Pemaco Superfund Site

PROPOSED PLAN

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY • REGION 9 • SAN FRANCISCO, CA • MARCH 2004

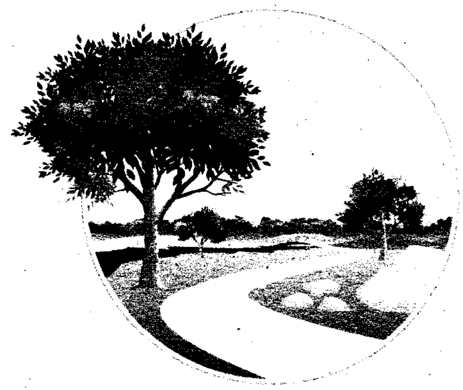
public comment period

April 4, 2004 through May 3, 2004

community meeting

Saturday, April 17, 2004
11:00 am
Maywood Activity Center
4801 E 58th Street

what's inside page



introduction

The United States Environmental Protection Agency (EPA), Region 9, is seeking public comments on this **Proposed Plan*** to address soil and groundwater **contamination** at the Pemaco Superfund Site in Maywood, California. The Proposed Plan identifies EPA's preferred cleanup remedy and summarizes the cleanup alternatives that were considered by EPA. This proposed plan summarizes information that can be found in the **Remedial Investigation** and **Feasibility Study** (RI/FS) Reports and other documents contained in the **Administrative Record File** for this Site. The Administrative Record File is available for public review at the Information Repositories listed on page 17. EPA's primary objective is to protect public health and the environment from environmental **contaminants** detected at the Pemaco Site.

EPA has prepared the Proposed Plan to: (1) inform the community about the history and environmental findings at the Site; (2) describe the cleanup options (alternatives) and EPA's preferred alternatives; (3) solicit public comments on EPA's preferred alternatives; and (4) describe how the public can become involved.

EPA will select the final cleanup method (the remedy) for the Site after considering the community's input. EPA encourages you to read this Proposed Plan and other related environmental studies for the Site. Public input on all alternatives, and on the information that supports the alternatives, is an important part of the remedy selection process. Your input can influence EPA's final decision.

As the lead agency for the Site, EPA has worked with the California Department of Toxic Substances Control (DTSC), on environmental issues at the Site. After considering public comments, EPA, in consultation with DTSC, will make a final selection of the remedies to be implemented at the Site. EPA will then present the remedies and implementation plans in a document called the **Record of Decision** (ROD). The ROD will include a **Responsiveness Summary**, which will present all public comments received on the Proposed Plan along with EPA's responses to those comments.

*All words in bold are defined in the Glossary on pages 17-18.

EPA is issuing this Proposed Plan pursuant to the requirements of the ***Comprehensive Environmental Response, Compensation, and Liability Act*** *(CERCLA) of 1980 and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), to facilitate community involvement in the selection of remedies for the Pemaco Superfund Site.*

Invitation to Comment on the Proposed Cleanup of the Pemaco Superfund Site, Maywood, CA

You have a chance to comment on the Proposed Plan for cleaning up the Pemaco Superfund Site at a public meeting on April 17, 2004. The United States Environmental Protection Agency (EPA), Region 9, wants to hear your views about the proposed plan for this cleanup. We have carefully studied the Site and now believe that the following actions are the best way to protect your health and the environment.

- Place a 1-ft layer of clean soil as a cover over the entire Site, and establish vegetative growth to stabilize the soil in place. Long-term monitoring and maintenance of the soil cover and vegetative growth is essential to prevent erosion and exposure of the underlying contaminants. This will cost $773,000 and take 1 – 2 months to complete.

- Extract contaminated groundwater and soil vapor to a depth of 35 feet below the surface using high vacuum pumps. Transport the extracted groundwater and soil vapor to separate aboveground treatment systems where the contaminants are removed prior to discharge. Treat groundwater with an ultraviolet oxidation system. Treat soil vapor with a flameless thermal oxidation (FTO) system for first year of operation; replace FTO with a granular activated carbon (GAC) system for remainder of project. Discharge the clean water to the storm water drain/channel and the treated soil vapor to air. This will cost $3.7 million and will take approximately 10 years to complete.

- Heat soil and groundwater in the most highly contaminated source area between 35 and 100 ft bgs through a process called electrical resistance heating. Collect volatilized contaminants at the surface via vapor extraction for treatment. Pump remaining contaminated groundwater and extract soil vapors outside of the source area between 35 and 100 ft bgs to the surface for treatment. Treat groundwater with an ultraviolet oxidation system. Treat soil vapor with an FTO system for first year of operation; replace FTO with a GAC system for remainder of project. Discharge the clean water to the storm drain/channel and the treated soil vapor to air. This will cost $8.9 million and will take approximately 10 years to complete - but 90% of project complete in 1 year with subsequent pumping for 4 years and monitoring for a total of 10 years.

You may make comments at the public meeting. You also have until May 3, 2004, to supply written comments on the Proposed Plan, or other material in the Administrative Record File. At the end of the comment period, EPA will review the suggestions and make a final decision about the Site cleanup. Your input on the Proposed Plan is an important part of the decision-making process and can influence EPA's final decision.

submit written comments

Public Comment Period:

EPA will accept written comments on the Proposed Plan during the public comment period, April 4 –May 3, 2004.

You may submit your comments to:

Ms. Rose Marie Caraway
U.S. EPA Region 9
75 Hawthorne St. (SFD 7 -2)
San Francisco, CA 94105-3901

attend the public meeting

Public Meeting:

You are invited to a meeting sponsored by EPA to hear about the Proposed Plan for cleaning up the Pemaco Superfund site. At the meeting you will be able to state your views about the cleanup.

The meeting will be held:

11 am, Saturday, April 17, 2004
Maywood Activity Center
4801 E. 58th Street
Maywood, CA

location of administrative record

Maywood Cesar Chavez Public Library
4323 E. Slauson Avenue
Maywood, CA 90270 • (323) 771-8600
Hours: Mon – Tues, 12 pm – 8 pm
Wed – Thurs, 11 am – 6 pm
Fri – Sat, 11 am – 5 pm
Sunday, CLOSED

U.S. EPA Records Center Region 9
95 Hawthorne Street, Suite 403 S
San Francisco, CA 94105
(415) 536-2000
Hours: Mon – Fri, 8 am to 5 pm

United States Environmental Protection Agency
75 Hawthorne Street • San Francisco, CA 94105
• Region 9 • Proposed Plan • Fact Sheet

site risks

Between the 1940s and 1991, Pemaco, Inc. operated a chemical blending facility at 5050 E. Slauson Avenue in Maywood, California. A wide variety of chemicals were used and stored in drums, aboveground storage tanks (ASTs), and underground storage tanks (USTs). Environmental assessments performed at the Pemaco facility have identified soil and groundwater contamination that originated from the blending and storage of chemicals. EPA has spent the last two years studying the property to determine what risks it poses to the health and welfare of people who live near or will use the Site upon its redevelopment into the Maywood Riverfront Park. We found that there is some risk to people who come into contact with the site-contaminated soil or groundwater. While the chance of becoming sick as a result of exposure to the contaminants is small, it is serious enough to require that actions be taken to reduce the levels of chemicals present in the soil and groundwater to safe levels. To provide more protection while the cleanup is being done, we have already put a fence around the Site and sampled nearby residential homes for indoor air contamination.

cleanup goals

- Reduce the risk posed by direct contact with contaminated soils and soil vapor migrating to the surface.
- Restore groundwater to standards established under the Safe Drinking Water Act.

your comments

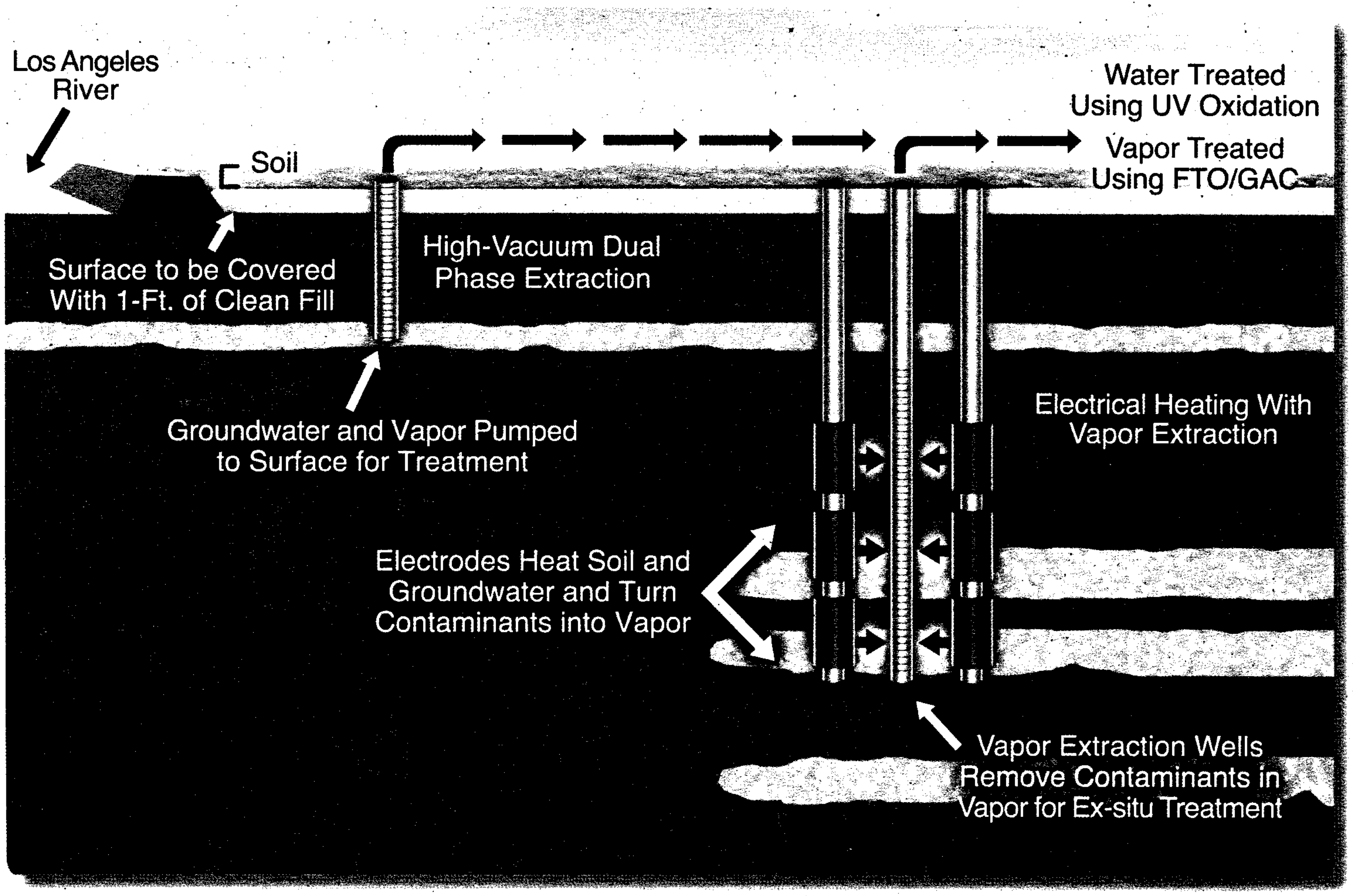
We looked at a number of ways to meet the cleanup goals, which are described more completely in the Proposed Plan and Administrative Record File. EPA believes that the Preferred Alternatives identified on the other side of this page (and illustrated below) will protect your health and the environment and can be done without major nuisance to your community. However, before making a final decision, we want to hear what you think. We encourage you to find out more about the cleanup plan and make your views and concerns known on all the options that were considered. The cleanup plan that is finally chosen will be described in a Record of Decision. That document will include a summary of the comments received along with how those comments effected the decision that was reached.

