EPA Proposes Cleanup Plan for the Picillo Farm Superfund Site

The U.S. Environmental Protection Agency (EPA) is proposing a cleanup plan, referred to as a preferred alternative, to address contamination at the Picillo Farm Superfund site in Coventry, Rhode Island. The Proposed Plan recommends a method of treating contaminated soils and contaminated groundwater¹ from among the cleanup options that were evaluated during the Feasibility Study (FS) performed for the site. In accordance with Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), EPA is publishing this Proposed Plan to provide an opportunity for public review and comment on the cleanup alternatives, known as remedial alternatives, under consideration for the site. The selection of a preferred alternative is not a final decision. EPA will consider public comments on all cleanup alternatives as part of the final decision-making process for selecting the cleanup remedy for the site.

EPA's preferred alternative has seven components: 1) extraction of contaminated groundwater using on-site extraction wells; 2) treatment of the extracted groundwater to federal and state drinking water standards by ultraviolet (UV)/oxidation and carbon adsorption or air stripping and carbon adsorption; 3) reinjection of the treated groundwater into the aquifer downgradient of the source; 4) treatment of contaminated soils by thermally enhanced vapor extraction and catalytic oxidation to levels necessary to achieve federal and state drinking water standards in groundwater; 5) excavation and off-site treatment of surface soil contaminated with polychlorinated biphenyls (PCBs) to levels necessary to protect the environment; 6) long-term monitoring and periodic reviews of the site to ensure that the remedy remains protective; and 7) institutional controls to limit the use of groundwater contaminated by the Picillo Farm site. The preferred alternative is described in greater detail on pages 13-23 of this document.

¹NOTE: Words that appear in bold print in this document are defined in the glossary on page 33.
This Proposed Plan:

1. Explains the opportunities for the public to comment on the remedial alternatives (pg. 2);

2. Includes a brief history of the site and the principal findings of site investigations (pg. 4);

3. Provides a brief description of the preferred alternatives (pg. 13) and other alternatives evaluated in the FS (pg. 23);

4. Outlines the criteria used by EPA to propose an alternative for use at the site, and briefly analyzes whether the alternatives meet each criteria (pg. 27); and

5. Presents EPA’s rationale for its preliminary selection of the preferred alternative (pg. 31).

To help the public participate in reviewing the cleanup options for the site, this document also includes information about where interested citizens can find more detailed descriptions of the remedy selection process and the alternatives under consideration for treatment of soil and groundwater contamination at the Picillo Farm Superfund site.

The Public's Role in Evaluating Remedial Alternatives

Public Informational Meeting
EPA will hold a public informational meeting on Tuesday, June 29, 1993 at 7:30 p.m. at the Western Coventry Elementary School, located on Route 117 in Coventry, Rhode Island to describe the preferred alternative and other alternatives evaluated in the FS. The public is encouraged to attend the meeting to hear the presentations and to ask questions.

Public Comment Period
EPA is conducting a 30-day public comment period from June 30 to July 29, 1993, to provide an opportunity for public involvement in the final cleanup decision. During the comment period, the public is invited to review this Proposed Plan and the Remedial Investigation (RI) and FS reports and to offer comments to EPA.

Informal Public Hearing
EPA also will hold an informal public hearing on Tuesday, July 13, 1993 at 7:30 p.m. at the Western Coventry Elementary School, Route 117, Coventry, Rhode Island, to accept oral comments on the cleanup alternatives under consideration for the site. This hearing will provide the opportunity for people to comment on the cleanup plan after they have heard the presentations made.
at the public informational meeting and reviewed this Proposed Plan. Comments made at the hearing will be transcribed, and a copy of the transcript will be added to the site Administrative Record available at the information repository locations listed on pages 3 and 4.

Written Comments

If, after reviewing the information on the site, you would like to comment in writing on EPA's preferred alternative, any of the other cleanup alternatives under consideration, or other issues relevant to the site cleanup, please deliver your comments to EPA at the Public Hearing or mail your written comments (postmarked no later than July 29, 1993) to:

Anna Krasko, Remedial Project Manager
U.S. Environmental Protection Agency
Waste Management Division (HSV-CAN5)
JFK Federal Building
Boston, MA 02203
(617) 573-5749

EPA’s Review of Public Comment

EPA will review comments received from the public as part of the process of reaching a final decision on the most appropriate remedial alternative, or combinations of alternatives, for cleanup of the Picillo Farm site. EPA’s final choice of a remedy will be issued in a Record of Decision (ROD) for the site this fall. A document, called a Responsiveness Summary, that summarizes EPA’s responses to comments received during the public comment period will be issued with the ROD. Once the ROD is signed by the EPA Regional Administrator, it will become part of the Administrative Record.

Additional Public Information

Because this Proposed Plan provides only a summary description of the investigation of the Picillo Farm site and the cleanup alternatives considered, the public is encouraged to consult the Administrative Record, which contains the RI and FS reports and other site documents, for a more detailed explanation of the site and all of the remedial alternatives under consideration.

The Administrative Record is available for review at the following locations:

EPA Records Center
90 Canal Street, 1st Floor
Boston, Massachusetts
(617) 573-5729
Hours:
Monday-Friday: 10:00 a.m. to 1:00 p.m. and 2:00 p.m. to 5:00 p.m.
Site History

The Picillo Farm site is located in Coventry, Rhode Island, approximately 20 miles southwest of Providence, near the intersection of State Highway 102 and Perry Hill Road (see Figure 1 on page 5). There are approximately 50 houses located to the north, northeast and east within a 1.5-mile radius of the site. The Picillo Farm property consists of approximately 100 acres of wooded and cleared wetland and upland area. Past investigations have focused on an eight-acre area (herein referred to as the disposal area), currently fenced, where hazardous waste disposal activities have been documented. At least 10,000 drums and an undetermined volume of bulk wastes were illegally disposed of in the disposal area prior to 1977.

The Picillo Farm site was discovered in 1977 after a fire occurred in the disposal area. Several investigations have been conducted since 1978 to locate, identify, and quantify sources of waste buried at the site, identify health and environmental risks, and evaluate remedial alternatives. The site was listed on the National Priorities List (NPL) published in September, 1983.

Cleanup Activities to Date

During the initial site investigation by the Rhode Island Department of Environmental Management (RIDEM), five trenches were identified within the eight-acre disposal area. Between 1980 and 1982, under the direction of RIDEM and EPA, the trenches were excavated and drums were removed and disposed off-site. In addition, 6,500 cubic yards of contaminated soil were removed from the trench areas and stockpiled on-site.

In 1985, EPA issued a ROD which called for disposal of the contaminated soil in an on-site landfill which met the standards established under the Resource Conservation and Recovery Act (RCRA). The State of Rhode Island contested the on-site disposal of the PCB-contaminated soil. As a result, in 1987, following the enactment of the Superfund Amendments and Reauthorization Act (SARA), EPA issued an amended ROD which called for the off-site disposal of stockpiled contaminated soil and the implementation of a Remedial Investigation/Feasibility Study (RI/FS) in order to evaluate the
Figure 1: Location Map, Picillo Farm Superfund Site

LOCATION OF HISTORIC TRENCHES
APPROXIMATE LOT BOUNDARIES

- X EXISTING FENCE
- SURFACE WATER
- WETLAND

LEGEND

- HOUSE
- LOCATION OF HISTORIC TRENCHES
- APPROXIMATE LOT BOUNDARIES
- X EXISTING FENCE
- WETLAND

0 500 1000 FT.
remedial alternatives for groundwater. In 1988, under an agreement with EPA, four of the Potentially Responsible Parties (PRPs) performed the off-site disposal of the contaminated, stockpiled soil and fencing of the disposal area.

Results of the Remedial Investigation

The purpose of the RI is to define the nature and extent of contamination and to determine the risk to human health and the environment posed by the site. Field activities conducted as part of the RI included the collection and analysis of groundwater, soil, surface water, sediment, and air samples. The RI also included an analysis of how the contaminants are migrating outward from the disposal area. The results of these analyses identified contaminants such as volatile organic compounds (VOCs), semivolatile organic compounds (SVOCs), pesticides, PCBs, and metals in groundwater, soils, surface water, and sediment. The findings of the field activities are summarized below (see Figure 2 on page 7).

