CTS Printex, Inc. Superfund Site

U.S. Environmental Protection Agency • Region 9 • San Francisco, CA • June 2011

EPA Seeks Public Comments on Proposed Plan to Amend 1991 Cleanup Plan

1.0 Introduction

The United States Environmental Protection Agency, Region 9 (EPA) is seeking public comments on its Proposed Plan to amend the 1991 Record of Decision (ROD) to address contaminated groundwater and vapor intrusion at the CTS Printex Superfund Site (Site) located in Mountain View, California (Figure 1). The original remedy selected in the 1991 ROD was to pump and discharge the contaminated, shallow groundwater to the sanitary sewer. The goal was to reduce levels of contaminants in groundwater and restore shallow groundwater to its beneficial use as a potential drinking water source. At that time, no cleanup goals for the vapor intrusion pathway were identified. This Proposed Plan provides the Site background, explains the scope of the response actions, evaluates cleanup alternatives to address contaminated groundwater and prevent vapor intrusion, and identifies and provides the rationale for EPA's Preferred Alternatives. EPA will review and consider all comments before selecting the final remedial alternatives and may modify its Preferred Alternatives based on those comments or new information. Therefore, the public is encouraged to review and comment on the alternatives presented in this Proposed Plan.

Figure 1 *Site Location Map*

Community Participation

EPA Wants Your Comments on this Proposed Plan for Cleanup

Public Comment Period:
June 3, 2011 – July 5, 2011

Your comments on any of the cleanup alternatives EPA considered, including the preferred alternatives, are welcome. You may submit comments orally at the public meeting (see below) or in writing by the July 5, 2011, deadline. You are encouraged to review the reports that formed the basis for the Proposed Plan by accessing the Administrative Record at either site repository listed at the end of this fact sheet. Please send your comments to:

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Public Meeting

EPA will hold a public meeting to explain the Proposed Plan, answer questions and receive comments.

Wednesday, June 15, 2011
7:00 pm to 9:00 pm

Mountain View City Hall
Plaza Conference Room, 2nd Floor
500 Castro Street

As the lead agency responsible for cleanup at the Site, EPA has prepared this Proposed Plan to provide an opportunity for the community to participate in EPA decision-making and the remedy selection process. This can be done by attending the public meeting on June 15 and/or commenting on the options presented (see front page). This plan is being issued pursuant to the requirements of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA), as amended by the Superfund Amendments and Reauthorization Act, also known as Superfund. This plan summarizes information that can be found in greater detail in the *Final Focused Feasibility Study (Parts I and II)*, dated May 2011, and other documents contained in the Administrative Record for the Site. The Feasibility Study looks at various options for addressing cleanup needs. These documents are available for public review at the information repositories listed at the end of this fact sheet. Many documents are also posted on EPA's website: **www.epa.gov/region09/ctsprintex.**

EPA's Preferred Alternative for groundwater is Enhanced Anaerobic Bioremediation (EAB) to treat an area with residual contamination and Monitored Natural Attenuation (MNA) in areas with lower levels of groundwater contamination. EAB involves the injection of chemicals and bacteria into the groundwater and establishing conditions suitable for the complete breakdown of the contaminants. MNA involves monitoring and letting naturally occurring physical, chemical, and/or biological processes reduce the contaminant levels in groundwater. EPA's proposed groundwater remedy also includes long-term monitoring and groundwater use restrictions to prevent human exposure to contaminated groundwater.

Additionally, EPA's Preferred Alternatives for vapor intrusion are based on a tiered approach that establishes response actions and appropriate vapor intrusion control measures for existing buildings and future construction at the Site. Institutional controls (restrictions or conditions on use) are necessary so that the Preferred Alternatives will be implemented and monitored properly.

2.0 Site Background

The former CTS Printex facility was located on property bounded by Colony Street on the South, Plymouth Street on the north, Sierra Vista Avenue on the west, and U.S. Highway 101 (Bayshore Freeway) on the east. Historically, CTS Printex used a volatile organic compound (VOC) called trichloroethene (TCE) in its manufacturing operations, which impacted soils and groundwater on and off the property. Figure 2 shows the location of the Former CTS Printex facility and the extent of VOC-contaminated shallow groundwater.

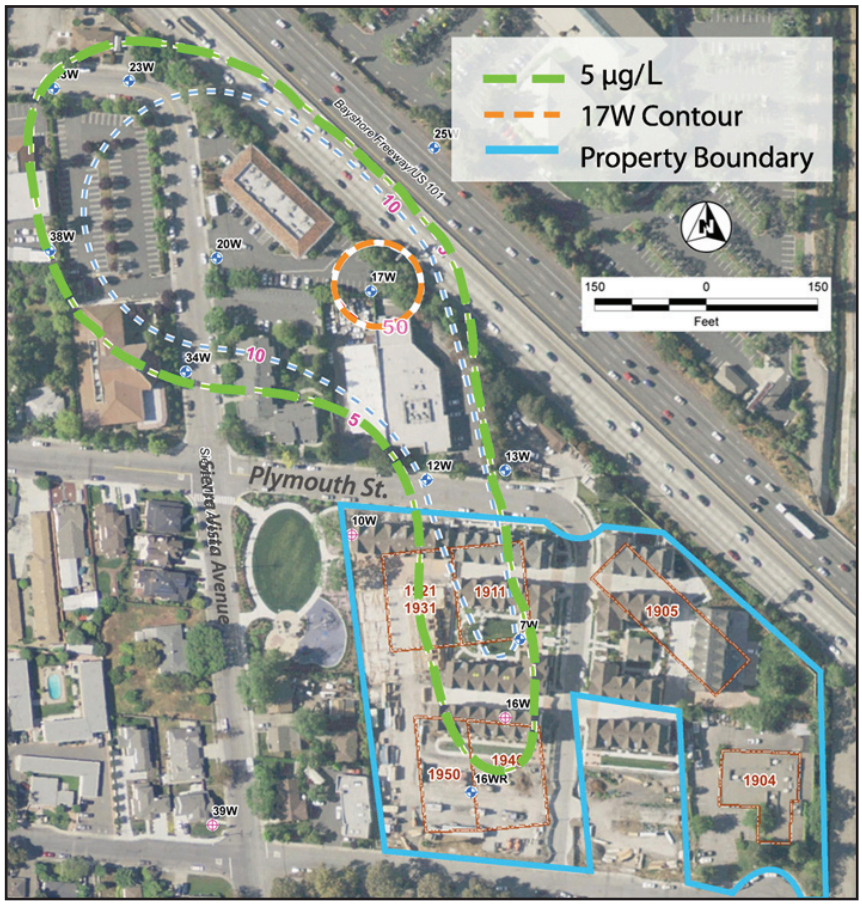

Figure 2 *Extent of the TCE Plume in Shallow Groundwater*

Groundwater extraction at the Site from 1987 to 1996 removed 106 million gallons of groundwater containing an estimated 99 pounds of TCE and reduced the lateral extent of the TCE plume in both the A and B zones (see Site Characteristics below). Figure 2 shows the estimated current extent of the shallow TCE groundwater plume.

