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Responsiveness Summary:

Basewide Engineering Evaluation–Cost Analysis

for Soil Vapor Extraction

(1) Response to Comments Raised in Public Meeting

(2) Response to RPM Comments

McClellan Air Force Base

November 1993

Response to Comments Raised in Public Meeting
on Soil Vapor Extraction (SVE)
Engineering Evaluation–Cost Analysis

22 September 1993

Vineland Elementary School
Rio Linda, California

Introduction

The transcript of the public meeting was reviewed to identify technical and procedural questions and issues raised by the citizens who attended the meeting. Government and other officials in attendance responded to these issues at the meeting. The following responses to the issues reflect those comments, as well as additional information relevant to the issue.

The comments from the meeting have been combined into logical groups for the purposes of this summary of responses. For each major issue identified, the principal commenter(s) and the pages on which the issue was most clearly raised are listed. The order in which the issues are listed is not a reflection of their level of priority.

Context

A soil vapor extraction (SVE) system was operated at Site S on McClellan AFB (McAFB) for about eight weeks in the spring of 1993, and then was shut down due to nuisance emissions of hydrochloric acid (HCl) gas. Since that time, modifications of the Site S system have been planned and work is underway to add a scrubber to remove the HCl from the exhaust gases. In addition, the Site S system has been modified to include a resin-based pollutant removal system as an alternative to the catalytic oxidation system and scrubber.

The purpose of the public meeting on 22 September was to inform and elicit comments from the public about plans to operate up to five SVE systems at various locations on McAFB as part of basewide removal actions.

Issue 1—Adequacy of SVE Test at Site S

(p. 25 and others) Frank Miller and others stated that the duration of the Site S test duration was not sufficient to demonstrate either the effectiveness of the SVE process or its safety for general application in the McAFB remediation effort. They stated that the test was a failure since it was shut down prematurely and has not operated since its shutdown in the spring of 1993.

Response:

The purpose of the SVE operation at Site S was to test whether or not SVE would be effective in removing and treating pollutants (especially chlorinated hydrocarbons), given the contamination and soil conditions at McAFB. The test also was intended to identify

operational problem areas and to indicate what changes might be made to enhance the cost effectiveness of SVE.

The test was a success with respect to its stated purpose. The Site S SVE system removed approximately 46,000 pounds of chlorinated hydrocarbons from the soil in less than eight weeks of test operation. This compares to about 43,000 pounds removed by four groundwater treatment systems over nearly eight years of much more expensive operation. The SVE equipment functioned reliably, as did the gas treatment (catalytic oxidation) system. Exhaust stream testing showed greater than 99 percent destruction of the chlorinated hydrocarbons, well above the 95 percent minimum guaranteed by the system manufacturer.

The only significant problem that occurred was the nuisance to nearby on-base personnel as a result of the emission of HCl gases from the treatment system. These gases were expected to be present, and the emissions were below limits established for this operation. However, in response to complaints from on-base personnel, the SVE system was shut down pending installation of a scrubber to remove the HCl.

During this shutdown period, McAFB also added a Purus PADRE resin system to the Site S SVE system. This resin system is designed to directly absorb chlorinated hydrocarbons from the gas stream, thus potentially avoiding the need for the catalytic oxidation system or the scrubber. This would eliminate the generation of HCl, as well as the NOx now being emitted. It is McAFB's intention to restart the Site S SVE system using the resin removal system and operate it for about eight weeks to test the system. After this test, the catalytic oxidation/scrubber system will be operated for about four months. The results of the two test will be compared and used to guide the designs of future SVE systems at McAFB.

Issue 2—Operation of SVE During Periods of Rainfall

(p. 30 and others) Frank Miller and others raised the concern that due to the short duration of the Site S test, there is no operational information from the "wet" winter months of the year. The presence of excessive water in the soil could cause the operation to fail or be ineffective.

Response:

It is correct that the Site S SVE system was not operated during the winter when there is usually substantial rainfall. However, review of the SVE technology and the characteristics of the McAFB soils do not suggest that excessive water will pose a problem. Site S SVE is designed to remove gases from the pore space—as well as any liquid contaminant—in the vadose (unsaturated) zones in the soil above the water table. Because the water table is so far below the surface (80–100 feet) and because the pore space is relatively large (20-30 percent), even heavy rainfalls should not fill the pore space and block gas flow. When the SVE system is reactivated, its operation will be monitored through the winter months to determine if the amount of rain has any noticeable effect on operations.

Issue 3—Compacting Soils and SVE Effectiveness

(p. 74) Jo Ann Fuller and others raised the concern that SVE operations will cause the soils to compact or become plugged, resulting in diminished effectiveness. Further, there are no plans for correcting such a problem should it occur.

