



Proposed Plan for Soil Gas Mitigation at Two Sites

(Breakout Shallow Soil Gas Proposed Plan)
Former McClellan Air Force Base

Air Force Real Property Agency
3411 Olson Street
McClellan, CA 95652-1003

Final Copy – July 2005

A. Introduction

The Air Force Real Property Agency¹, referred to as the Air Force, is issuing this **Proposed Plan** for the cleanup of two sites at the former McClellan Air Force Base. This Proposed Plan addresses soil at two sites contaminated with **volatile organic compounds (VOCs)** that can contaminate **soil gas** that enters a building via the **vapor intrusion pathway**.

This Proposed Plan does not address other exposure pathways or contaminants in soil or any **groundwater** contamination. Future Proposed Plans will address these other pathways and contaminants.

The Air Force presents this Proposed Plan to provide the public with a chance to be involved with the cleanup decisions at McClellan. This Proposed Plan summarizes the past actions, investigations and studies that the Air Force has performed at each of these sites. It also lists the alternatives the Air Force believes are the most workable solutions for protecting human health and the environment and proposes the best.

The Air Force will make a final cleanup decision after all comments are considered. *A public comment period and a public meeting are described at the bottom of this page.*

The Proposed Plan discusses the details of the

Public Comment Period and Public Meeting

Public Comment Period

- June 30 through July 29, 2005

We encourage you to comment on this Proposed Plan and the alternatives during the public comment period.

Mail your written comments to:

Air Force Real Property Agency
Attention: Community Relations
3411 Olson Street
McClellan, CA 95652-1003

Or email to: brian.sytsma@afropa.pentagon.af.mil

Comments must be received by close of business (5 p.m.) on July 29, 2005.

Public Meeting

- July 13, 2005
- 6:30 p.m.

Location - Bell Avenue Elementary School, 1900 Bell Ave.

You are invited to a public meeting on July 13, 2005. The Air Force will present a summary of the proposed plan. You will be able to ask questions and tell us what you think about the cleanup alternatives. The Air Force will record oral comments and respond to them in the final decision document.

For additional information, call Brian Sytsma, McClellan Community Relations; (916) 643-1250 ext 257

^{PIP}To assist the reader, as each key term is introduced, it appears in **bold type**. A glossary of key terms is provided on Page 17.

Air Force's **Preferred Cleanup Alternative** and other cleanup alternatives that were considered.

The Air Force and regulatory agencies work as a team to investigate and clean up McClellan. The Air Force is the lead agency for environmental cleanup activities at the former base. The primary regulatory agencies overseeing the McClellan cleanup are the United States Environmental Protection Agency (U.S. EPA) and the State of California, represented by the Department of Toxic Substances Control (DTSC) and the Central Valley Regional Water Quality Control Board (RWQCB).

This Proposed Plan and public comments lead to a **Record of Decision** in which the final cleanup decision is established and described in detail. Based on the consideration of public comments or new information, the final cleanup choice presented in the Record of Decision may be different from the Air Force's Preferred Alternative presented in this Proposed Plan. This Record of Decision will be called the "Breakout **Shallow Soil Gas** Record of Decision", and is scheduled to be completed in December 2005. The Air Force will respond to all comments received during the public comment period. Comments and responses will appear in the Record of Decision, in a section called the **Responsiveness Summary**. The public comment period is from June 30 through July 29, 2005.

The Air Force issues this Proposed Plan to fulfill the requirements under the **Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA)** and the **National Oil and Hazardous Substances Pollution Contingency Plan (NCP)**. The U.S. EPA has final authority for selecting remedies at federal facilities on the **National Priorities List**, such as McClellan.

This Proposed Plan is based on the Operable Unit B - Group 1 POL/SSG Remedial Characterization Summaries Addendum for Selected Sites (also known as the **Remedial Investigation**) and the Breakout Shallow Soil

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Gas Feasibility Study, as well as other site-specific reports. The Remedial Investigation looks at the nature and extent of contamination at the sites. The Feasibility Study was produced to develop a range of alternatives. The main purpose of the Feasibility Study was to evaluate the technical and economic feasibility of the cleanup options, including No Action, for addressing the contamination.

The Remedial Investigation, Feasibility Study and other related documents are located in a special file at McClellan. This file, known as the Administrative Record, is located at 3411 Olson Street, McClellan, CA. To make an appointment to view documents or get more information, call (916) 643-1742, extension 239. The Administrative Record is open from 8 a.m. to 3 p.m., Monday through Friday. The Remedial Investigation, Feasibility Study and other documents are also available at www.afropa.hq.af.mil/mcclellan

B. History, Site Background

The former base, which includes about 3,000 acres, is seven miles northeast of downtown Sacramento, CA (see Figure 1, page 3). McClellan is surrounded by the city of Sacramento to the west and southwest,

Detailed site information is available in the Breakout Shallow Soil Gas Feasibility Study and the **Environmental Summary Folders (ESFs)** for SA 16 and PRL T-46. Which can be found in the Administrative Record at McClellan AFB

unincorporated areas of Antelope on the north, Rio Linda on the northwest, and North Highlands on the east.



FIGURE 1:
Location of McClellan

Founded in 1936, McClellan was an aircraft repair depot and supply base. McClellan's mission was to provide logistics and maintenance support for aircraft, communications and electronic systems. In 1995, the federal government decided to close McClellan. It closed in July 2001. The Air Force used a wide-range of toxic and hazardous chemicals at the former base. These chemicals were mostly industrial solvents and cleaners, aviation fuels and a variety of oils and lubricants.

The Air Force put wastes in disposal pits and landfills on the base. Past disposal practices, spills, releases and leaking tanks and pipelines caused soil and groundwater contamination at McClellan.

The Environmental Protection Agency listed McClellan on its National Priorities List in July 1987. This listing was due to the groundwater contamination. Under the Super-

fund program, the Air Force funds and conducts cleanup of the former base.

McClellan has an active community relations /public participation program to increase communication between the Air Force and the neighboring community. This includes the **Restoration Advisory Board**. A Restoration Advisory Board consists of stakeholders from the community, regulatory agencies and the Air Force. The Air Force also conducts public outreach meetings and speaking engagements with local organizations.

C. Summary of Site Characteristics

Current land use at McClellan is a combination of open grassland, industrial (aircraft operations/maintenance), light industrial (warehouse, laboratories, support services), aircraft runways, taxiways and ramps, office buildings and residential uses. Current Sacramento County redevelopment plans include similar use of property and existing facilities.

The sites contained in this Proposed Plan are a combination of buildings, storage areas, and parking lots in an industrial area.