Enforcement

CTS Corporation and Nearon Enterprises are the responsible parties and have conducted cleanup activities since the 1980s. Soil cleanup has been completed. To address shallow groundwater contamination, a groundwater extraction system operated from 1987 until 1996 when the remedy

was turned off after the California Regional Water Quality Control Board (Water Board) determined the system was no longer effective. Annual groundwater monitoring continues at the Site. The Water Board was the lead regulatory agency overseeing the cleanup activities at the Site until this role was transferred to EPA in 2006.

3.0 Site Characteristics

The current land use at the Site is commercial/light industrial, and residential. Groundwater generally flows to the northwest towards San Francisco Bay. Groundwater contamination at the Site is found in two shallow water bearing zones: the A zone and the B zone. The A zone is approximately 10 to 20 feet below ground surface (bgs), and the B zone is approximately 30 to 40 feet bgs.

The contaminants of concern (COCs) identified in the 1991 Record of Decision (ROD) for shallow groundwater at the Site are VOCs and include : 1,1-dichloroethane (1,1-DCA), 1,1-dichloroethene (1,1-DCE), 1,2-dichloroethane (1,2-DCA); trans-1,2-dichloroethene (t-DCE), tetrachloroethene (PCE); toluene; 1,1,1-trichloroethane (1,1,1-TCA), trichloroethene (TCE); methylene chloride (MeCl); chloroform (CHL); and benzene (BZ).

VOCs currently at concentrations above their applicable drinking water standards known as maximum contaminant levels (MCLs) are TCE, 1,1-DCE, cis-1,2-DCE, trans-1,2-DCE, and 1,1-DCA. Due to its potential to be formed by the degradation of TCE or 1,2-DCE, vinyl chloride is also considered a chemical of potential concern in shallow groundwater at the Site.

Key results from the updated Site Conceptual Model are: (a) the shallow groundwater plume is generally stable; (b) while the shallow groundwater (A and B zones) has low VOC concentrations, several chemicals have concentrations above their applicable MCL; (c) the primary VOC contaminants in the shallow groundwater are TCE and 1,2-DCE; (d) an area of residual contaminant mass is located near well 17W and at depths of 15 to 30 feet bgs (see Figure 3); and at concentrations between 51 and 75 µg/L for TCE and 250 to 300 µg/L for 1,2-DCE, respectively; and (e) natural attenuation processes are occurring, essentially reducing TCE to 1,2-DCE and vinyl chloride.

Volatile contaminants found in shallow soils and groundwater may migrate from groundwater upward through the soil as a vapor and enter into buildings through cracks in floors, plumbing/piping conduits or utility corridors. TCE found in shallow groundwater is the primary chemical source for vapor intrusion at the Site, generally defined by the area where TCE concentrations in shallow groundwater are greater than 5 micrograms per liter (µg/L), or parts per billion (ppb).

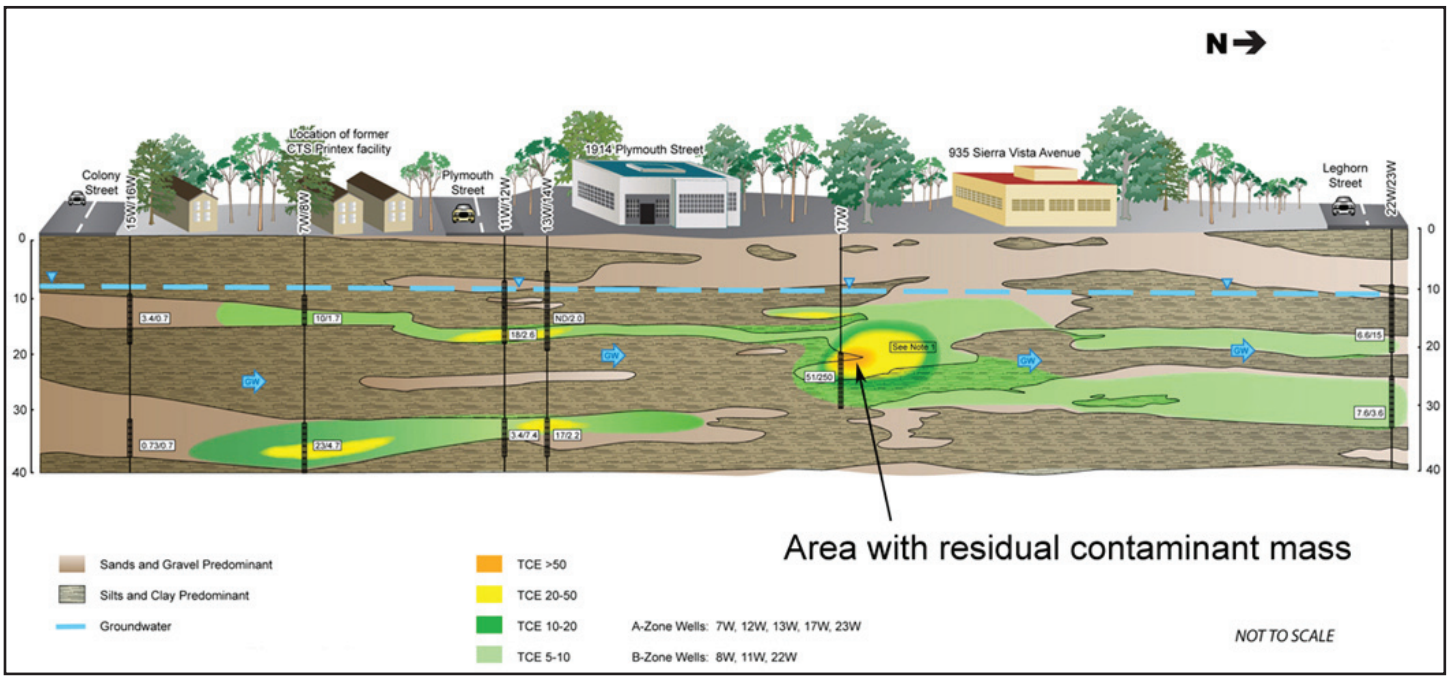

Figure 3 *Location of Residual Contaminant Mass in Vicinity of well 17W*

4.0 Scope and Role of Response Actions

The purpose of the proposed groundwater response action is to address the remaining contamination and thereby achieve groundwater cleanup levels, i.e., MCLs.

In addition, EPA has determined that the proposed response actions for the vapor intrusion pathway are necessary. The reason for this is to address potential health risks associated with long-term exposure to TCE and other Site contaminants in buildings overlying the shallow groundwater contamination at the Site.