Response:

SVE has been used at many other sites in California and elsewhere with no evidence that compaction of soils is likely. Even at highly contaminated sites, the pore space occupied by pollutants is relatively small, so contamination represents only a small fraction of the soil volume. This implies that any settling of the ground would be essentially undetectable. Another mechanism for soil compaction might be the application of the vacuum, resulting in reduced withdrawal efficiency and the need for higher vacuum. If this were a problem, it would manifest itself in the area immediately next to the well screen where the pressure differential (pressure drop) is the highest, where a very significant reduction in the gas flow for a particular applied vacuum would be observed. There is no evidence that this has occurred.

Issue 4—SVE Failure Modes

(p. 62) Paul Miller raised the concern that there might be failure modes of the SVE system that would endanger off-site citizens.

Response:

The primary concern appears to be that there could be a catastrophic failure mode that would create an immediate threat to persons off the base or on the base. There is no possibility that the SVE system could fail in this mode. Any significant equipment failure will cause the SVE system to shut down, thus returning the site to its non-operating status. As originally designed, the SVE system treats the withdrawn gases as they are removed, so there is no storage of contaminants that could escape in a failure scenario. Also, there is no catastrophic failure mode for support systems such as the catalytic oxidation unit. These systems use energy and materials as needed, and they do not draw from stored materials such as tanks of propane. The new scrubber unit does contain caustic materials to neutralize the HCl gases; however, this is contained in permitted, double-protected housings. The material is in liquid form, and it would be contained at the site in the event of a leak.

The new resin system being tested is designed to absorb the contaminants withdrawn from the site. The resins—as well as the contaminants removed from the resin—are stored in closed containers. Even in the event of a resin spill, the contaminants would remain physically and chemically locked in the resin. The tank holding the contaminants extracted from the resins will be emptied each day, with the materials stored on base in approved facilities pending ultimate disposal.

A secondary concern may be that air emissions are possible threats to the community. The emissions from the SVE system are regulated by the state of California and by the U.S. Environmental Protection Agency. Plant operations and key emissions are continuously monitored, and special monitoring is done as required. Operation of the Site S system has met all requirements during its test phase and is expected to continue to meet air emissions requirements in the future. If operation of the SVE system falls outside requirements, it will be shut down.

Issue 5—HCl Emissions

(pp. 68 and 114) Trudy Ross and others raised concerns that the release of HCl should not have occurred from a properly run and proven system and that the correction measures

have not been demonstrated. They questioned how the new system will be operated and monitored.

Response:

As noted above, HCl emissions were predicted, and they occurred as expected. Although the ground-level concentrations were higher than expected, they were within regulatory limits. McAFB did not anticipate that HCl emissions would constitute a nuisance; however, when on-base personnel expressed their concerns, McAFB shut down the system. One of the purposes of the test of the SVE system was to detect this type of problem.

When the SVE system at Site S is restarted and operations at other sites are started for the first time, HCl and other emissions will be monitored to ensure that they are within legal requirements and to ensure that there is no adverse effect on persons on the base or off the base. If there is an adverse effect, the systems will be shut down. As always, monitoring results will be shared with the public.

Issue 6—Off-Base Air Monitoring

(pp. 49 and 107) Bill Ross raised the concern about the commitment of McAFB to off-site air monitoring.

Response:

The concern was raised that there is no agency responsible for monitoring the air if a citizen believes his or her health is being affected by air pollutants from McAFB. It is true that there is no such agency. All governmental agencies operate under laws and regulations that establish their roles, as well as under budget constraints that can restrict their efforts to levels below that believed desirable. Therefore, government agencies must establish a graduated response to complaints or apparent problems to best use their resources.

If a citizen believes he or she is adversely affected by an air pollutant, several agencies near McAFB are committed to responding to the complaint. If, in the judgment of the agency, there appears to be a problem that warrants investigation, the agency will take additional steps. If the agency has the jurisdiction and resources, it will initiate the investigation. If it does not have the jurisdiction, it will take steps to bring in another agency to conduct the investigation. If it does not have the resources, it will identify the need for an investigation and attempt to gain the resources or otherwise address the problem.

Whether or not a probable problem is found, the agency will inform the complainant of the findings and the intended action to be taken. In the final analysis, if the complainant is not satisfied with the response, he or she can procure their own private monitoring or raise the issue to a higher administrative or political level.