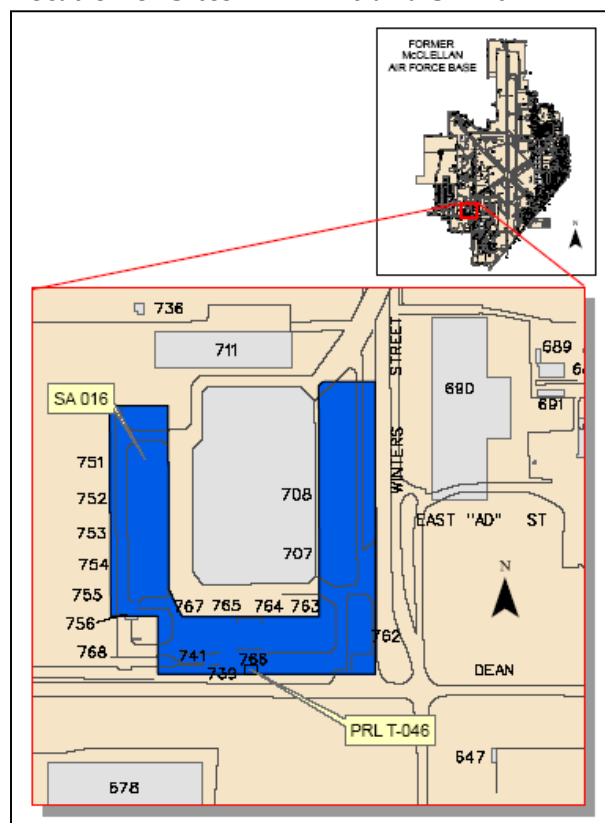
Over the past 25 past years, the Air Force has studied the contamination in the soil and groundwater at McClellan. The studies found a variety of chemicals and waste products that have been designated as **Contaminants of Concern**. One class of these contaminants is Volatile Organic Compounds, or VOCs. They are carbon-containing compounds that evaporate readily at room temperature. VOCs are commonly used in dry cleaning, metal plating, electronics manufacturing and metal degreasing.

In various places at McClellan, VOCs can be found within the full extent of the soil column, from ground surface to the **groundwater**, approximately 100 ft below surface. The air found between particles of soil is referred to as soil gas. When VOCs are present, soil gas can contain vaporized VOCs. This soil gas can

be drawn into buildings, where the occupants inhale the VOCs originating in the soil. This exposure pathway is referred to as the vapor intrusion pathway. VOCs nearer the surface have a greater impact on indoor air since they are more readily drawn into the vapor intrusion pathway. Consequently, most scrutiny is given to the VOC contamination in the upper 15 feet of soil, referred to as **shallow soil gas (SSG)**.

The section below describes the two sites addressed in this Proposed Plan and shown in Figure 2. The VOC contaminants of concern are shown in parenthesis.

Figure 2:
Location of Sites PRL T-46 and SA-16



1. *PRL T-46 (fuels), Air Force proposes no action for shallow soil gas:* Site was a 2000-gallon **oil/water separator** tank that was installed in 1968 and removed in 1990. It received storm water runoff and rinse water that drained from the open maintenance hangers that are located on site SA-16. Releases during the tank removal resulted in high concentrations of fuels in the area

of the tank that were partially cleaned up by a **bioventing system** that was installed in 1993 and operated until 2005. Bioventing systems inject air into the subsurface to enhance natural biodegradation. The biovent system is currently considered for expansion to treat an area within site SA 16. No contaminants remain at this site that pose a significant risk by the vapor intrusion pathway. Consequently it is recommended for no action for shallow soil gas. The Air Force did not evaluate alternatives for this site in the Feasibility Study due to the lack of contamination.

2. *SA 16 (Benzene, Ethylbenzene and Naphthalene), proposed for institutional controls:* This site contains open hangars that were used for aircraft maintenance and fueling and defueling operations. There are records of jet fuel spills, and the potential exists for subsurface releases of fuels and associated materials. During recent investigations at the site, over 80 samples were taken. Major vapor intrusion pathway contaminants include, ethylbenzene, elevated in one sample, and benzene and naphthalene, elevated in two samples each.

The risk from the vapor intrusion pathway does not exceed the acceptable risk range for **unrestricted use**. (Risk range and how it is used is described in more detail in section E.) However, sufficient uncertainty exists concerning the total risk at the site that the Air Force is proposing to limit the use of the property to industrial activities until the total risk is better defined during remedy design. This would be accomplished using institutional controls which would preclude residential use of the sites by the use of zoning and deed restrictions. By limiting activities at the site, the occupant's exposure and consequent risk is greatly reduced.

D. Scope and Role of the Proposed Plan

The Proposed Plan addresses soils contaminated with VOCs, summarizes the evaluation of cleanup options for each of the contaminated sites, and presents the preferred cleanup alternative.

The Proposed Plan addresses VOCs found in shallow soil gas for two sites. Other exposure pathways and contaminants will be considered in later plans. The goal of the actions in this plan is to reduce the potential indoor exposure to contaminated soil gas.

The Air Force proposes no action and unrestricted use at site PRL T-46 for the vapor intrusion pathway because it is well below the acceptable risk range for unrestricted use. Unrestricted use allows for anything to be built, including homes and schools although some sensitive uses have additional requirements beyond the scope of CERCLA. The Air Force proposes institutional controls restricting use at site SA 16.

E. Summary of Site Risks

A **risk assessment** is a scientific process that uses both facts and assumptions to evaluate potential adverse effects (such as cancer) on human health from exposure to chemicals. For these sites, the risk is estimated by comparing the measured VOC concentrations in the soil gas to the preliminary cleanup goals.

Preliminary cleanup goals have been developed for the common VOCs that could enter the vapor intrusion pathway at McClellan AFB. In simple terms, they are the concentrations of specific VOCs that have a significant affect on human health. They were developed to evaluate the potential adverse effects on residents or workers that could result if chemicals intrude into indoor air from soil. The residential preliminary cleanup goals protect human health for unrestricted land use. The occupational set protects human health for industrial use and would allow commercial and industrial activities. The

occupational set is less restrictive because exposures are assumed to be lower than those in a residential or unrestricted setting.

During their development, unresolved disagreements between the regulatory risk assessors and the Air Force resulted in two sets of preliminary cleanup goals that differ by an average factor of four for residential risk (seven for occupational risk). The result is that when the Air Force calculates risk, using their cleanup goals, the result is, on average four times smaller than if risk were calculated for the same site, but using the regulator's cleanup goals. The reader is referred to the Breakout Shallow Soil Gas Feasibility Study for a complete discussion.