Groundwater Quality

The contaminated groundwater flowing from the former disposal area consists of a wide variety of halogenated, aromatic, and water soluble solvents, phenols, phthalates, and their respective degradation products. Sampling to date has indicated that the volatile contaminants, while exhibiting some variation and seasonal fluctuation, have not decreased significantly since the mid-1980s. The contaminated groundwater forms two plumes: the northwest plume, emanating from the vicinity of the northeast, northwest and west trenches, and the southwest plume, emanating from the vicinity of the west, south, and slit trenches. The northwest plume discharges to the northwest and west into seeps and the Unnamed Swamp, where it is diluted and degraded before it reaches Whitford Pond. The southwest plume discharges to the southwest into seeps and the Great Cedar Swamp.

Each plume has some unique contaminants related to the materials originally disposed of in each trench. The northwest plume is characterized by high concentrations of halogenated, aromatic, and water soluble solvents, phenols, ketones, acids, and esters suggesting origin from styrene copolymers, phenol-formaldehyde resins, and other polymers. Chlorinated phenols appear to be unique to this plume. In addition, there are a large number of tentatively identified volatile and semivolatile compounds (TICs), which are compounds not on the Target Compound List (TCL) that were identified in this plume, consisting of xylenes, naphtha-based solvents and other petroleum hydrocarbons.
Figure 2: Groundwater and Source Contamination

LEGEND

- Area where contaminants in groundwater exceed interim cleanup levels
- Historic trenches
- Area where contaminants in soil exceed cleanup levels
- Existing fence
- Approximate lot boundaries
- Wetland

Picillo Farm Superfund Site 7
(printed on recycled paper)
Halogenated volatile organics as high as 72,000 parts per billion (ppb), aromatic volatile organics exceeding 45,000 ppb, and water soluble organics exceeding 100,000 ppb were detected in the northwest groundwater plume. Up to 6,900 ppb of total semivolatile organic contaminants were also found. In the vicinity of the west trench, total volatile and semivolatile organic contaminants would exceed 20,000 ppb if tentatively identified compounds, xylenes, and naphtha solvents are included.

The southwest plume is characterized by halogenated and aromatic solvents, but contains several unique compounds including 1,2-dichloropropane, 2,6-dinitro-4-trifluoromethylphenol, and 1-chloro-2-nitro-4(trifluoro)methylbenzene. The chloro-, fluoro-, and nitrobenzenes may be related to dye wastes. Concentrations of total volatile and semivolatile compounds in the southwest plume (near the slit trench) are approximately 7,000 ppb with halogenated organics representing a majority of the contaminants.

All contaminants found to date in groundwater have been dissolved. However, due to the high levels of VOCs found, some contaminants may exist as an undissolved liquid referred to as free phase dense non-aqueous phase liquids (DNAPLs). Because current technology cannot easily locate free phase DNAPLs, their possible existence is based on circumstantial evidence at this site, and the amount of free phase DNAPLs, if they exist, is not possible to determine.

Pesticides and PCBs are not significant groundwater contaminants at the site. Several pesticides were detected sporadically at trace concentrations, typically in the 0.02 to 0.10 ppb range. PCBs were detected in only one monitoring well at a concentration of 3.2 ppb.

Based on the level of total volatile organic (TVO) contamination, the areas of the plume are referred to as source, concentrated and dilute. For more detail on the plume areas refer to the Feasibility Study Report.

Soil

Soil sampling conducted during the soil boring program indicates that significant subsurface soil contamination still exists in and near the northeast, northwest, and west trenches. Lower contamination concentrations exist in the south and slit trenches. The majority of the soil contamination was found 10 to 30 feet below the ground. A variety of VOCs and SVOCs were detected in and near the former disposal trenches. In the vicinity of the northeast trench, up to 235,000 ppb of halogenated and aromatic VOCs were detected. Up to 4,600 ppb of water soluble VOCs were also detected. Highly contaminated soils were discovered as deep as 44 feet near this trench. Phenols (up to 31,000 ppb) and 1,2-dichlorobenzene (up to 22,000 ppb) were the two SVOCs detected at the highest concentrations in and near this trench.
Several aromatic and halogenated VOCs were also detected from samples collected in and near the northwest and west trenches. The most contaminated sample collected during the soil boring revealed the presence of greater than 12,500,000 ppb (1.25%) of halogenated VOCs and 41,000,000 ppb (4.1%) of aromatic VOCs. Significant concentrations of phenols and 1,4-dichlorobenzene were also detected in the northwest and west trenches.

The sampling in the vicinity of the northeast, northwest, and west trenches indicates that "fingering" of DNAPL contamination may have occurred, meaning that thin zones of high concentrations of contamination have spread out from the trenches. In at least the northwest and west trenches, this contamination has migrated back into the clean soil which had been used to backfill excavated trenches in the 1980s. The most highly contaminated soil samples were collected from the vadose zone just above the water table in these trenches.

Analysis of near-surface and surface soil samples collected throughout the former disposal area indicated lower levels of VOC contamination. The highest level of total VOC contamination was less than 120 ppb and the total SVOC concentrations typically were detected at less than 25,000 ppb.

In general, pesticide and PCB concentrations were either not detected during analysis or were at low concentrations, occurring sporadically throughout the site, mostly at the surface. The highest PCB concentration was detected in a surface soil sample collected at the former PCB pile location, where 28,000 ppb was measured. PCBs were also measured in the sediments (up to 7,000 ppb) accumulated in the drainage ditch that originates adjacent to the PCB pile and directs runoff to the northwest corner of the site. PCBs were not detected in most other surface soil samples collected around the site.

Surface Water and Sediments

The pattern of surface water and sediment contamination corresponds with the patterns of the most concentrated groundwater plumes. The most contaminated surface water and sediment sampling locations are at the discharge points from the groundwater plume originating in the disposal area. Lower concentrations of surface water contamination were observed north of the disposal area along a seepage slope, and at the edge of Unnamed Swamp.

Although similar to the contaminant profile observed in groundwater, the profile of surface water and sediment contamination includes higher relative concentrations of degradation products (i.e., chloroethane, vinyl chloride, 1,1-dichloroethane), especially at the edge of Unnamed Swamp. The highest total VOCs concentration detected in surface water was 4,400 ppb. At some locations, total VOC concentrations in sediment exceed those detected in the corresponding surface water.
SVOCs were also detected in surface water, but at much lower concentrations, usually less than 100 ppb. The primary SVOCs appear to be phenols, phthalates, and halogenated aromatics. Similar SVOCs were detected in sediments, but at much higher concentrations, up to 3,990 ppb of total SVOCs, sometimes exceeding the total VOCs detected in the same samples. Significant concentrations of polynuclear aromatic hydrocarbons (PAHs) and ethers, in addition to those mentioned above, were also detected in sediment.

Pesticides and PCBs do not appear to be significant contaminants in surface water and sediment, although these chemicals were detected sporadically around the site. The highest concentration, 27 ppb of the pesticide Methoxychlor, was detected in a sediment sample collected from a seep in the southwest portion of the site. As discussed above, PCBs have been measured in sediments collected from the drainage ditch, which originates from the former PCB pile location.

**Air**

Air monitoring conducted at the most contaminated surface water locations indicated volatile organic contaminants (1,1-dichloroethane and cis-1,2-dichloroethene) were present at one groundwater discharge point for the northwest plume directly above the seep. The levels do not exceed federal or state air quality standards.

**Summary of Site Risks**

A baseline risk assessment was conducted by EPA to evaluate potential risks to human health and the environment associated with assumed exposure to contaminants at or from the Picillo Farm site.

**Human Health Risk Assessment**

The human health risk assessment considered current and reasonably foreseeable future land uses at and near the Picillo Farm property. Human health risks were estimated from exposure to site contaminants for each environmental medium (groundwater, soil, sediments, and surface water). The assessment identified and evaluated the following possible exposure pathways for human exposure to site contaminants:

- **Groundwater.** Ingestion of groundwater within the contaminated plume.
- **Soil.** Dermal (skin) contact and incidental ingestion of surface and subsurface soils from the disposal area and outlying areas.
- **Sediment.** Incidental ingestion and dermal contact with sediment.
- **Surface Water.** Dermal contact and incidental ingestion while wading and swimming; ingestion of surface water as drinking water; and ingestion of fish.
EPA concluded that the major risk to public health would result from ingestion of contaminated groundwater and surface water. This is not a current risk because the contaminated groundwater, surrounding the site, and the Unnamed Swamp are not presently used as water supplies. If, in the future, residents were to use the groundwater from the contaminated aquifer or the Unnamed Swamp as a drinking water supply, such use would pose unacceptable long-term risks to human health.

