

Installation Restoration Program

West/Annexes/Basewide Operable Unit
Travis Air Force Base

Proposed Plan for Groundwater Cleanup

F I N A L



APRIL 1998

Proposed Plan for Groundwater Cleanup

Introduction

The Air Force seeks your comments on the **interim actions*** that are proposed for the cleanup of **groundwater** contamination at four locations on Travis Air Force Base (AFB). This Proposed Plan describes the groundwater contamination at these four locations and the possible options that are available to clean up this contamination. The Plan also identifies the Air Force's preferred alternatives and the rationale for them.

This Proposed Plan is available for public comment from April 8, 1998 to May 8, 1998. You are encouraged to provide your comments to us during this 30-day public comment period using any of the methods described on page 11 of this Plan. You are also invited to discuss these groundwater cleanup plans at a 7:00 p.m. public meeting on April 23, 1998 at the Fairfield/Suisun Community Center in Fairfield. A map of the public meeting site is provided on the back cover.

The Air Force, together with the U.S. EPA and the State of California, realize that community input and acceptance is critical to the success of any cleanup action. Your participation in the review and discussion of all proposed groundwater cleanup alternatives is needed to help in the selection of the interim cleanup actions at these four groundwater sites.

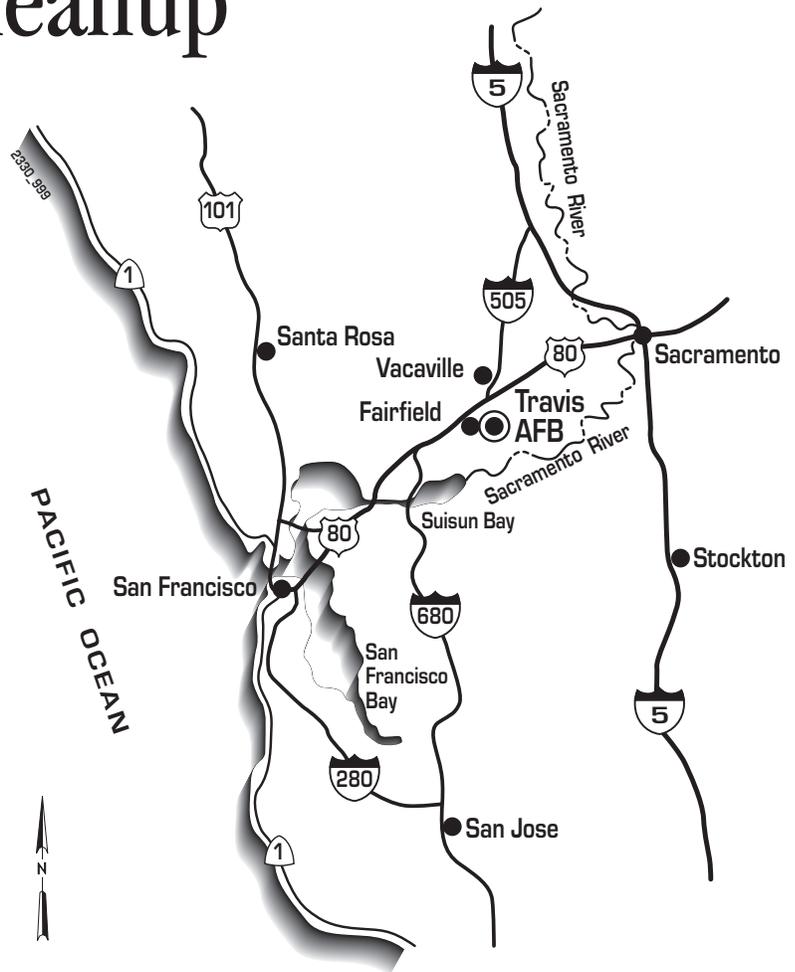


Figure 1
Regional Location Map, Travis AFB

Site Description

Travis AFB occupies approximately 5,025 acres in Solano County, California, midway between San Francisco and Sacramento (Figure 1). It is located in primarily agricultural or range land, although residential development to the southwest and commercial development to the north and west has occurred in recent years.

**Words highlighted in boldface are defined in the Glossary on Page 12 of this Proposed Plan.*



The four groundwater cleanup locations shown on Figure 2 are part of a geographical area known as the West/Annexes/Basewide Operable Unit, or WABOU. The WABOU is one of two **operable units (OU)** at Travis AFB that has groundwater contamination. The other OU is called the North East West Industrial Operable Unit, or NEWIOU. The cleanup of groundwater contamination in the NEWIOU was described in an earlier Proposed Plan. Both operable units also have soil contamination and associated cleanup options. These cleanup options will be described in a separate NEWIOU Soil, Sediment and Surface Water Proposed Plan and WABOU Soil Proposed Plan.