The likelihood of any kind of cancer resulting from exposure to a contaminated site is generally expressed as a probability, for example, "one-in-a-million." In other words, for every million people that are exposed, one extra cancer case can occur as a result of exposure to a certain contaminant. The US EPA acceptable cumulative risk range for all chemicals and all pathways is between 1-in-a-million and 100-in-a-million. The VOC concentrations that equal the preliminary cleanup goals correspond to a 1-in-a-million risk. It takes 100 times more VOCs in the soil to reach the upper end of the risk range 100-in-a-million.

Preliminary cleanup goals are also calculated for adverse health effects other than cancer. They represent the highest concentrations of VOCs in the soil gas that demonstrate no observable adverse health effect and are generally much larger than the 1-in-a-million cancer risk concentrations. They are used to calculate hazard quotients for each chemical by dividing the preliminary cleanup goal into the chemical's maximum concentration at the site. Hazard quotients are summed for all chemicals to get a site wide value. A site hazard quotient less than one means that the contaminant concentrations at the site have no observable health affect.

The Air Force and regulators consider risks greater than the US EPA's cumulative risk

range (100-in-a-million) unacceptable, and generally recommend action. For risks that fall within the target risk range, the Air Force evaluates site-specific information such as data sufficiency and potential use to determine whether action is warranted. Once a decision is made to consider action at a site, the preliminary cleanup goals are used for comparative analysis of alternatives. For risks that fall below the target risk range (1-in-a-million) for calculated risk scenarios, no action is required. The target for hazard quotient is one or no observable effect.

The Air Force estimated the risk associated with the vapor intrusion pathway for both sites described in this Proposed Plan. The risk from intrusion of shallow soil gas at site PRL T-46 falls well below the 1-in-a-million risk probability for unrestricted use regardless whether the Air Force or the regulator's preliminary cleanup goals are used to estimate the risk. The site's hazard quotient is also less than one.

SA16 falls at the top of the Air Force unrestricted use risk range (100-in-a-million) and near the bottom of the occupational use risk range (9-in-a-million). The hazard quotients are 3 and 0.3 respectively. Using the regulator's values, the resulting residential risk is 300-in-a-million and the occupational risk is 40-in-a-million. The hazard quotients are 8 and 1.5 respectively.

The potential risk is probably somewhat lower than calculated. This is because there are uncertainties in the risk assessment process and uncertainties in the site data that the Air Force compensates for by basing the preliminary cleanup goals on health protective assumptions:

- The most health protective toxicity factors are used among those approved by the regulatory risk assessors.
- Residential exposure is assumed 7 days a week, 24 hours a day for 30 years.

- Workplace exposure is assumed 5 days a week, 24 hours a day for 25 years although residential inhalation rates are used.
- All contamination directly underlying the building is assumed to go up, into building, none escapes at the edges and none goes down to ground-water.
- The maximum measured concentration in the top 15 ft of the site completely underlies the building.
- No biological or chemical degradation is considered in the model.
- Depth of contamination is set at the minimum allowable in the model.
- Minimum air replacements mandated by the building code for new construction are used.

A complete discussion of the risks from these sites is in the Remedial Investigation and Feasibility Study reports.

The sites presented in this Proposed Plan do not require ecological risk assessments because they do not have ecological habitat and the known contaminants will not affect downstream habitats. The Remedial Investigation recommended both sites for no further ecological investigation.

The human health and environmental risks posed by the sites help determine whether or not cleanup action is needed. The Air Force analyzed various risk assessment scenarios for each site to evaluate future land uses. Following is a summary of the risks determined in the Remedial Investigation and Feasibility Study.

PRL T-46

The Air Force found fuel-related compounds in soil samples near the former oil/water separator at PRL T-46. After operation of the bioventing system to degrade the fuels, follow-up sampling was completed. Those samples indicate that the VOCs that could intrude into indoor air have been substantially reduced and the remaining residential risk is less than 0.02 in a-million. Using the

regulator's values, the resulting residential risk is 0.1-in-a-million

Other contaminants at the site will be dealt with in a subsequent feasibility study that will address all of the contaminants and exposure pathways not included in this proposed plan.

SA 16

The Air Force found chlorinated solvents and fuel-related compounds at site SA 16 that have a potential to enter the vapor intrusion pathway. The main risk drivers are benzene and naphthalene. During a 2002 investigation, benzene was found exceeding the Air Force residential preliminary cleanup goals in two of 57 samples. Heptane, and 1,2,4 Trimethylbenzene had a residential hazard quotient greater than one. During a 1992 investigation naphthalene was found exceeding the Air Force residential preliminary cleanup goal in two of 136 samples. Naphthalene also had a residential hazard quotient exceeding one. Their combined residential vapor intrusion pathway risk is 100-in-a-million, and occupational risk is 9-in-a-million.

SA 16 Residential Vapor Inhalation Risk

Chemical	Max Site Concentration (ppbv)	Preliminary Cleanup Goal (ppbv)	Risk (in-a-million)
Naphthalene	6300	74	85
Benzene	5600	290	19
Total Vapor Inhalation Risk			104
ppbv = parts per billion by volume			

SA 16 Occupational Vapor Inhalation Risk

Chemical	Max Site Concentration (ppbv)	Preliminary Cleanup Goal (ppbv)	Risk (in-a-million)
Naphthalene	6300	960	6.6
Benzene	5600	2300	2.4
Total Vapor Inhalation Risk			9.0
ppbv = parts per billion by volume			

Using the maximum concentration for each chemical and adding their risks produces an overestimate. The measured maximum concentrations of these chemicals are not located together so a person would likely not be exposed to the maximum of both chemicals at the same time. Also 84 percent of the risk comes from a single naphthalene measurement which was taken in 1992. Since naphthalene is biodegradable, this old measured value is likely much reduced by natural processes, but there is no current confirmation data.

Summary

It is the Air Force's current judgment that the preferred cleanup alternative identified in this Proposed Plan is protective of human health and the environment. The calculated risk for indoor air is well within EPA's acceptable risk range when use is restricted to non-residential activities. In addition, the Air Force currently believes that the cumulative risk from all contamination and all pathways is within the EPA acceptable risk range for restricted use. It will be addressed in subsequent RODs.

F. Remedial Action Objectives

Remedial action objectives are goals established for protecting human health and the environment. Some remedial action objectives can be shown in numbers while others may be shown as goals for the cleanup action. The remedial action objectives for soil VOCs that can intrude into indoor air as soil gas include the following:

- Prevent and reduce human exposure to soil gas contaminants by restricting land uses to those that have risks within the acceptable risk range.
- Achieve compatibility with other remedial actions at McClellan (i.e., actions to address other contaminants and exposure pathways).
- Restore cleaned areas to a condition compatible with the existing surrounding environment and land use.

