objectives by extracting and treating the entire groundwater contaminant plume containing TCE and PCE.

Similar to Alternatives GW1, GW2, and GW3, institutional controls would be required to prevent the installation of wells in the contaminated groundwater, while the remedy is being implemented, and a review of the remedy every five years would also be required.

EVALUATION OF ALTERNATIVES

Nine criteria are used to evaluate the different remediation alternatives individually and against each other in order to select the preferred remedial alternative. This section of the Proposed Plan profiles the relative performance of each alternative against the nine criteria, noting how each compares to the other options under consideration. The nine evaluation criteria are described in the text box. The Detailed Analysis of Alternatives can be found in the FS report.

1. Overall Protection of Human Health and the Environment

Soils

The No Action Soil Alternative SO1 is not protective of human health and the environment because it allows continued leaching of TCE to groundwater. Soil Alternative SO2 relies primarily on the cap covering to meet the first two remedial action objectives, and on the natural attenuation of contaminants to reduce impacts to groundwater. It is considered protective of public health and the environment because the cap would minimize the potential for exposure to the contaminated soils.

The remaining soil alternatives are considered protective of public health and the environment. Soil Alternatives SO3 and SO4 use in-situ treatment to remove the majority of TCE present in the source areas. Soil Alternative SO4 uses excavation and off-site disposal to a large extent, as well as in-situ treatment to achieve the same result.

Groundwater

The No Action Groundwater Alternative GW1 is not considered protective of human health and the environment because it does not reduce contamination, or include groundwater monitoring to determine the fate and transport of the plume over time, and is without any means to evaluate the time until remediation goals are met. Future exposure to groundwater could result in unacceptable and uncontrolled risks to the public.

The remaining alternatives are considered protective. Groundwater Alternatives GW2 and GW3 have components of natural attenuation with long-term monitoring for the downgradient portion of the plumes, whereas, GW4 does not include natural attenuation because it includes treatment of the entire plume. Each alternative includes more aggressive remediation in the upgradient groundwater "hot spots" of contamination.

2. Compliance with ARARs

Major applicable ARARs for the site are listed below.

Chemical ARARs: NJDEP Soil Cleanup Criteria (N.J.A.C. 7-26D) - TBCs for Soil - Federal MCLs (40 CFR 141)- ARARs for Groundwater NJDEP GWQS (N.J.A.C. 7:9-6).

Action ARARs: Federal Safe Drinking Water Act (40 CFR 144); Underground injection permitting NJDEP GWQS (N.J.A.C. 7:9-6) - Treatment standards for re-injection of groundwater; National Contingency Plan (CERCLA) - (40 CFR 300, Subpart E) - General Remediation; NJDEP Technical Regulations (N.J.A.C. 7:26E) - General Remediation in New Jersey.

Location ARARs: National Historic Preservation Act (16 U.S.C. 470) - Preserving historic places (Morris Canal); Wetlands Act of 1970 (N.J.S.A. 13:9A-1 et.seq.) - Protection of wetlands.

A full list of ARARs is included in Appendix B of FS.

Soils

All the alternatives other than the No Action Alternative, SO1, are expected to meet ARARs. The remedial goal for TCE in soils is 1 ppm, which is a number developed by the NJDEP to assure protection of groundwater. This standard is more stringent than the TCE - residential/non-residential direct contact remedial goals of 23 ppm and 54 ppm, respectively. Action-specific ARARs would be met under Soil Alternatives SO2, SO3, and SO4.

Groundwater

With the exception of the No Action Groundwater Alternative, GW1, each groundwater alternative satisfies the ARARs.

All alternatives that involve active groundwater treatment, GW2, GW3, and GW4, would restore the aquifer to cleanup standards in less time than Alternative GW1. Air treatment for emissions from treatment plants to meet Clean Air Act and applicable NJDEP ARARs may be required for GW2, GW3, and GW4.

3. Long-term Effectiveness and Permanence

Soils

The long-term effectiveness and permanence of the alternatives vary largely as a result of the adequacy and reliability of the systems implemented. Soil Alternative SO4 is expected to achieve the greatest removal of TCE from the soils in the shortest period of time, however, both Alternatives SO3 and SO4 are expected to achieve long-term effectiveness.