This WABOU Groundwater Proposed Plan summarizes the technical information that applies to the four groundwater sites and the potential interim cleanup alternatives that could be used to clean up the groundwater contamination. This information is presented in much greater detail in the WABOU **Remedial Investigation (RI)** report and the WABOU **Feasibility Study (FS)** report. You are encouraged to visit the Travis AFB **Information Repository** in Vacaville to review these documents. The address of the Information Repository is provided on the back cover.



After the interim groundwater actions are selected, they will be documented in a formal legal report, known as an Interim Record of Decision (IROD). The IROD will be approved and signed by the U.S. Air Force, the U.S. Environmental Protection Agency (U.S. EPA), the California Department of Toxic Substance Control (DTSC), and the San Francisco Bay Regional Water Quality Control Board (RWQCB). The three regulatory agencies have provided technical oversight and program management to Travis AFB to assist in the decision-making process.

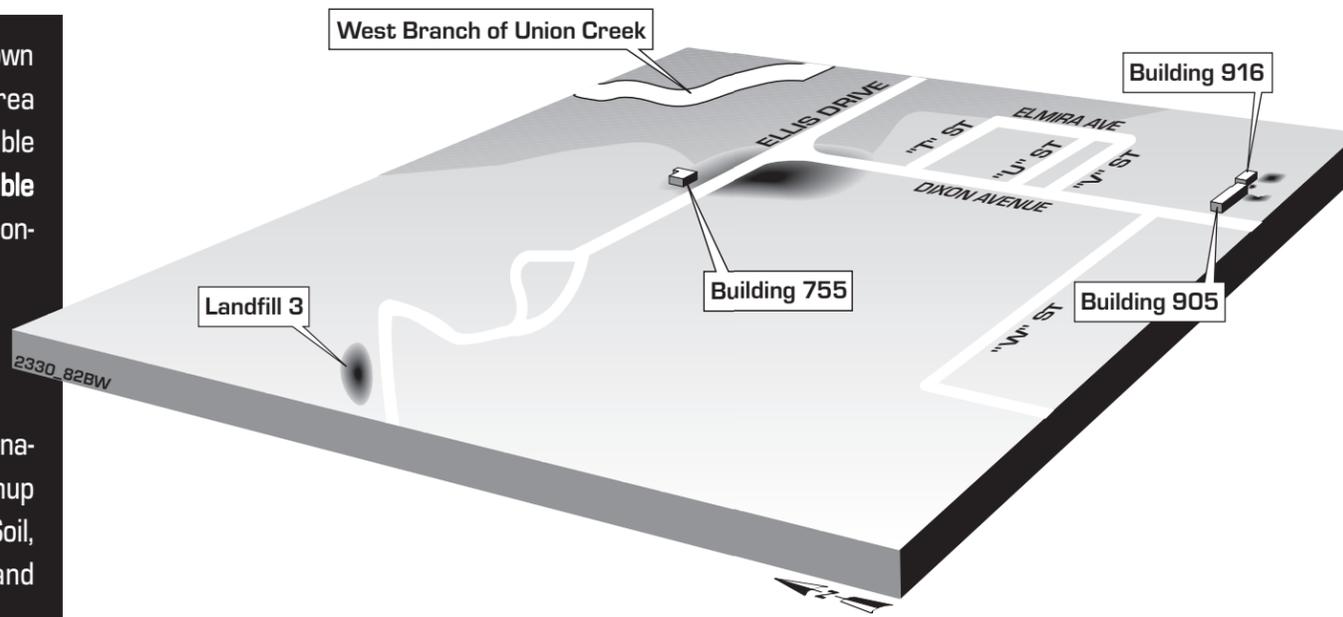


Figure 2
Groundwater Sites in the WABOU

Travis AFB has provided strategic airlift support to military forces worldwide since it was established in 1943. It is home to the largest mobility organization in the Air Force. As other Air Force bases have closed across the country, Travis AFB has received additional responsibilities, including the support of several squadrons of KC-10 aerial refueling aircraft. To support these missions, various hazardous materials, such as oils, fuels, and solvents, are used to maintain the aircraft.

In 1983, Travis AFB established an Installation Restoration Program (IRP) to investigate and clean up soil and groundwater contamination from past base operations. Releases of hazardous waste had occurred as a result of leaking pipelines, spills, or waste disposal to landfills. Although the materials handling and disposal practices of the past were in compliance with regulations at the time, they resulted in contamination and have been stopped. Travis AFB now follows current environmentally safe guidelines for the management and disposal of all hazardous materials and waste. In 1989, after evaluating initial IRP data, the U.S. EPA placed Travis AFB on the **National Priori-**

ties List (NPL). The cleanup of NPL sites must follow the applicable procedures outlined in the federal Superfund Act and supporting regulations. The official title of the Superfund Law is the *Comprehensive Environmental Response, Compensation, and Liability Act* or CERCLA. Figure 3 shows the status of the WABOU within the CERCLA process.