5.0 Summary of Site Risks

Shallow groundwater at the Site is not currently used for drinking water, prohibited from being used (a recorded land use covenant prohibits groundwater use at the location of the former CTS Printex facility), and subject to well standards under Santa Clara Valley Water District (SCVWD) Ordinance 90-1 (requires wells to be sealed from the surface to 50 feet bgs). Although shallow groundwater at the Site is not currently used for drinking water, the groundwater must be cleaned up to drinking water standards which are the health protective MCLs.

The 1991 ROD identified the potential long-term exposure risk from TCE and other chemicals of concern through the vapor intrusion pathway, but did not develop Remedial Action Objectives (RAOs) for this pathway

5.1 Basis for Taking Action

Groundwater: Since the original remedy was not able to achieve MCLs and restore shallow groundwater to its beneficial use as a potential drinking water source (i.e., COC concentrations are greater than their respective drinking water standard), it is EPA's current judgment that the groundwater preferred alternative identified in this Proposed Plan, or one of the other active groundwater measures considered, is necessary to reduce COC concentrations in shallow groundwater to achieve health protective MCLs.

Vapor Intrusion: In 2005, an Environmental Site Assessment was conducted by the developer of the properties located where the former CTS Printex facility once stood. As part of the due diligence activities associated with the purchase, a human health risk assessment (HHRA) was performed to evaluate whether occupants of the proposed homes, as well as construction workers associated with the redevelopment, would have unacceptable exposures due to TCE from vapor intrusion. Soil and soil vapor samples were collected to evaluate potential exposure of future residents and construction workers to TCE through ingestion, dermal contact, and inhalation of dust-borne particulates and outdoor air emissions.

The HHRA concluded that while the risk levels were within EPA's risk management range of 1×10^{-6} (one in a million) to 1×10^{-4} (one in ten thousand), the estimated increased risk of cancer due to TCE alone was slightly higher than EPA's 1×10^{-6} point of departure risk level. In 2006, the properties were sold and redeveloped for residential use. To ensure that residents would be protected against vapor intrusion, the developer installed vapor barriers and passive sub-slab ventilation systems beneath the buildings. In addition, indoor air sampling conducted prior to each building's occupancy confirmed that subsurface vapor intrusion was not impacting indoor air quality.

As part of the supplemental remedial investigations performed in 2010, EPA conducted indoor and outdoor air sampling for the other four existing buildings (three commercial structures and one apartment complex) located within the Site (north of Plymouth Street). The indoor air results were compared against outdoor "ambient" air concentrations and long-term health-based indoor air screening levels. Indoor air results for both commercial and residential building types did not exceed the residential indoor air screening level of 1.2 $\mu g/m^3$.

In addition to indoor air samples, EPA collected sub-slab vapor samples (samples collected below the building slab) at the three commercial buildings to evaluate the potential for vapor intrusion into the building. The sub-slab vapor results showed the potential for vapor intrusion for two of the three buildings sampled. Sub-slab soil vapor concentrations between 2,900 and 8,500 $\mu g/m^3$ were found in the subsurface and these levels exceed EPA's sub-slab regional screening level of 61 $\mu g/m^3$. The potential for vapor intrusion will be reduced as VOC groundwater concentrations reach cleanup levels (i.e., MCLs).

Using a multiple-lines-of-evidence approach to evaluate all data collected to date to assess potential vapor intrusion pathways at the Site, EPA has determined that response actions are needed. These actions will ensure that occupants of future buildings are protected from the potential risk of subsurface groundwater contamination migrating into buildings above indoor air action levels.

Therefore, the Preferred Alternatives identified in this Proposed Plan are necessary to protect public health of building occupants from COCs in shallow groundwater via the subsurface vapor intrusion pathway.

6.0 Remedial Action Objectives (RAOs)

Remedial Action Objectives (RAOs) are specific goals for protecting human health and the environment. The RAO established in the 1991 ROD was to reduce levels of chemicals in groundwater and restore groundwater to its beneficial use as a potential drinking water source. At that time, no RAOs for the vapor intrusion pathway were identified.

EPA is proposing to add a second RAO for groundwater to:

- Accelerate the reduction of vapor intrusion risk (i.e., Site COCs in shallow groundwater and soil gas) to levels that are protective of current and future building occupants, such that the need for a vapor intrusion remedy would be minimized or no longer necessary.

EPA is also proposing the following RAO for vapor intrusion to:

- Protect occupants of commercial and residential buildings at the Site by preventing subsurface Site contamination from migrating into indoor air above indoor air action levels for long-term exposure.

Table 1 lists the indoor air action levels that EPA proposes for residential buildings and commercial buildings at the Site. For example, EPA is proposing a TCE indoor air action level of 1 microgram per cubic meter (µg/m³) for residential buildings, and 6 µg/m³ for commercial buildings.

Table 1 *Indoor Air Action Levels for Residential & Commercial Buildings CTS Printex Superfund Site, Mountain View, California*

Chemical[1]	Indoor Air Level (µg/m³)[1]		Comments
	Residential	Commercial	
1,1-DCA	2	8	Based on $1x10^{-6}$ lifetime cancer target risk
1,1-DCE	210	880	Based on non-cancer hazard index of 1
trans-1,2-DCE	63	260	Based on non-cancer hazard index of 1
cis-1,2-DCE	63	260	Not Available. Based on trans-1,2-DCE non-cancer hazard index of 1
TCE	1	6	Based on $1x10^{-6}$ lifetime cancer target risk
Vinyl Chloride[2]	0.2	3	Based on $1x10^{-6}$ lifetime target cancer risk

Notes: [1]Chemicals still considered COCs in shallow groundwater due to having concentrations above its MCL or potential to form from degradation of TCE or 1,2-DCE.

[2]Detected in shallow groundwater, but not at concentrations above its MCL.

7.0 Summary of Remedial Alternatives

Alternatives are presented separately for groundwater cleanup and vapor intrusion control.

7.1 Summary of Groundwater Alternatives

This section summarizes the remedial alternatives developed in the *Final Focused Feasibility Study: Part 2 – Groundwater*.

Common Elements for Groundwater Alternatives

Institutional controls, or ICs, are legal and administrative controls applied to properties to minimize the potential for human exposure to contamination and to protect the integrity of an engineered remedy. All alternatives include the following ICs: (1) the existing "environmental restriction" covenant for the properties where the former CTS Printex facility stood and (2) SCVWD well ordinance 90-1. In combination, these ICs prevent the use of the contaminated groundwater at the Site for drinking water. Except for Alternative 1, No Action, all alternatives include groundwater monitoring to evaluate the effectiveness of the implemented remedy.

In addition to the current COCs identified in the 1991 ROD, EPA is proposing to add cis-1,2-DCE and vinyl chloride to the COC list for the Site. These chemicals are part of the current groundwater monitoring program because both chemicals are breakdown products of TCE and have been detected at the Site.