for more information...

You can see a copy of the Proposed Plan, which describes the cleanup alternatives we studied, and also get more information about the site by visiting the Administrative Record File which can be found at:

Maywood Caesar Chavez Library
4323 E. Slauson Avenue
Maywood, CA 90270
Telephone: (323) 771-8600

Finally, you can ask for a copy of the Proposed Plan to be sent to you by calling 1-800-231-3075.



site background

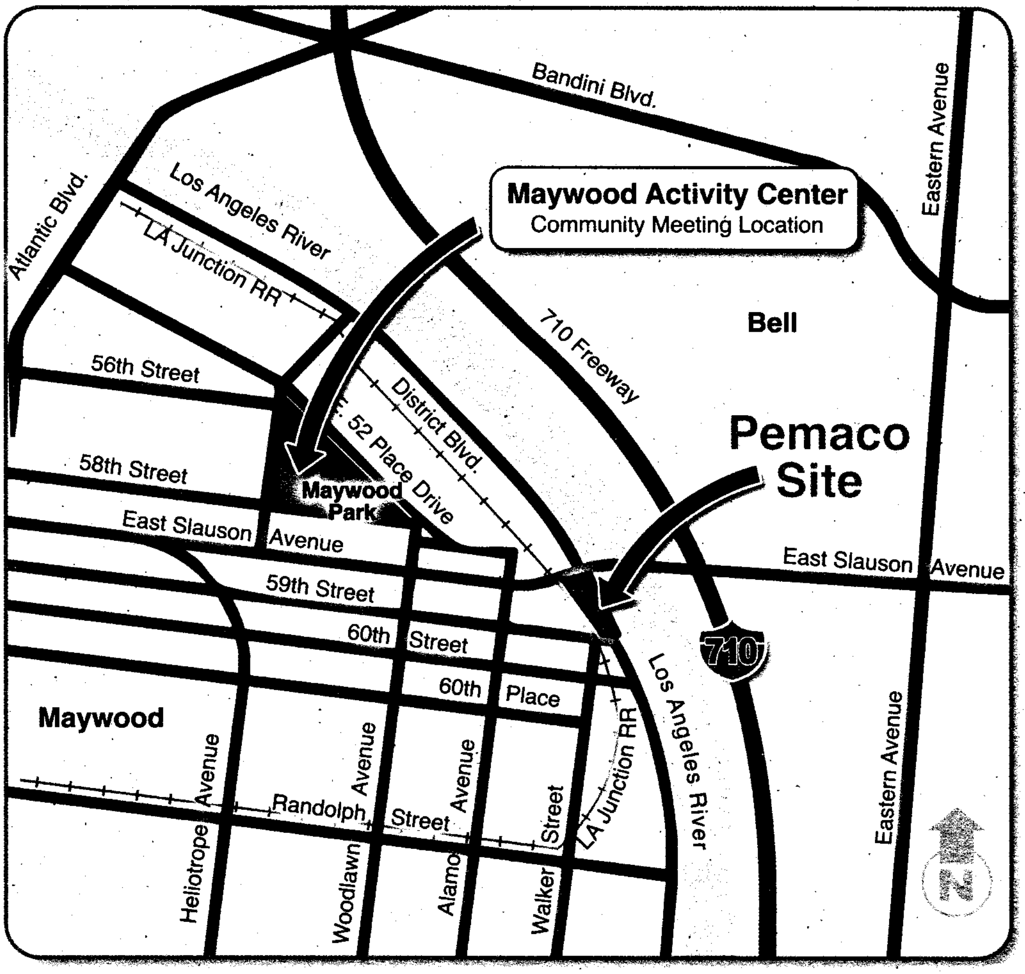
The Pemaco Superfund Site is located at 5050 E. Slauson Avenue in Maywood, California (see Figure 1). It is a 1.4-acre site in a mixed industrial and residential community. The Pemaco Site was used by Pemaco, Inc., which formally operated as a custom chemical blending facility from the 1940s until 1991. No other use of the property is documented since 1991. The City of Maywood, in conjunction with the Trust for Public Land, is planning to use the Pemaco property along with several adjacent properties to build the Maywood Riverfront Park.

During its operation, the Pemaco facility used a wide variety of chemicals including chlorinated and aromatic solvents, flammable liquids, oils, and specialty chemicals. These chemicals were stored in drums, aboveground storage tanks (ASTs), and underground storage tanks (USTs).

The first environmental assessment of the property was completed in 1990 by the Pemaco facility owner. The owner abandoned the Site some time after 1991 and environmental activities at the Site shifted to Los Angeles County and EPA. Environmental assessments performed at the Pemaco facility between 1990 and 1999 identified soil and ***groundwater*** contamination that occurred due to spillage from the tanks and drums.

Between 1991 and 1994, approximately four hundred 55-gallon drums and three ASTs were removed from the Site by order of the Los Angeles District Attorney's office. A substantial fire in 1993 destroyed much of the main warehouse building. At the request of Los Angeles County, regulatory involvement by EPA's Region 9 Emergency Response team included: removal of the remaining stored chemicals, drums, ASTs, and USTs, fence installation around the Site, building demolition, environmental sampling, and the design, installation, and operation of a soil vapor extraction (SVE) system. The SVE was installed as an interim measure in 1998 and operated until 1999, when it was shut down due to community concerns with emissions from the thermal oxidation unit used to treat the extracted vapors.

The EPA added the Site to the ***National Priorities List (NPL)*** in 1999 to continue remediation (cleanup) efforts at the Site.



▲ ***Figure 1.*** *Location Map of Pemaco Superfund Site*

the superfund process

Site Discovery

Evidence of potential contamination is reported in 1992.

NPL ranking/ listing

Site placed on EPA's National Priorities List in January 1999, making it eligible for cleanup action under Superfund.

Remedial Investi- gation (RI)

EPA investigates the nature and extent of contamination. The RI report was completed in November 2003.

Feasibility Study (FS)

EPA identifies and analyzes alternatives for addressing site contamination. The FS report was completed in February 2004.

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community involvement activiti

▲ ***Figure 2.*** *The Superfund Process for the Pemaco Superfund Site*

Environmental investigations and cleanup of contamination at the Pemaco Site are following the federal ***Superfund*** process. The Superfund process is shown in Figure 2 (below). Public participation activities up to this point include three community meetings and numerous interviews of community members. The EPA has also worked closely with the City of Maywood during the RI and FS process.

site characteristics

EPA performed a full-scale RI between January 2001 and November 2001 to identify the nature and extent of soil and groundwater contamination at the Pemaco Superfund Site. EPA also conducted ***treatability tests*** and additional "data gap" assessments between December 2001 and December 2002 to support the FS. These activities included the collection of over 2,500 ambient air, soil, soil vapor, and groundwater samples. Quarterly groundwater monitoring is ongoing.

Fifty-six ***chemicals of concern*** (COCs) have been identified in Site soils and groundwater zones based on the comparison of analytical results to federal and state regulatory levels for contaminants in the environment. The COCs include:

- ***Volatile Organic Compounds*** (VOCs, organic compounds that evaporate readily into the air) which include:
  - Tetrachloroethene (PCE) – a cleaning solvent,
  - Trichloroethene (TCE) – a cleaning solvent,
  - Dichloroethene (DCE) – a by-product of TCE, and
  - Vinyl chloride – a by-product of TCE.
- ***Metals***,
- ***Solvents*** [non-halogenated volatile organic compounds (NHVOCs)], and
- ***Semi-volatile organic compounds*** (SVOCs), which include ***polyaromatic hydrocarbons*** (PAHs - a group of chemicals that are formed during the incomplete burning of coal, oil and gas, or other organic substances).

The following sections describe the nature and extent of contamination based on data retrieved during the RI for the following environmental media: (1) surface and near-surface soil, (2) upper ***vadose zone*** soil, 3) lower vadose zone soil, (4) perched groundwater, and (5) Exposition groundwater.

soil investigations

Surface and Near-Surface Soil (0-3 feet below ground surface, "bgs")

PAHs were the most prevalent COCs detected in surface and near-surface soil samples. Metals exceeding regulatory levels in surface and near-surface soils include arsenic, iron, lead, and manganese. No solvents or SVOCs were detected in surface/near-surface soils at concentrations exceeding regulatory levels.

The majority of surface soil contamination (approximately 2,200 cubic yards) appears to lie along the edges of the Pemaco Site. This would be consistent with the fact that clean fill was placed over much of the Site during previous removal actions of the former warehouse foundation, UST excavation, and soil removal within the central portion of the Site.