McAFB have been responsive throughout the years since contamination was first identified on base. From the beginning, McAFB has taken a liberal interpretation of its jurisdiction with respect to the citizens in the area, working with them to test water and air off base. In addition, McAFB has supported evaluation of epidemiological information to ensure early identification and correction of any adverse effects arising from the contamination. McAFB has received the cooperation of the large majority of the surrounding communities in the past and continues to work with them. There is an ongoing effort to sample groundwater outside McAFB and to sample domestic wells as appropriate. McAFB has just concluded an investigation of the possible presence of gas contamination in crawl spaces under

housing in some of the adjacent neighborhoods, with the conclusion that there was very little contamination. Even though many of these efforts were not required by law or regulation, McAFB believes they are important not only to reassure the neighboring communities, but also to build as complete a picture as possible of what McAFB has done, and not done, to these communities. McAFB plans to continue to be liberal in support of off-site monitoring, although it is not possible to guarantee complete compliance with what any particular person requests. McAFB does guarantee that every complaint will be treated seriously, that it will be evaluated, and that the findings will be discussed with the complainant.

Issue 7—Operation of Resin System

(p. 81 and others) Charles Yarbrough and others raise questions about the plans for the use of the resin system in the SVE system.

Response:

As noted earlier, HCl is generated during the gas treatment of the chlorinated hydrocarbons, a component of volatile organic hydrocarbon compounds (VOCs). Also discussed above was McAFB's plan to install a scrubber to remove HCl from the exhaust gases. A different way to eliminate HCl is to prevent the VOCs from reaching the catalytic oxidation chamber in the first place, thus preventing the formation of HCl. McAFB has installed a Purus PADRE resin system in front of the catalytic oxidation system at Site S. The gases from the SVE system will pass through the resin, which will remove the VOCs. The remaining gases will pass through the catalytic oxidation system and then be discharged.

The catalytic oxidation system will remain in place while the resin system is being tested. The first reason is to ensure that the VOCs are destroyed even if the resin bed does not function as well as anticipated. The second reason is that there are other gases present, such as vinyl chloride, that are not likely to be removed by the resin system to the extent necessary but which are destroyed by the catalytic oxidation system.

During the next several months, this combined system will be tested and the effectiveness of the removal for all the gases of concern will be measured. The resin system has been evaluated in the past, but was not installed in the initial SVE system because of limited information at the time. The cost of operating the resin system was perceived to be higher than the cost of operating the catalytic oxidation system, especially with the large amounts of contaminants found at Site S. McAFB has continued to evaluate resin systems for use in SVE gas treatment, with particular interest in applying it when the concentrations of pollutants are lower.

The scrubber system to be installed and operational in about two months. At that time, McAFB will test the effectiveness of the scrubber in removing HCl from the exhaust gases and its cost of operation. Depending on the results of the test at Site S and the continued evaluation of experience elsewhere, the use of resin systems and/or scrubbers will be considered for additional SVE systems at McAFB.

Issue 8—Scale of SVE at McAFB

(pp. 74, 93, and others) Jo Ann Fuller, Barbara Miller, and others raised questions about the scale of plans to install SVE systems around the base concerning the number of systems, locations, and the area to be remediated.

Response:

The current plan is to operate approximately five SVE systems at McAFB. The primary purpose of this action is to provide early removal of significant quantities of the greatest concentrations of contaminants to interrupt the movement of soil contamination into the groundwater. The secondary purpose of the program is to further evaluate the use of SVE at McAFB. While the Site S SVE system has generated operational and cost data and will continue to do so, the additional systems will augment those data and help us to gain experience with SVE systems in different soils and contamination conditions at McAFB, while reducing new groundwater contamination.

Determining the area of effectiveness of each of the SVE systems is a more complex issue. Most of the five systems will be installed under areas that are covered by impermeable coverings ("caps"). These range from the specially applied covering at OU D containing Site S to concrete floors remaining from demolished buildings. Though the removal rates are undoubtedly higher if the contamination is closer to the SVE well(s), in the presence of a cap the SVE system will draw gas from under the entire cap, thus making the cap area the effective area of contaminant removal. In areas without caps, the area from which effective removal takes place depends on the soils, the layout of the SVE wells, and the methods of operation of the SVE system.

In most cases, it has not been fully feasible to characterize the exact mix of pollutants and their spatial distribution underground. This difficulty results in part from overlapping sources and sites and from the high cost of the extensive drilling and sampling. Rather than spend resources on detailed characterization, sufficient sampling is performed to identify representative types of contaminants, approximate concentrations, and approximate spatial distributions. One of the advantages of SVE is that it can function at some distance (up to several hundred feet) to remove contaminants. In contrast, physical removal of contaminated soil requires precise identification of the location of contaminated soil. In addition, since SVE removes soil gas arising at some distance from the SVE well, it serves in part as its own sampling system for areas within its radius of influence. This information can be used as feedback to the SVE designers and operators to modify the system operation—or to extend the system—to accomplish the goals of the removal action.