Alternative SO3 is rated somewhat lower than Soil Alternative SO4 for long-term protectiveness because the amount of soils that will be excavated is less, and the alternative relies more heavily on the DPE technology which may not effectively remove all of the TCE as excavation would. However, DPE remediation is expected to continue until remedial goals are achieved, and the shallow soil mixing included in Soil Alternative SO3 will improve removal effectiveness in anticipated silt and clay soils, while allowing the areas of greatest TCE contamination to be identified and more precisely targeted for remediation. In addition, the fracturing of the deeper

underlying silt and clay soils will aid TCE removal via DPE, where removal will be more difficult.

Soil Alternative SO2, Capping, is not as effective in the long-term as Alternatives SO3 and SO4 because residual contamination remains on-site and maintenance of the cap would be required to ensure the long-term effectiveness of the cap. In addition, this alternative would have no effect on the contaminant area believed to be located below the ANC building foundation, known as ANC C, which may be already capped or partially capped by the building.

Soil Alternative SO1 is considered the least effective alternative because it will not remove TCE or limit further leaching of contamination into the groundwater.

Groundwater

The long-term effectiveness and permanence of the extraction and ex-situ treatment Groundwater Alternatives GW2, GW3 and GW4, are better than Alternative GW1, because these involve the active reduction of TCE and PCE concentrations in groundwater near the highest areas of contamination, over a shorter time frame.

The groundwater collection and treatment alternatives, GW2, GW3 and GW4, are similar in their long-term effectiveness and permanence due to the relatively high rates of pumping and treatment of groundwater. Groundwater Alternative GW4 ranks higher in long-term effectiveness and permanence because a larger mass of TCE and PCE in groundwater near the original sources would be actively removed. Alternative GW2 will take longer than GW3 to achieve remediation goals, while Alternative GW4 will take the shortest amount of time.

The remaining alternative, GW1, the No Action Groundwater Alternative, is not considered to be effective in the long term.

4. Reduction of Toxicity, Mobility, or Volume of Contaminants through Treatment

Soils

Soil Alternative SO3 relies on active treatment (DPE), which is more protective of human health and the environment by reducing the volume of soil contamination more than Soil Alternatives SO1 (No Action), and SO2 (capping). Soil Alternative SO3 will eliminate continued leaching of contamination to groundwater, whereas, Soil Alternatives SO1 and SO2 do not actively treat impacted soil which will continue to impact groundwater. Soil Alternative SO3 does not require engineering and institutional controls after treatment that would be needed with Soil Alternatives SO1 and SO2. The time of remediation is much shorter for Soil Alternative SO3 when compared to Soil Alternative SO2. Soil Alternative SO3 will allow unrestricted use of the area after treatment. Soil Alternatives SO1 and SO2 would limit future use since engineering and institutional controls will be needed.

Treatment is not included in Soil Alternatives SO1 or SO2; therefore, these alternatives are considered the least effective in terms of this criteria.

Soil Alternatives SO3 and SO4 include treatment of soils to remove and destroy TCE. Soil Alternative SO4 offers the greatest potential reduction in TCE mass because it relies more heavily on excavation, which completely removes contaminated soil in accessible areas, and uses a proven technology (DPE) to remediate the remaining less accessible source areas. Soil Alternative SO3 would also be effective at reducing TCE mass because it relies on excavation, and homogenizes the soil and allows areas of greatest contamination to be more accurately delineated and targeted for DPE treatment.

Higher contaminant mass removal of TCE at shallow depths with Soil Alternative SO4, compared to SO3; however, below 20 feet, the removal will be the same because both will employ the same DPE treatment.

Soil Alternative SO3 reduces the volume of shallow contaminated material through in-situ treatment, whereas Soil Alternative SO4 involves removal of shallow contaminated soils for landfilling and in-situ treatment for contaminated soils below 20 feet.