Public Comment Period	Record of Decision (ROD)	Remedial Design	Remedial Action	5-Year Review	NPL De-listing
The public comments on alternatives, including EPA's preferred alternative, during formal public comment period. EPA considers these comments and prepares responsiveness summary.	EPA documents the selected remedy in the Record of Decision.	EPA oversees development of detailed specifications for the selected remedy.	EPA oversees construction and operation of the remedy.	EPA reviews the effectiveness of the remedy every five-year period of the cleanup action.	EPA removes the site from the Superfund (NPL) List when cleanup goals are achieved.

roughout the superfund process

s occur throughout the superfund process

Upper Vadose Zone Soil (3-35 feet bgs)

VOCs are the most prevalent and widespread contaminants within upper vadose zone soils at the Pemaco Site, where an estimated 80,000 to 95,000 cubic yards of VOC-contaminated soil have been identified. The release of VOCs at Pemaco is likely a result of leaking USTs and spills associated with the loading area located in the southwest corner of the Site and leaking ASTs and drum storage in the north-central portion of the Site.

Arsenic and total chromium were the only metals detected above regulatory levels in upper vadose zone soils. Samples that reported these concentrations were collected from borings located offsite. The distance of these samples from the Pemaco Site suggest that detected concentrations are likely background levels and not from a Pemaco release.

Acetone is the only solvent/NHVOC to exceed regulatory levels; elevated concentrations of acetone have been attributed to bentonite pellets used during well installation, as concentrations fluctuated around well installation events.

The most prevalent SVOCs within the upper vadose zone soils were PAHs, the majority of which were located adjacent to the central-west part of the Pemaco Site. There was no indication of historical use of PAHs at the Pemaco facility; PAHs are likely due to vehicle exhaust, previous fires, and paving activities that have occurred in the area over the years.

Lower Vadose Zone Soil (35-100 feet bgs)

Like upper vadose zone soils, VOCs are the most common and widespread contaminants within lower vadose zone soils, where an estimated 14,000 cubic yards of VOC-contaminated soil have been identified through soil sampling. The highest VOC concentrations are concentrated within the southwest corner of the Pemaco Site between the depths of 55 and 60 feet bgs.

Metals that exceeded regulatory levels in lower vadose zone soils include the following: antimony, arsenic, barium, cadmium, total chromium, and nickel. The distribution of metals within lower vadose zone soils suggests that these metals are likely background and not from a Pemaco release.

No solvents or SVOCs were detected in lower vadose zone soils at concentrations exceeding regulatory levels.

groundwater investigations

Groundwater beneath the Pemaco Site exists in several layers. The shallowest layer, the perched groundwater zone, begins at a depth of approximately 25 ft and ranges in thickness from 5-inches to approximately 5-ft. Beneath the perched groundwater zone, there are five different zones saturated with water that are typically found between 65 and 175 ft. These zones are similar to the more regional Exposition ***Aquifer***; therefore, they have been informally named from top to bottom, the Exposition 'A' through 'E' Zones.

The 'A' and 'B' Zones are the main zones of concern and both vary from a few inches to 10 ft thick. The remaining three zones, 'C', 'D', and 'E' are typically found from 95 to 110 ft bgs, 125 to 145 ft bgs, and 160 to 175 ft bgs, respectively.

Municipal groundwater production wells in the vicinity of the Site draw water from aquifers beginning at approximately 350 ft bgs or deeper. As the groundwater aquifers used for drinking water are much deeper than the contaminated groundwater zones associated with the Pemaco Site, contamination from the Pemaco Superfund Site has not affected drinking water sources in the Maywood area.

perched groundwater zone

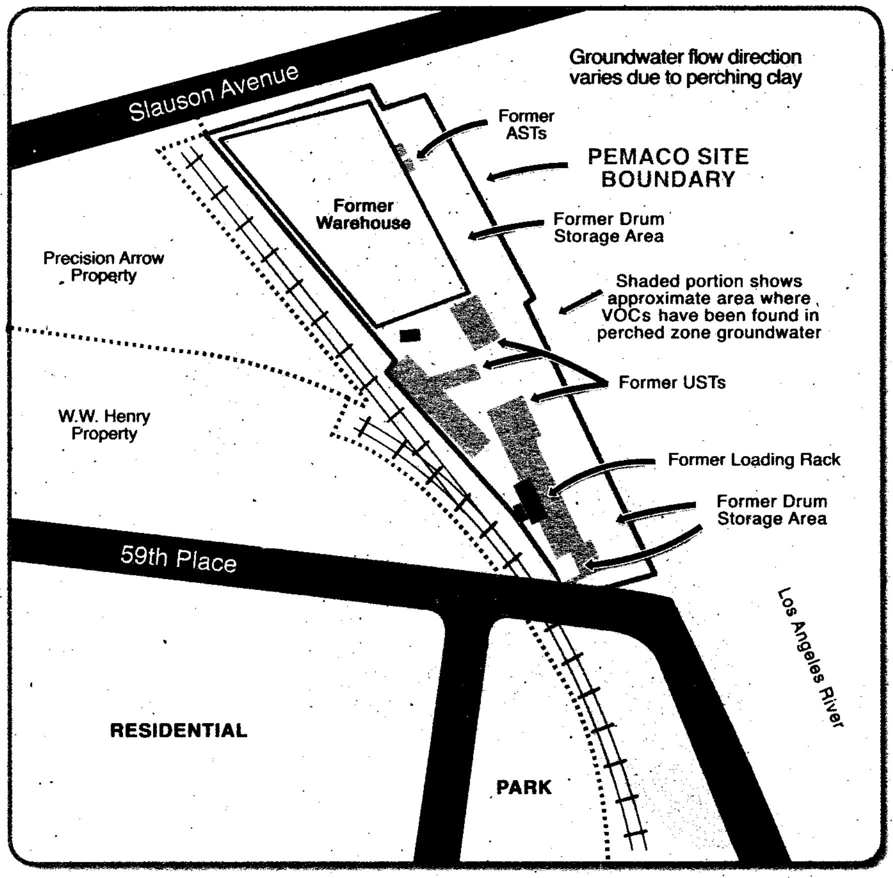
PCE, TCE, and vinyl chloride are the most common and widespread chemicals detected within the perched groundwater zone, where approximately 1.4 million gallons of VOC-contaminated groundwater has been identified. "***Hot spots***" within the ***plumes*** have had concentrations of total VOCs exceeding 1,000 ***parts per billion*** (ppb). The dissolved-phase portions of the plumes extend offsite and have migrated up to 250 ft to the south and up to 200 ft southwest of the Pemaco property. Contaminant plumes originating from the Pemaco property have also co-mingled (mixed) with other plumes from neighboring properties (former W.W. Henry and Lubricating Oil Services properties).

Figure 3 (page 5, top) illustrates the composite (PCE, TCE, and vinyl chloride plumes overlapped) VOC contaminant plume in perched groundwater.

exposition groundwater zones

VOCs above regulatory levels are widespread in the Exposition 'A' and 'B' Zones, where approximately 15.6 million gallons of VOC-contaminated groundwater has been identified. VOCs, mainly TCE, have been identified in the Exposition 'C' and 'D' Zones, but are limited to one ***monitoring well*** located adjacent to the Pemaco Site within the Exposition contaminant plume "hot spot". Contaminants in the Exposition 'E' Zone have not been detected at concentrations above regulatory levels.

The largest contaminant plumes found in the Exposition 'A' and 'B' Zones primarily contain TCE and its daughter products (1,1-DCE, cis-1,2-DCE, trans-1,2-DCE and vinyl chloride). Figure 4 (page 5, bottom) illustrates the composite (overlapped) TCE plume for the Exposition 'A' and 'B' groundwater zones. The "hot spot" of this plume is directly below the southern-most portion of the Pemaco property and contains TCE at concentrations exceeding 20,000 ppb. Contaminant concentrations of this nature in groundwater are indicative of heavily contaminated soils that have ***free product*** or high concentrations of residual contamination. Subsequently, the soils within the 10,000 ppb-contour of the Exposition composite plume (see Figure 4) are considered ***principal threat wastes***. The dissolved-phase portion of the Exposition contaminant plume extends southwest of the



▲ ***Figure 3.*** *Site Map Illustrating Perched Groundwater Contaminant Plume*

as the number of additional cancers that might occur due to exposure to the Site's contamination. EPA's goal is to keep cancer risks from a Superfund site in the range between 1-in-1-million people (10^{-6}) and 100-in-1-million (10^{-4}) – this is EPA's target risk range.

For contaminants that do not cause cancer, but may cause other health effects ("***non-carcinogens***"), risk is expressed as a Hazard Index (HI). If the HI is less than or equal to 1.0, no adverse health effects are expected. HIs greater than 1.0 indicate an increased risk of health effects; the higher the HI, the more likely that health effects could be experienced, especially by more sensitive members of the exposed group.

risk for future park users

The estimated cancer risks for a future park user (through ingestion and dermal contact with surface soils) fall in the middle of the EPA target risk range. This cancer risk was primarily due to potential exposure to benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, dibenzo(a,h)-anthracene, and indeno(1,2,3-cd)pyrene, chemicals which have other multiple sources in the area. The total noncarcinogenic HI was well below the target level of 1.0.