Issue 9—Public Participation

(p. 38) Leslie Birkenstock takes issue with the apparent lack of public involvement in this and related cleanup issues and questions McAFB commitment to public involvement.

Response:

The questioner challenged the degree of public notice for the particular meeting, as well as the general commitment to public participation by McAFB. Public notice was given by display advertisements, press releases, and interviews to the media, well beyond that required by law. Mailings were made to the full McAFB mailing list of 2,600 parties that have shown interest in environmental issues at McAFB. These actions follow the long-standing policy of McAFB to inform and involve the public as fully as possible concerning

actions proposed by McAFB or findings made as a result of the program. The questioner, in fact, noticed one of the advertisements and participated in the meeting as a result.

We suspect that our outreach efforts early in the McAFB remediation process was helped by a high level of public concern for the problems at McAFB at that time. The positive response of McAFB in part addressed these concerns by showing McAFB's commitment to solving the contamination problems. As the community has become more convinced that McAFB is committed to solving these problems, fewer persons have felt the need to be actively involved in our community outreach. Nevertheless, the questioner is representative of a group of persons not involved early in the process, and this suggests that the public is not as thoroughly engaged as might be desired. McAFB is committed to effective public participation in its restoration activities and will review its already strong program to identify ways to bring newly interested or affected people into the process.

Issue 10—Destruction Standards for Gas Treatment

(p. 49) Bill Ross inquired about the regulatory requirement for the destructive efficiency of the gas treatment system and about the policy for operation with respect to the requirement.

Response:

In cooperation with the U.S. Environmental Protection Agency, the local jurisdictions, and the California Air Quality Control Board, the state of California has reviewed and approved the Site S SVE system. Based on their evaluation of the performance capability of the catalytic oxidation gas treatment system and of the concentrations and amounts of pollutants in the gas stream, they agreed that catalytic oxidation was the best choice for the SVE system. The manufacturer claimed a minimum removal rate of 95 percent for the VOCs to be treated, which implies that the overall concentration of VOCs (including both chlorinated and non-chlorinated hydrocarbons) in the exhaust is less than 5 percent of the entering concentration. In fact, monitoring performed during the test period consistently showed removal rates above 99 percent. The McAFB policy is that every effort will be made to operate at or above 99 percent removal, and that operation below that removal rate will not be allowed for any extended period of time.

California also has established limits on dioxin and other pollutants in the exhaust of the SVE system. In all cases, the operation of the SVE system at Site S has more than satisfied the requirements.

Issue 11—Clean-Up Levels to Be Achieved

A number of questions implied concern about the ultimate cleanup levels to be achieved and how these levels will be integrated into the ultimate cleanup of contamination at McAFB.

Response:

The Site S SVE study and the proposed additional four new SVE sites are being planned as non–time-critical removal actions pursuant to CERCLA. These are actions designed to make immediate reductions in the potential for further groundwater contamination, and the consequent potential dispersal of contaminants. So far as can be determined, the actions are consistent with all plausible long-term remediation actions, and indeed, are themselves likely to be components of long-term remediation methods at McAFB. The actions are

proposed, studied, and approved by California and federal agencies pursuant to CERCLA and all applicable laws and regulations.

Because these removal actions are being taken in advance of the results of the overall long-term McAFB contamination evaluation and the analysis and selection of alternative remediation measures, it is not feasible to establish precise cleanup levels for the removal action. Because of the difficulty in making precise estimates of the total amount of contamination present at each site, it is also not feasible to identify precise goals in terms of initial quantities. Instead, it is McAFB's intention to operate each SVE system to remove contaminants as long as the system is reasonably cost-effective. As shown at Site S, initial removal rates can be very high. It is expected that after several months of operation, the concentrations of contaminants in the gas stream will decrease. When these concentrations decrease to such levels that little material is being removed, SVE operations will cease or be moved to a location that provides more effective removal.

In any case, the final decisions concerning the contamination concentrations and amounts that are the target of the long-term McAFB remediation will be made as part of the overall remediation process pursuant to CERCLA. Specifically, based on the experience gained with SVE and other remediation measures, McAFB plans to propose a series of actions that will be embodied in Records of Decision (RODs). It is anticipated that one of these will be a basewide SVE ROD. The proposed alternative cleanup measures and the degree of cleanup will be subjects of the public debate required under the ROD process, and will include the data and findings from the SVE removal action. The alternatives will be developed taking into account contamination concentrations and amounts, technologies available to further remove or reduce the adverse effects of those pollutants, the risk to the public associated with the pollutants, and other factors as relevant. The standards and regulations to be applied will be all the Applicable or Relevant and Appropriate Requirements.