For a complete explanation of risks to human health posed by contamination at the Picillo site, please refer to the Baseline Human Health Risk Assessment that is available as part of the RI Report at the information repository at the EPA Records Center and the Coventry Public Library.

**Ecological Risk Assessment**

A separate baseline Ecological Risk Assessment (ERA) was performed to estimate the magnitude of potential adverse effects on wildlife from exposure to contaminants associated with the surface water, sediments, and soil.

The following four indicator species were selected for evaluation in the ERA:

- Green Frog;
- American Woodcock;
- Short-tailed Shrew; and
- Mink.

In addition, risks were estimated for the entire aquatic community of both the aquatic and wetland zones of exposure.

Four distinct zones of ecological exposure were identified to reflect the diversity of ecosystems and habitats of the study area. These four exposure zones are:

- Terrestrial areas within the disposal area;
- Terrestrial areas outside the disposal area;
- Wetland habitats that are not permanently flooded; and
- Permanently flooded aquatic wetland habitats.

Potential effects on the wildlife from exposure to site contaminants were estimated for several pathways based on the characterization of the site and the study area, including:

- Direct contact; and
- Food-chain exposure.

Methods for evaluation included a comparative analysis of contaminants concentration with regulatory criteria and guidelines, food-chain modeling, and a chronic sediment toxicity tests on two invertebrate species.
No obvious symptoms of vegetation or animal stress were observed on site or in the larger study area. No adverse effects were observed in chronic toxicity tests performed using sediment collected from the site.

Calculations indicated ecological risks for the American Woodcock, Short-tailed Shrew, and Mink are due to the non-site related lead levels in soil/sediment, and low levels of metals, pesticides, and PCBs in the surface soils within the disposal area, and at several widely scattered wetland locations.

For a complete explanation of risks to the environment posed by contamination at the Picillo site, please refer to the Baseline Ecological Risk Assessment that will be available as part of the RI Report at the information repository at the EPA Records Center and the Coventry Public Library.

Proposed Cleanup Objectives and Levels

Using the information gathered during the RI and FS, EPA identified remedial response objectives for cleanup of the Picillo Farm site. The FS identifies two categories of response, a Source Control (SC) response and a Management of Migration (MM) response. The SC response includes specific actions required to prevent the continued release of site contaminants into the environment. The SC response at the Picillo Farm site addresses soils in the disposal area near the trenches. The MM response addresses minimizing or mitigating the migration of site contaminants. At the Picillo Farm site, the MM response addresses all groundwater contamination migrating from the site as well as surface water and sediment contamination caused by the contaminated groundwater. The cleanup objectives are listed below.

1. Restore contaminated groundwater to drinking water standards, and to a level that is protective of human health and the environment, as soon as practicable;

2. Restore contaminated surface water to drinking water standards and ambient water quality criteria (AWQCs), and to a level that is protective of human health and the environment, as soon as practicable;

3. Prevent or mitigate the continued release of hazardous substances to the groundwater and surface water from the soils by reducing the concentration of contaminants in the soil so that the concentration in groundwater and surface water will not exceed drinking water standards or AWQCs and will not pose a risk to human health and the environment;

4. Prevent or mitigate releases of contaminants to the Unnamed Swamp;
5. Reduce contaminant exposure of wildlife through food-chain bioaccumulation and direct contact with contaminated surface water, sediments, and surface soils; and

6. Minimize impact on wetlands due to operation of remedial alternative.

To meet these objectives, EPA has proposed site-specific cleanup levels that will be protective of human health and the environment. The remedial alternative selected for the site must achieve EPA's cleanup levels. The groundwater cleanup levels are considered interim cleanup levels and are based on Maximum Contaminant Levels (MCLs), Maximum Contaminant Level Goals (MCLGs), or State of Rhode Island Drinking Water Standards as appropriate. EPA will perform periodic assessments, including a future risk assessment, to evaluate the Remedial Action following implementation. EPA will establish final groundwater cleanup levels for the site based on these assessments.

Soil cleanup levels have been established to prevent migration of contaminants into groundwater and are necessary for the groundwater to be restored to drinking water standards. Surface water cleanup levels have been based on the federal and state standards for ambient surface water quality under the Safe Drinking Water Act, MCLs, MCLGs, Health Advisories, or State of Rhode Island Drinking Water Standards as appropriate. Sediments and surface soil cleanup levels have been established by EPA for this site based on the protection of ecological receptors.

**EPA's Preferred Alternative**

EPA's selection of the preferred cleanup alternative for the Picillo Farm site, as described in this Proposed Plan, is the result of a comprehensive evaluation and screening process. The FS for the site was conducted to identify and analyze the alternatives considered for addressing contamination at the site. The FS report for the Picillo Farm site describes the alternatives considered, as well as the process and criteria EPA used to narrow the list to four potential remedial alternatives to address source areas and three potential remedial alternatives to address the management of migration of contaminants. (For details on EPA's screening methodology, see Sections 3 and 4 of the FS report.) The following sections describe the preferred alternative and the other alternatives EPA retained for detailed analysis.

EPA is proposing a cleanup plan to address contamination sources and groundwater contamination at the Picillo Farm site. (The FS evaluates both Source Control [SC] and Management of Migration [MM] alternatives. The designations "SC" and "MM" in the descriptions below refer to the numbering system used in the FS report to refer to the alternatives.)
Preferred Source Control Alternative

Alternative SC-2: Thermally Enhanced Vapor Extraction

This alternative is designed to treat the contamination in the subsurface soils while in place and thus avoid the need for excavating the soils and exposing the contamination. To meet this objective a thermally enhanced (using heat) vapor extraction system would be installed on-site in the areas where the soil contamination exceeds the soil cleanup levels established to prevent migration of contaminants into the groundwater. The groundwater table in these areas would be lowered by pumping and hot air would be injected into the soils to enhance the volatilization of both VOCs and SVOCs. The volatilized organics would then be collected in vapor extraction wells and piped to a catalytic oxidation system where the organics would be oxidized and the extracted groundwater would be treated by UV/Oxidation or air stripping (see preferred alternative MM-3 on page 17). Access to all areas of active remediation would be restricted.

Approximately 70 vapor extraction wells and 60 hot air injection wells would be installed in and near the disposal area. The vapor extraction wells would be evenly spaced approximately 60 feet apart in the area near the disposal trenches. Figure 3 on page 15 identifies the proposed locations of the vapor extraction and hot air injection wells. The vapor extraction system would be connected to a vacuum pump with polyvinyl chloride (PVC) piping. The vacuum pump would produce a vapor flow rate of approximately 200 cubic feet per minute. From the vacuum pump the contaminated gas would be passed through a heat exchanger to recover the heat from the treated gas in the effluent of the catalytic oxidation system. Following the heat exchanger, the temperature of the gas stream would be raised further in the preheater and then the contaminants would be destroyed in the catalytic oxidation system. The resultant compounds would be water, carbon dioxide and hydrochloric acid (formed due to the presence of chlorinated solvents).

After the destruction of the contaminants, the gas would be passed through the heat exchanger again, this time to lower the temperature of the treated gas stream. Once the gas has been cooled, the hydrochloric acid would be removed using a caustic scrubber to adsorb the acid gases and to produce a nonhazardous brine solution that would be disposed of off-site. From the scrubber, the clean air would then be released to the atmosphere (see Figure 4 on page 16).