Once placed on the NPL, the Air Force entered into a legal agreement with the U.S. EPA and the State of California, known as a Federal Facility Agreement (FFA). The FFA provides procedures and schedules for the investigation and cleanup of contamination at Travis AFB.

The WABOU consists of three components:

- The western portion of the installation
- The annexes, or noncontiguous parcels of property that are under the jurisdiction of the Travis AFB installation commander
- Other sites within the installation not addressed by the NEWIOU; this is the “basewide” component of the WABOU

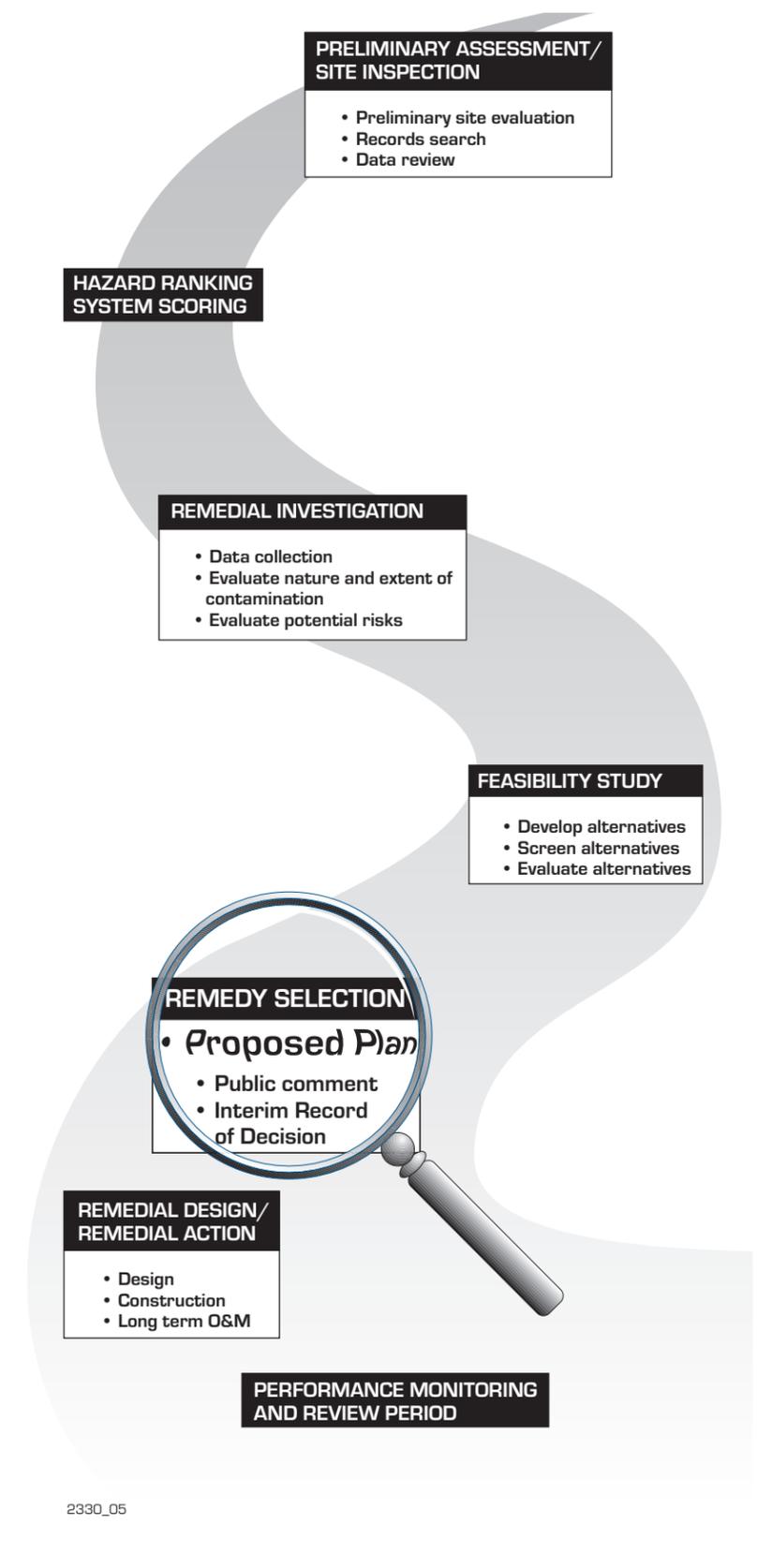


Figure 3
Studies in the WABOU have progressed to the step called Remedy Selection in the CERCLA Process