-
- Expedite site cleanup and restoration.

G. Summary of Alternatives

Following is a summary of the alternatives evaluated for site SA 16 with identified VOC contaminants of concern in soil gas. The Air Force did not evaluate alternatives for site PRL T-46 because there were no contaminants of concern for the vapor intrusion pathway. The Air Force proposes to take no cleanup action at this site for the vapor intrusion pathway.

The Air Force's preferred cleanup alternative for SA 16 is Alternative 2A, institutional controls. The Air Force asks the public to comment on both the preferred alternatives and the other alternatives presented.

Cost estimates for all of the alternatives are in accordance with EPA guidance. The table on page 15 shows the costs for each alternative. The numbering of the alternatives corresponds to the numbers presented in the feasibility study.

Common Elements

Many of these alternatives include common components. The remedial alternatives address only VOC contamination in soil that poses a threat via the vapor intrusion pathway. Each alternative, except for Alternative 1, requires institutional controls until the cleanup action is done.

Alternative 1 - No Action

CERCLA requires a no action alternative to establish a basis for comparison with other alternatives. No cleanup activities take place; therefore this alternative does not actively reduce contamination. Although, natural degradation processes that reduce contamination are allowed to continue. There are no cleanup costs for this alternative.

Alternative 2A - Institutional Controls Only (Restricted Land Use)

Under Alternative 2A, institutional controls will be implemented to eliminate or limit exposure via indoor air inhalation to human

receptors by restricting use to industrial activities. They will remain in place until natural attenuation processes have reduced contaminant levels to those acceptable for unrestricted use.

The Air Force will place institutional controls on the property, in the form of deed restrictions. The institutional controls will be worded to meet the remedial action objectives contained in this and, as appropriate, other RODs affecting the property. The institutional controls will also be included in a state land use covenant (SLUC), which the Air Force and the State will execute, and which will be recorded immediately prior to recordation of the deed.

Prior to deeding of the property, restrictions equivalent to the institutional controls are imposed by the lease documents for the property. The Air Force is responsible for monitoring and enforcing those restrictions.

Alternative 2B - Institutional Controls with Vapor Barriers and Gas Collection (Restricted Land Use)

Under Alternative 2B, institutional controls would be implemented to eliminate or limit exposure via indoor air inhalation to human receptors much like the previous alternative. Alternative 2B includes engineered controls (vapor barriers and gas collection). Alternative 2B could support residential land use because the protection of the vapor intrusion pathway is more robust with the addition of vapor barriers and gas collection.

Under Alternative 2B, vapor barriers would be installed in building foundations over VOC-contaminated shallow soil gas, to limit migration of VOCs into indoor air. Vapor barriers could be installed for new construction. Several types of vapor barriers are commercially available, including sheet-type high-density polyethylene and spray-on rubberized asphalt. The specific design of the vapor barrier would be determined by the engineer at the time of implementation and

will be based on the foundation type and location.

Under Alternative 2B, a gas collection system would be installed beneath existing or new occupied buildings. This action would block the pathway to indoor air by venting soil gas to the atmosphere. Gas collection systems utilize a network of perforated pipes installed either sub-slab or in the crawlspace of a building to create preferential pathways for soil gas migrating toward the surface. Soil gas is collected and vented to the atmosphere. Gas collection systems may be operated either passively (with direct ventilation to the atmosphere) or actively (with vacuum extraction and discharge to the atmosphere). For the purposes of the cost estimate, it is assumed that the gas collection system would be passive. Depending on site-specific conditions, a vapor barrier might also be installed to limit any upper migration of residual soil vapor into indoor air. Soil vapor samples would be collected to assess the effectiveness of the gas collection system at reducing contaminant concentrations. With implementation of Alternative 2B and performance monitoring to demonstrate that the venting is effective, the alternative would be protective for residential use of the site.

Alternative 3A – Soil Vapor Extraction (Unrestricted Land Use) and Alternative 3B – SVE (Restricted Land Use)

Under Alternatives 3A and 3B, soil vapor extraction would be implemented at sites containing VOCs in shallow soils. A soil vapor extraction system includes a series of extraction wells connected to a vacuum blower by conveyance piping. The number and location of extraction wells would largely depend on soil permeability, concentration levels, and the extent of contamination. This process would reduce the mobility and volume of the contamination in the subsurface by physically extracting VOCs from the soils and creating reduced pressure in the subsurface, thereby limiting migration of soil gas to indoor air. Extracted vapors would

either undergo further treatment (i.e. granular activated carbon adsorption followed by thermal destruction upon regeneration) or would be vented to the atmosphere for **photolytic dissolution**.

Interim institutional controls and monitoring to verify the effectiveness of the SVE system would be required during operation and would be performed by the Air Force. The Air Force would continue to implement the **encroachment permit process** until the remedial action is complete, even if that occurs after property transfer. Under Alternative 3A, when results of shallow soil gas monitoring indicate that the contamination has been removed to less than unrestricted use preliminary cleanup goals, the system would enter the soil vapor extraction closeout process and eventually be decommissioned, after which the site would be available for unrestricted land use. Although the likely use of the site and surrounding property would continue to be industrial. Under Alternative 3B, the site would be cleaned up to levels acceptable for industrial use, but unacceptable for unrestricted use. Under Alternative 3B, the institutional controls would continue until natural attenuation processes reduce contamination to levels acceptable for unrestricted use.

Alternative 4A – Bioventing (Unrestricted Land Use) and Alternative 4B – Bioventing (Restricted Land Use)

Under Alternatives 4A and 4B, bioventing would be implemented. The bioventing alternative involves delivering oxygen to VOC-contaminated soils by forced air movement, through the extraction and/or injection of air, to increase oxygen concentrations. The addition of oxygen stimulates the natural biodegradation of VOCs by native microorganisms. Site controls, such as fencing, signage, and security, would be implemented as necessary during the remedial action.

In contrast to soil vapor extraction systems, bioventing uses relatively low airflow rates that provide only enough oxygen to sustain microbial activity.

Like in the previous alternative, the Air Force would continue to implement the encroachment permit process until the remedial action is complete, even if that occurs after property transfer. Under Alternative 4A, when soil vapor monitoring data indicate that the contamination has been removed to less than unrestricted use preliminary cleanup goals the bioventing system would enter the closeout process and eventually be decommissioned, after which time the site would be available for unrestricted land use. Although the likely use of the site and surrounding property would continue to be industrial. Under Alternative 4B, the site would be cleaned up to levels below the industrial preliminary cleanup goals, but above the unrestricted use preliminary cleanup goals. Under Alternative 4B, the institutional controls would continue until natural attenuation processes reduce contamination to levels acceptable for unrestricted use.