The vacuum extraction system will be operated in conjunction with a dewatering system. A dual well system could be installed to lower the water table (dewater) and extract contaminants from the soil (soil vapor extraction). The vapor extraction wells would extend to the depth where the volatile compounds will be extracted. The dewatering well, smaller in diameter, would extend through the soil vapor extraction well below the lowered water table. The dewatering wells would be drilled into the shallow bedrock to a
Figure 3: Conceptual Site Plan for Preferred Alternative SC-2 and MM-3

- **UNNAMED SWAMP**
- **AREA OF GROUNDWATER EXTRACTION**
- **LEGEND**
  - GROUNDWATER EXTRACTION WELLS
  - GROUNDWATER REINJECTION WELLS
  - HOT AIR INJECTION WELL
  - VACUUM EXTRACTION WELL
  - AREA WHERE CONTAMINANTS IN SOIL EXCEED CLEANUP LEVELS
  - EXISTING FENCE
  - WETLANDS
  - AREA WHERE CONTAMINANTS IN GROUND WATER EXCEED INTERIM CLEANUP LEVELS

**VIEW LOOKING NORTH**
- UNNAMED SWAMP
- GROUNDWATER INJECTION WELL
- HOT AIR INJECTION WELL
- VAPOR EXTRACTION WELL
- DEWATERING WELL
- BEDROCK
- CLAY-SAND-BOULDER TILL
- SAND AND GRAVEL DEPOSITS

(1) Only one of the Hot Air Injection Wells shown
(2) Only one of the Vapor Extraction Wells shown

NOT TO SCALE
Figure 4: Conceptual Soil Treatment System: Remedial Alternative SC–2, Thermally Enhanced Vapor Extraction

- Hot Air
- Air Heater
- Contaminated Air
- Vacuum Pump
- Heat Exchanger
- Preheater
- Catalyst Chambers
- Treated Air with Acid Gases
- Air Injection Well in Ground
- Vapor Extraction Well in Ground
- Condensed Contaminants to Off-Site Disposal
- Treated Air with Acid Gases
- Scrubber
- Cooler
- Waste Brine to Off-Site Waste Disposal
- Clean Gas Stream to Atmosphere
- Soda Ash
sufficient depth to allow for the capture of any DNAPLs that may be present in the highly fractured shallow bedrock and to cause the upward flow of groundwater from the deep bedrock to capture dissolved contamination. Contaminated water from the dewatering of soils would be treated by the groundwater treatment facility discussed in the "Preferred Management of Migration Alternative" section below.

At the design stage, a pilot test would be conducted to optimize the system and to determine actual number and locations of the vapor extraction and hot air injection wells. During design and implementation of the thermally enhanced vapor extraction, EPA will consider using other methods to enhance the effectiveness of the system in meeting cleanup levels. Such methods may include other enhancements to vapor extraction, such as radio frequency heating, steam injection and air sparging as well as additional vacuum extraction wells, additional dewatering wells and different dewatering techniques such as trenches or horizontal wells.

As well as the subsurface soil, contamination is also present in the surface soil at the Picillo site in the drainage ditch and in the vicinity of the former PCB pile. Several surface soil samples were found to contain low concentrations of PCBs. The soil in the drainage ditch and near the former PCB pile would be excavated (approximately 600 cubic yards) and disposed of at an off-site, RCRA-regulated, treatment, storage, and disposal facility.

Alternative SC-2

*Estimated Time for Design and Construction*: 3 years  
*Estimated Time for Restoration*: 6 years  
*Estimated Capital Cost*: $2,700,000  
*Estimated Operation and Maintenance Cost*: $1,400,000  
*Estimated Total Cost*: $4,100,000

Preferred Management of Migration Alternative

Alternative MM-3: UV/Oxidation or Air Stripping of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region

Contaminants, both VOCs and SVOCs, are present in the groundwater beneath and downgradient of the disposal area. Alternative MM-3 has been designed to actively contain the source and concentrated regions of the plume, by extracting (pumping) and treating groundwater, in order to limit the effect

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2 The time for design and construction includes one year for the performance of a pilot demonstration of the thermally enhanced vapor extraction

3 Cost are presented as 1993 net present worth.
the contamination near the trenches has on the aquifer; and to allow the dilute portion of the plume to naturally attenuate.

EPA has selected a combination of two treatment options in Alternative MM-3 to treat the contaminated groundwater: UV/Oxidation and carbon adsorption and air stripping and carbon adsorption. Both treatment options are protective of human health and the environment, and both involve active restoration of the groundwater. Based on the cost estimate in the FS, the UV/Oxidation treatment system is more cost-effective than the treatment option of air stripping and carbon adsorption. However, in this preferred alternative, EPA is proposing a second treatment option, air stripping and carbon adsorption, so that if the cost estimates change to the extent that air stripping becomes more cost-effective than UV/Oxidation, EPA has the option of selecting air stripping and carbon adsorption.

**Groundwater Treatment**

Groundwater from the source and concentrated regions of the groundwater plume would be collected using at least three extraction wells operating at a rate of approximately seven gallons per minute located in the concentrated region of the plume (see Figure 3 on page 15). At these pumping rates, a total of 21 gpm would be extracted from the containment wells. An additional 49 gpm of groundwater from the dewatering wells will be mixed with the water from the containment wells and treated in the groundwater treatment system. Actual pumping rates and number of extraction wells will be determined during the design.

The three groundwater containment wells would be four-inch diameter wells constructed with stainless steel well casing to minimize degradation of the well. Destruction of PVC well casing has been noted at the site, necessitating the use of the higher grade casing material. Each of the wells would be drilled into the shallow bedrock to a sufficient depth to allow for the capture of any DNAPLs that may be present in the highly fractured shallow bedrock and to cause the upward flow of groundwater from the deep bedrock to capture dissolved contamination. The groundwater would be pumped from each well using individual pumps to allow for the extraction of groundwater from specific areas.

The extracted groundwater would be pumped to an equalization tank in the groundwater treatment building (see Figure 5 on page 19). This tank would be sized to allow mixing and equalization of the various groundwater streams. The tank will also be used as a settling tank to remove any pure contaminants or solids which would be drummed and sent to an off-site facility for reclamation or treatment.
Figure 5: Conceptual Groundwater Treatment System: Remedial Alternative MM-3, UV/Oxidation
From the equalization tank the groundwater will be pumped to a metal precipitation unit where manganese, iron and other inorganic (metallic) compounds will be removed. The metals removal system will minimize the chances for adversely affecting the UV/oxidation system and would also reduce any elevated metal concentrations in the groundwater to naturally occurring levels. The metal sludge would be sent to an off-site facility for reclamation and treatment.

After the metal precipitation system, the pH of the groundwater would be adjusted to a value between 6 and 7 and pumped to the UV/oxidation system. Hydrogen peroxide, ozone, or a combination of both, would be added to the groundwater. The groundwater then would be exposed to ultraviolet light in a reactor and approximately 99% of the organic contamination will be destroyed. The ultraviolet light causes the hydrogen peroxide or ozone to form molecules that, because they are highly reactive, break down the VOCs and SVOCs into water, carbon dioxide, and harmless chloride salts. If ozone is used, air from the treatment system will pass through activated carbon filters to remove the contaminants and through catalytic decomposer which converts the remaining ozone to oxygen prior to discharging to the atmosphere.

After the UV/oxidation system, the groundwater would be passed through activated carbon filters to remove any remaining contamination and ensure that the groundwater meets cleanup levels. The activated carbon filters would be used until they were filled with contaminants, and then periodically sent off-site for regeneration.

The resultant treated water would be pumped from the groundwater treatment building to approximately three reinjection wells to maintain the water balance in the Unnamed Swamp and the Great Ceder Swamp at current levels. The piping to the reinjection wells would be buried to minimize the chances for winter freeze-ups. EPA may consider other methods, such as discharge to surface water, to return the treated groundwater into the aquifer.

The dilute region of the plume would be isolated from the source contamination by using the pump and treat system as described above to provide active containment. The dilute portion of the plume would then be allowed to naturally attenuate. Natural attenuation of this region would occur through three main processes:

- Diffusion;
- Biodegradation; and
- Physical and chemical (abiotic) degradation.

The isolation and natural attenuation of the dilute region of the plume would be enhanced by the reinjection of the treated groundwater downgradient of the extraction wells.
UV/oxidation, air stripping and carbon adsorption are reliable, proven treatment methods that will effectively remove the contaminants of concern. EPA estimates that the groundwater will be restored to drinking water standards in approximately 20 years if no free phase DNAPLs exist in the groundwater. Based on site specific conditions, if free phase DNAPLs exist, drinking water standards might not be met in the foreseeable future for reasons of technical impracticability. The extraction wells might then only be able to restrict contaminants to their present locations and enable the cleanup of the remainder of the aquifer to proceed. If, following a reasonable period of system operation, EPA determined that these conditions existed, EPA would continue the pumping and treating the groundwater to ensure protection of the other parts of the aquifer. EPA will also periodically review advances in groundwater cleanup technologies to determine if new techniques would be more effective at recovering and treating free phase DNAPLs than those in this plan. If a superior method is found, EPA would consider using it at this site. At this time EPA has not determined that free phase DNAPLs exist or that it is technically impracticable to meet drinking water standards throughout the site. Based on current data, EPA expects to restore groundwater to drinking water standards within 20 years.