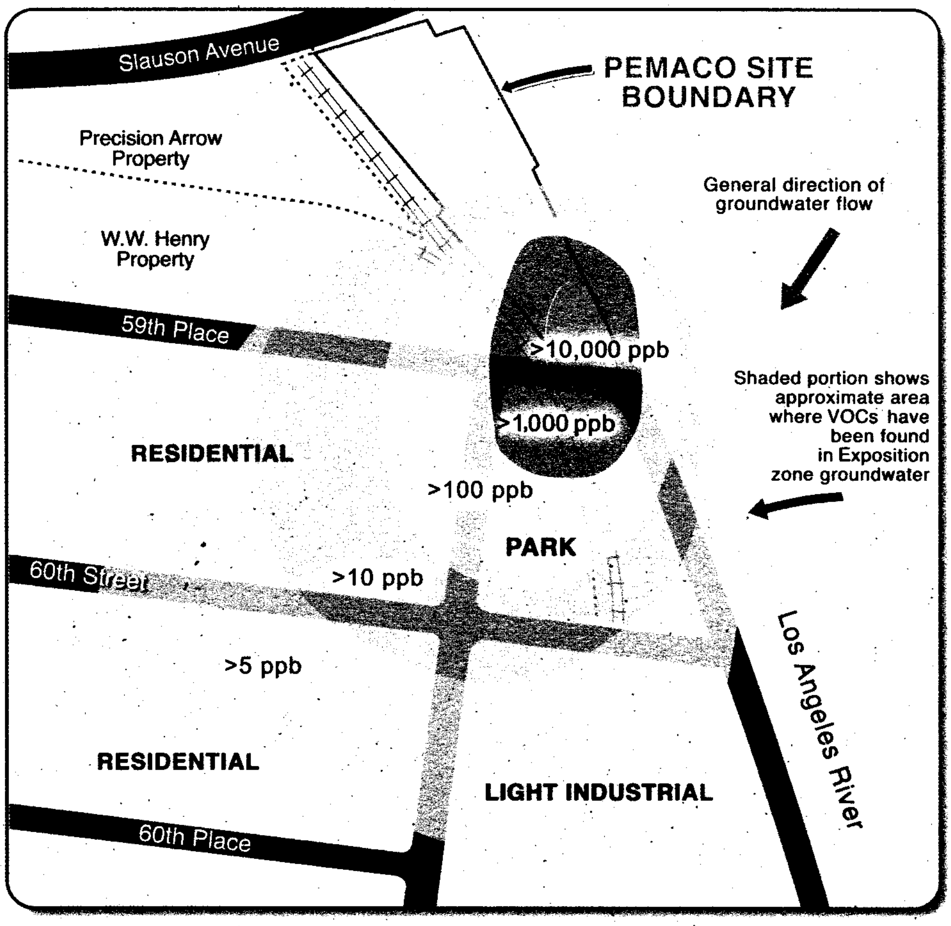
Pemaco property and lies beneath a two-block area that is used for residential housing.

summary of site risks

A risk assessment was performed to identify and estimate potential risks to people from Pemaco contamination if the Site was ***not*** cleaned up. The risk assessment estimated potential risks for the following groups, (1) future park users, (2) future onsite residents (if any), and (3) present-day offsite residents. Two types of potential health risks were addressed in the assessment, the risk of developing cancer and the risk of developing non-cancer health effects.

The risk assessment concluded that potential health risks from Pemaco contamination are low at present. However, if the contamination is not cleaned up, health risks could be much greater in the future.

Potential risks from cancer-causing contaminants ("***carcinogens***") are defined as the probability of a person getting cancer from a long-term exposure to those carcinogens. This probability is expressed



▲ ***Figure 4.*** *Site Map Illustrating Exposition Groundwater Contaminant Plume*

risk for future onsite residents

Potential risks to future residents were calculated in the event that park development plans change and housing is built on the Site instead. Estimated cancer for any such future onsite residents fall well above the upper end of the EPA target risk range, indicating the Site must be cleaned up to protect against these risks. These high cancer risks were primarily due to arsenic, benzene, chloroform, TCE, and vinyl chloride in groundwater. The total HI also greatly exceeded the target level of 1.0, primarily due to potential exposure to acetone, arsenic, benzene, chloroform, cis-1,2-dichloroethene, manganese, TCE, and vinyl chloride in surface soils and groundwater. Both carcinogenic and non-carcinogenic risks to future onsite residents are primarily through direct contact to surface soils or through ingestion and/or inhalation of groundwater.

risk for current offsite residents

Risk estimates for residents currently living near the Pemaco Site were based on testing of outdoor and indoor air. In addition to Pemaco, there are other air sources of many chemicals in the Maywood and greater Los Angeles area (especially related to motor vehicle traffic), thus risks estimated from this testing must distinguish between risks due to Site-related contamination and those from other sources.

Estimated cancer risks for current offsite residents, based on indoor and outdoor air testing, fall within the target risk range. Cancer risk was primarily due to potential exposure through inhalation of chloroform, benzene, methyl tert-butyl ether, and PCE. The total noncarcinogenic HI exceeded the target level of 1.0, primarily due to chloroform, 1,2,4-trimethylbenzene, and benzene. Many or all of the major contributors to cancer and non-cancer risks are chemicals which are likely present in outdoor and indoor air due to their release from motor vehicles or from nearby industrial facilities. This conclusion is supported by risk estimates based on background air data, which also resulted in cancer risks within the target risk range and a non-cancer HI greater than 1.0.

In order to focus on Site-related contamination, estimates of cancer risk were made based on the assessment of vapor intrusion (movement of Site-related soil vapor contamination into overlying houses). Modeling of this vapor intrusion gave estimates of cancer risk within the target range, and a noncancer HI well below the 1.0 screening level. The greatest potential cancer risk from vapor intrusion was due to exposure to TCE. Based on the outdoor and indoor air testing results, the influence of motor vehicle traffic and industrial operations in the area and the vapor intrusion modeling, U.S. EPA concluded the indoor air vapor intrusion pathway is currently of minimal concern at the Pemaco Site.

It is the EPA's current judgment that the Preferred Alternatives identified in this Proposed Plan, or one of the other active measures considered in the Proposed Plan, are necessary to protect public health or welfare or the environment from actual or potential exposure to the hazardous substances detected at the Pemaco Superfund Site.

remedial action objectives

The remedial action objectives (RAOs) describe what the proposed Site cleanup is expected to accomplish. EPA has identified cleanup levels for contaminated groundwater and soil beneath the Site as part of the RAOs. The cleanup goals are based on Federal and California EPA Maximum Contaminant Levels, EPA Region 9 Preliminary Remediation Goals, and health-based goals determined during the Pemaco Baseline Risk Assessment. EPA's cleanup objectives for the Pemaco Superfund Site are presented in Figure 5 below. Media specific remediation goals are listed by media zone in the FS.

figure 5. remedial action objectives

- Prevent risk of human exposure to soils and groundwater having (1) COCs in excess of ARARs/TBCs, (2) a total excess cancer risk greater than 10^{-4} to 10^{-6} and (3) a non-carcinogenic threshold value greater than 1.0.
- Prevent migration of COCs: 1) from surface soils and/or upper vadose zone soils to the perched groundwater, 2) from perched groundwater and/or lower vadose zone soils to Exposition groundwater zones, 3) from Exposition groundwater zones to deeper groundwater zones and/or local production wells at a rate that would cause groundwater to exceed ARARs/TBCs.
- Restore groundwater quality in the perched groundwater zone and in the Exposition 'A' and 'B' groundwater zones to ARARs/TBCs or to local background groundwater quality.
- Minimize and prevent further migration of COCs.

ARARs = Applicable and Relevant and Appropriate Requirements (primarily Federal and California Maximum Contaminant Levels (MCLs))

TBCs = To Be Considered (documents for those chemicals lacking ARARs, primarily EPA Region 9 Preliminary Remediation Goals (PRGs).

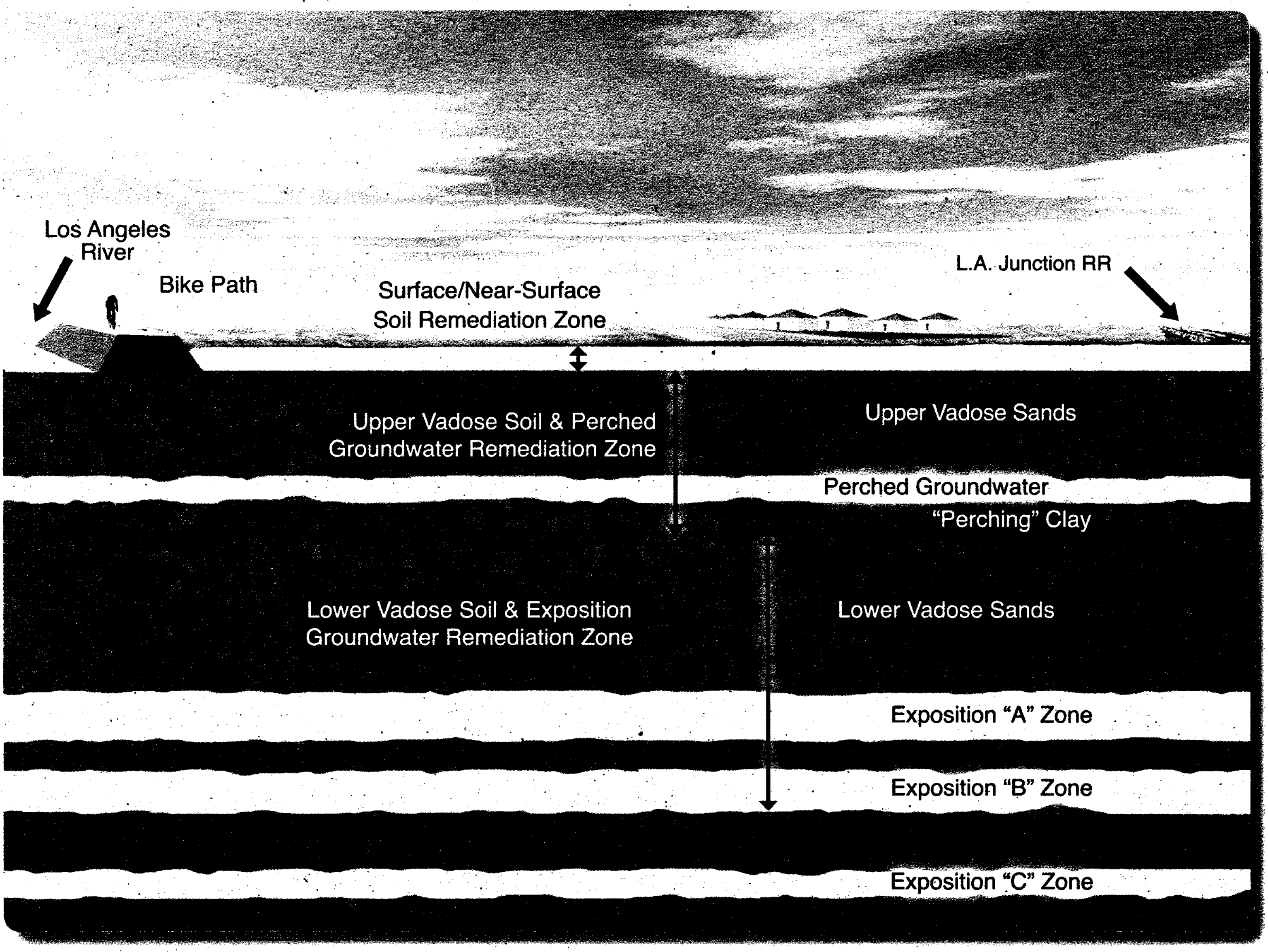
strategy used to develop cleanup alternatives

Due to the characteristics, scope, and complexity of the Site (e.g., five zones), it was determined that one set of remedial alternatives for the entire site would not be possible. Therefore, EPA identified combinations of media zones and treatment technologies for groundwater and soil that are compatible, and provide a degree of economic or other benefit when used in conjunction with each other. This approach resulted in the development of three "remediation zones" consisting of:

- Surface and Near-surface Soils (0-3 ft bgs),
- Upper Vadose Soils and the Perched Groundwater (3-35 ft bgs), and
- Lower Vadose Soils and the Exposition Groundwater (35-100 ft bgs).