Alternative 5A – Thermally Enhanced Soil Vapor Extraction (Unrestricted Land Use) and Alternative 5B – Thermally Enhanced SVE (Restricted Land Use)

The Air Force screened out Alternative 5 before the detailed analysis and did not estimate costs. Please see Section H of this Proposed Plan or the Feasibility Study.

Under Alternatives 5A and 5B, thermally enhanced SVE would be implemented to remove VOCs from shallow soil gas. The thermally enhanced soil vapor extraction alternative is similar to traditional soil vapor extraction, but involves electric or radio frequency heating of the subsurface soil to increase the mobility and facilitate extraction of contaminants. Site controls, such as fencing, signage and security, would be implemented as necessary during the remedial action. Interim institutional controls and monitoring

to verify the effectiveness of the thermally enhanced soil vapor extraction system would be required during operation and would be performed by the Air Force. The Air Force would continue to implement the encroachment permit process until the remedial action is complete, even if that occurs after property transfer. Under Alternative 5A, when the analytical results indicate that the contamination has been removed to less than unrestricted use preliminary cleanup goals, the soil vapor extraction system would enter the soil vapor extraction closeout process and eventually be decommissioned, after which time the site would be available for unrestricted land use. Under Alternative 5B, the site would be cleaned up to levels above the unrestricted use preliminary cleanup goals, but below the industrial preliminary cleanup goals. Under Alternative 5B, the institutional controls would continue until natural attenuation processes reduce contamination to levels acceptable for unrestricted use.

Alternative 6A – Excavation and Disposal (Unrestricted Land Use) and Alternative 6B – Excavation and Disposal (Restricted Land Use)

The Air Force screened out Alternative 6 before the detailed analysis and did not estimate costs. Please see Section H of this Proposed Plan or the Feasibility Study.

Under Alternative 6A and 6B, shallow soil contaminated with VOCs would be excavated and transported to a landfill. Excavation would be conducted using conventional earthmoving equipment. In areas where the extent of the target volume is uncertain, laboratory analysis of in situ soil gas samples may be used to guide excavation. Site controls, such as fencing, signage, and security, would be implemented as necessary during the remedial action. Interim institutional controls and monitoring would be implemented until the remedial activities are completed. The Air Force would continue to implement the encroachment permit process until the remedial action is complete,

even if that occurs after property transfer. The excavation void would be backfilled with clean soil.

Under Alternative 6A, the VOC-contaminated soil would be removed from the site such that residual concentrations of VOCs in soil gas are below levels supportive of unrestricted land use. Under Alternative 6B, VOC-contaminated soils would be removed to the extent that residual shallow soil gas contamination is below industrial preliminary cleanup goals. Under Alternative 6B, the institutional controls would continue until natural attenuation processes reduce contamination to levels acceptable for unrestricted use.

H. Evaluation of Alternatives

Nine criteria are used to evaluate the different alternatives in order to select a cleanup alternative. The text box below lists the nine criteria. Three groups make up the nine criteria the first two are the threshold criteria, the next five are the primary balancing criteria and the last two are the modifying criteria. The selected alternative must meet the threshold criteria.

The retained alternatives are effective and implementable at a low to moderate cost for the cleanup of VOCs in shallow soil gas at SA 16. Conversely, Alternatives 5A/5B and 6A/6B (Thermally Enhanced SVE and Excavation and Disposal) were screened out because of relatively high costs. Alternatives 5A/5B and 6A/6B might be more cost effective for sites with more significant shallow soil gas contamination than SA 16.

The evaluation is summarized by criteria.

1. Overall Protection of Human Health and the Environment

Under Alternative 1 for SA 16, no action would not reduce the risk to human health, because exposure to contaminants via the vapor intrusion pathway would be possible. Calculated risk associated with Alternative 1 for this single pathway is at the upper end of the acceptable risk range. Future impacts to

Nine Criteria Used to Evaluate Alternatives

1. **Overall Protection of Human Health and the Environment.** The degree to which each alternative eliminates, reduces, or controls threats to human health and the environment is assessed. Strategies can include treatment, engineering methods, or institutional controls.
2. **Compliance with State and Federal Environmental Requirements.** The alternatives are evaluated for compliance with environmental protection requirements.
3. **Long-term Effectiveness.** The alternatives are evaluated based on their ability to maintain reliable protection of human health and the environment after implementation.
4. **Reduction of Contaminant Toxicity, Mobility, and Volume.** Each alternative is evaluated based on how it reduces the harmfulness of contaminants, their ability to move through the environment.
5. **Short-term Effectiveness.** The length of time needed to implement each alternative is considered. The risks that a particular alternative may pose to workers and nearby residents are assessed.
6. **Implementability.** The technical feasibility and administrative ease of a remedy, including the availability of goods and services, are considered.
7. **Cost.** The benefits of a particular alternative are weighed against the cost of implementation.
8. **State Acceptance.** The Air Force requests State comments on the Proposed Plan. Then, the Air Force considers whether the State agrees with, has reservations about, or opposes the Preferred Alternative.
9. **Community Acceptance.** The Air Force assesses community acceptance of the Preferred Alternative by giving the public an opportunity to comment on the selection process. A public comment period is held. The Air Force considers and responds to public comments before making the final decision.

human health are possible under Alternative 1.

Alternatives 2A and 2B achieve protection of human health by limiting exposure to contaminants through institutional controls.

Alternatives 3A and 3B both provide protection of human health by removing the contaminated soil gas and limiting its migration to indoor air. By inducing a vacuum and actively extracting vapors from the vadose zone, the soil vapor extraction component of Alternatives 3A and 3B provides a preferential pathway for the vapors and prevents vapor buildup beneath the buildings.

Alternatives 4A and 4B provide protection of human health at SA 16 because fuel-related VOCs are eliminated through biological processes. In addition, institutional controls are implemented during the remedial action to protect human health. When the remedial action is complete, a minimal likelihood of risk to human health exists. Soil gas would be collected during treatment to monitor contaminant concentrations. If residual concentrations remain above the unrestricted use levels, the institutional controls would continue to be implemented (Alternative 4B).

2. Compliance with State and Federal Environmental Requirements.

No remedial actions are performed under Alternative 1. However, as discussed in the previous section, there is a potential future threat to human health from the fuel-related VOCs. There is additional uncertainty because all maximum concentrations within SA 16 source areas may not have been identified and other exposure pathways have not been assessed. Therefore, Alternative 1 might not comply with state Applicable or Relevant and Appropriate Requirements (ARARs) for implementation of land use covenants at sites with residual contamination.