Groundwater

Groundwater Alternative GW4 is the most effective alternative for the reduction of contaminant mass because it removes and destroys the most TCE and PCE, through treatment prior to reinjecting into the aquifer. Groundwater Alternatives GW2 and GW3 also remove TCE and PCE within the targeted cleanup areas to below the cleanup goals. The targeted TCE and PCE cleanup areas for Alternative GW2 is smaller than for either Alternative GW3 or GW4, but it contains more concentrated contamination than would be treated by these alternatives. Each of these alternatives captures less groundwater than Groundwater Alternative GW4, which treats the entire groundwater plume that exceeds a concentration of 1 ppb for TCE and PCE. Groundwater Alternative GW1 does not reduce contaminant mass through treatment.

5. Short-term Effectiveness

Soils

All soil alternatives have minimal short-term impacts with respect to the protection of workers, the community and the environment during remedial construction, assuming adequate monitoring is conducted and mitigative actions are taken.

Soil Alternatives SO3 and SO4 will potentially have an adverse effect on the areas adjacent (and downgradient) to ANC A since re-routing of storm water away from that area may be necessary, as these are low lying areas where water collects. The type of storm water controls necessary would be evaluated during the remedial design phase.

Air monitoring in the vicinity of the work zone would be important for the shallow soil mixing of Soil Alternative SO3 and the excavation in Soil Alternative SO3 and SO4, to evaluate the appropriate level of personal protective equipment for workers. In addition, emission control techniques such as the use of dust suppressants and minimizing the open working area of the excavation would be employed as needed to minimize adverse effects on workers and the community from volatile emissions of TCE.

The time to achieve the RAOs is estimated to be 1 to 2 years for Soil Alternatives SO3 and SO4, but could take longer. Under Soil Alternatives SO1 and SO2, RAOs may not be achieved for decades or longer because of the slow leaching of contaminants to groundwater.

Groundwater

The No Action Groundwater Alternative, GW1, has no short-term impacts because it involves no remedial action.

Groundwater Alternative GW4 is considered to have the greatest negative short-term impact, because the large volumes of water extracted may promote dewatering within the valley, which could lessen recharge to streams, and damage natural resources such as the tributaries and wetlands along Pohatcong Creek. The implementability of this alternative is also considered to be poor because of the number of extraction wells required (approximately 30) and the number of large treatment systems that would require multiple operators on a daily basis, as well as numerous lengthy piping runs to some extraction, treatment and reinjection systems, that may interfere and be disruptive within the developed portions of Washington Township.

Groundwater Alternatives GW2 and GW3 have minimal impacts with respect to the environment, the protection of workers during remedial construction, and the protection and disruption of the community during remedial action.

The time until RAOs are achieved is shortest for the groundwater collection and treatment alternatives, GW2, GW3 and GW4, because these alternatives will actively reduce the concentrations of contaminants in groundwater. Groundwater Alternatives GW2 and GW3 are similar in terms of time frames and short-term effectiveness related to time until RAOs are met, estimated at 55 and 47 years, respectively. The time to achieve RAOs is longest for Alternative GW1, which would take greater than an estimated 60 years, and shortest for GW4, estimated at 22 years.

6. Implementability

Soils

The main technical implementability challenge for Soil Alternative SO2 would be to design permanent storm water controls to minimize the potential for infiltration and lateral flow to areas below the cap. Surface water controls may cause drainage changes as well as require other expensive storm water controls. Soil Alternatives SO3 and S04 also require temporary storm water controls to minimize water infiltration through the ANC A area during implementation of the DPE cleanup, though these are not as critical as in Soil Alternative SO2. Adequate fracturing of silt and clay soils to achieve good air flow is a technical challenge for Soil Alternatives SO3 and SO4. All alternatives are expected to have some level of impact on present company operations at the ANC facility. However, fracturing soils beneath the existing building has been determined to most likely be infeasible due to structural stability concerns. In addition, Soil Alternative S04 has major implementation challenges and would be very difficult to implement due to the limited accessibility to impacted soils underneath the present building. It would also require costly and extensive structural stabilization during excavation at ANC A and ANC C. Soil Alternative SO3 is much easier to implement when compared to Soil Alternative SO4 since this is an in-situ alternative and excavation would be minimal.