Estimated time frames to construct and implement an alternative until the cleanup levels are met are provided for each alternative except Alternative 1 – No Action. The estimated time frames are based on groundwater monitoring trend analysis and computer model results. The primary use of these time estimates is to compare alternatives only and not to predict an exact cleanup time for the Site.

Total present worth costs for each alternative were calculated using a discount rate of 7 percent and an annual cost escalation rate of 2 percent in accordance with EPA guidance and are approximate (+50% and – 30%).

Alternative 1 - No Action

EPA is required to consider the No Action alternative as a baseline for comparison. Under this alternative, the existing land use covenant would remain in place, no active remediation would be implemented, and groundwater monitoring would cease.

Alternative 2A – Groundwater Extraction, Monitoring, and ICs (1991 ROD Remedy)

Groundwater extraction wells would be re-installed plume-wide, consistent with the original remedy, to remove contaminated shallow groundwater until cleanup levels are met. Extracted water would be discharged to the sanitary sewer for subsequent treatment at a wastewater treatment facility. The estimated time to construct this alternative is one year, and the estimated cleanup time frame is 22 years.

The estimated capital cost for Alternative 2A is $855,000, with average annual operation and maintenance (O&M) costs of $256,400. The total present worth is $4,482,000.

Alternative 2B – Groundwater Extraction, MNA, and ICs

Groundwater extraction wells would be installed at select locations, including the area of residual contaminant mass near well 17W, to remove higher VOC concentrations. MNA would be used in areas not subject to groundwater extraction. The estimated time to construct this alternative is approximately one year, and the estimated length of time required to achieve cleanup is 22 years.

The estimated capital cost for Alternative 2B is $695,000, with average annual O&M costs of $228,300. The total present worth is $3,976,000.

Alternative 3A – In-situ Chemical Oxidation (ISCO), MNA, and ICs

In-situ chemical oxidation is a treatment process used to convert contaminants such as TCE into water, carbon dioxide, and chloride salts. ISCO would require injection of an oxidant (a chemical that produces a reaction) into the shallow groundwater in the area with residual contaminant mass located in the vicinity of monitoring well 17W (see Figure 3). To achieve a reasonably uniform delivery of the oxidant, an injection grid layout would be established across the treatment area. For the rest of the plume, reduction of contaminant concentrations in shallow groundwater would occur by MNA. If MNA is not effective in reducing COC concentrations, indicated by decreasing trends, then ISCO would be applied to those areas as well.

For the area with active ISCO treatment, the time required to achieve cleanup levels is estimated at less than one year. For other portions of the plume, the estimated time to achieve cleanup levels by natural attenuation is approximately 15 years.

The estimated capital cost for Alternative 3A is $2,365,000, with average annual O&M costs of $68,500. The total present worth is $3,197,000.

Alternative 3B - Enhanced Anaerobic Bioremediation (EAB), MNA, and ICs (EPA's Preferred Alternative)

Enhanced anaerobic bioremediation (EAB) consists of adding a suitable chemical substrate (e.g., lactate, emulsified oils, molasses, ethanol, etc.) and bacteria throughout the shallow groundwater in the area with residual contaminant mass located in the vicinity of well 17W (See Figure 3). Under suitable anaerobic (without oxygen) conditions, the VOCs in groundwater will biodegrade to intermediate by-products, and then eventually to nontoxic end products. To distribute the substrate and bacteria throughout the treatment area, a flushing or recirculation system is created by extracting groundwater and then re-injecting this groundwater. For the rest of the plume, reduction of contaminant concentrations in shallow groundwater would occur by MNA. If MNA is not effective in reducing COC concentrations, indicted by decreasing trends, then EAB would be applied to those areas as well.

The time required to achieve the MCLs in the area of active EAB remediation is approximately two to four years. For areas using natural attenuation, the estimated time to achieve cleanup levels is approximately 15 years.

Alternative 3B has an estimated capital cost of $859,000, with average annual O&M costs of $72,900. The total present worth is $1,766,000.

Alternative 3C – In-situ Chemical Reduction (ISCR), MNA, and ICs

Zero-valent iron, such as cast iron particles, can chemically reduce TCE and the other VOCs to intermediate byproducts and eventually to harmless end products. Similar to Alternative 3A, this alternative would involve injecting a solution containing zero-valent iron into shallow groundwater in the area with residual contaminate mass located in the vicinity of

well 17W (see Figure 3). For the rest of the plume, reduction of contaminant concentrations in shallow groundwater would occur by MNA. If MNA is not effective in reducing COC concentrations, indicated by decreasing trends, then ISCR would be applied to those areas as well.

The estimated time to complete the zero-valent iron injections is less than one year, with the length of time required to achieve cleanup levels in the treated area estimated to be less than four years. For areas using natural attenuation, the estimated time to achieve clean up levels is approximately 15 years.

The estimated capital cost for Alternative 3C is $1,542,000, with average annual O&M costs of $68,500. The total present worth is $2,374,000.

Alternative 4: Monitored Natural Attenuation (MNA) and ICs

Natural attenuation relies on naturally occurring physical, chemical, and/or biological processes that act without treatment to reduce the mass, toxicity, mobility, volume, or concentration of contaminants in shallow groundwater. While annual monitoring to date has indicated that natural attenuation may be occurring at the Site since discontinuation of groundwater extraction in 1996, there is a high degree of uncertainty with this alternative. Therefore, an enhanced groundwater monitoring program would be included as part of MNA to demonstrate that conditions are suitable for the complete biodegradation of TCE and other VOCs and to evaluate the performance of the natural attenuation processes.

Based on modeling projections, MNA alone may take more than 30 years to achieve cleanup levels.

Alternative 4 has no capital costs since monitoring wells are in place. The estimated average annual O&M costs are $33,800. The total present worth is $661,000.

7.2 Summary of Vapor Intrusion Alternatives

This section summarizes the remedial alternatives developed in the *Final Focused Feasibility Study: Part1 – Vapor Intrusion Pathway*. Because each building type and its associated conditions may differ, the following alternatives are discussed in order to allow the appropriate one to be selected for a particular building type in Section 9.2.3.

Common Elements for Vapor Intrusion

Except for Alternative 1, No Action, all alternatives would include vapor intrusion ICs to: (1) ensure that the engineering controls used to prevent levels of indoor contaminants associated with the vapor intrusion pathway from reaching EPA's indoor air action levels are maintained and monitored as required by the remedy; (2) ensure that the appropriate engineering controls are installed as part of any new development at the Site; (3) provide information to building owners and occupants regarding the vapor intrusion remedy for each building; and (4) provide information to EPA and the Responsible Parties regarding new construction and changes of property ownership at the Site. The ICs that would be used for the Site are: City of Mountain View planning and building permit reviews; recorded covenants; and informational outreach. Each of these ICs can be used in combination and would be monitored for effectiveness.