Alternatives 2A and 2B comply with ARARs for protection of human health. The institutional and engineering controls could

be designed to comply with location- and action-specific ARARs; however AFRPA and the State are discussing the obligation of the Air Force under the State's regulation. Under Alternative 2B, chemical-specific ARARs are addressed by limiting or eliminating the exposure pathways to contaminated SSG through the use of vapor barriers and gas collection systems.

Alternatives 3A and 3B comply with ARARs. Air emissions that might occur during soil vapor extraction operation would comply with the Sacramento Metropolitan Air Quality Management District requirements. Based on soil gas data for SA 16, it is anticipated that the extracted vapors would not require treatment and can be vented directly to the atmosphere. If vapor treatment is needed, granular activated carbon could be used for a relatively low additional cost.

Alternatives 4A and 4B comply with ARARs. The alternatives involve the treatment of waste at the point of release, rather than excavation. Therefore, regulations that govern the treatment, storage, or disposal of hazardous waste are not applicable.

3. Long-term Effectiveness and Permanence

All current risks remain under Alternative 1 for the short term. Untreated shallow soil gas contamination at SA 16 poses a potential low-level risk to human health via the vapor intrusion pathway. The fuel-related VOC contaminants would attenuate naturally through volatilization, diffusion, and biological degradation, which would provide long-term reduction in risk at the site.

Alternatives 2A and 2B will provide continued protection of human health as long as the institutional controls, particularly prohibiting unrestricted use, are monitored and enforced, and the engineering controls (Alternative 2B) are maintained. The institutional controls in the deed to the property and the SLUC will "run with the land." That is, they are permanent, recorded

encumbrances on the title to the property that will be noted in title insurance reports for all sales transactions involving the property, thereby giving every subsequent purchaser notice of them. If the risk that is the reason for the restriction imposed by an institutional control is mitigated or removed in the future, the landowner may, upon showing to the satisfaction of the Air Force, USEPA, and the State that there is no longer a need for the restriction, request a modification or removal of the institutional control.

Extraction of contaminated shallow soil gas using soil vapor extraction under Alternative 3A and 3B provides long-term effectiveness in protecting human health because the contaminants are permanently removed. Soil vapor extraction systems can reliably attain remedial action objectives for soil gas. Because contaminant concentrations are reduced to levels below the unrestricted use preliminary cleanup goals under Alternative 3A, no long-term institutional controls are needed. Institutional controls would be needed under Alternative 3B, because contaminants are left in place at levels unacceptable for unrestricted use. However, additional degradation of contaminants is likely to occur under Alternative 3B after the system is shut down.

Treatment of the soil contaminants using in situ biological processes under Alternatives 4A and 4B provides long-term effectiveness in protecting human health and the environment because contaminants are permanently destroyed. Bioventing systems can reliably attain performance specifications, and have a high likelihood of attaining unrestricted use levels necessary for Alternative 4A.

For Alternative 4A, long-term institutional controls would not be required if the unrestricted use is attained. Under Alternative 4B, institutional controls continue until natural attenuation reduces contamination to levels acceptable for unrestricted use. The high oxygen levels established in the subsurface during the bioventing operation

would continue to degrade residual concentrations left at the site.

4. Reduction of Toxicity, Mobility or Volume through Treatment

Under Alternative 1, permanent or significant reduction in toxicity and volume will occur as natural biological, chemical, or physical degradation occurs. These processes are irreversible and result in the reduction.

Under the institutional control component of Alternatives 2A and 2B, permanent or significant reduction in toxicity and volume will occur gradually, as in Alternative 1. However, Alternative 2B would result in a reduction in the mobility and volume of contaminants through the use of engineered controls (vapor barriers and gas collection).

Under Alternatives 3A and 3B, contaminated soil gas would be removed from the vadose zone. Both the mobility and volume of contamination are irreversibly reduced by this remedial action.

Under Alternatives 4A and 4B, shallow soil gas contaminated with fuel-related VOCs would be treated using in situ bioventing. The toxicity, mobility, and volume of contamination are all irreversibly reduced by biological processes.

5. Short-term Effectiveness

No remedial action would be taken under Alternative 1. Therefore, residual risks from SSG at the site would remain unchanged in the short term.

Under Alternatives 2A and 2B, the remedial action objectives for protection of human health are achieved in the short term with implementation of institutional controls. No exposure pathways are completed or created with either the implementation of institutional controls or the installation of engineered controls (vapor barriers and gas collection). All site work necessary for construction of the engineered controls would be performed above grade, therefore there would be no direct contact with shallow soil gas.

Prior to the completion of the remedial action under both Alternatives 3A and 3B, institutional controls will be implemented as under Alternative 2A. Under Alternative 3A, institutional controls would be in place during system operation. Implementation, monitoring, and enforcement of the institutional controls would protect human health and the cleanup systems until the unrestricted levels are achieved. Under Alternative 3B, institutional controls would continue after soil vapor extraction was terminated until natural attenuation processes reduce contamination to levels acceptable for unrestricted use.

Prior to completion of the remedial action under Alternatives 4A and 4B, institutional controls would be implemented as under Alternative 2A. For Alternative 4A, these institutional controls would be applied as an interim measure until unrestricted use levels are attained. For Alternative 4B, the institutional controls would continue until natural attenuation processes reduce contamination to levels acceptable for unrestricted use.

6. Implementability

No technology factors are evaluated (e.g., ability to construct or operate the technology, availability and reliability of the technology or specialists) under Alternative 1.

Alternative 2A and 2B are readily implementable on a technical basis. Materials, legal mechanisms, and services to implement the alternatives are available. Because the Air Force will have a right of access in the deed covenant, the Air Force will be able to respond promptly to breaches of the institutional controls and implement future remedial actions if Alternatives 2A or 2B are implemented. Coordination with other remedial programs to address VOC contamination in soil and groundwater will be required.

Alternatives 3A and 3B are technically feasible and reliable for remediation of most VOCs.

The Air Force has successfully implemented soil vapor extraction at McClellan and numerous other installations.

Alternatives 4A and 4B are technically feasible and reliable for cleanup of most fuel-related VOCs. The Air Force has successfully implemented bioventing at McClellan and numerous other installations.

7. Cost

Based on total costs, Alternative 2A is the least costly alternative.

There are no costs associated with Alternative 1.

Under Alternatives 2A and 2B, the annual costs for institutional controls at SA 16, which include Parts 1, 2, and 3 and EPA oversight, are \$4,800. Total costs and present-worth costs for 30 years are shown to allow comparisons between alternatives. However, annual costs for institutional controls will only be incurred until natural attenuation processes reduce contaminants to levels acceptable for unrestricted use. Although institutional controls may be implemented at only a single site at this time, the average costs assume some efficiency in implementing institutional controls at multiple sites over time. For this cost estimate, it was assumed that institutional controls will be implemented at 100 sites.