Groundwater

Groundwater Alternative GW2 is easier to implement when compared to both Groundwater Alternatives GW3 and GW4, due to the lesser volumes of water to be extracted and treated. The additional water will require more or larger treatment systems to be constructed in the built up portions of Washington Township, as well as much more involved extensive operation and maintenance

and greatly increased cost. Moreover, the estimated time frame for remediation is not significantly reduced between Groundwater Alternatives GW2 and GW3 (from 55 to 47 years): however, the volume of water to be treated is tripled.

Groundwater Alternative GW4 may require excessive disruption of local streets and infrastructure during implementation, and for future repairs that will be necessary during the long-term operation and maintenance of the system. The siting of the numerous required treatment plants may pose challenges for Groundwater Alternatives GW3 and GW4. The large quantities of extracted groundwater in Groundwater Alternative GW4 may also present technical difficulty in terms of handling and reinjection. Permitting at the state and local levels will likely be much more difficult when compared to Groundwater Alternatives GW2 and GW3, due to the larger volume of water being extracted and treated, and the greater potential for negative impacts. The additional volumes of water will require multiple extraction and treatment systems throughout the Valley. With Groundwater Alternative GW4, there is also a real potential to damage natural resources in the valley, such as dewatering of local surface water bodies and streams. This would also place severe limits on water use by the municipal supply wells, production wells, and local irrigation wells. Access requirements for the construction of the large number of extraction and systems and the lengthy piping runs to these systems would be extensive throughout the valley. The costs for implementing Groundwater Alternative GW4 are nearly six times higher than Groundwater Alternative GW2, however, the time of remediation is only cut in half.

Alternatives GW3 and GW4 are much more difficult to implement than Alternative GW2. The mass reduction of TCE and PCE in groundwater is estimated to be the same through the life of the remedial action.

7. Cost

Soils

The No Action Soil Alternative SO1 has the lowest present worth cost of $0. Soil Alternative SO2, Cap Cover, is the next least expensive alternative in terms of present worth, costing $1,240,000. Soil Alternative SO3's present worth cost is $4,400,000, and that of Soil Alternative SO4 is $10,400,000.

Groundwater

The No Action Groundwater Alternative, GW1, has the lowest present worth cost of $0. The present worth cost for Alternative GW2 is much lower than for Alternatives GW3 and GW4. The present worth cost for Alternative GW2 is $8,060,000, and for Alternative GW3, $25,760,000. Alternative GW4 is the most expensive alternative at $46,840,000, significantly more than the other alternatives.

8. State/Support Agency Acceptance

The State of New Jersey is still evaluating EPA's preferred alternative presented in this Proposed Plan, with respect to the State's ISRA program. The NJDEP has an ISRA Remediation Agreement with the PRP for the ANC facility, and under this program, the NJDEP will be requiring the PRP to collect comprehensive data that EPA plans to use in the design for the soils part of the remedy. EPA will be coordinating activities with the NJDEP so as to avoid duplication of effort and maximize results.

9. Community Acceptance

Community acceptance of the preferred alternatives will be evaluated after the public comment period ends and will be described in the Responsiveness Summary of the Record of Decision (ROD), the document that officially formalizes the selection of the remedy.

SUMMARY OF THE PREFERRED ALTERNATIVE

Soil

Soil Alternative SO3 is EPA's and NJDEP's preferred remedial alternative for contaminated soils and includes DPE and excavation for the source areas.

Prior to installation of the DPE system at source areas, the source areas will be further characterized, and impacted soils to a depth of approximately 20 feet would be mixed to homogenize the soil and increase air flow and permeability. The exact extent of soil contamination at ANC C will be determined based on sampling during the Remedial Design phase. Because of the limited horizontal and vertical extent of contamination at ANC B, soils in this area will be excavated and disposed of off-site. The excavations will be backfilled with certified clean fill material. Soil sampling will also be conducted to verify the effectiveness of the remedy.