Building permit reviews would be conducted by the City of Mountain View (a similar program was recently adopted for the MEW Superfund site) to notify EPA and the responsible parties regarding new building construction or building modifications at the Site. EPA will work with the City of Mountain View to formalize its planning, permitting, and tracking procedures for the Site. These procedures will include EPA approval of plans to ensure a vapor intrusion control system is part of new building construction or any modification of an existing building's slab or foundation.

Recorded environmental restriction covenants are proprietary controls. An example of a recorded covenant is the covenant for the property which formerly housed the CTS Printex facility; that covenant prohibits interference with the established vapor intrusion control system incorporated into the residential development. Covenants only need to be negotiated once for each property, because once recorded, they "run with the land" and are binding and permanent on subsequent property owners unless terminated in accordance with the terms of the covenant. Recorded covenants would be effective in informing future property owners of vapor intrusion issues and remedial requirements. Restrictive covenants would be negotiated between property owners and the CTS Printex responsible parties, designating EPA as a third party beneficiary.

An IC Implementation and Assurance Plan describing monitoring activities, schedules, and task responsibilities would be prepared for the Site. Applicable ICs for each property would be included in an Operation, Maintenance, and Monitoring Plan for future (new) construction.

Present worth costs are based on 15 years (the estimated time frame for the Preferred Alternative for groundwater to achieve cleanup levels). Costs estimates for remedial Alternative 3 is based on a 7,000 square-foot commercial building. Alternative 4 costs are based on a residential building of 5,000 square feet and a commercial building of 7,000 square feet.

Alternative 1 – No Action

EPA is required to consider the No Action alternative as a baseline for comparison to other alternatives. This alternative does not include engineering controls, ICs, or monitoring for vapor intrusion. For future buildings or existing building modifications, a potential vapor intrusion pathway may exist. If building occupants have vapor intrusion exposures, this alternative would not be protective of human health.

No incremental increased costs are associated with this alternative.

Alternative 2 – Monitoring and Institutional Controls (ICs) (EPA's Preferred Alternative for Existing Buildings North of Plymouth Street)

This alternative would implement the following ICs: planning and building permit reviews, and informational outreach for all properties overlying subsurface groundwater contamination at the Site. These ICs would be used in combination and would be monitored for effectiveness. In addition, monitoring would be performed to evaluate the potential for vapor intrusion at the time of new development or new construction where an existing building's slab or foundation is modified. Monitoring for multiple lines of evidence may consist of groundwater monitoring, soil gas samples, and confirmatory indoor air samples.

Building permit reviews would be conducted by the City of Mountain View (a similar program was recently adopted for the MEW Superfund site) to notify EPA and the responsible parties regarding new building construction or building modifications at the Site. EPA will work with the City of Mountain View to formalize its planning and permitting procedures for the Site. These procedures will include EPA approval of plans to ensure a vapor intrusion control system is part of the new building construction or where an existing building's slab or foundation is modified. Informational letters would be distributed to all owners of the five properties overlying subsurface groundwater contamination at the Site

There are no capital costs for this alternative, however, the annual cost of monitoring and building permit reviews is estimated between $5,000 and $15,000. If a new construction evaluation is required, one-time monitoring costs are estimated to be $12,000. The total present worth cost for Alternative 2 is $105,000.

Alternative 3 – Mechanical Indoor Air Ventilation and ICs

Operation of mechanical indoor air ventilation systems (i.e., HVAC systems) in commercial buildings can prevent vapor intrusion and achieve indoor air quality similar to outdoor air by (1) creating a slightly higher pressure inside the building, and (2) increasing the air exchange rate to reduce indoor VOC concentrations. EPA does not consider this alternative applicable to residential buildings because the mechanical ventilation systems are not consistently managed and operated.

A recorded environmental restriction covenant would be required to prohibit interference with the operation and maintenance of the vapor intrusion control system and would be effective in informing future property owners of vapor intrusion issues and remedial requirements.

Initial capital costs to install an HVAC system for a new commercial building are not included since HVAC systems are required by law and building code. However, incremental costs for an enhanced HVAC system were estimated for a 7,000 square-foot hypothetical commercial building, comparable to existing commercial building sizes at the Site. The incremental capital cost for a 7,000-square-foot commercial building is estimated to be $4,000. Annual costs are estimated to be $13,300. The total present worth cost for Alternative 3 is $150,000.

Alternative 4 – Vapor Barrier, Sub-Slab/Sub-Membrane Passive Ventilation, and ICs (EPA's Preferred Alternative for Future Buildings and Existing Residential Buildings South of Plymouth Street)

This alternative would consist of a vapor barrier and a passive, sub-slab ventilation system that could be converted to an active ventilation system. The passive, sub-slab ventilation system would consist of: (1) a gravel and/or sand layer with perforated pipe (or an equivalent geomembrane) for vapor collection, (2) solid piping in vertical risers that vent to the atmosphere; and (3) a wind-driven turbine located on top of each riser to generate a slight negative pressure at the vapor collection area. Post-construction indoor air monitoring would be conducted prior to building occupancy, and periodic inspections would be made to verify the integrity and effectiveness of the alternative's components.

A recorded environmental restrictive covenant would be required to prohibit interference with the operation and maintenance of the vapor intrusion control system and would be effective in informing future property owners of vapor intrusion issues and remedial requirements.

Residential Building: Capital costs are estimated to be $75,000. Annual costs are estimated to average $2,600. The total present worth cost of Alternative 4 for a new 5,000 square-foot residential building is $105,000.

Commercial Buildings: Capital costs for a 7,000-square-foot commercial building are estimated to be $105,000. Annual costs are estimated to average $2,600. The present worth cost of Alternative 4 a new commercial building is $134,000.

8.0 Evaluation of Alternatives

EPA evaluates each of the alternatives individually and against each other based on nine standard criteria. This section of the Proposed Plan profiles the relative performance of each alternative against seven criteria described below, noting how it compares to other options under consideration. Two criteria – state acceptance and community acceptance – will be evaluated after the close of the public comment period.

8.1 Evaluation of Groundwater Alternatives

Table 2 illustrates the comparison of each groundwater alternative to the threshold and balancing criteria.