Response to RPM Comments on
Basewide Engineering Evaluation—Cost Analysis
for Soil Vapor Extraction

U.S. Environmental Protection Agency, Region IX

General Evaluation Document

1. **Comment:** Section 1, page 4, VOC Cleanup Levels. This discussion is very confusing and does not, in my opinion, represent the discussions on this subject at project managers meetings. It is my recollection that we agreed that these removal actions would cite the state of California anti-degradation policy as an ARAR and evaluate the effectiveness of SVE in attaining this ARAR. The EE/CA should be modified to present how the AF will assess the effectiveness of the removal action to meet this ARAR.

   Response: The text has been revised to clarify the role of the initial basewide SVE removal actions in the determination of VOC cleanup levels. It is McAFB's strategy to use basewide removal actions to facilitate the development of realistic VOC cleanup levels by generating site-specific cost and performance information. These removal actions will not specify VOC cleanup levels; instead, they will specify a VOC cleanup goal. While it is not a legal requirement to meet the cleanup goal, this goal will be attained to the extent feasible. The initial cleanup goal is set at background level, the most stringent interpretation of California's antidegradation policy. The SVE system will be designed and operated in an effort to attain this initial goal. As the removal action progresses, it will generate cost and performance information that will be used to evaluate the feasibility of attaining the initial goal. If it is not feasible to attain background level, VOC cleanup levels will be set at the lowest levels achievable, providing those levels are protective of groundwater beneficial uses.

   Section 8 of the General Evaluation Document outlines the framework for evaluating SVE performance. Descriptions of the sampling plan, evaluation procedures, and decision factors are outside the scope of this document and will be included in the workplan, design document, and other documents, as appropriate. VOC cleanup levels ultimately will be specified in the basewide SVE ROD, using support from the evaluation of basewide removal actions.

2. Section 5, pages 29-35, Applicable or Relevant and Appropriate Requirements (ARARs).

(a) **Comment:** Second paragraph page 29, first sentence, remove "..., except when removal actions involve ...".

   Response: Agreed; the text has been deleted.

(b) **Comment:** Third paragraph, last sentence, states that soil cleanup ARARs will not be attained. The EE/CA should evaluate if this is correct; i.e., will soil cleanup ARARs be met?, how will the AF evaluate this? If the AF determines that it is not practicable to meet this ARAR then a discussion on the evaluation is appropriate.

   Response: The text has been clarified to specify California's antidegradation policy as an ARAR. The SVE system and its operation will be designed to try to attain background levels. It is possible that this goal will not be met during the removal

action since the primary objective is to achieve early risk reduction by removing significant quantities of VOCs from soils in the vadose zone. Cost and performance information generated during the removal action will be evaluated to develop numerical cleanup levels in accordance with the antidegradation policy. The evaluation of the feasibility of meeting background cleanup levels and the determination cleanup levels will be documented in decision support documents for the basewide SVE ROD.

(c) **Comment:** Chemical Specific ARARs, first paragraph, last sentence, should address TBCs as well.

Response: Agreed; the text has been revised to include a description of TBCs (To Be Considered criteria) identified by the Regional Water Quality Control Board.

(d) **Comment:** Chemical Specific ARARs, second paragraph, third sentence, how will the AF consider ARARs in other media? It is appropriate to provide this evaluation as a part of this document.

Response: The effect on soil cleanup levels of ARARs in other media will be determined based on a combination of modeling and sampling, complemented by coordination and consultation with the regulatory agencies. Also see response to Comment 1.

(e) **Comment:** SMAQMD Rule 202, New Source Review, page 31, how will the AF comply with the offset requirements?

Response: The base currently is purchasing the NOx credit needed for planned SVE removal actions. In the future, the base will purchase or lease NOx credit needed for additional SVE operations.

(f) **Comment:** SMAQMD Rule 402, Nuisance, page 32, is Title 22, Section 66264.343 (b) an ARAR? What will the AF do if 1.8 Kg/hr is not attainable? How will the AF evaluate emissions as a goal?

Response: Title 22, Section 66264.343 (b) is a TBC, not an ARAR; it applies to incinerators and does not apply to the catalytic oxidizer. This TBC is included because it specifies HCl emission requirements that can be used to set performance requirements for the off-gas treatment unit. The HCl scrubber has been designed to operate at 99% removal efficiency, and HCl emissions are expected to be much less than 4 lbs/hr (1.8 kg/hr). Emissions will be monitored periodically to ensure compliance.

(g) **Comment:** Location Specific ARARs, page 35, last paragraph, how will these ARARs be applied? Last sentence states that the AF will not attempt to comply to the maximum extent possible. In the event that the AF can not fully comply there must be documentation as to why this is not possible.