Site Name	Site Designation	Site Description
Building 755	DP039	Building 755 is the Battery and Electric Shop that services batteries and other electrical components. A former acid neutralization sump was used to dispose of battery acid and industrial solvents. The sump has been removed, but a plume of solvent-contaminated groundwater remains. The plume is about 1,400 feet long and 800 feet wide. The highest solvent concentration is 210,000 parts per billion (ppb) of trichloroethene (TCE), one of a family of chlorinated solvents. It is found beneath the former sump area. The federal and California drinking water standard (MCL) for TCE is 5 ppb.
Landfill 3	LF008	Landfill 3 consists of a series of small trenches that were used to dispose of pesticide containers. Several chlorinated pesticides are present in the groundwater surrounding the trenches. An example is Alpha-Chlordane at 270 parts per trillion (ppt). Its California drinking water standard (MCL) is 100 ppt.
Building 905	SS041	Building 905 is the Entomology Shop that was used to mix and store pesticides and herbicides. An outdoor concrete wash facility was used to wash pesticide residue from pesticide applicator vehicles. The topsoil surrounding the wash facility contains a variety of chlorinated pesticides. The groundwater beneath the shop contains low concentrations of pesticides. Heptachlor epoxide at 23 ppt is the only pesticide that exceeds the California drinking water standard (MCL) of 10 ppt.
Building 916	SD043	Building 916 is an emergency electric power facility. Beneath the diesel generators is a sump that formerly drained into an outdoor trench. A small TCE plume is downgradient of the facility and has a maximum concentration of 71 ppb. The federal and California drinking water standard (MCL) for TCE is 5 ppb.

Table 1
WABOU Groundwater Sites

Summary of Site Risks

There are no *immediate* human health or ecological risks associated with contaminated groundwater in the WABOU. That is because the groundwater beneath this part of Travis AFB is not used for drinking, cooking or bathing. Also, it is unlikely for the local plants and animals to gain access to this water supply, based on the depth to groundwater.

However, cleanup activities are still required in order to protect people, plants and animals from *potential* future health risks. These risks are associated with the slow movement of contaminated groundwater to a place where groundwater could be used as a domestic water supply or where construction workers may be exposed to groundwater during future trenching

operations. All construction projects that include trenching operations on Travis AFB are reviewed by the Travis AFB Environmental Management Office to ensure that on-base construction workers are protected from exposure to groundwater contaminants. Table 1 briefly describes the four sites and the representative dissolved chemical that creates most of the potential risk at each site. A complete list of the dissolved chemicals at each site is found in the WABOU RI and FS.

The Interim Approach

The proposed groundwater cleanup actions for the WABOU are interim in nature. At a minimum they will reduce the amount of contamination in groundwater while protecting human health and the environment. But why use an interim plan instead of a final plan?

Cleanup Alternative	Description
G1 - No Action	This serves as a starting point for comparing the other alternatives. No groundwater treatment takes place.
G2- Monitored Natural Attenuation	Monitored Natural Attenuation is a groundwater treatment strategy that relies on naturally occurring processes to prevent the spread of contamination. A major part of this strategy is the destruction of contaminants into harmless byproducts by subsurface microorganisms. Groundwater monitoring is used to verify the effectiveness of this strategy.
G3 - Containment/Treatment/Discharge	This alternative is designed to prevent the migration of the groundwater contamination. Groundwater is pumped from a series of extraction wells that are built near the leading edge of the contaminant plume. The resulting hydraulic barrier removes the contaminated groundwater before it can move past the extraction wells. The removed groundwater is treated using activated carbon and is either discharged to Union Creek or used for irrigation.
G4 - Extraction/Treatment/Discharge	This alternative uses the extraction wells as described in alternative G3. It also places additional extraction wells in the more highly contaminated part of the plume in order to actively treat the whole plume. The removed groundwater is treated and is either discharged to Union Creek or used for irrigation.
G5 - Source Area and Groundwater Extraction/Treatment/Monitored Natural Attenuation	This alternative applies only to Building 755 and is divided into three parts. The first part uses a vacuum-enhanced groundwater technology, known as Dual-Phase Extraction (DPE). A DPE system uses a vacuum to draw contaminated groundwater into an extraction well and at the same time lower the local water table. Exposed pools of solvents would then evaporate, and the contaminated vapors are removed by the vacuum. The water and vapors are cleaned in a treatment plant. This is designed to remove the source of contamination at this site. The second part uses extraction wells in the center of the plume to remove highly contaminated groundwater. The third part uses Monitored Natural Attenuation to treat the portion of the plume with lower contaminant concentrations. Monitored Natural Attenuation is described in alternative G2.
G6 - Source Area Extraction/Treatment/Monitored Natural Attenuation	This alternative also applies only to Building 755 and is divided into three parts. The first part is the DPE system that is described above. The second part uses a reactive wall in the subsurface to treat the contaminated groundwater as it passes through the wall. The third part uses Monitored Natural Attenuation technology to treat the portion of the plume with lower contaminant concentrations. Monitored Natural Attenuation is described in alternative G2.