EPA used these three remediation zones illustrated in Figure 6 to organize the assembly of remedial alternatives and to support the basis for sound risk management decisions.

Based on the RAOs and the quantity and composition of groundwater and soil to be remediated, technologies were assembled into remedial alternatives (clean up options) for each remediation zone. Remedial alternatives for the two upper remediation zones, 1) Surface and Near-surface Soil Remediation Zone and 2) the Upper Vadose Soil and Perched Groundwater Remediation Zone, were assembled utilizing technologies that address the entire area of contamination within each zone, as contaminant concentrations are relatively homogenous. Contamination in the Lower Vadose Soil and Exposition Groundwater Remediation Zone covers a much larger surface area and varies in concentration more than the two upper remediation zones. To assemble remedial alternatives for this zone, technologies were assembled to address the areas of varying concentration within the Exposition contaminant plume (e.g., greater than 10,000 ppb, greater than 1,000 ppb, and greater than 10 ppb-contours of the composite Exposition groundwater contaminant plume for TCE).



▲ ***Figure 6**. Contaminated Media and Remediation Zones for Pemaco Superfund Site*

summary of cleanup alternatives

Remedial action (cleanup) alternatives were developed for the Site through the RI/FS process. EPA considered a number of alternatives for each remediation zone that could be used to reduce risks from potential exposure to contaminants.

CERCLA requires remedial action alternatives to be evaluated in terms of how well the alternatives meet nine specific remedy selection criteria (see Figure 7).

Each of the alternatives still being considered, including EPA's preferred alternatives, is summarized on pages 9-14. EPA's preferred alternatives for each remediation zone are considered to be the alternatives that best meet the remedy selection criteria.

remedy selection 9 criteria analysis

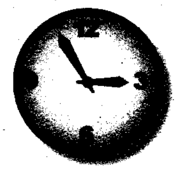
1 Overall Protection of Human Health and the Environment
How risks are eliminated, reduced or controlled through treatment, engineering or institutional controls.

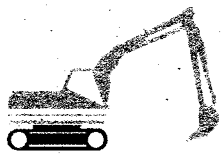
2 Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)
Federal and state environmental statutes met and/or grounds for waiver provided.

3 Long-term Effectiveness
Maintain reliable protection of human health and the environment over time, once cleanup goals are met.

4 Reduction of Toxicity, Mobility or Volume (TMV) Through Treatment
Ability of a remedy to reduce the toxicity, mobility and volume of the hazardous contaminants present at the site.

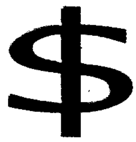
5 Short-term Effectiveness
Protection of the human health and the environment during construction and implementation period.

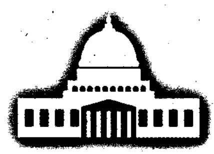




6 Implementability
Technical and administrative feasibility of a remedy, including the availability of materials and services needed to carry it out.

7 Cost
Estimated capital, operation and maintenance costs of each alternative.





8 State Acceptance
State concurs with, opposes, or has no comment on the preferred alternative.

9 Community Acceptance
Community concerns addressed; community preferences considered.

final remedy

▲ ***Figure 7.*** *Remedy Selection: Nine Criteria for Evaluating Remedial Alternatives*

alternative N1 - no action

Present Worth Cost Estimate:..$0.00
Direct Capital Cost Estimate:..$0.00
Annual O&M Cost Estimate:...$0.00

EPA is required to consider a No Action alternative for comparison with other remedial alternatives. The No Action alternative provides a baseline for evaluation in terms of risk to the public if no action is taken. The No Action alternative does not involve any proactive treatment, removal, or monitoring of the contaminated area. Under this alternative, pathways for human exposure to COCs in surface and near surface soils and the spread of contaminants will continue.

There is no cost associated with this alternative and it would provide the least overall protection of human health and the environment. The No Action Alternative does **not** meet EPA's remedial action objectives and does not comply with state and federal requirements.

EPA'S preferred surface and near-surface soil remediation zone alternative:

alternative N2- soil cover/revegetation

Present Worth Cost Estimate:...............................$773,000.00
Direct Capital Cost Estimate:...............................$358,000.00
Annual O&M Cost Estimate:..................................$ 25,000.00

This alternative would involve the placement of a 1-ft layer, or approximately 4,550 cubic yards of clean soil, on the Site and establishing vegetative growth to stabilize the soil in place (approximately 1,080 cubic yards of top soil plus vegetation). The soil cover does not treat or destroy the COCs but acts as containment and eliminates the possibility of human exposure to COCs in surface and near-surface soils. Long-term monitoring and maintenance of the soil cover and vegetative growth is essential to prevent erosion and exposure of the underlying contaminants. The addition of a non-woven geotextile layer below the soil cover would enhance this option by acting as an indicator of excessive erosion and providing an additional cover layer to ensure the effectiveness of the soil cover. The completed soil cover could serve as a recreational area following revegetation.

Soil cover construction is estimated to take 1 to 2 months to complete and would require indefinite surface inspections and implementation of corrective actions (e.g., maintenance and/or repair of their surfaces in order to address erosion and surface wear) to remain effective.

alternative N3 - excavation and offsite disposal

Present Worth Cost Estimate:............................$1,305,000.00
Direct Capital Cost Estimate:............................$1,305,000.00
Annual O&M Cost Estimate:...$0.00

Soil excavation and offsite disposal involves removal of the affected soils (approximately 2,900 cubic yards) and disposal of the soil offsite at an approved landfill (approximately 3,770 cubic yards after expansion). By removing the affected soil, pathways for human exposure to COCs and the spread of contaminants from the soil to groundwater are eliminated. Following soil removal, the Site would be regraded and revegetated similar to the soil cover option (Alternative N2). The total duration of the excavation and offsite disposal remedial action is assumed to be 1.5 months. No long-term monitoring or maintenance would be required because COCs would be physically removed from the Site.

alternative SP1- no action

Present Worth Cost Estimate: $0.00
Direct Capital Cost Estimate: $0.00
Annual O&M Cost Estimate: $0.00

EPA is required to consider a No Action alternative for comparison with other remedial alternatives. The No Action alternative provides a baseline for evaluation in terms of risk to the public if no action is taken. The No Action alternative does **not** involve any proactive treatment, removal, or monitoring of the contaminated media. If not addressed, residual VOC contamination in upper vadose soils can migrate to the surface in vapor form and/or migrate downward and act as a continual source of contamination to groundwater.

Under this alternative, pathways for human exposure to COCs in upper vadose soil and perched groundwater and the spread of contaminants will continue. There is no cost associated with this alternative and it would provide the least overall protection of human health and the environment. The No Action Alternative does **not** meet EPA's remedial action objectives and does not comply with state and federal requirements.

EPA'S preferred upper vadose soil and perched groundwater remediation zone alternative:

alternative SP2- high-vacuum dual-phase extraction/ultraviolet oxidation/flameless thermal oxidation/granular activated carbon

Present Worth Cost Estimate: $3,659,000.00
Direct Capital Cost Estimate: $1,431,000.00
Annual O&M Cost Estimate: ....$ 488,000.00

High-Vacuum Dual-Phase Extraction (HVDPE) uses high vacuum to pull groundwater and soil vapor to the surface for aboveground treatment. Extraction wells would be installed to remove both gas and liquid contaminants from upper vadose soils (approximately 80,000 to 95,000 cubic yards) and perched groundwater (approximately 1.4 million gallons), respectively. The extracted groundwater and soil vapor are transported to separate aboveground treatment systems where the contaminants are remediated. This alternative utilizes ***ultraviolet oxidation*** (UV Ox) for groundwater treatment and ***flameless thermal oxidation*** (FTO) for vapor treatment. Both UV Ox and FTO would completely destroy all contaminants contained in the groundwater and vapor. The FTO soil vapor treatment system would be replaced by a ***granular activated carbon*** (GAC) system after approximately one year of operation. Assuming cleanup criteria are met, the treated groundwater could be reinjected back into the ground, discharged to the sanitary sewer, or discharged to the LA River.

This alternative assumes that the largest amount of contamination, approximately 50 to 60%, will be extracted during the first year of operation. Some COCs, such as 1,4-dioxane and vinyl chloride, cannot be treated efficiently by GAC at high concentrations. It is unlikely that the FTO vapor treatment system will emit products of incomplete combustion, such as dioxins and furans, above background levels due to the system's highly effective removal efficiency. The FTO would be carefully monitored for the release of these chemicals. After the first year, it is estimated that the majority of the high concentrations of contaminants, including 1,4-dioxane and vinyl chloride, will have been extracted and destroyed using FTO and switching to a GAC vapor treatment system would be more cost effective. Evaluation of the proportion of these COCs in the vapor stream would be necessary prior to implementing GAC vapor treatment.