The primary differences between the costs for Alternatives 2A and 2B are because of the vapor barriers and gas collection systems that would be included in Alternative 2B but not in Alternative 2A. These additional costs would be incurred by the owner of the property during any new construction that might occur.

The estimated costs of implementing Alternatives 3A and 3B are summarized in the following table. The costs include implementing, monitoring, and enforcing institutional controls until the remedial action is completed; installation and operation and maintenance of the soil vapor extraction system; monitoring; and system closeout.

Annual costs for SVE system operation and maintenance and monitoring of the site are included for 2007 through 2009 for Alternative 3A and 2008 for Alternative 3B. For Alternative 3A, after 2009, the system would enter the SVE closeout process and, when approved, system monitoring would be discontinued. For Alternative 3B, institutional controls would be continued after 2008 until residual VOCs naturally degrade.

The estimated costs of implementing Alternatives 4A and 4B include implementing, monitoring, and enforcing institutional controls until the remedial action is completed, installation and O&M of the bioventing system, monitoring, and system closeout. Annual costs for O&M of the monitoring and biovent system of the site are included for 2007 through 2009 for Alternative 4A, and for 2007 through 2008 for Alternative 4B.

More detailed cost information is provided in Appendix D of the Breakout Shallow Soil Gas Feasibility Study.

8. State Acceptance

The State of California agrees with proposed action at site PRL T-46. The State of California does not agree with the proposed action at site SA 16.

9. Community Acceptance

The Air Force will evaluate community

acceptance of the preferred cleanup alternative after the public meeting and the public comment period. The Air Force will describe community acceptance in the Record of Decision.

I. Preferred Cleanup Alternatives

The Air Force proposes Alternative 2A (institutional controls only) at SA 16 that preclude its use for residential activities. It is protective of human health at the lowest cost. Alternative 2B, which is more protective because a vapor barrier and passive gas collection are included, is approximately twice as expensive based on total and present-worth costs as Alternative 2A. The treatment alternatives using bioventing and soil vapor extraction are the most expensive but have the additional benefit of degrading or physically removing the contaminants relatively quickly. The treatment alternatives with long-term institutional controls (Alternatives 3B and 4B) are more expensive than their counterparts that attain the unrestricted use preliminary cleanup goals (Alternatives 3A and 4A).

The contaminants that are most responsible for the elevated health risk at the site are readily biodegradable. Their natural degradation is not accounted for by the health risk approximations used in the risk analysis or cost analysis. Natural processes will reduce the vapor intrusion pathway risk to acceptable levels with or without active contaminant removal. Consequently the cost of alternatives

Cost Comparison for Alternatives^a at SA 16

	Alternative 1 No Action	Alternative 2: Institutional Controls		Alternative 3 SVE		Alternative 4 Bioventing	
		A	B ^b	A	B	A	B
Restricted Land Use	No	Yes	Yes	No	Yes	No	Yes
Total Cost	\$0	\$210,000	\$342,000	\$427,000	\$510,000	\$353,000	\$447,000
PW ₃₀ ^c	\$0	\$154,000	\$286,000	\$408,000	\$444,000	\$336,000	\$382,000

Notes:

a. Alternative 5A/5B and 6A/6B (Thermally Enhanced SVE and Excavation/Landfill) were not retained for detailed analysis at any sites, including costs

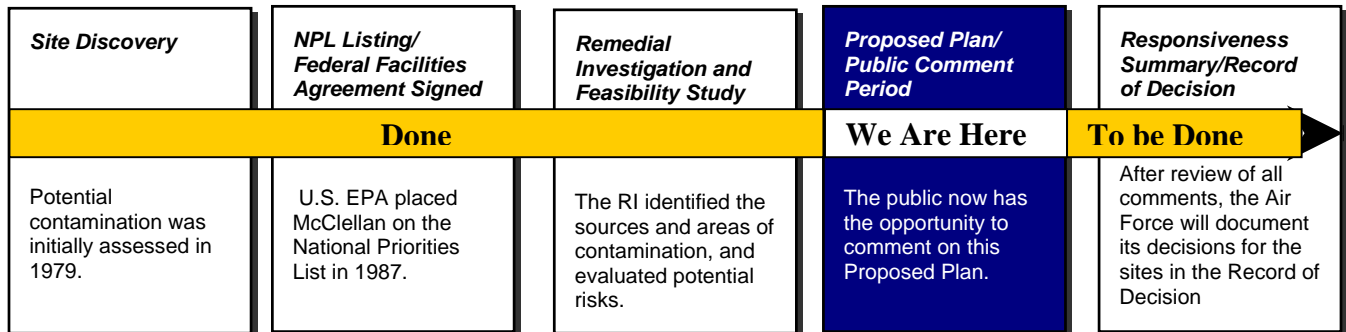
b. Includes Vapor Barriers and Gas Collection

c. PW₃₀ = 30-year **present-worth** cost.

assuming long term institutional controls to preclude unrestricted use are probably overestimated. Based on information currently available, the Air Force believes that the preferred cleanup alternative is protective of human health and the environment. Furthermore, the Air Force believes the

proposed alternative meets all requirements and is cost-effective. The preferred cleanup alternative can change in response to public comments or new information. The Air Force invites community comments on the preferred cleanup alternative, as well as the other alternatives presented in this Proposed Plan.

Installation Restoration Program Process



WE ARE HERE: A 30-day comment period will be held from June 30 through July 29, 2005, to receive public comments on this Proposed Plan. In addition, a public meeting will be held July 13, 2005 at 6:30 p.m. to receive both oral and written comments on the Air Force's proposed alternatives.

J. Community Participation

The Air Force provides cleanup information through public meetings, the Administrative Record and announcements published in community newspapers. The Air Force, along with the Federal and State Regulatory agencies, encourages the public to gain a better understanding of the Superfund activities that have been conducted.

The public comment period begins June 30 and runs through July 29. The public meeting is July 13

What is next?

The Air Force will choose a cleanup remedy based on the RI and the FS, plus other site related reports and comments received during the public comment period.

The decision will be presented in the Breakout Shallow Soil Gas Record of Decision. The record of decision will include a responsiveness summary addressing public and regulatory comments received during the public comment period.

The Air Force expects to sign the Breakout Shallow Soil Gas Record of Decision by December 2005. This will be announced by public notice.

The record of decision will be available to the public on the McClellan website, and at the Administrative Library or by contacting Brian Sytsma, McClellan Community Relations; (916) 643-1250 ext 257.