Alternate Groundwater Treatment Technology

The only component of the preferred alternative that would change if air stripping and carbon adsorption were implemented is the groundwater treatment system. All other components of the preferred management of migration alternative would remain the same.

Air stripping and carbon adsorption would be used to treat the contaminated water collected from the groundwater extraction wells and the dewatering system and sent to the equalization tank. After the metal precipitation system, the pH of the groundwater will be adjusted to a value between 6 and 7 and pumped into the air stripping unit, where it would be countercurrently contacted with clean air to volatilize the majority of the volatile organic contaminants.

Both the resultant air and water streams would be treated by activated carbon to remove any remaining contamination prior to discharge. The vapor phase activated carbon filter would be preceded by a heater to raise the temperature and to reduce the relative humidity of the contaminated air stream, thereby increasing the adsorptive capacity of the carbon filter. These filters would capture the contaminants removed from the contaminated water and would discharge clean air to the atmosphere. The liquid phase activated carbon filters would be sized to remove the contaminants remaining in the groundwater. The contaminated carbon would be periodically sent off-site to be regenerated.
**Institutional Controls**

While the soil and groundwater are being remediated, institutional controls will be implemented to restrict access to the disposal area and to the region of the aquifer where contamination is in excess of the cleanup levels. The area where institutional controls will be implemented includes the Picillo Farm property and three adjacent properties. The institutional controls, i.e., deed restrictions, ordinances, would have three functions:

- Restrict access to the site to prevent direct human exposure to contaminants;
- Restrict land use on the site to prevent future residential development where contaminants in the groundwater are at concentrations greater than the cleanup levels; and
- Restrict groundwater use to prohibit the installation of new wells in the contaminated portion of the plume and the deep bedrock groundwater below the contamination.

The restrictions would be maintained until the cleanup levels are met or the site is determined not to pose a threat to human health and the environment.

**Monitoring**

The monitoring program for the Picillo site has been designed based on the results of the RI and would be modified as the cleanup and the natural attenuation occurs. The objective of the program would be two-fold:

1) To monitor for changes in contaminant concentrations; and

2) To ensure that there are no contaminants in the residential wells that exceed drinking water standards.

The program will be implemented to evaluate the performance of the treatment system, the rate of natural attenuation, and the overall effectiveness of the remedy. The monitoring program will consist of monitoring the selected groundwater monitoring wells, residential wells, surface water and sediment locations.

The monitoring program would also include the installation and periodical monitoring of at least three deep bedrock wells to check for dissolved contamination in the deep bedrock. These three deep bedrock wells would be installed between the site and the residents in the area as early warning wells that could be sampled to monitor for contamination approaching the residential wells. If contamination was found in these wells then measures would be evaluated to protect the users of the residential wells.
In addition to the long-term groundwater and surface water monitoring, five-year reviews would be conducted to evaluate whether the cleanup remains protective of public health and the environment and whether additional cleanup measures should be taken. The five-year reviews would be initiated five years after the start of the remedial action and continue until no contaminants remain at the site above levels that allow for unrestricted use and unlimited exposure.

Alternative MM-3: UV/Oxidation of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region

Estimated Time for Design and Construction: 2 years
Estimated Time for Restoration: Approximately 20 years
Estimated Capital Cost: $1,600,000
Estimated Operation and Maintenance Cost: $10,000,000
Estimated Total Cost: $11,600,000

Alternative MM-3: Air Stripping of the Source and Concentrated Regions and Natural Attenuation of the Dilute Region

Estimated Time for Design and Construction: 2 years
Estimated Time for Restoration: Approximately 20 years
Estimated Capital Cost: $900,000
Estimated Operation and Maintenance Cost: $18,000,000
Estimated Total Cost: $18,900,000

Other Alternatives Evaluated in the FS

The public is invited to comment not only on the preferred cleanup alternative, but also on the other Source Control alternatives and Management of Migration alternatives that EPA evaluated in the FS. The times and costs of each SC and MM alternative are presented in this Proposed Plan as part of a cleanup scenario, when both, MM and SC alternative are implemented. Each of these alternatives is described briefly below. A more detailed description of each alternative can be found in the FS report.

Other Alternatives to Address Source Control

Alternative SC-1: No Action
This alternative is required by law to be developed for each Superfund Site to assess impacts on public health and the environment if no measures are taken to remediate current site conditions. The No Action alternative provides a baseline for comparison to other remedial alternatives considered. Natural attenuation of the contaminated soil will occur over time through diffusion, biological degradation, and abiotic degradation. The No Action response does not supersede the March 1987 ROD for the Picillo Farm site, and therefore, any requirements of that document would continue to apply, including the
maintenance of the disposal area, the drainage ditch, and the fence around the disposal area.

As in the preferred alternative, the No Action alternative will require five-year evaluations.

**Alternative SC-1**

*Estimated Time for Design and Construction: Not Applicable*
*Estimated Time for Restoration: Approximately 500 years*
*Estimated Capital Cost: None*
*Estimated Operation and Maintenance Cost: None*
*Estimated Total Cost: None*

**Alternative SC-3: Thermal Desorption**

This alternative involves the excavation and on-site treatment of the contaminated subsurface soil through the use of thermal desorption. Prior to excavating the soils, however, the volatile contamination would be reduced by approximately 60% using vapor extraction (see preferred alternative SC-2). Vapor extraction would be used in order to reduce the short-term risk to the local residents and workers from the VOCs emitted during excavation. After vapor extraction, approximately 94,000 cubic yards of contaminated soil (a total of 240,000 cubic yards, which includes the clean soil above the contaminated soil) would be excavated and transported to the on-site thermal desorption system where the soils would be heated and the contamination volatilized and destroyed in a catalytic oxidation unit. After the soil is treated or shown to meet the preliminary remedial levels for soils, it would be returned to the trenches where it was removed.

The PCB contaminated surface soil, in the drainage ditch and in the vicinity of the former PCB pile would also be excavated (approximately 600 cubic yards). This material would be disposed of at an off-site treatment, storage, and disposal facility.

**Alternative SC-3**

*Estimated Time for Design and Construction: 2 years*
*Estimated Time for Restoration: 7 years*
*Estimated Capital Cost: $1,900,000*
*Estimated Operation and Maintenance Cost: $22,000,000*
*Estimated Total Cost: $23,900,000*

**Alternative SC-4: Off-Site Incineration**

The off-site incineration alternative involves excavation of the contaminated soil, and transportation of the soil to an off-site incinerator facility. Prior to excavating the soils, however, the VOC contamination would be reduced by approximately 60% using vapor extraction (see preferred
alternative SC-2). Vapor extraction would be used in order to reduce the short-term risk to the local residents and workers from the VOCs emitted during excavation. After vapor extraction, approximately 94,000 cubic yards of contaminated soil (a total of 240,000 cubic yards, which includes the clean soil above the contaminated soil) would be excavated and transported off-site for incineration.

The PCB contaminated soil in the drainage ditch and in the vicinity of the former PCB pile would be excavated (approximately 600 cubic yards) and disposed of at an off-site treatment, storage, and disposal facility.

_Altimate SC-4_

_Estimated Time for Design and Construction:_ 2 years  
_Estimated Time for Restoration:_ 6 years  
_Estimated Capital Cost:_ $2,200,000  
_Estimated Operation and Maintenance Cost:_ $99,000,000  
_Estimated Total Cost:_ $101,200,000

_Altimate MM-1: No Action_

Under this alternative limited action would be taken to include continued sampling of the groundwater wells and the surface water seeps. Natural attenuation of the contaminated groundwater and soil would occur over time through dilution, biological degradation, and abiotic degradation. The No Action response would not supersede the March 1987 ROD for the Picillo Farm site and, therefore, any requirements of that document would continue to apply. This alternative is referred to as Limited Action alternative in the FS report.