HVDPE allows for good control over the spread of contamination and a reduction in contaminant volume for both soil and groundwater. HVDPE would effectively eliminate possibilities for human exposure to contamination in both the upper vadose soils and perched groundwater as well as reduce the potential for the spread of contamination. The total duration of this alternative is projected to be 10 years (5 years of HVDPE plus 5 years of monitoring).

alternative SP3 - in-situ chemical oxidation

Present Worth Cost Estimate:..............................$2,540,000
Direct Capital Cost Estimate:..............................$1,849,000
Annual O&M Cost Estimate:................................$ 133,000

In-situ chemical oxidation (ISCO) is based on the delivery of chemicals to the approximately 1.4 million gallons of contaminated groundwater in the perched zone. It destroys the contaminants by converting them into harmless compounds commonly found in nature. ISCO involves injecting the selected ***oxidizing agents*** into the subsurface and collecting and analyzing groundwater samples to monitor the degradation process, or breakdown of contaminants. The contaminant concentrations, general chemistry parameters, and environmental indicators are documented prior to and following the injection events. Long-term monitoring would be necessary. Costs are based on one year of ISCO treatment plus a minimum of 5 years of monitoring (6 years total).

ISCO is not recommended for ***in-situ*** treatment of soil since the mechanics of ***substrate*** delivery are unproven and groundwater is required to assist with dispersion. For this reason, ISCO would only provide a partial treatment solution to this remediation zone. Pathways for human exposure to COCs and the potential spread of contamination in soil to groundwater would not be addressed.

alternative SP4 - enhanced in-situ bioremediation

Present Worth Cost Estimate:..............................$1,735,000.00
Direct Capital Cost Estimate:..............................$1,008,000.00
Annual O&M Cost Estimate:................................$ 140,000.00

Enhanced ***In-situ*** Bioremediation (EISB) involves injecting an organic substrate into the subsurface and collecting and analyzing groundwater samples to monitor the bioremediation process, or breakdown of contaminants. EISB is a method used to destroy chlorinated VOCs (PCE and TCE) using processes naturally occurring in the environment. This process is triggered by injection of the selected organic substrate. Hydrogen Release Compound (HRC®) is the most likely, available organic substrate to be used at Pemaco and is well documented for accelerating (speeding up) ***in-situ*** bioremediation. This process results in the breakdown of PCE and TCE into harmless compounds over time. Costs are based on 1 year of EISB treatment plus a minimum of 5 years of monitoring (6 years total).

EISB is not recommended for ***in-situ*** treatment of soil since the mechanics of substrate delivery results are unproven and groundwater is required to assist with dispersion. For this reason, EISB would only provide a partial treatment solution to this zone. Pathways for human exposure to COCs and the potential spread of contaminants in soil to groundwater would not be addressed.

lower vadose soil and exposition groundwater alternatives - SG

alternative SG1 - no action

Present Worth Cost Estimate:...$0.00
Direct Capital Cost Estimate:...$0.00
Annual O&M Cost Estimate:...$0.00

EPA is required to consider a No Action alternative for comparison with other remedial options. The No Action alternative provides a baseline for evaluation in terms of risk to the public if no action is taken. The No Action alternative does ***not*** involve any proactive treatment, removal, or monitoring of the contamination. If not addressed, contaminated lower vadose soils (approximately 14,000 cubic yards) will continue to act as a source of contamination for the Exposition groundwater zones. In addition, a pathway for human exposure may eventually exist if groundwater contamination within the Exposition groundwater zones (approximately 15.6 million gallons of VOC-contaminated groundwater) spreads towards domestic production wells.

There is no cost associated with this alternative and it would provide the least overall protection of human health and the environment. The No Action Alternative does ***not*** meet EPA's remedial action objectives and does not comply with state and federal requirements.

alternative SG2 - in-situ chemical oxidation/in-situ chemical reduction/pump and treat/monitored natural attenuation/ultraviolet oxidation

Present Worth Cost Estimate: $5,412,000.00
Direct Capital Cost Estimate: $3,160,000.00
Annual O&M Cost Estimate: ....$ 433,000.00

ISCO is based on the delivery of chemical oxidants to contaminated media in order to destroy the contaminants by converting them to harmless compounds commonly found in nature. ISCO involves injecting the selected ***oxidizing agent,*** into the subsurface and collecting and analyzing groundwater samples to monitor the breakdown process. ***In-situ*** Chemical Reduction (ISCR) is the same as ISCO in its application, but involves injecting a selected ***reducing agent*** into the subsurface (rather than an oxidizing agent). The contaminant levels, general chemistry parameters, and environmental indicators are documented prior to and following the injection events. Long-term monitoring is also required.

For this alternative, oxidizing or reducing agents are applied in the groundwater based upon concentrations of contaminants in the groundwater (see Figure 4). ISCO and ISCR would be used in combination, series, or individually to treat higher concentrations of contaminants within the 1,000 ppb area of the plume. Groundwater pump and treat (P&T) would be used in the area of the plume with concentrations between 10 ppb and 1,000 ppb to provide hydraulic control and to help spread the oxidizing/reducing agents within the contaminated groundwater.

Monitored Natural Attenuation (MNA) consists of collecting and analyzing groundwater samples and data to document the levels of contaminants present in the groundwater and their ability to breakdown naturally over time. MNA would be used outside the 10 ppb groundwater zone to demonstrate plume reduction.

A ***treatability study*** would be performed to determine the effectiveness of ISCO or ISCR, the ideal spacing between injection points, and the amount of oxidizing/reducing agent that is needed. ISCO and ISCR are applied the same way (via well), and have similar costs. The treatability study results would be used to determine whether both technologies or just one would be applied. The total duration of this alternative is estimated to be 1 year plus at least 5 years of monitoring (6 years total).

ISCO is not recommended for ***in-situ*** treatment of soil since the mechanics of substrate delivery results are unproven and groundwater is required to assist with delivery of the chemical to the contaminated zones. For this reason, ISCO/ISCR would only provide a partial treatment solution in this zone.

alternative SG3 - enhanced in-situ bioremediation/pump and treat/monitored natural attenuation/ultraviolet oxidation

Present Worth Cost Estimate: $4,874,000.00
Direct Capital Cost Estimate: $2,622,000.00
Annual O&M Cost Estimate: ....$ 433,000.00

Enhanced ***In-situ*** Bioremediation (EISB) involves injecting a substrate(electron donor) into the ground and collecting and analyzing groundwater samples to monitor the bioremediation process. EISB is a method used to break down chlorinated VOCs (such as PCE and TCE) using processes naturally occurring in the environment. Hydrogen Release Compound (HRC®) is the most likely, available organic substrate to be injected into the ground at Pemaco and has been proven effective in accelerating ***in-situ*** bioremediation rates of chlorinated VOCs. This process helps PCE and TCE break down over time into harmless compounds such as ethene over time.

Under this alternative, EISB would be used, based on treatability study results, to treat higher concentrations of contaminants (within the 1,000 ppb contour – see Figure 4). Groundwater P&T would be used to provide hydraulic control and to help spread the substrate in the area of the plume with concentrations between 10 ppb and 1,000 ppb. Monitored Natural Attenuation would be used to demonstrate plume reduction outside the 10 ppb contour. Costs are based on 1 year of EISB treatment plus a minimum of 5 years of monitoring (6 years total).

EISB is not recommended for ***in-situ*** treatment of soil since the mechanics of substrate delivery results are unproven and groundwater is required to deliver the chemical to the contaminated zones. For this reason, EISB would only provide a partial treatment solution to the lower vadose soil and Exposition groundwater remediation zone.

alternative SG4 - vacuum-enhanced groundwater extraction/pump and treat/monitored natural attenuation/ultraviolet oxidation/flameless thermal oxidation/granular activated carbon

Present Worth Cost Estimate: $6,129,000.00
Direct Capital Cost Estimate: $3,019,000.00
Annual O&M Cost Estimate: ....$ 676,000.00

Vacuum-enhanced groundwater extraction uses typical groundwater extraction wells with both submersible pumps and high-vacuum surface pumps. ***Drawdown*** caused by groundwater extraction would allow soil vapors to be extracted. As the soil vapor is extracted (under vacuum), it removes VOC contaminants that are trapped in the soil pores, effectively reducing contamination in lower vadose soil.

Under this alternative, vacuum-enhanced groundwater extraction would be performed on all wells within the 1,000 ppb contaminant plume (see Figure 4) to treat contaminants and free product. Between the 10 ppb and 1,000 ppb composite plume contours, typical P&T wells would be used. MNA would be used outside the 10 ppb plume to demonstrate plume reduction. The extracted groundwater and soil vapor would be transported to separate aboveground treatment systems. UV Ox would be used for groundwater treatment and FTO would be used for vapor treatment. Both UV Ox and FTO would completely destroy all contaminants onsite. After one year of remediation, the vapor treatment system would be switched to GAC, a more cost effective option for lower levels of contamination. Assuming cleanup criteria are met, the treated groundwater could be reinjected into the ground, discharged to the sanitary sewer, or discharged to the LA River.

This alternative assumes that large amounts of VOCs, approximately 50%, would be extracted during the first year of operation. Some COCs present within this remediation zone, in particular vinyl chloride, cannot be treated by GAC at elevated concentrations and would therefore require vapor treatment using FTO. It is unlikely that the FTO vapor treatment system will emit products of incomplete combustion, such as dioxins and furans, above background levels due to the system's highly effective removal efficiency. The FTO would be carefully monitored for the release of these chemicals. After the first year, it is estimated that the majority of contaminants, including vinyl chloride, will have been extracted and destroyed using FTO and switching to a GAC vapor treatment system would be more cost effective. Further evaluation of the proportion of vinyl chloride would be necessary prior to implementing GAC vapor treatment.

Groundwater extraction coupled with high-vacuum vapor extraction allow for good control over contamination movement and a reduction in the quantity (onsite) of COCs through extraction of liquid and gas contaminants. This alternative would effectively eliminate human exposure to contamination in this zone as well as remove the potential for the spread of contamination. The total duration of this alternative is assumed to be 20 years (15 years of operation plus 5 years of monitoring).

EPA'S preferred lower vadose soil and exposition groundwater remediation zone alternative:

alternative SG5 - electrical resistance heating with vapor extraction/ vacuum enhanced groundwater extraction/pump and treat/ultraviolet oxidation/flameless thermal oxidation/granular activated carbon

Present Worth Cost Estimate: $8,895,000.00
Direct Capital Cost Estimate: $5,094,000.00
Annual O&M Cost Estimate: ....$ 818,000 .00

Electrical Resistance Heating (ERH) utilizes electrodes that are inserted into the ground to the depth of the contamination. The electrodes heat the soil and groundwater to approximately 100 degrees Celsius. Contaminants are ***volatilized*** and removed from the subsurface through ***in-situ steam stripping***. Volatilized contaminants are collected at the surface via vapor extraction (VE) for treatment.