The dates for the public comment period, the public meeting and the location of the Administrative Record Library are provided on the front page of this Proposed Plan.

Glossary/Acronyms

Air Force Real Property Agency - A field-operating agency activated by the secretary of the Air Force. The mission is to execute the environmental programs and real and personal property disposal for major Air Forces bases in the U.S. being closed.

Applicable or Relevant and Appropriate Requirements (ARARs) – promulgated state laws and regulations that are determined to be relevant and appropriate to the remedy.

Biovent system – A technique used to reduce fuel-related contaminants in soil by introducing air to increase the oxygen content in the soils. The increased oxygen promotes biological activity, allowing microorganisms to break down contaminants.

Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) – Was passed in 1980 and was designed to respond to the past disposal of hazardous substances, which in many cases created inactive, hazardous waste sites. The act was extensively amended in 1986 by the Superfund Amendments and Reauthorization Act, which amended CERCLA and brought existing Department of Defense cleanup programs into CERCLA.

Contaminants of Concern – Substances selected for remediation based on: (1) predicted impacts to surface water or groundwater resources; (2) concentration measurements above maximum contaminant levels; and (3) health risk posed by the contaminant.

Encroachment Permit Process – An Air Force process used to control the site soil disturbance activities to prevent damage to any cleanup activities and to ensure that proper Health and Safety precautions are taken in contaminated areas of the base.

Environmental Summary Folder (ESF) - a file of all document information related to a site that is available in the administrative record for public review.

Feasibility Study (FS) – A study of a hazardous waste site that must be completed before a cleanup remedy can be chosen and implemented. The FS identifies and evaluates alternatives for addressing contamination.

Groundwater – Underground water that fills pores between particles of soil, sand, and gravel or openings in rocks to the point of saturation. Where groundwater occurs in significant

quantity, it can be used as a source of drinking water.

Institutional Controls – Administrative or legal mechanisms that protect property users and the public from existing contamination remaining at the site.

Oil/Water Separator – A device, often in the form of a tank, that allows oil to float to the top while the water below is drained off.

National Oil and Hazardous Substances Pollution Contingency Plan (NCP) – The federal regulation that guides determination of the sites to be cleaned up under the Superfund program. This plan also provides the organizational structure and procedures for preparing for and responding to discharges of oil and releases of hazardous substances in accordance with CERCLA and the Clean Water Act.

National Priorities List – EPA's published list of the highest priority hazardous waste sites in the United States for investigation and cleanup.

Photolytic Dissolution – Natural process by which organic compounds in the atmosphere are degraded by sunlight.

Preferred Cleanup Alternative – The Air Force's suggested cleanup method for the contaminated site. The preferred alternative is protective of human health and the environment, complies with ARARs and is cost-effective.

Preliminary Cleanup Goals (PCGs) – Clean up goals set for the protection of human health. The set risk level is one in a million - one person out of a million people may contract cancer.

Present Worth – Like the Total Cost, Present Worth includes construction and annual operation and maintenance costs over the life of the alternative. It is the amount of money that would need to be invested today in order to yield the funds required over the life of the alternative.

Proposed Plan - A summary of remedial alternatives for a contaminated site, including a preferred alternative and the reasons for its selection. This step is the community's opportunity to review and comment on all cleanup alternatives under consideration. The responses to the comments are presented in the Record of Decision. All changes from the Proposed Plan are explained in the ROD.

Record of Decision (ROD) – A document explaining and legally committing the lead agency to the cleanup alternative(s) that will be used at a site. The ROD is based on information and technical analyses generated during the remedial investigation, the feasibility study, and consideration of public comments and community concerns.

Remedial Investigation (RI) – A hazardous waste site study to examine the nature and extent of site contamination.

Responsiveness Summary – The section within the Record of Decision that summarizes comments received from the public during the public comment period, and provides lead agency response to them.

Restoration Advisory Board – A board consisting primarily of members of the public. RAB members have the opportunity to review cleanup reports and provide advice to decision makers on investigation and cleanup matters. The RAB is a forum for the exchange of information between community members, regulatory agencies and Air Force personnel.

Risk Assessment – A study based on the results of the remedial investigation to determine the extent to which chemical contaminants found at a Superfund site pose a risk to public health and the environment.

Shallow Soil Gas – Soil gas within 15 feet of the ground surface.

Soil Gas - Air in between soil particles that may be contaminated by contaminants that have vaporized in the soil.

Soil Vapor Extraction – A method of treating soil contaminants by extracting contaminated soil gas using perforated underground pipes connected to vacuum pumps.

Unrestricted Use - Risk is reduced to such a low level as to allow anything to be built, including homes and schools.

Volatile Organic Compound (VOC) – An organic compound containing carbon that evaporates (volatilizes) readily at room temperature. At McClellan, most VOCs are chlorinated compounds but not at the two sites covered by this proposed plan.

Vapor Intrusion Pathway – A pathway used in risk analysis where contaminants in the soil volatilize into soil gas, migrate into buildings and inhaled by the occupants.

**For further
information on the sites,
please contact:**

Air Force Real Property Agency

*Brian Sytsma
McClellan Community Relations;
(916) 643-1250 ext 257*

Department of Toxic Substance Control

*Kris Escarda
Public Participation Specialist
(916) 255-6683*

or

*Kevin Depies
Remedial Project Manager
(916) 255-3688*

**United States Environmental
Protection Agency**

*Viola Cooper
Community Involvement Coordinator
(415) 972-3243 or (800) 231-3075*

or

*Joe Healy
Remedial Project Manager
(415) 972-3269*

USE THIS SPACE TO WRITE YOUR COMMENTS

Your input on the Proposed Plan for the former McClellan Air Force Base is important to the Air Force. Comments provided by the public are valuable in helping the Air Force select a final cleanup remedy for the sites.

You may use the space below to write your comments, then fold and mail. Please use additional pages if needed. Comments must be postmarked by July 29, 2005. The address to mail your comments to is: AFRPA/DD, 3411 Olson Street, McClellan, CA 95652. If you have any questions about the comment period, please contact Brian Systma at (916) 643-1250, Ext. 257. Those with electronic communications capabilities may submit their comments to the Air Force via Internet at the following email address: brian.sytsma@af.mil

If you would like to be on the mailing list to receive information about environmental restoration activities at the former McClellan Air Force Base, please complete the Name and Address section below and mark the box. Please mail this page to the above address.

Name _____
Address _____
City _____ State _____ Zip _____

Email Address _____
(Optional)
 Yes, add me to the mailing list.



Return Address:

**Air Force Real Property Agency
Attention: Community Relations
3411 Olson Street
McClellan, CA 95652-1003**