Response: Location-specific ARARs will be identified as part of the analysis for site-specific SVE removal actions; they will be described in site-specific EE/CA documents. If a proposed site is at or near any of the locations listed in Table 5-3, SVE design and operation will be modified to comply with the additional requirements associated with the special location. The design document for each site will describe how the AF will comply with these ARARs. For those cases in which full compliance is not possible, a document will be prepared to explain the reason.

3. **Comment:** Section 6, SVE Technology Description and Cost Estimate, pages 36–49. (a) Adsorption, page 39, second paragraph, the AF should provide a more detailed discussion on the replacement and regeneration of the carbon filters. (b) Catalytic Oxidation, Page 40, last paragraph, the AF should provide a more detailed discussion on the waste stream generated from the scrubber as well as disposal of this waste stream.

   Response: (a) The AF plans to regenerate carbon off base. The EE/CA document provides a general description of the SVE system, and the SVE design document will provide a more detailed description of carbon replacement and regeneration. (b) Agreed; the text has been revised to include a description of the treatment and disposal of the waste stream generated from the scrubber.

4. **Comment:** Section 7, SVE System Enhancements, Alternative Off-Gas Treatment, page 49. The discussion on resin adsorption should be more detailed with respect to waste stream generated and disposal.

   Response: Agreed; the text has been revised to reflect the current plan for Site S waste stream generation and disposal of the resin adsorption system.

5. **Comment:** Section 8, Evaluation Process, page 50-53. It has been my understanding that the AF would attempt to evaluate these removal actions for compliance with the non-degradation policy (see comment 1). As presented here the AF will not make this determination until after the removal action is complete. It is also appropriate to state that the non-degradation policy is an ARAR and make a calculation to determine mass flux to groundwater that complies with non-degradation (of groundwater) in the event that SVE is not capable of attaining non-degradation for soils.

   Response: California's antidegradation policy is included as an ARAR. As applied to removal actions, the antidegradation policy is interpreted as a goal and background levels are used as the starting point. It is recognized that the removal action may not be able to attain this goal, but the data from the removal actions will be used to generate information regarding the feasibility of future SVE remedial actions. If background levels cannot be achieved, the cost and performance data will be used to determine appropriate cleanup levels that are both achievable and protective of groundwater beneficial uses. The evaluation process and the decision will be documented in the basewide SVE ROD.

Response to RPM Comments on
Basewide Engineering Evaluation—Cost Analysis
for Soil Vapor Extraction

California Regional Water Quality Control Board,
Central Valley Region

General Evaluation Document

1. **Comment:** GED, Page 4, fourth paragraph. It is stated that if the goal is not technically and economically feasible, then the cleanup level will be set at the lowest level achievable. Verbiage should be included that the established cleanup level must be protective of all beneficial uses of the ground water. This will include municipal, industrial, and agricultural supply. See Table 5-1, which discusses ARARs.

   Response: Agreed; the text has been revised accordingly.

Site Specific Document OU D / Site 3

2. **Comment:** Site Specific Document OU D/Site 3, page 9, first paragraph. The second sentence states that the removal action will characterize the site and remove any contamination that is detected. Is McClellan willing to establish cleanup values at background concentrations? If so, a significant amount of time and effort can be saved in the cleanup level determination.

   Response: The text has been revised. The SVE system and its operation will be designed in an effort to attain background levels in accordance with California's antidegradation policy. It is possible that this goal will not be met during the removal action since the primary objective is to achieve early risk reduction by removing significant quantities of VOCs from soils in the vadose zone. Cost and performance information generated during the removal action will be evaluated to develop numerical cleanup levels in accordance with the antidegradation policy. The evaluation of the feasibility of meeting background cleanup levels and the determination cleanup levels will be documented in decision support documents for the basewide SVE ROD.

Response to RPM Comments on
Basewide Engineering Evaluation—Cost Analysis
for Soil Vapor Extraction

State of California Environmental Protection Agency
Department of Toxic Substances Control

General Evaluation Document: General Comments

1. **Comment:** The Department recommends that the SVE EE/CA include a section describing how McAFB will evaluate the potential cumulative impacts (e.g., oxides of nitrogen (NOx) and hydrogen chloride (HCl) emissions) of this "plug in" concept.

   Response: Agreed; the fourth paragraph of Section 5 has been revised.

2. **Comment:** The Department recommends that a neutron probe be used prior, during and after operation of the SVE system. The neutron probes would probably be of most use at sites where saturated conditions are suspected (e.g., Industrial Waste Line (IWL), sumps, etc.). Ideally, the neutron probe response would be discrete lithologies. Use of the neutron probe would be helpful in evaluating effects of SVE on soil moisture (and possibly Dense Non-Aqueous Phase Liquids (DNAPLs). In areas where the IWL would be a potential source area, monitoring of the neutron probe response would aid in determining the effectiveness of repairing the IWL.