Table 2 *Summary of Nine Evaluation Criteria for Groundwater Alternatives*[1]

Evaluation Criteria	Alternative 1: No Action	Alternative 2A: Groundwater Extraction and ICs	Alternative 2B: Groundwater Extraction, MNA, and ICs	Alternative 3A: ISCO, MNA, and ICs	Alternative 3B: EAB, MNA, and ICs (PREFERRED)	Alternative 3C: ISCR, MNA, And ICS	Alternative 4: MNA and ICs
Overall Protection of Human Health and the Environment	○	◒	◒	◒	◒	◒	◒
Compliance with ARARs	○	◒	◒	◒	◒	◒	◒
Long-term Effectiveness and Permanence	–	◒	◒	●	●	●	◒
Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment	–	◒	◒	●	●	●	○
Short-Term Effectiveness	–	◒	◒	◒	●	●	◒
Implementability	–	◒	●	●	●	●	●
State Acceptance	State Acceptance is a modifying criterion that will be evaluated after the public comment period						
Community Acceptance	Community Acceptance is a modifying criterion that will be evaluated after the public comment						
Capital Cost	$0	$855,000	$695,000	$2,365,000	$859,000	$1,542,000	$0
Annual O&M Cost[2]	$0	$256,400	$228,300	$68,500	$72,900	$68,500	$33,800
Present Worth Cost[3]	$0	$4,482,000	$3,976,000	$3,197,000	$1,766,000	$2,374,000	$661,000
Construction Time	–	1 Year	1 Year	1 Year	1 Year	1 Year	0 Year
Cleanup Time[4]	–	~22 Years	~22 Years	~15 Years	~15 Years	~15 Years	>30 Years

[1]Alternative 2A through 4 include groundwater monitoring.
[2]Annual O&M costs are the average cost over the time frame to achieve cleanup levels.
[3]Present Worth cost estimated over the time to achieve cleanup levels, and using a 2% rate of escalation and 7% discount rate.
[4]Estimated

○ = Does Not Meet Criterion ◒ = Meets Criterion ● = Meets Criterion Best

Threshold Criteria

Overall protection of human health and the environment

The alternative must be able to achieve and maintain protection of human health and the environment to eliminate the risk from exposure to groundwater impacted with COCs above protective cleanup levels, e.g. MCLs.

All of the alternatives except the "no action" alternative would reduce concentrations of chemicals of concern (COCs) in the shallow groundwater to meet the RAOs and provide protection of human health and the environment. Because Alternative 1 – No Action is not protective of human health and the environment, it is eliminated from consideration under the remaining eight criteria.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Section 121(d) of CERCLA requires that remedial actions at Superfund sites must attain (or the decision document must justify the waiver of) any federal or more stringent state environmental standards, requirements, criteria, or limitations, which are collectively referred to as "ARARs."

ARARs can be chemical-specific, action-specific, or location-specific. For example, the MCL, or drinking water standard, for TCE (5 µg/L) is a chemical-specific ARAR. Alternative 1 does not comply with ARARs because it would leave groundwater concentrations of TCE and other COCs at the Site above their respective MCLs. Because Alternative 1 does not meet this threshold criterion, it was not analyzed further. All other alternatives would reduce COC concentrations below MCLs and meet their respective ARARs.

Balancing Criteria

Long-term effectiveness and permanence

Long-term effectiveness and permanence refers to expected residual risks and the adequacy and reliability of the alternative to manage any residual risk (e.g., untreated COCs) remaining after cleanup levels have been met.

Contaminant removal achieved by Alternatives 2A, 2B, 3A, 3B, and 3C would be permanent. Alternative 4 is estimated to take well over 30 years to achieve this criterion, while Alternatives 2A through 3C should achieve groundwater cleanup levels in less than 30 years. The original remedy, groundwater extraction (Alternative 2A), did not achieve groundwater cleanup levels. Therefore, both Alternatives 2A and 2B are rated lower than Alternatives 3A, 3B, and 3C. Alternatives 3A, 3B, and 3C actively remediate the area with residual contamination to permanently remove the COCs and best satisfy this criterion.

Reduction in toxicity, mobility, or volume through treatment

This criterion considers the anticipated performance of an alternative to permanently and significantly reduce the toxicity, mobility, or volume of COCs in groundwater.

Alternative 3A, 3B, and 3C will eventually transform through treatment the chemical contaminants to nontoxic end products and best satisfy this criterion. Alternatives 2A and 2B use groundwater extraction, which previously did not completely satisfy this criterion at the Site. Alternative 4 is not an active treatment for the purposes of this criterion and thus ranks lowest of the other alternatives.

Short-term effectiveness

Short-term effectiveness addresses the period of time needed to implement the alternative and any adverse impacts that may affect workers, the community or the environment during the construction and operation of the alternative until cleanup levels are achieved.

All alternatives can be implemented in a way that protects the community and workers and could be constructed in less than one year. Alternative 3A may pose some concerns for workers due to the chemicals used for ISCO. Another aspect of short-term effectiveness is the amount of time required to achieve the remediation goals. Alternatives 2A and 2B would require approximately 20+ years to achieve the cleanup, while Alternative 4 would require more than 30 years. Alternatives 3B and 3C would require an estimated 15 years to achieve cleanup and best satisfy this criterion.

Implementability

Implementability addresses the technical and administrative feasibility of an alternative from design through construction and operation. Factors such as availability of services and materials, administrative feasibility and coordination with other governmental entities are also considered.

Alternative 4 is the easiest to implement, as monitoring wells currently exist. Alternatives 2A, 2B, 3A, 3B, and 3C employ active remediation and vary with regard to implementability. Because the Site is currently developed, installing new extraction wells under Alternative 2A would be the most difficult alternative to implement. For Alternatives 2B, 3A, 3B, and 3C, the proposed system components are located in accessible

areas. Alternatives 2A, 2B, 3A, 3B, and 3C would require access agreements with private property owners for installation, operation and monitoring of the remedial system. Materials and services to install, operate and monitor the components of the alternatives are locally available.

Cost

EPA compares each alternative based on present worth cost (a measure of the total project cost over the time frame required to achieve the cleanup goals). The estimated present worth costs for the alternatives, not including the No Action alternative, range from $661,000 for Alternative 4 to $4.4 million for Alternative 2A (see Table 2). Alternative 3B has the lowest cost among alternatives with active remediation (Alternatives 2A, 2B, 3A, 3B, and 3C). For Alternative 4, the uncertainty in the time frame to achieve cleanup levels could increase the estimated present worth cost.

8.2 Evaluation of Vapor Intrusion Alternatives

Table 3 illustrates the comparison of each vapor intrusion alternative to the threshold and balancing criteria.

Table 3 *Summary of Nine Evaluation Criteria for Vapor Intrusion Alternatives**

Evaluation Criteria	Alternative 1: No Action	Alternative 2: Monitoring and ICs	Alternative 3: Mechanical Indoor Air Ventilation and ICs (Commercial Buildings only)	Alternative 4: Vapor Barrier, Sub-Slab/ Sub-Membrane Passive Ventilation, and ICs
Overall Protection of Human Health and the Environment	○	◒	●	●
Compliance with ARARs	–	◒	●	●
Long-term Effectiveness and Permanence	–	◒	◒	●
Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment[1]	N/A	N/A	N/A	N/A
Short-Term Effectiveness	–	N/A	◒	●
Implementability	–	◒	●	●
State Acceptance	State Acceptance is a modifying criterion that will be evaluated after the public comment period			
Community Acceptance	Community Acceptance is a modifying criterion that will be evaluated after the public comment			
Capital Cost[2]	$0	$0	$4,000	$105,000
Annual O&M Cost[3]	$0	$10,000[3,5]	$13,300	$2,600
Present Worth Cost[2, 3]	$0	$105,000	$150,000	$134,000

[1]N/A – Not Applicable
[2]Costs for a 7,000 square-foot new, commercial building.
[3]Middle of cost range listed.
[4]Present worth cost based on 15 years (estimated time frame for preferred alternative to achieve groundwater clean-up)
[5]Monitoring costs for new construction evaluation are $12,000.
* See Table 6 for EPA's Preferred Alternatives.