The No Action would require long-term monitoring of the groundwater and surface water and five-year reviews to determine if additional cleanup measures should be taken.

_Altimate MM-I_

If a Source Control alternative is implemented other than No Action, SC-1:  
_Estimated Time for Design and Construction:_ Not Applicable  
_Estimated Time for Restoration:_ Approximately 40 years  
_Estimated Capital Cost:_ None  
_Estimated Operation and Maintenance Cost:_ $3,700,000  
_Estimated Total Cost:_ $3,700,000
If No Action Source Control alternative, SC-1, is implemented:

*Estimated Time for Design and Construction: Not Applicable*
*Estimated Time for Restoration: Approximately 500 years*
*Estimated Capital Cost: None*
*Estimated Operation and Maintenance Cost: $4,300,000*
*Estimated Total Cost: $4,300,000*

**Alternative MM-2: UV/Oxidation or Air Stripping of the Source and Concentrated Regions and Air Stripping of the Dilute Region**

Alternative MM-2 involves the extraction and treatment of groundwater in the source and concentrated regions of the plume in order to limit the effect the residual contamination has on the entire aquifer. Alternative MM-2 will also remediate the dilute region of the plume as quickly as possible by pumping and treating the groundwater in that region.

The groundwater treatment system proposed to remediate the groundwater allows splitting of the groundwater into two separate streams to utilize optimum technologies for each. The dilute region of the groundwater plume would be treated in a packed column air stripper, and the source region would be treated with UV/oxidation or in a packed column air stripper. After the initial treatment the groundwater would be mixed together and then passed through an activated carbon filter for final treatment. The treated groundwater would then be reinjected into the aquifer. The contaminated air would be passed through activated carbon filter to remove contaminants prior to discharge to the atmosphere.

While the groundwater is being remediated, institutional controls would be implemented as in the preferred alternative. Alternative MM-2 would include installation of deep bedrock wells and long-term groundwater and surface water monitoring similar to the preferred alternative. Five-year reviews will be performed as with other alternatives.

**Alternative MM-2: UV/Oxidation of the Source and Concentrated Regions and Air Stripping of the Dilute Region**

*Estimated Time for Design and Construction: 2 years*
*Estimated Time for Restoration: Approximately 20 years*
*Estimated Capital Cost: $2,200,000*
*Estimated Operation and Maintenance Cost: $12,000,000*
*Estimated Total Cost: $14,200,000*
Alternative MM-2: Air Stripping of the Source, Concentrated and Dilute Regions

Estimated Time for Design and Construction: 2 years
Estimated Time for Restoration: Approximately 20 years
Estimated Capital Cost: $1,300,000
Estimated Operation and Maintenance Cost: $19,000,000
Estimated Total Cost: $20,300,000

Summary of the Comparative Analysis of Alternatives

EPA uses nine criteria to evaluate each remedial alternative retained for detailed analysis in the FS. The nine criteria are used to select a remedy that meets the national Superfund program objectives of protecting human health and the environment, maintaining protection over time, and minimizing untreated waste. Definitions of the nine criteria and a summary of EPA’s evaluation of the alternatives using the nine criteria are provided below:

1. Overall Protection of Human Health and the Environment addresses how an alternative as a whole will protect human health and the environment. This includes an assessment of how public health and environmental risks are properly eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

   The preferred alternative for addressing contaminant sources, thermally enhanced vapor extraction and catalytic oxidation (SC-2) would provide overall protection to human health and the environment through treatment of all the contaminated soils in the disposal area. Treatment of the contaminated soils would prevent further migration and contamination of the groundwater enabling the groundwater to be restored to drinking water standards.

   Alternatives SC-3 and SC-4 would also provide protection of human health and the environment by excavating and treating the contaminated soil. However, the excavation of the soils in close proximity to nearby residents and the high concentration of VOCs in the soils cause a concern for short-term health risk to the community and the workers. To limit this health risk, vapor extraction would be performed prior to excavating the soils for either alternative, and approximately 60% of the contaminants would be removed, but the actual air emissions that would result for the excavation after vapor extraction would still pose an unknown health risk to the community.

   Alternative SC-1, No Action would not provide protection of human health and the environment because contaminants would remain in soil and continue to be released into groundwater for about 500 years.
The preferred alternative for addressing groundwater contamination on site (MM-3), as well as alternative MM-2, would provide protection to human health and the environment by removing the VOC, SVOC, and metal contamination from groundwater. However, both alternatives, MM-2 and MM-3, have the potential to impact the wetlands surrounding the site by extracting the groundwater and dewatering parts of the Unnamed Swamp and the seeps. MM-2 presents a greater risk of impacting the environment than does alternative MM-3 because MM-2 requires the extraction of the groundwater in the dilute region of the plume, which is in very close proximity to the swamp. The preferred alternative would allow the groundwater to naturally attenuate in the dilute region; and therefore, the impact to the wetland would be less than that posed by MM-2.

Alternative MM-1 (No Action) would not provide for the protection of human health or the environment. Without the implementation of a Source Control alternative, the aquifer would likely be returned to its beneficial use in approximately 500 years. With the implementation of a Source Control alternative, the aquifer would likely be returned to its beneficial use in approximately 40 years.

2. Compliance with Applicable or Relevant and Appropriate Requirements (ARARs) addresses whether or not a remedy complies with all state and federal environmental and public health laws and requirements that apply or are relevant and appropriate to the conditions and cleanup options at a specific site. If an ARAR cannot be met, the analysis of the alternative must provide the grounds for invoking a statutory waiver.

With the exception of the No Action alternatives (SC-1) and (MM-1), all of the other alternatives that received detailed analysis in the FS would meet all ARARs. The No Action alternatives would not meet ARARs because they would allow continued release of contaminants from source areas and possible spread of contamination through the groundwater to currently uncontaminated areas.

3. Long-Term Effectiveness and Permanence refers to the ability of an alternative to maintain reliable protection of human health and the environment over time once the cleanup levels have been met.

All SC alternatives (except SC-1, No Action) provide similar degrees of long-term effectiveness and permanence since treatment of all hazardous materials is provided prior to disposal.

All of the MM alternatives, with the exception of MM-1 (No Action), provide similar degrees of long-term effectiveness and permanence since the only major difference is the time frame in which protection is achieved in the dilute portion of the plume.
4. Reduction of Toxicity, Mobility, or Volume through Treatment are three principal measures of the overall performance of an alternative. The 1986 amendments to the Superfund statute emphasize that, whenever possible, EPA should select a remedy that uses a treatment process to permanently reduce the level of toxicity of contaminants at the site, the spread of contaminants away from the source of contamination, or the volume or amount of contamination at the site.

All of the source control alternatives, with the exception of SC-1 (No Action), reduce the extent of toxicity, mobility, and volume of the contamination since all would employ treatment prior to disposal. SC-4 would provide the greatest reduction since it involves incineration of all hazardous wastes. SC-2 and SC-3 provide a lesser degree of treatment than incineration. SC-1 would not reduce the toxicity, mobility, or volume of the contamination.

Both MM-2 and MM-3 reduce the extent of toxicity, mobility, and volume of the contamination since all would employ treatment prior to disposal. MM-2 would provide the greatest reduction since it involves the collection and treatment of the dilute and source regions of the plume and MM-3 would only collect and treat the source region. MM-1 (No Action) would not reduce the toxicity, mobility, or volume of the contamination through treatment.

5. Short-Term Effectiveness refers to the likelihood of adverse impacts on human health or the environment that may be posed during the construction and implementation of an alternative until cleanup levels are achieved.

The preferred source control alternative (SC-2), SC-3, and SC-4 would be effective in the short term. However, because of the potential for release of contaminants during the excavation activities in alternatives SC-3 and SC-4, special engineering precautions would be necessary to minimize the potential for contaminant emissions to ensure short-term protection of workers and area residents during cleanup related construction activities. Alternative SC-4 would also require the use of a large number of trucks to transport the contaminated soil off-site. This activity would impact the residents surrounding the Picillo Farm site.

The preferred MM alternative and alternative MM-1 (No Action) would have only minimal impacts on human health and the environment. However, alternative MM-2 could potentially dewater the wetlands surrounding the Picillo Farm site because of the need to extract and treat the groundwater in the dilute region of the plume.