Table 2
Groundwater Cleanup Alternatives

Travis AFB needs a legal document, known as a *Record of Decision* (ROD), and funding to start a groundwater cleanup action. The ROD documents that the Air Force, the regulatory agencies and the public are in agreement as to how the cleanup is to take place. It also specifies how clean the groundwater must be before the cleanup can be considered finished. The ROD allows Travis AFB to request funding for the cleanup action.

Since it could take a long time to finalize technical and legal details contained in a ROD, such as final cleanup levels, Travis AFB and the agencies have agreed to use an

interim ROD, or IROD, at this time. A groundwater IROD will allow Travis AFB to start groundwater cleanup actions promptly while the remaining details are worked out. The IROD also provides for an interim period which gives the Air Force, the regulatory agencies and the **Restoration Advisory Board (RAB)** the time needed to build the groundwater cleanup facilities, to evaluate their effectiveness, and to select the final cleanup actions for each site.

Preliminary Cleanup Goals

Although the final cleanup goals for groundwater have not been established, the

Overall Protection of Human Health and the Environment

Addresses whether a remedy provides adequate protection of human health and the environment and describes how risks are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.

Reduction of Toxicity, Mobility, or Volume (TMV) Through Treatment

Refers to the anticipated ability of a remedy to reduce the TMV of the hazardous components present at the site.

State Acceptance

Indicates whether, based on its review of the information, the state concurs with, is opposed to, or has no comment on the preferred alternative.

Short-term Effectiveness

Addresses the period of time needed to complete the remedy, and any adverse impacts on human health and the environment that may be posed during the construction and implementation period, until the clean up goals are achieved.

Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)

Addresses whether a remedy will meet all ARARs (federal and state environmental statutes) and/or provide grounds for invoking a waiver.

Cost

Evaluates the estimated capital and operation and maintenance costs of each alternative.

Implementability

Refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to carry out a particular option.

Long-term Effectiveness and Permanence

Refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once clean up goals have been met.

Community Acceptance

Indicates whether community concerns are addressed by the remedy and whether the community has a preference for a remedy. Although public comment is an important part of the final decision, EPA is compelled by law to balance community concerns with all of the previously mentioned criteria.



Figure 4
Nine CERCLA Criteria

WABOU FS developed preliminary cleanup goals that are protective of human health and the environment. Therefore, the interim groundwater cleanup actions will focus on contamination that exceeds the preliminary cleanup goals. These goals were developed from the following sources:

- Chemical concentrations that are listed in federal and California laws. An example is the **Maximum Contaminant Level (MCL)** for a chemical. Table 1 provides the lower of either the federal or California MCL for the major groundwater contaminant at each site.
- When a chemical does not have an MCL, a concentration based on the

results of human health or ecological studies is used.

- Concentrations of inorganic chemicals that are also normally present in nature. These are often called background concentrations and help to tell the difference between naturally occurring levels of chemicals and contaminants from Air Force activities.

The Cleanup Alternatives

Once the nature and extent of contamination at the four groundwater sites were determined in the WABOU RI, the WABOU FS was conducted to help decisionmakers identify the appropriate cleanup methods for each site. The study looked at all avail-