○ = Does Not Meet Criterion ◒ = Meets Criterion ● = Meets Criterion Best

Threshold Criteria

Overall protection of human health and environment

Alternative 1 would not eliminate, reduce or control risk through any engineering or management controls and would not be protective of human health as long as any potential long-term exposure risk from vapor intrusion exists. Alternative 2 is protective of human health as long as IC requirements are monitored for effectiveness and additional data are generated at the time of new development. Alternatives 3 and 4 are both protective as long as the vapor intrusion control system is properly installed, designed, operated, and maintained.

Alternative 2 would be the most cost-effective alternative to ensure occupants of future buildings are protected from subsurface groundwater contamination migrating into buildings above indoor air action levels. If mitigation is necessary to address vapor intrusion in the future, ICs would be layered with Alternative 3 or 4. Alternative 3 has lower costs for future commercial buildings, and Alternative 4 is most cost-effective for future residential buildings over time.

Because Alternative 1 – No Action – is not protective of human health, if any potential long-term exposure risk from vapor intrusion exists, it is eliminated from consideration under the remaining eight criteria.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

California Civil Code §1471(a) may be an applicable or relevant and appropriate requirement (ARAR) for this remedy. This statutory provision sets forth the requirements for an environmental restriction covenant in California. When implemented along with appropriate ICs or combination of ICs, Alternatives 2, 3, and 4 would meet this ARAR.

Balancing Criteria

Long-term effectiveness and permanence

Alternative 2 may not provide long-term effectiveness because adherence to ICs is not guaranteed. Alternatives 3 and 4 provide long-term effectiveness in preventing the entry of VOCs into a building at levels exceeding actions levels for long-term exposure. However, the long-term effectiveness and permanence of Alternative 3 is dependent on proper operation and maintenance of both indoor air ventilation system and ICs. Alternative 4 has been demonstrated at other sites to be effective in controlling vapor intrusion in new buildings and is therefore ranked highest.

Reduction in toxicity, mobility, or volume through treatment

Unlike typical remedial alternatives to address contamination, alternatives for vapor intrusion are not necessarily designed to reduce the toxicity, mobility, or volume through treatment of the Site contaminants, but rather are designed to prevent exposure to these contaminants. Treatment of the contaminants causing vapor intrusion will be accomplished by directly addressing the subsurface shallow groundwater contamination in accordance with the groundwater preferred alternative proposed in this plan.

Short-term effectiveness

As Alternative 2 has no construction or field work (unless new construction requires monitoring for multiple lines of evidence), protection of workers' health is not an issue for this alternative. Alternatives 3 and 4 could be implemented in a short time frame (less than one year) and are rated equally for this criterion.

Implementability

Alternative 2 is implementable for existing buildings, though subject to interaction between various governmental agencies and reliance upon future Site property owners, developers, and contractors to follow procedures to maintain IC effectiveness. The City of Mountain View has adopted this approach for the MEW Superfund site, and a similar model would be applied for the CTS Printex Site. Remedial Alternatives 3 and 4 are implementable for new commercial buildings by incorporating each system's requirements into the design, construction and operation of the building. Alternative 3 would require monitoring by building personnel to prevent adverse adjustments that could reduce the effectiveness of the mechanical indoor air ventilation system to control vapor intrusion. Alternative 4 is implementable and feasible for new residential or commercial buildings and therefore would satisfy this criterion best.

Cost

A comparison of relative costs for the alternatives is presented below for future residential and commercial buildings.

Residential – Alternative 4 has the highest cost.

Commercial – Alternative 3 is higher in cost than Alternatives 2 and 4, primarily due to energy costs to operate the mechanical ventilation system. Alternative 2 has the lowest present worth cost.

9.0 Summary of the Preferred Alternatives

9.1 Groundwater

EPA's Preferred Alternative is Alternative 3B – Enhanced Anaerobic Bioremediation (EAB), MNA, and ICs. The Preferred Alternative is recommended because it would protect human health and the environment and meet ARARs by relying on achieving suitable conditions within the treatment zone to biodegrade the VOCs in shallow groundwater to cleanup levels. Implementation of this remedy can be achieved despite the developed nature of the Site. In addition, the Preferred Alternative has the following advantages:

- Achieves the cleanup goals in a reasonable time frame (approximately 15 years) and at less cost than other remedial alternatives using treatment;
- Eliminates the potential for vapor intrusion in a shorter period of time;
- Can be readily applied to other areas as a contingency, if needed.

If MNA cannot be demonstrated (indicated by decreasing or stable trends of all COCs) within 15 years of completing in situ EAB treatment, then EAB treatment will be implemented. EPA will determine the need for EAB during its evaluation of remedy effectiveness as part of its required five-year reviews.

The following institutional controls (ICs) have already been implemented: the existing environmental restriction covenant for the property where the former CTS Printex facility stood, and the SCVWD well ordinance 90-1. In combination, these ICs prevent the use of the contaminated groundwater at the Site for drinking water.

The current land use at the Site will not be affected by this Preferred Alternative.

The groundwater monitoring program would be enhanced and two additional chemicals, cis-1,2-DCE, and vinyl chloride, will be added as COCs.

Table 4 *Proposed Vapor Intrusion Response Action for Existing Residential and Commercial Buildings*[1]

Area(s)	Description	Proposed Response Action
A	Residential buildings with vapor intrusion control system installed. Confirmatory indoor air concentrations below indoor air action levels.	Passive sub-slab ventilation system with vapor barrier in place. Continue inspection and maintenance under OMMP in place. Proprietary IC (Environmental Restriction Covenant) in place.
B	Residential building with current indoor air concentrations below indoor air action levels. No current risk for vapor intrusion. Building has demonstrated through multiple lines of evidence that there is no potential or anticipated future risk for vapor intrusion impacting indoor air quality.	No further action required.
C, D	Commercial buildings with current indoor air concentrations below indoor air action levels. No current risk for vapor intrusion. However, buildings have not demonstrated through multiple lines of evidence that there is no potential or anticipated future risk for vapor intrusion at the property exceeding indoor air action levels.	No engineered remedy required. Implement proprietary and/or governmental ICs to track new construction/ development.
E	Commercial building with current indoor air concentrations below the indoor air action levels. No current risk for vapor intrusion. Building has demonstrated through multiple lines of evidence that there is no potential or anticipated future risk for vapor intrusion impacting indoor air quality.	No further action required.
F	Unoccupied Parking Area. Property overlying plume has not demonstrated through multiple lines of evidence that there is no potential or anticipated future risk for vapor intrusion impacting indoor air quality if new buildings are constructed.	Implement proprietary and/or governmental ICs to track new construction/ development.