6. Implementability refers to the technical and administrative feasibility of an alternative, including the availability of materials and services needed to implement the alternative.
The thermally enhanced vapor extraction technology used in the preferred source control alternative is innovative having been tested only at a few sites; therefore, it would have to be pilot tested prior to implementation. The treatment technology used in alternative SC-3, Thermal Desorption, is readily implementable and has been successfully implemented at other sites. Alternative SC-4 may be difficult to implement due to the volume of soil and waste that would have to be shipped to a hazardous waste disposal facility for incineration.

The MM alternatives would be equally easy to implement and all have been used successfully at other sites. The installation of the groundwater extraction wells and the construction of the UV/oxidation system and the air stripper are easily implementable.

7. Cost includes the net present worth of the capital (up-front) cost of implementing an alternative as well as the net present worth of the cost of operating and maintaining the alternative over the long term.

The capital, operation and maintenance, and total cost for each alternative is provided as part of the site description in the preceding sections on "EPA's Preferred Alternative" and "Other Alternatives Evaluated in the FS".

8. State Acceptance addresses whether, based on its review of the RI/FS and Proposed Plan, the State concurs with the alternative EPA is proposing as the remedy for the site. State of Rhode Island acceptance of this Proposed Plan will be evaluated based on comments received during the public comment period.

9. Community Acceptance addresses whether the public concurs with EPA's Proposed Plan. Community acceptance of this Proposed Plan will be evaluated based on comments received at the upcoming public meetings and during the public comment period.

Of the nine criteria, overall protection of human health and the environment and compliance with all applicable or relevant and appropriate requirements are considered threshold requirements that must be met by all remedies. EPA balances its consideration of alternatives which meet the threshold criteria with respect to long-term effectiveness and permanence; reductions of toxicity, mobility, or volume through treatment; short-term effectiveness; implementability; and cost. State and community concerns are considered as modifying criteria factored into a final balancing of all criteria to select a remedy. Consideration of State and community comments may prompt EPA to modify aspects of the preferred alternative or decide that another alternative considered provides a more appropriate balance.
EPA’s Rationale for Proposing the Preferred Alternative

Based on current information and analysis of the RI and FS reports, EPA believes that the preferred alternative for the Picillo Farm site is consistent with the requirements of the Superfund law and its amendments, specifically Section 121 of CERCLA, and the National Contingency Plan (NCP).

The preferred source control alternative (SC-2) provides overall protection of human health and the environment and achieves the applicable or relevant and appropriate requirements. The preferred source control alternative also provides for the significant reduction of toxicity, mobility, and volume through treatment, poses the fewest short-term risks, and is the most cost effective. Unlike SC-3 and SC-4, the preferred source control alternative does not require the excavation of the soil to remediate the contamination which increases the risk of exposure to VOCs emissions. Although the preferred alternative is an innovative technology and will need to be pilot-tested prior to its implementation at the site, the pilot test program and implementation of SC-2 would take approximately the same length of time as implementation of SC-3 and SC-4.

The preferred management of migration alternative (MM-3) also provides overall protection of human health and the environment and achieves all applicable or relevant and appropriate requirements within approximately 20 years. Alternative MM-2 also would achieve all applicable or relevant and appropriate requirements within approximately 20 years; however, MM-2 has the potential to harm the environment by dewatering the wetlands surrounding the Picillo Farm site. The preferred management of migration alternative provides significant reductions in mobility, toxicity, and volume through treatment, and provides long-term effectiveness and permanence. However, MM-3 does not treat the contamination in the dilute region of the plume and allows natural attenuation to return this portion of the plume to its beneficial use. The preferred alternative is also readily implementable and cost-effective given the benefits over the No Action alternative (MM-1).

In summary, the Preferred Alternative would achieve the best balance among the criteria used by EPA to evaluate the alternatives. The Preferred Alternative would:

- Provide short- and long-term protection of human health and the environment;
- Attain all federal and state applicable or relevant and appropriate requirements;
• Provide significant reduction of toxicity, mobility, and volume of the site contaminants through treatment; and

• Utilize permanent solutions and innovative treatment technologies to the maximum extent practicable.

For More Information

If you have any questions about the site or would like more information, you may call or write to:

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Glossary

Activated Carbon: A powdered or granular form of carbon that has been treated to increase its surface area and adsorptive properties. It is widely used in pollution control systems for liquids and gases because contaminants adsorb, or adhere, to the surface of the carbon.

Air Stripping: Air treatment method used to remove volatile organic compounds (VOCs) from contaminated water by inducing air flow through the water to transfer VOCs from the water to the air.

 Ambient Water Quality Criteria: Concentration values of toxic pollutants in surface waters that, based on available data, will not result in adverse impacts on aquatic life or on consumers of such aquatic life.

Applicable or Relevant and Appropriate Requirements (ARARs): ARARs include any State or Federal statute or regulation that pertains to protection of public health and the environment in addressing certain site conditions or using a particular cleanup technology at a Superfund site. A State law to preserve wetland areas is an example of an ARAR. EPA must consider whether a remedial alternative meets ARARs as part of the process for selecting a cleanup alternative for a Superfund site.

Aquifer: A layer of rock or soil that can supply usable quantities of groundwater to wells and springs. Aquifers can be a source of drinking water and provide water for other uses as well.

Background Concentration: The concentration (e.g., in parts per billion) of a chemical in the environment not attributable to a particular source (e.g., naturally occurring metals).

Baseline Risk Assessment: A qualitative or quantitative evaluation of human health and/or environmental risk resulting from existing conditions and their relative consequences should no further action be taken.

Bedrock: The layer of rock located below the glacially deposited soil and rock under the ground's surface. Bedrock can be either solid or fractured (cracked); fractured bedrock can support aquifers.

Carbon Adsorption: An add-on control process which uses activated carbon to absorb volatile and semivolatile organic compounds from a gas or liquid stream. The contaminants are later recovered from the carbon.

Catalytic Oxidation: An oxidation process used to treat organic compounds in air. The air stream is heated to 600 to 1000°F and the contaminants are oxidized using a solid catalyst.
Caustics: Corrosive materials having a high pH. Also referred to as "alkalines" or "bases."

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A Federal law passed in 1980 and modified in 1986 by the Superfund Amendments and Reauthorization Act (SARA). The act created a special tax that goes into a Trust Fund, commonly known as Superfund, to investigate and clean up abandoned or uncontrolled hazardous waste sites. Under the program, EPA can either: 1) pay for site cleanup when parties responsible for the contamination cannot be located or are unwilling or unable to perform the work or 2) take legal action to force parties responsible for site contamination to clean up the site or pay back the Federal government for the cost of the cleanup.

Dense Non-Aqueous Phase Liquid (DNAPLs): A class of compounds which, because they are heavier than water, tend to sink in an aquifer rather than move horizontally along with the groundwater flow. Upon reaching a layer or formation of low permeability (clay or bedrock), DNAPLs will usually spread out in a thin lens over the surface of this layer. If there are depressions in the layer, the DNAPLs may collect into pockets. If the layer or formation is inclined or fractured, DNAPLs may continue to flow downward. As DNAPLs pass through the subsurface they also leave a trail of residual DNAPL. These pockets, lenses and residual DNAPLs are very difficult to detect and recover with existing technology. When DNAPLs exist in an aquifer and are not dissolved in the surrounding groundwater, it is usually known as free phase DNAPLs. If pockets of free phase DNAPL are slowly dissolving and contaminating surrounding groundwater, then they would continue to be a long-term source of contamination in the aquifer.

Dewatering well: A well installed to lower the water table to below its natural, or static level by withdrawing the groundwater from the aquifer.

Downgradient: The area of reducing hydraulic head (energy contained in a water mass) below a specified point which generally indicates the direction of groundwater flow.

Extraction well: Any well installed to extract groundwater. The extraction wells associated with cleanup activities are designed and located to withdraw groundwater for treatment.

Feasibility Study (FS) Report: Report that summarizes the development and analysis of remedial alternatives that EPA considers for the cleanup of Superfund sites.

Flocculation: Separation of suspended solids during wastewater treatment by chemical creation of clumps of flocs.
Flow (Groundwater Flow): The term used to describe the direction and rate of movement of groundwater. Also referred to as groundwater velocity.