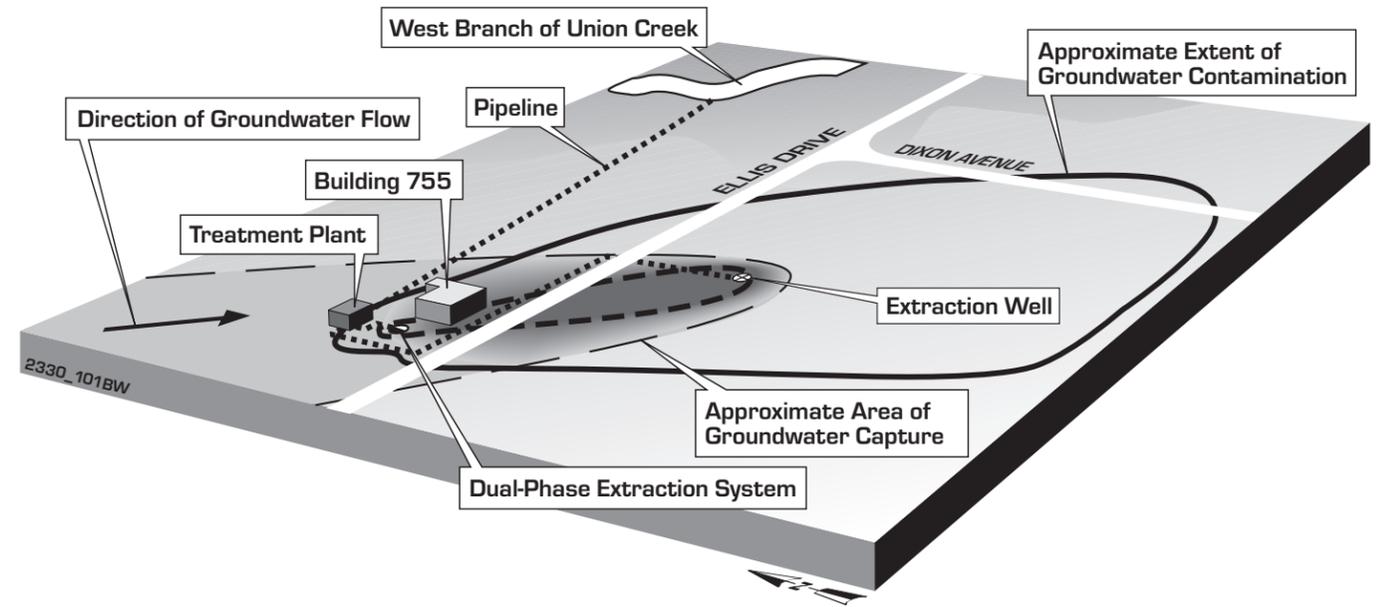


Figure 5
Conceptual Diagram of the Alternative G5 Layout for Building 755

able treatment technologies, screened out the technologies that would not work, and used the remaining technologies to develop six cleanup strategies, known as remedial alternatives. These remedial alternatives are described in Table 2.

The FS evaluated the alternatives using the first seven of the nine criteria established by the U.S. EPA. All nine criteria are briefly described in Figure 4 and are listed below.

1. Overall Protection of Human Health and the Environment
2. Compliance with Applicable or Relevant and Appropriate Requirements
3. Long-Term Effectiveness and Permanence
4. Reduction of Toxicity, Mobility, or Volume
5. Cost
6. Short-Term Effectiveness
7. Implementability
8. State Acceptance
9. Community Acceptance

State acceptance is received when the two California agencies, the DTSC and the RWQCB, accept the proposed actions at the four WABOU groundwater sites. Community acceptance is received through the review of and comment on this Proposed Plan at the April 23, 1998 public meeting and during the 30-day public comment period. The evaluation of how well the alternatives meet these last two criteria will be reported in the WABOU Groundwater IROD.

The Preferred Interim Alternatives

Travis AFB has proposed a preferred remedial alternative for each of the four groundwater sites in the WABOU. The proposals are based on the environmental conditions and the nature and extent of the contamination found at each site. They are also based on the technology and EPA criteria evaluations from the WABOU FS. However, Travis AFB may consider the use of other innovative technologies if they are shown to offer improved performance and cost effectiveness over the preferred alternative. The

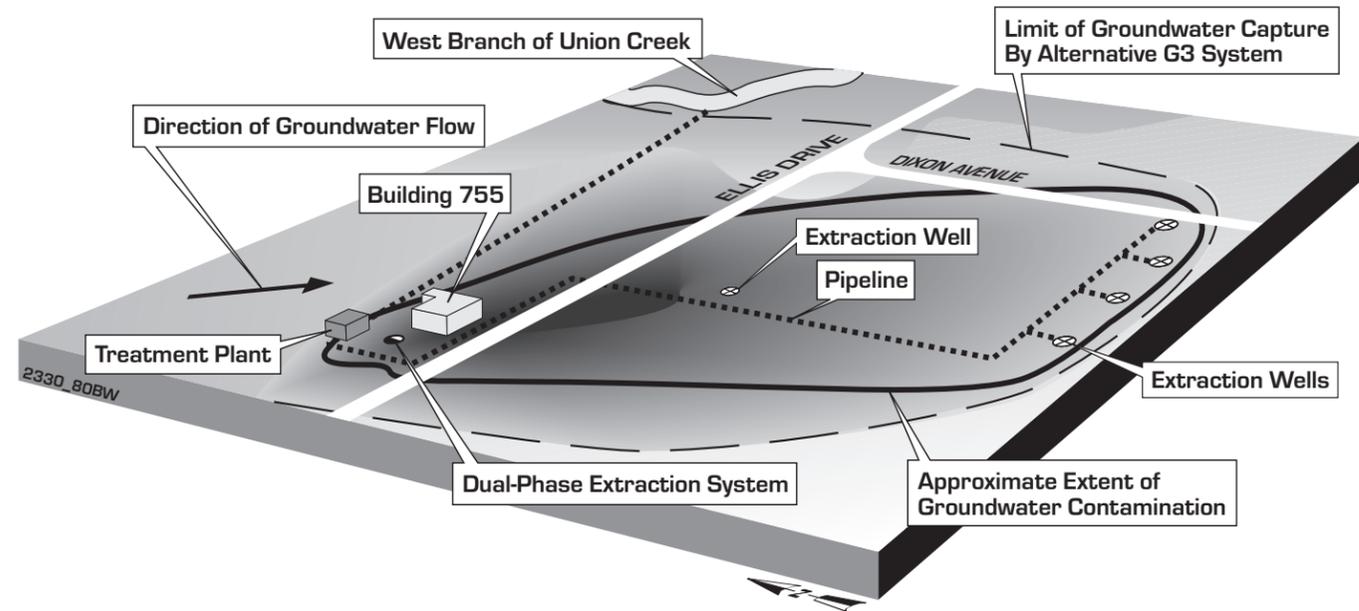


Figure 6
Conceptual Diagram of the Alternative G5 & G3 Layout for Building 755

following sections present the alternatives that the Air Force prefers to use at each site, the reasons for these preferences, and the estimates for the cost and cleanup time.