   Response: Although installation of a boring that could be used for repeated continuous neutron probe measurements would provide information about dewatering of subsurface soils during SVE operations and measure water infiltration during high rainfall events, there is no specific performance measure for the SVE system that could be derived from these data. Therefore, the installation of a boring for neutron probe measurements is not a standard part of the SVE system described in the EE/CA. Specific data quality objectives will be developed for various applications. Those applications that pertain to SVE operations can be incorporated into future design documents for individual sites.

   The location of borings for the neutron probe measurements will have to be specific to the information desired. A boring that is used to study soil dewatering should probably be installed at a site with an engineered or other cap that prevents infiltration of rainwater. Measurement of rainwater infiltration (rate and penetration depth) should be done in a boring that is located well away from any other cover such as buildings, concrete pads, or asphalt surfaces. Monitoring the effectiveness of industrial waste line leak repairs should occur near a major historic leak, which may not be located near any of the proposed SVE sites.

3. **Comment:** The Presumptive Remedy section (Section 3) should briefly summarize performance data for the SVE systems.

   Response: There is no central repository of RD/RA information. We have contacted the RPMs for the ten California NPL sites to gather pertinent information. These ten sites are in varying stages of RD/RA: some are still in the RD phase, two are in the pilot test phase, several are in operation, and one has regulatory approval to terminate the system operation. A short description of these findings has been added to the subsection "Other Sites."

4. **Comment:** The description of the work being performed at Site S needs to be expanded. The Site S SVE system should be considered the "test-bed" for SVE enhancements or "slip stream" treatability studies.

   Response: Agreed; the text has been revised to include the more recent results and activities at Site S.

General Evaluation Document: Specific Comments

1. **Comment:** Page 1. The **"plug-in approach"** allows McAFB to not only "rapidly identify" SVE sites, but to take **quick action to remediate** the sites.

   Response: The text has been revised in response to the comment.

2. **Comments:** (a) Page 6. The first sentence on the page is incomplete. (b) The Department could not find the USEPA, 1993a reference in the **References** section.

   Response: (a) The text has been revised. (b) The reference list has been revised to correct the typographical error.

3. **Comment:** Page 10. Future community relations event 4. The Technical Review Committee (TRC) can be used to present new site specific EE/CA documents, but the Department does not recommend that the TRCs be used as public meetings for site-specific documents.

   Response: The text has been revised according to the comments.

4. **Comment:** Page 23. Identify that HCl emissions and noise problems have been encountered at Site S. Dioxin emissions were an issue when the thermal unit was operating at lower temperatures. The thermal unit operating temperatures and dioxin emissions during operation at other sites must be given significant attention and should be acknowledged as a potential "show stopper." Site S is also the site most likely to test new technologies via a slip stream.

   Response: The text has been expanded to incorporate the comments.

5. **Comment:** Page 35. Provide a discussion on efforts that could be employed to control NOx emissions.

   Response: The base is actively pursuing off-gas treatment technologies that minimize or eliminate NOx production. The off-gas alternatives under evaluation include electron beam destruction (ZAPIT) and resin adsorption (Purus PADRE). A description of these efforts has been included in Section 3, "Site S Treatability Study," and Section 7, "Alternative Off-Gas Treatment."

Site-Specific Documents IC 1, IC 7, OU C1, and OU D / Site S and OU D / Site 3: General Comments

1. **Comment:** The Department recommends that McAFB evaluate well construction materials (PVC versus stainless steel) for wells located in pit material or suspected free product areas.

Response: McAFB will evaluate the performance differences between PVC and stainless steel screens and casings for vapor extraction wells. The approach will include a literature review and a vendor survey. Results of the study will be incorporated into one of the site design documents. Data will be obtained on the performance of the PVC construction material (screen and casing) from the extraction wells at Site S in OU D.

2. **Comment:** For purposes of this EE/CA, the figures showing the plan and 3-dimensional view of total VOCs and the 3-dimensional model of the geology will suffice, but should be consistent between site-specific documents. The design documentation for the SVE actions should include:

   - detailed geologic and contaminant cross sections;
   - vapor extraction well placement and screen intervals;
   - identify vacuum monitoring wells; and
   - plan view maps with scales.

   Response: The design document for each recommended site will include the requested information at the level of detail available for the particular site.

Site-Specific Document IC 1

1. **Comment:** Page 2. The "zones of contamination" should reference Figure 2-6.

   Response: A reference has been added.

2. **Comment:** The statement that "It does not appear that the observed soil types have a strong influence on the soil gas concentration or its distribution." is not readily supported and contradicts information previously provided by two McAFB consultants (i.e., Jacobs and Radian).