Alternative SO3 minimizes leaching of contaminants to groundwater, prevents risks from direct contact to contaminated media, and limits erosion of contaminated soils by treating contaminated soil to below the 1 ppm cleanup goal. This alternative will eliminate the need for long-term monitoring or institutional controls after treatment and will not limit future use of the source areas after completion of the remedial actions.

Groundwater

Groundwater Alternative GW2 is the preferred remedial alternative for groundwater. This includes pumping and treatment of the most contaminated part of the TCE plume (concentrations exceeding 500 ppb) using a series of extraction wells along the downgradient edge of this source area. The TCE groundwater extraction system is expected to consist of three high yield extraction wells, each pumping at approximately 140 gallons per minute (gpm) to address the TCE-contaminated groundwater. The PCE groundwater extraction system is expected to consist of one extraction well, pumping at approximately 100 gpm. Total generated groundwater for both systems is expected to be approximately 520 gpm, which is roughly 749,000 gallons per day. Extracted water will be treated using air stripping (transferring TCE and PCE from liquid to vapor phase) prior to reinjection into the regional aquifer. Natural attenuation with long term monitoring will be used in the downgradient parts of the TCE and PCE plumes to reduce contamination to below the remedial goals for each of 1 ppb.

If, during implementation, any residences or businesses within the aerial extent of the OU1 plume are found to have not yet been connected to public water, EPA would offer to connect them, and seal their wells. Industrial and irrigation water wells in the area would also be evaluated, and a determination will be made regarding their continued use, including the possibility of either closure or treatment prior to use.

Institutional controls would be required to prevent the installation of wells in the contaminated groundwater, at least while the remedy is being implemented, and a review of the remedy every five years would also be required. Furthermore, potential groundwater users are protected by being provided with a public water supply.

The Preferred Alternative was selected over the other alternatives because it is expected to achieve substantial and long-term risk reduction through treatment and is protective of human health and the environment. The Preferred Alternative would reduce risk within a reasonable time frame, and at comparably less cost to other remedies and provide a long-term reliable remedy.

Based on the information available at this time, EPA and the State of New Jersey believe the Preferred Alternative would be protective of human health and the environment, would comply with ARARs, would be cost-effective, and would utilize permanent solutions and alternative treatment technologies to the maximum extent practicable. Because the Preferred Soil Alternative would treat most of the highly contaminated source areas, the remedy would also meet the statutory preference for selection of a remedy that involves treatment as a principal element.

COMMUNITY PARTICIPATION

EPA and the State of New Jersey provide information regarding the cleanup of the Pohatcong Valley Superfund Site to the public through public meetings, the Administrative Record file for the site, and announcements published in the Express Times newspaper. EPA and the State encourage the public to gain a more comprehensive understanding of the site and the Superfund activities that have been conducted there. The dates for the public comment period, the date, location and time of the public meeting, and the locations of the Administrative Record files, are provided on the front page of this Proposed Plan. EPA Region 2 has designated a point-of-contact for community concerns and questions about the Superfund program. To support this effort, the Agency has established a 24-hour, toll-free number the public can call to request information, express concerns or register complaints about Superfund. The Public Liaison Manager for EPA's Region 2 office is:

George H. Zachos
Toll-free (888) 283-7626
(732) 321-6621
U.S. EPA Region II
2890 Woodbridge Avenue, MS-211
Edison, New Jersey 08837

For further information on the Pohatcong Valley Superfund Site, please contact:

Stephen Cipot	Patricia Seppi
Remedial Project Manager	Community Relations
(212) 637-4411	(212) 637-3679

U.S. EPA
290 Broadway 19th Floor
New York, New York 10007-1866

GLOSSARY

ARARs: Applicable or Relevant and Appropriate Requirements. These are Federal or State environmental rules and regulations that may pertain to the site or a particular alternative.

Carcinogenic Risk: Cancer risks are expressed as a number reflecting the increased chance that a person will develop cancer if exposed to chemicals or substances. For example, EPA's acceptable risk range for Superfund hazardous waste sites is 1×10^{-4} to 1×10^{-6}, meaning there is 1 additional chance in 10,000 (1×10^{-4}) to 1 additional chance in 1 million (1×10^{-6}) that a person will develop cancer if exposed to a site contaminant that is not remediated.