Building 755 - Alternatives G5 and G3

Alternative G5 is the primary cleanup strategy proposed for this site. This strategy is divided into three parts and starts with an aggressive approach toward removing the groundwater contamination source. Figure 5 shows the conceptual layout of the proposed treatment system. The former battery acid neutralization sump was used for the disposal of chlorinated solvents, and the high solvent concentrations found in the sump area (210,000 ppb of TCE) suggest that there may be pools of pure solvent beneath the water table. Since solvents tend to dissolve into water very slowly, it is likely that standard groundwater pump-and-treat methods would take a very long time to achieve preliminary cleanup goals.

The Air Force proposes to use a dual-phase extraction (DPE) system to clean up the highly concentrated contamination beneath the former sump area in a more efficient

manner. A DPE system applies a vacuum to the underground soil layers and draws contaminated water into the extraction well, thereby lowering the local water table in the vicinity of the solvent pools. The vacuum also stirs up the air between the soil particles. Any pure solvent pools that are exposed to the air by the lowered water table will evaporate, and the contaminated vapors will be drawn out of the extraction well by the vacuum. Air is more efficient in removing solvents than water, because the solvents evaporate quickly. So, the goal of using a DPE system is to remove the source area in a shorter time period than by using standard groundwater pump-and-treat methods.

The second part of the cleanup consists of the installation of at least one extraction well in the central portion of the groundwater plume. This will reduce the high concentrations of dissolved solvents and the potential risk that they pose. The actual number and placement of the well(s) will be determined after taking into account the effect of the DPE system on the groundwater plume.

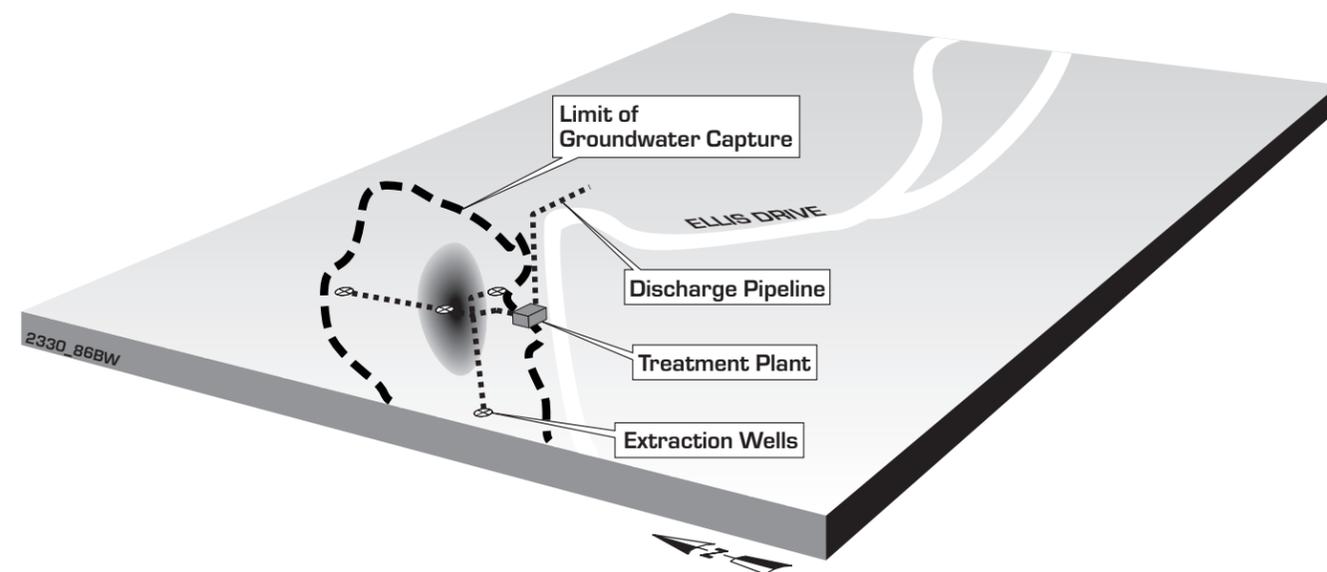


Figure 7
Conceptual Diagram of the Alternative G4 Layout for Landfill 3

An innovative technology known as a reactive wall may be tested at this site to determine if it can chemically destroy the high concentrations of dissolved solvents. If shown to be effective under the local site conditions, it would be an improvement over the standard pump-and-treat approach.