   Response: Soil gas concentrations decrease in a regular pattern as a function of distance from the postulated source, as illustrated in figure 2-10 of the site specific document for IC 1. The soil types associated with the concentrations in this plot are silt, silty sand, poorly sorted sand, and well sorted sand. The plot shows data from borings that completely surround the suspected discharge location. The different soil types are represented over the entire concentration and distance range and no clustering of soil types can be recognized. At constant distance it is likely for samples to have similar soil gas concentrations whether they are collected from silt, sand, or an intermediate mixture. The controlling influence for soil gas concentration appears to be distance from the source rather than soil type.

   At Site 24 in OU A, observed soil gas concentrations increase in a regular pattern as depth increases. The pattern is thought to result from degassing of contaminated groundwater that was retained in the soil when the water table was lowered. Dispersion of contaminants is thought to be by diffusion upward from this source. Interbedded soil types in the vadose zone are silts, sands, and gradations between these two types. The regular and predictable decrease in concentration upward from the source, through all the interbedded soil types present, indicates that dispersion of contaminants in the vapor phase is relatively insensitive to the soil types encountered along the way. Similar observations also have been made at two sites in OU C1—PRL 41 and PRL 69.

Based on individual borehole analyses from OU C1 (Site 42 and PRL 68), samples from alternating silt and sand units contain similar soil gas concentrations. The same observations have been made from borings that contain alternating clay, sandy clay, clayey sand, silty sand, and sand. In general, concentrations are more closely related to the location within the plume and the depth of the sample than to soil types. These relationships will be discussed in more detail in a forthcoming report.

3. **Comment:** Pages 7 and 8. Tables 2-3 A and B are difficult to read given the size and use of a color printer to produce the text.

   Response: The table has been modified and printed in black tone only.

4. **Comment:** Page 19. Bullet 2. The Department recommends running a neutron probe if a boring is proposed in the highly contaminated core zone.

   Response: See previous comment on the use of a neutron probe. No additional holes are proposed in the core zone.

5. **Comment:** Page 24. The Department is not convinced that screening vapor extraction wells over long intervals would be as conductive to mass removal as shorter intervals over the finer grained lithologic units. The Department recommends that, if additional vapor extraction wells need to be installed during the SVE EE/CA action, at least one site use shorter screens over the fine grained units so a mass removal comparison could be attempted.

   Response: The use of large screen intervals was generally accepted at the time of installation of these wells, and they are being used for the removal actions as a cost saving measure. In the future, shorter screen intervals will be considered to test removal efficiencies in fine grained soils should additional extraction wells be needed. Options will be discussed in the design documents for individual sites.

Site-Specific Document IC 7

1. **Comment:** Page 2. The "zones of contamination" provided in the bullets should reference Figure 2-9.

   Response: The figure will be referenced.

Site-Specific Document OU C1

1. **Comment:** Pages 9 and 10. Figures 2-3 & 2-4. Both figures should have the A and A' labels on the cross-section and reference Figure 22.

   Response: Labels have been added to figures 2-3 and 2-4 and a reference to the cross-section has been added to the plan map in figure 2–2.

2. **Comment:** Page 11, Pgph 5. TCE concentrations should probably be 10,000 to 20,000 parts per billion, not parts per million.

   Response: Units of TCE concentration have been changed to micrograms/liter.

3. **Comment:** Page 16, Pgph 2. The Department suggests that the "effective" radius of influence for each well will be less than the 100 to 150 feet "anticipated" in the text. Page 18; The Department recommends that the cost estimate included installation (if necessary) and hook-up of several (2 to 4) additional SVE wells and vadose monitoring wells in the event the anticipated 100 to 150 foot radius of influence is not realized.

   Response: A total of seven characterization boreholes have been converted to extraction wells. With one exception, these wells are concentrated in the area of the former pond locations and separated by distances of 100 to 150 feet; the volumes around these wells start to overlap each other at 50 to 75 feet. Additional characterization borings are planned to define the plume extent on the north and west. Depending on the data, they also could be converted to extraction wells and incorporated into the final design.

Site-Specific Document OU D / Site 3

No Comments

Site-Specific Document OU D / Site S

1. **Comment:** Page 5. Figure 2-2 should indicate the cross-section shown in Figure 2-3.

   Response: Figure 2-3 has been revised to indicate the cross-section.

2. **Comment:** Page 7. Figure 2-4 should indicate the cross-section shown in Figure 2-5.

   Response: Figure 2-5 has been revised.

3. **Comment:** Section 5. The Department recommends that McAFB evaluate well construction materials (PVC versus stainless steel) for SVE wells located in pit materials or suspected free product areas.

   Response: This issue will be addressed in the SVE design document.