[1]Overlying shallow groundwater contamination at the Site.

9.2 Vapor Intrusion

9.2.1 Existing Buildings

To determine the appropriate level of action that would be required, EPA has developed criteria and a classification system for existing buildings (see Table 4 and Figure 4) using a multiple- lines-of-evidence approach from all data generated to date. Existing residential buildings, located in Area A, have an engineered remedy in place (i.e., vapor barrier with sub-slab passive ventilation system) and currently have indoor air concentrations below EPA's action level. Unless demonstrated otherwise, continued monitoring and maintenance of that engineering control is required to ensure indoor air concentrations remain below the action levels.

Figure 4 *Areas for Existing Buildings*

To ensure EPA receives sufficient notice of any changes in land use, new construction or changes to existing buildings where the building slab or foundation is modified, ICs are proposed for Areas C, D, and F (see Figure 4).

9.2.2 Future Buildings/New Construction

To determine the appropriate tier, lines of evidence (e.g., groundwater, soil gas, etc.) will be collected and evaluated at the time of development or new construction. Once a building has been assigned a tier by EPA, the selected action for a building of that tier would be implemented, including engineering and institutional controls. Where multiple lines of evidence indicate that there is no longer the potential for vapor intrusion above indoor air action levels, the proposed building would be categorized as Tier 2. For new buildings, the description of tiers and the corresponding proposed actions are shown in Table 5 on next page.

9.2.3 Applicable Alternatives for Vapor Intrusion Pathway

This section describes the applicable alternatives for each building scenario based on the alternative evaluation performed in Section 7.2, the comparative analysis described in Section 8.2, and the proposed response actions described in Sections 9.2.1 and 9.2.2 for existing buildings and future buildings, respectively.

Existing Commercial Buildings

The alternatives applicable for existing commercial buildings are:

- Alternative 1: No Action
- Alternative 2: Monitoring and ICs
- Alternative 3: Mechanical Indoor Air Ventilation and ICs

To ensure occupants of future buildings are protected from subsurface groundwater contamination migrating into buildings above indoor air action levels, Alternative 2 best meets the proposed response actions for existing commercial buildings.

Table 5 *Proposed Vapor Intrusion Response Action for Future Commercial and Residential Buildings/New Construction*[1]

Tier	Description	Proposed Response Action
1	Future (new) building(s) on properties where lines of evidence (soil gas, groundwater, etc.) indicate that there is the potential for vapor intrusion into the new building above indoor air action levels.	Implement Preferred Alternative – Sub-slab/Sub-membrane Passive Ventilation with Vapor Barrier. Perform confirmation indoor air sampling after construction to verify preferred alternative is effective. Implement proprietary ICs.
2	Future (new) building(s) on properties where lines of evidence (soil gas, groundwater, etc.) indicate there is no potential for vapor intrusion into the new building above indoor air action levels.	Upon confirmation and with EPA approval, no further action is required.
3	New building(s) on properties overlying shallow groundwater with TCE concentrations not exceeding 5 micrograms per liter (µg/L).	No response action required.

[1]Overlying shallow groundwater contamination at time of development.

Existing Residential Buildings

The alternatives applicable for existing residential buildings are:

- Alternative 1: No Action
- Alternative 2: Monitoring and ICs
- Alternative 4: Sub-Slab/Sub Membrane Passive Ventilation with Vapor Barrier and ICs

Alternative 4 has been implemented for all buildings in Area A. Alternative 1 meets the proposed response action for existing residential buildings in Area B.

Future Commercial Buildings

The alternatives applicable for future commercial buildings are:

- Alternative 1: No Action
- Alternative 3: Mechanical Indoor Air Ventilation and ICs
- Alternative 4: Sub-Slab/Sub Membrane Passive Ventilation with Vapor Barrier and ICs

Alternative 4 would ensure occupants of Tier 1 buildings (see Table 5) are protected from subsurface groundwater contamination migrating into commercial buildings above indoor air action levels.

Future Residential Buildings

The alternatives applicable for future residential buildings are:

- Alternative 1: No Action
- Alternative 4: Sub-Slab/Sub Membrane Passive Ventilation with Vapor Barrier and ICs

Only Alternative 4 would meet the proposed response action for Tier 1 buildings (see Table 5) and ensure occupants of future residential buildings are protected from subsurface groundwater contamination migrating into buildings above indoor air action levels.

9.2.4 Selection of EPA's Preferred Alternative for the Vapor Intrusion Pathway

EPA's Preferred Alternatives to address the vapor intrusion pathway and ensure protection of human health for existing and future buildings are summarized in Table 6. Institutional controls are fundamental and necessary so that the Preferred Alternatives selected are implemented and monitored properly.

Based on information currently available, EPA believes the Preferred Alternatives for the groundwater and vapor intrusion pathway meet the threshold criteria and provide the best balance of tradeoffs among the alternatives with respect to the balancing and modifying criteria. EPA expects the Preferred Alternatives to satisfy the following statutory requirements of CERCLA §121(b): (1) be protective of human health and the environment; (2) comply with ARARs; (3) be cost-effective; (4) utilize permanent solutions and alternative treatment technologies or resource recovery technologies to the maximum extent practicable. In addition, the groundwater Preferred Alternative satisfies the preference for treatment as a principal element.

Table 6 *EPA's Preferred Alternatives – Vapor Intrusion Pathway*

Building Scenario	Preferred Alternative
Existing Buildings (Commercial and Residential)	
Area A	Alternative 4 – Passive Sub-slab Ventilation with Vapor Barrier, and ICs (already implemented). ICs include: • Environmental Restriction Covenant (already recorded)
Area C, D, and F	Alternative 2 – Monitoring and ICs. ICs consist of: • Planning, permitting, and building requirements to install appropriate engineering controls in future construction.
Area B and E	Alternative 1 – No Action
New Buildings/New Construction (Commercial and Residential)	
Tier 1	Alternative 4 - Vapor Barrier with Passive Sub-slab/Sub membrane Ventilation, Monitoring, and ICs (with ability to convert to Active Ventilation). ICs consist of: • Permitting and building requirements to install appropriate engineering controls. • Environmental Restriction Covenant.
Tier 2 and 3	Alternative 1 - No Action

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Site Repositories

The Administrative Record, which includes Site information and copies of the documents EPA used to create this Proposed Plan, is available at:

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