Under this alternative, ERH with VE would be used to treat soil and groundwater within the 10,000 ppb-groundwater contaminant plume (see Figure 4). Vacuum-enhanced groundwater extraction would be used between the 1,000 ppb and 10,000 ppb plume. Groundwater P&T would be used between the 10 ppb and 1,000 ppb plume to control the movement of the contaminant plume. MNA would be used outside the 10 ppb composite plume to demonstrate plume reduction. The contaminated groundwater and soil vapor would be transported to separate above ground treatment systems. UV Ox would be used for groundwater treatment and FTO for vapor treatment. Both UV Ox and FTO would completely destroy all chemicals onsite. After one year of remediation, the vapor treatment system would be switched to GAC, a more cost effective option for lower levels of contamination. The treated groundwater could be re-injected back into the aquifer, discharged to the sanitary sewer, or discharged to the LA River. (Continues page 14.)

EPA'S preferred lower vadose soil and exposition groundwater remediation zone alternative: (continued)

alternative SG5 - electrical resistance heating with vapor extraction/ vacuum enhanced groundwater extraction/pump and treat/ultraviolet oxidation/flameless thermal oxidation/granular activated carbon

This alternative assumes that the amount of contaminants extracted during operation of the ERH would quickly overload a carbon treatment system. In addition, some COCs present within this remediation zone, in particular vinyl chloride, cannot be treated efficiently by GAC at elevated concentrations. Therefore, FTO would be used for vapor treatment for the first year of operation or for the duration of ERH. It is unlikely that the FTO vapor treatment system will emit products of incomplete combustion, such as dioxins and furans, above background levels due to the system's highly effective removal efficiency. The FTO would be carefully monitored for the release of these chemicals. Once ERH operation is complete (approximately 1 year), it is estimated that the majority of contaminants, including vinyl chloride, will have been extracted and destroyed using FTO and switching to a GAC vapor treatment system would be more cost effective. Evaluation of the proportion of vinyl chloride would be necessary prior to implementing GAC vapor treatment.

ERH combined with VE reduces toxicity, mobility, and the amount of contamination. ERH with VE would effectively eliminate human exposure to contamination in this zone as well as the potential for movement of contamination within the groundwater. The total duration of this alternative is estimated to be approximately 10 years (1 year of ERH, 4 additional years of P&T, and 5 additional years of MNA).

evaluation of alternatives

The assembled remedial alternatives were evaluated in detail with respect to the nine evaluation criteria developed by EPA, which are outlined in Figure 7. The following figures (Figures 8 through 10) summarize the evaluation of cleanup alternatives (summarized above) for the Pemaco Superfund Site.

figure 8. surface and near surface soil remediation zone - alternatives evaluation summary

● Fully meets criterion
◓ Partially meets criterion
○ Does not meet criterion

Evaluation Criteria:	Alternative N1 No Action	Alternative N2 Soil Cover/ Revegetation	Alternative N4 Excavation/ and Offsite Disposal
Overall Protectiveness	○	●	●
Compliance with State and Federal Requirements	○	●	●
Long-term Effectiveness and Permanence	○	●	●
Reduction of Toxicity, Mobility, or Volume	○	◓	●
Short-term Effectiveness	N/A	●	◓
Implementability	N/A	●	●
Present Worth Cost ($)	0	773,000	1,305,000
State Agency Acceptance	State Agency acceptance of the preferred alternatives will be evaluated after the public comment period.		
Community Acceptance	Community acceptance of the preferred alternatives will be evaluated after the public comment period.		

NOTE: Cost estimates and present worth values are rounded to three significant figures. Cost estimates are considered order-of-magnitude with an expected accuracy of plus 50 to minus 30 percent.

figure 9. upper vadose soil and perched groundwater remediation zone - alternatives evaluation summary

● Fully meets criterion
◓ Partially meets criterion
○ Does not meet criterion

Evaluation Criteria:	Alternative SP1 No Action	Alternative SP2 HVDPE/ UV Oxidation/ FTO/GAC	Alternative SP3 *In-situ* Chemical Oxidation	Alternative SP4 Enhanced *In-situ* Bioremediation
Overall Protectiveness	○	●	◓	◓
Compliance with State and Federal Requirements	○	●	◓	◓
Long-term Effectiveness and Permanence	○	●	●	●
Reduction of Toxicity, Mobility, or Volume	○	●	◓	◓
Short-term Effectiveness	N/A	◓	●	●
Implementability	N/A	●	●	●
Present Worth Cost ($)	0	$3,659,000	$2,540,000	$1,735,000
State Agency Acceptance	State Agency acceptance of the preferred alternatives will be evaluated after the public comment period.			
Community Acceptance	Community acceptance of the preferred alternatives will be evaluated after the public comment period.			

NOTE: Cost estimates and present worth values are rounded to three significant figures. Cost estimates are considered order-of-magnitude with an expected accuracy of plus 50 to minus 30 percent.

figure 10. lower vadose soil and exposition groundwater remediation zone - alternatives evaluation summary

● Fully meets criterion
◓ Partially meets criterion
○ Does not meet criterion

Evaluation Criteria:	Alternative SG1 No Action	Alternative SG2 ISCO/ISCR/ P&T/MNA/ UV Oxidation	Alternative SG3 EISB/ P&T/MNA/ UV Oxidation	Alternative SG4 Vacuum-Enhanced Groundwater Extraction/ P&T/MNA/ UV Oxidation/ FTO/GAC	Alternative SG5 ERH with VE/ Vacuum-Enhanced Groundwater Extraction/P&T/ MNA/UV Ox/ FTO/GAC
Overall Protectiveness	○	●	●	●	●
Compliance with State and Federal Requirements	○	●	●	●	●
Long-term Effectiveness and Permanence	○	◓	◓	●	●
Reduction of Toxicity, Mobility, or Volume	○	◓	◓	◓	●
Short-term Effectiveness	N/A	●	●	●	●
Implementability	N/A	●	●	●	◓
Present Worth Cost ($)	0	$5,412,000	$4,874,000	$6,129,000	$8,895,000
State Agency Acceptance	State Agency acceptance of the preferred alternatives will be evaluated after the public comment period.				
Community Acceptance	Community acceptance of the preferred alternatives will be evaluated after the public comment period.				

NOTE: Cost estimates and present worth values are rounded to three significant figures. Cost estimates are considered order-of-magnitude with an expected accuracy of plus 50 to minus 30 percent.

summary of preferred alternatives

Based on EPA's evaluation of alternatives for the first seven of the nine criteria, EPA prefers Alternative N2 (Soil Cover/Revegetation) for the Surface and Near-surface Soil Remediation Zone, Alternative SP2 (High-Vacuum Dual-Phase Extraction/Ultraviolet Oxidation/ Flameless Thermal Oxidation/Granular Activated Carbon) for the Upper Vadose Soil and Perched Groundwater Remediation Zone, and Alternative SG5 (Electric Resistance Heating with Vapor Extraction/Pump &Treat/Ultraviolet Oxidation/Flameless Thermal Oxidation/Granular Activated Carbon) for the Lower Vadose Soil and Exposition Groundwater Remediation Zone. The final remedy, or selection of preferred alternatives, can differ based on public comment or new information.

The Soil Cover/Revegetation Alternative (N2) for the Surface and Near-surface Soil Remediation Zone is considered adequate and reliable in eliminating human exposure risks and preventing migration of soil (via erosion). While this alternative does not reduce the toxicity or volume of COCs, the soil cover would provide significant reductions in contaminant mobility and would eliminate exposure to humans. The COCs in this zone (metals, PAHs) are characteristically immobile in nature and may degrade naturally over time. Unlike the excavation alternative, the Soil Cover/Revegetation Alternative would have minimal impact to construction workers, the community, and the environment during implementation. Alternative N2 would be the simplest alternative to implement from an administrative and technical viewpoint, is protective of human health, and presents the best value.

The High-Vacuum Dual-Phase Extraction/Ultraviolet Oxidation/ Flameless Thermal Oxidation/Granular Activated Carbon Alternative (SP2) for the Upper Vadose Soil and Perched Groundwater Remediation Zone would effectively reduce the toxicity, mobility, and volume of contamination within upper vadose soils and the perched groundwater. HVDPE is the only technology among the alternatives assembled for this remediation zone that actively addresses contamination in *both* soil and groundwater, thereby providing the highest level of protection to human health and the environment. HVDPE is a well-proven technology and is expected to be highly reliable in eliminating pathways for human exposure to COCs and the potential movement of chemicals to deeper groundwater zones. As approximately 50% to 60% of contaminants will be extracted during the first year of HVDPE, a Flameless Thermal Oxidation unit would be required for vapor treatment in order to meet discharge criteria.. After the first year, it is estimated that the majority of contaminants, including vinyl chloride and 1,4-dioxane, which cannot be treated efficiently by GAC, will be significantly reduced. Further evaluation of the vapor stream will determine when the switch from an FTO to a more cost effective GAC vapor treatment system can occur.

The Electric Resistance Heating with Vapor Extraction/Vacuum-Enhanced Groundwater Extraction/Pump & Treat/Ultraviolet Oxidation/Flameless Thermal Oxidation/Granular Activated Carbon Alternative (SG5) for the Lower Vadose Soil and Exposition Groundwater Remediation Zone utilizes the only technology, ERH, that is expected to effectively reduce the principal threat wastes within this remediation zone, thereby providing the highest level of protection to human health and the environment. Through heating the soil and groundwater, VOCs trapped in the fine-grained soils (clay) would be released from these soils via steam stripping. The physical removal of COCs would effectively eliminate all pathways for human exposure and the potential spread of contamination. The vacuum-enhanced groundwater P&T alternative (SG4) would not effectively remove contaminants trapped in the fine-grained soils. Likewise, due to the uncertainty associated with delivering substrates to contaminated areas (substrates rely to a great extent on groundwater for dispersion) and their ability to break down elevated concentrations of contaminants, the ***in-situ*** remedial alternatives (SG2 and SG3) would not likely address the source area. Without remediation, affected lower vadose soils could act as a continual source of contamination to the Exposition groundwater zones and, over time, to deeper zones that may be used for local drinking water wells. The Electric Resistance Heating Alternative is anticipated to meet remedial action objectives in the shortest amount of time. In order to meet discharge criteria, a Flameless Thermal Oxidation unit would be required for vapor treatment for the duration of ERH operation (approximately 1 year), as the estimated amount of contamination to be generated by the ERH may quickly overload a carbon treatment system. After the first year, it is estimated that the majority of contamination will be extracted and destroyed, including vinyl chloride, (which cannot be efficiently treated by GAC), and vapor treatment would be switched to GAC, a more cost effective option for lower levels of contamination.