Groundwater: Water found beneath the earth’s surface that fills pores between materials such as sand, soil, gravel and cracks in bedrock and often serves as a principal source of drinking water.

Incinerator: Any structure or furnace used to burn waste substances and in which all the factors of combustion, such as temperature, can be controlled.

Institutional Controls: Restrictions established to prevent specified activities from occurring in a designated area. Examples include deed restrictions, easements and zoning.

Maximum Contaminant Levels (MCLs): The maximum permissible level of a contaminant in water that is consumed as drinking water. These levels are determined by EPA and are applicable to all public water supplies.

Maximum Contaminant Level Goal (MCLG): The maximum level of a contaminant in drinking water at which no known or anticipated adverse effect on human health would occur, and which allows and adequate margin of safety.

National Contingency Plan (NCP): The regulation which forms the framework for the federal hazardous substance response program. The NCP includes procedures and standards for how EPA, other federal agencies, States and private parties respond under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to releases of hazardous substances and under the Clean Water Act to discharges of oil.

National Priorities List (NPL): EPA’s list of the most serious uncontrolled or abandoned hazardous waste sites that are eligible to receive federal funds for investigation and cleanup under the Superfund program.

Natural Attenuation: The process by which a compound is reduced in concentration over time, through natural processes, such as adsorption, degradation, dilution, and/or transformation.

Net Present Worth: The amount of money necessary to secure the promise of future payment, or series of payments, at an assumed interest rate.

Parts per Billion (ppb): A unit of measurement used to describe levels of contamination. For example, one gallon of a solvent in one billion gallons water is equal to one part per billion.

Pesticide: A substance intended for preventing, destroying, repelling, or mitigating any pest or a substance used as a plant regulator. Some pesticides have been found to cause cancer or produce other toxic effects in humans and animals.
Petroleum: A substance which is a complex mixture of paraffin, naphthene, and aromatic hydrocarbons with small amounts of sulfur, nitrogen and oxygen compounds. Examples of petroleums include gasoline, naphtha, fuel oil and lubricating oil.

Plume: A three dimensional zone within the groundwater that contains contaminants and generally moves in the direction of, and with, groundwater flow.

Polymer: Basic molecular ingredients in plastic, composed of giant molecules formed by the union of up to hundreds or thousands of simple molecules.

Potentially Responsible Party (PRP): Any individual or company such as owners, operators, transporters, or hazardous substance generators potentially responsible for contamination at a Superfund Site. Whenever possible, EPA requires PRPs, through administrative and legal actions, to clean up hazardous waste sites.

Precipitation: Removal of solids from liquid waste so that the hazardous solid portion can be disposed of safely.

Recharge: The processes by which water is absorbed and is added to the zone of saturation, either directly into a formation, or indirectly by way of another formation.

Record of Decision (ROD): A public document that explains the cleanup alternative to be used at a National Priorities List (NPL) site. The ROD is based on information and technical analysis generated during the RI/FS and on consideration of the public comments and community concerns.

Reinjection Well: A well designed to return treated water into the aquifer. It is intended to maintain the water balance in the aquifer by replacing the contaminated groundwater withdrawn for treatment.

Remedial Alternative: Option evaluated by EPA to address the source and/or migration of contaminants at a Superfund site to meet health based cleanup goals.

Remedial Investigation (RI): The Remedial Investigation determines the nature and extent of contamination at a hazardous waste site and the problems that the contamination causes. Results of the RI direct the types of cleanup options that are developed in a Feasibility Study (FS).

Resource Conservation and Recovery Act (RCRA): This law, enacted in 1976, puts in place a "cradle to grave" system for the management of hazardous wastes in this country. Its chief implementing tool is a permit system; all hazardous waste treatment, storage, or disposal facilities must meet certain standards, most often outlined in permits, in order to remain in operation.
Many of the permit standards outlined by RCRA focus specifically on protecting groundwater from contamination.

**Safe Drinking Water Act (SDWA):** Enacted in 1974, the SDWA requires the establishment of primary and secondary drinking water standards and controls on underground injection activities. The 1987 Amendments require states to develop wellhead protection programs.

**Saturated Zone:** The zone of a geologic formation found below the water table, and where all void space is saturated with water (commonly used as the definition of groundwater).

**Secondary Drinking Water Standards:** Unenforceable federal guidelines regarding the taste, odor, color, and certain other non-aesthetic effects of drinking water. Considered guidelines for the states.

**Sediments:** The sand or mud found at the bottom and sides of bodies of water, such as creeks, rivers, streams, lakes, swamps, and ponds. Sediments typically consist of soil, silt, clay, plant matter, and sometimes gravel.

**Seep:** A point at which groundwater discharges to a land surface. Seep typically describes a groundwater discharge to the bottom of a stream, lake, or other surface water body.

**Semi-Volatile Organic Compounds (SVOCs):** A type of volatile organic compound that is heavier in weight and that does not volatilize (or evaporate) as easily as other volatile organic compounds.

**Solubility:** The ability of one compound or fluid to dissolve and become assimilated into another.

**Solvents:** Liquids capable of dissolving other liquids or solids to form a solution. The chief uses of industrial solvents are as cleaners and degreasers. Solvents also are used in paints and pharmaceuticals. Solvents used in foundries and other industrial applications are frequently VOCs. Many solvents are flammable and toxic to varying degrees.

**Source:** Area at a hazardous waste site from which contamination originates.

**Superfund Amendments and Reauthorization Act (SARA):** Enacted in 1986, SARA increased the amount of money in the Superfund Trust Fund five-fold to $8.5 billion to be used over the five years from 1986 to 1991. It also streamlines many of the procedures used by the EPA in addressing abandoned or uncontrolled hazardous waste sites, puts a greater emphasis on permanent solutions, and introduces new authorities such as the Community Right-To-Know program which will increase public disclosure of the releases of hazardous wastes to all environmental medium.
Surface Water: Bodies of water on the surface of the earth, such as rivers, lakes, and streams.

Target Compound List (TCL): A list of approximately 130 organic compounds typically found at and analyzed for at hazardous waste sites.

Thermal Desorption: A thermal treatment method used to remove VOCs and some SVOCs from contaminated soil by heating the soil and volatilizing the contaminants to the air.

Thermally Enhanced Vapor Extraction: Hot air or steam is injected into the subsurface soils to enhance the volatilization of the contaminants. The soil is put under a vacuum and the volatilized contaminants are collected at vapor extraction wells in the vadose zone.

Ultraviolet (UV)/Oxidation System: A reactor designed to shine light in the ultraviolet spectrum through the contaminated groundwater and cause the oxidation of the contaminants to carbon dioxide and water.

Upgradient: The area of increasing hydraulic head (energy contained in a water mass) above a specified point. Groundwater generally flows from upgradient regions to downgradient regions.

Vadose Zone: The zone of a geologic formation found above the water table; where some void space is not saturated with water but, rather, contains air. Also referred to as the unsaturated zone.

Volatile Organic Compounds (VOCs): A group of chemical compounds composed primarily of carbon and hydrogen that are characterized by their tendency to evaporate (or volatilize) into the air from water or soil. VOCs include substances that are contained in common solvents and cleaning fluids. Some VOCs are known to cause cancer.

Volatility: The potential for a compound to evaporate from its liquid state and become a gas.

Water Table: The level below which the soil or rock is saturated with water; the upper boundary of the saturated zone. At this level, the hydraulic pressure is equal to atmospheric pressure. Also used to refer to an aquifer that exists in unconfined conditions (e.g., a water table aquifer); the water table of an unconfined aquifer is represented by the water level in wells not being pumped.

Wetlands: Areas such as marshes, bogs, and swamps that are saturated with water long enough each year to affect the type of soil and vegetation found in the area. Wetlands are federally protected because they purify water, prevent floods, feed and shelter fish and wildlife, and offer recreational opportunities.
Mailing List Additions/Deletions/Changes

If you or someone you know would like to be added to (or deleted from) the Picillo Farm Superfund site mailing list, or if you want to alert us to a change in your address, please fill out and mail this form to:

Liza Judge
Community Involvement Coordinator
U.S. Environmental Protection Agency, Region 1
JFK Federal Building (REA)
Boston, MA 02203
(617) 565-3419

Name ________________________________
Address ________________________________
Affiliation (optional) ________________________________

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