CERCLA: Comprehensive Environmental Response, Compensation and Liability Act. A Federal law, commonly referred to as the "Superfund" Program, passed in 1980 that provides for response actions at sites found to be contaminated with hazardous substances, pollutants or contaminants that endanger public health and safety or the environment.

COPC: Chemicals of Potential Concern.

ERA: Ecological Risk Assessment. An evaluation of the risk posed to the environment if remedial activities are not performed at the site.

FS: Feasibility Study. Analysis of the practicability of multiple remedial action options for the site.

Groundwater: Subsurface water that occurs in soils and geologic formations that are fully saturated.

HHRA: Human Health Risk Assessment. An evaluation of the risk posed to human health should remedial activities not be implemented.

HI: Hazard Index. A number indicative of noncarcinogenic health effects that is the ratio of the existing level of exposure to an acceptable level of exposure. A value equal to or less than one indicates that the human population is not likely to experience adverse effects.

HQ: Hazard Quotient. HQs are used to evaluate noncarcinogenic health effects and ecological risks. A value equal to or less than one indicates that the human or ecological population are not likely to experience adverse effects.

ICs: Institutional Controls. Administrative methods to prevent human exposure to contaminants, such as by restricting the use of groundwater for drinking water purposes.

Nine Evaluation Criteria: See text box on Page 10.

Noncarcinogenic Risk: Noncancer Hazards (or risk) are expressed as a quotient that compares the existing level of exposure to the acceptable level of exposure. There is a level of exposure (the reference dose) below which it is unlikely for even a sensitive population to experience adverse health effects. USEPA's threshold level for noncarcinogenic risk at Superfund sites is 1, meaning that if the exposure exceeds the threshold; there may be a concern for potential noncancer effects.

NPL: National Priorities List. A list developed by USEPA of uncontrolled hazardous substance release sites in the United States that are considered priorities for long-term remedial evaluation and response.

Operable Unit (OU): a discrete action that comprises an incremental step toward comprehensively addressing site problems. This discrete portion of a remedial response manages migration, or eliminates or mitigates a release, threat of a release, or pathway of exposure. The cleanup of a site can be divided into a number of operable units, depending on the complexity of the problems associated with the site.

Present-Worth Cost: Total cost, in current dollars, of the remedial action. The present-worth cost includes capital costs required to implement the remedial action, as well as the cost of long-term operations, maintenance, and monitoring.

Proposed Plan: A document that presents the preferred remedial alternative and requests public input regarding the proposed cleanup alternative.

Public Comment Period: The time allowed for the members of a potentially affected community to express views and concerns regarding USEPA's preferred remedial alternative.

RAOs: Remedial Action Objectives. Objectives of remedial actions that are developed based on contaminated media, contaminants of concern, potential receptors and exposure scenarios, human health and ecological risk assessment, and attainment of regulatory cleanup levels.

Record of Decision (ROD): A legal document that describes the cleanup action or remedy selected for a site, the basis for choosing that remedy, and public comments on the selected remedy.

Remedial Action: A cleanup to address hazardous substances at a site.

RI: Remedial Investigation. A study of a facility that supports the selection of a remedy where hazardous substances have been disposed or released. The RI identifies the nature and extent of contamination at the facility and analyzes risk associated with COPCs.

SVOC: Semi-Volatile Organic Compound. Type of chemical that somewhat vaporizes, often producing a distinguishable odor.

TBCs: "To-be-considereds," consists of non-promulgated advisories and/or guidance that were developed by EPA, other federal agencies, or states that may be useful in developing CERCLA remedies.

USEPA: United States Environmental Protection Agency. The Federal agency responsible for administration and enforcement of CERCLA (and other environmental statutes and regulations), and final approval authority for the selected ROD.

VOC: Volatile Organic Compound. Type of chemical that readily vaporizes, often producing a distinguishable odor.