EPA believes the preferred alternatives summarized above meet the threshold criteria and provide the best tradeoffs among the other alternatives with respect to the balancing and modifying criteria. EPA expects the preferred alternatives to satisfy the statutory requirements in CERCLA Section 121(b): 1) be protective of human health and the environment; 2) comply with ARARs; 3) be cost-effective; 4) use permanent solutions and alternative treatment technologies to the maximum extent practical; and 5) satisfy the preference for treatment as a principal element. Based on the state and community acceptance criteria, analysis of the final remedy will be documented in the Record of Decision, following close of the public comment period, on May 3, 2004.

information repositories

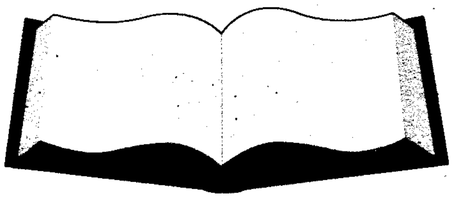
Copies of the Pemaco Superfund Site Remedial Investigation and Feasibility Study Reports, and other Site-related documents are available for review at the locations listed below. These documents are part of the Administrative Record for the Pemaco Superfund Site.

U.S. EPA Superfund Records Center

95 Hawthorne Street, Suite 403S
San Francisco, CA 94105-3901
Telephone: (415) 536-2000
Fax: (415) 764-4963

Maywood Cesar Chavez Library

4323 E. Slauson Avenue
Maywood, CA 90270
Telephone: (323) 771- 8600



for additional information

For additional copies or other information on the Proposed Plan for the Pemaco Superfund Site, please contact the following:

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glossary of terms

Administrative Record File
A complete body of documents that forms the basis for selecting a CERCLA response action.

Aquifer
Water found within layers of material (such as soil, rock, sand, or gravel) below the ground surface.

Bgs Below ground surface.

Carcinogens A substance that causes cancer.

Chemicals of concern (COCs)
Site-specific chemicals that exceed regulatory levels.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)
A federal law first passed in 1980 and subsequently amended. The act created a trust fund, known as Superfund, to investigate and clean up abandoned or uncontrolled waste sites.

Contamination/Contaminants
Any chemical, biological, or related substance that has an adverse effect on human health, water, soil, or air.

Drawdown
The lowering of the water level in a well as a result of withdrawal.

Feasibility Study (FS)
EPA study that determines the best way to clean up environmental contamination.

Flameless Thermal Oxidation (FTO)
A process that converts VOCs into harmless compounds with up to 99.99% efficiency.

Free Product
A petroleum product in liquid phase.

Granular Activated Carbon (GAC)
Pure carbon that can adsorb pollutants.

Groundwater
The supply of water found below the ground surface, usually in aquifers.

"Hot Spot"
Area of highly contaminated soil or groundwater.

In-situ
Actions conducted in their original location. With respect to remedial actions, ***in-situ*** refers to cleanup in place where soil or groundwater contamination exists.

Metals
Any of a class of chemical elements that have a luster and can conduct heat and electricity.

Monitoring Well
A well used either to collect groundwater water samples for water quality testing, or to measure groundwater levels.

National Priorities List (NPL)
EPA's annually updated list of the most serious uncontrolled or abandoned hazardous waste sites in the U.S. identified for possible long-term cleanup under the Superfund.

Noncarcinogens
Chemicals that do not cause cancer, but may cause other adverse health effects.

Oxidizing Agent
A chemical that accepts electrons.

Parts per billion (ppb)
Unit of measurement.

Plume
A volume of a substance that moves from its source to places farther away from the source.

Polyaromatic Hydrocarbons (PAHs)
Group of semi-volatile organic compounds.

Principal Threat Waste
Heavily contaminated materials that have free product or high concentrations of residual contamination.

Proposed Plan
A document that summarizes all of the cleanup alternatives that were studied as part of the RI/FS process, and identifies the preferred cleanup alternatives for a site.

Record of Decision (ROD)
A document explaining the cleanup actions that will be implemented at a contaminated site. The ROD is based on information and technical analyses generated during the RI/FS and on comments received on the Proposed Plan.

Reducing Agent
A chemical that provides electrons for other chemicals.

Remedial Investigation (RI)
The CERCLA process of determining the type and extent of hazardous material contamination at a site.

Responsiveness Summary
A written summary of oral and/or written comments, criticisms, and new relevant information received by the agency during a public comment period and the agency's responses to these comments. A responsiveness summary is an appendix to a Record of Decision.

Semi-volatile Organic Compounds (SVOCs)
VOCs that are semi-volatile.

Solvents
Chemicals often used as cleaning agents.

Steam Stripping
Volatized VOCs are stripped from contaminated zone and brought to the surface through soil vapor extraction.

Substrate
With respect to remedial actions, materials injected into subsurface to cleanup contaminants in the soil and groundwater.

Superfund
Superfund is the common name for the process established by CERCLA to investigate and cleanup abandoned or uncontrolled hazardous waste sites.

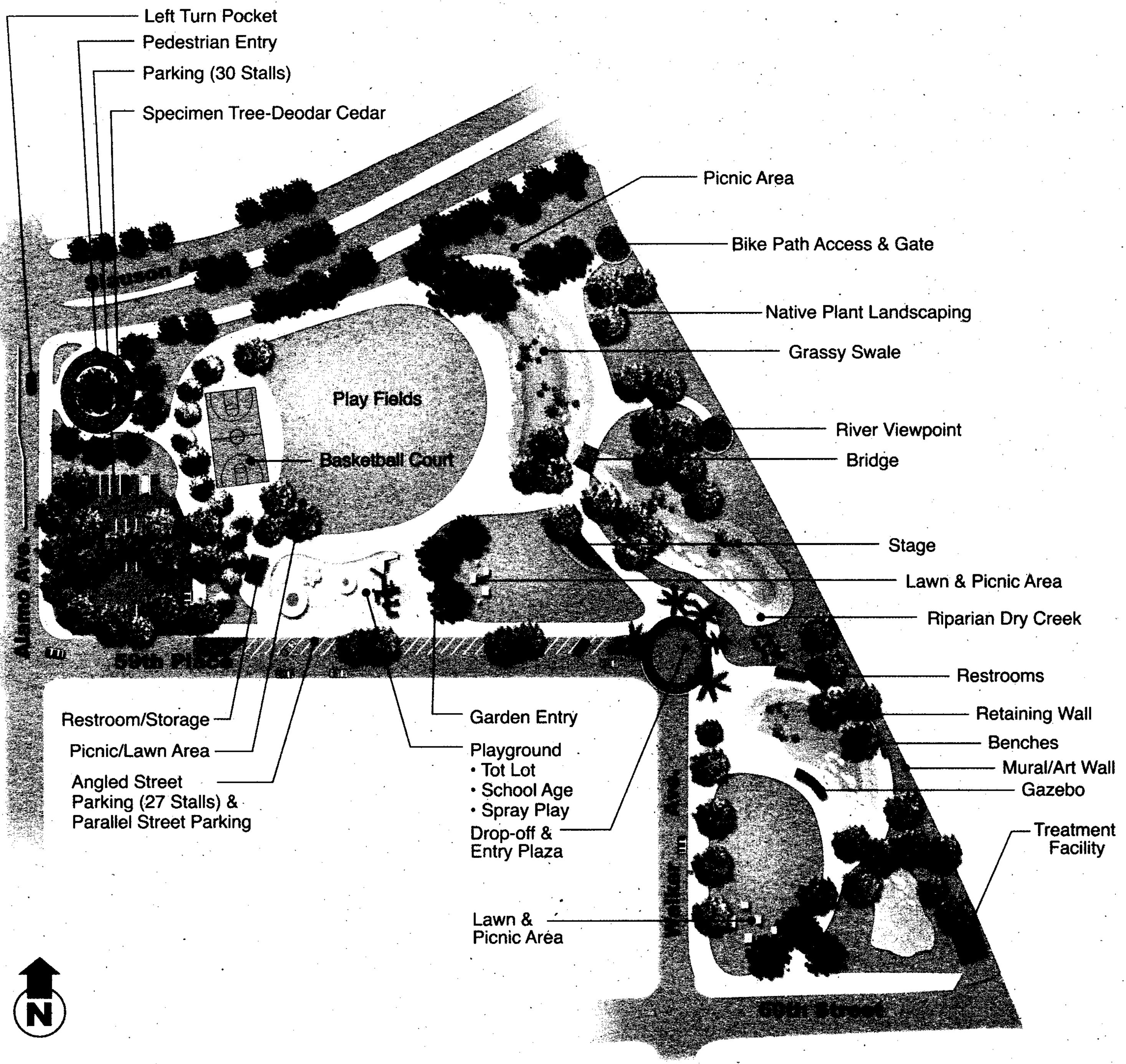
Treatability Study/Treatability Tests
A short-term investigation of how a particular technology will clean up contamination.

Ultraviolet Oxidation (UV Ox)
A destruction process that destroys contaminants in water without releasing VOCs to the atmosphere.

Vadose Zone
Unsaturated (not completely filled with water) layer of soil/rock.

Volatile Organic Compounds (VOCs)
Carbon-containing chemical compounds that evaporate readily at room temperature.

Volatilize
Turn to vapor.



▲ ***Figure 11.*** *Maywood Riverfron Park ~ Conceptual Design*

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Para su conveniencia, una versión traducida en español de este boletín está disponible y se ha enviado para acompañar la versión en ingles.

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