To ensure that the plume will not migrate any further, Alternative G3 has been added to the Alternative G5 cleanup strategy. Alternative G3 uses a row of extraction wells around the plume to prevent its further expansion. Figure 6 presents the conceptual layout of this alternative. The Monitored Natural Attenuation component of Alternative G5 can then be tested through the collection of analytical data in accordance with U.S. EPA and California guidelines. Acceptance of this cleanup approach by the regulatory agencies can only be obtained if the subsurface microorganisms are shown to be active and capable of breaking down the contaminants and preventing the spreading of the plume.

The estimated cost of alternative G5 over a 30-year period is \$4,950,000. This assumes that the DPE system is needed for 10 years

and that the groundwater extraction and treatment system is needed for 30 years. The addition of Alternative G3 would result in a small cost increase to the overall project cost, since the additional four extraction wells would be connected to the Alternative G5 treatment plant. An additional treatment plant would not have to be built. The cleanup using Alternative G5 is estimated to take a long time, if the Natural Attenuation component proves to be slow in reaching preliminary cleanup goals. The cleanup using Alternatives G5 and G3 is estimated to take between 35 and 70 years.

Landfill 3 - Alternative G4

Before the groundwater cleanup can begin, the pesticide-contaminated debris and soil in the trenches that contribute to the groundwater contamination need to be removed. This activity is discussed in greater detail in the WABOU Soil Proposed Plan.

Once the contaminated soil and debris are removed, the Air Force proposes to install a network of extraction wells to remove

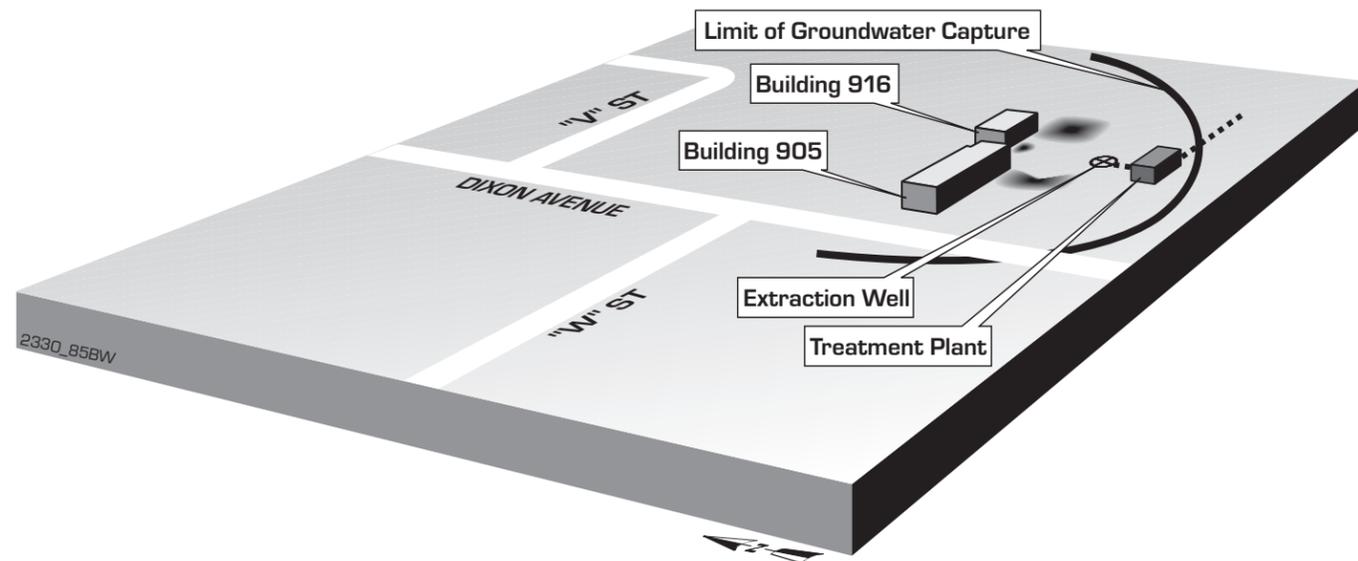


Figure 8
Conceptual Diagram of the Alternative G3 Layout for Buildings 905 and 916

contaminated groundwater from beneath the trenches and to prevent contaminated groundwater from moving away from the site. Figure 7 presents the conceptual layout of Alternative G4.

This is the most aggressive cleanup strategy for this site. The older pesticides at this landfill are resistant to natural breakdown processes, so Alternative G2 may not be successful in stopping future plume migration. Alternative G3 would eventually meet cleanup goals, but it is not as effective at removing contamination and may have a longer cleanup time.

The estimated cost of Alternative G4 calculated over a 30-year period is \$820,000. The estimated cleanup time is less than 30 years.

Buildings 905 and 916 - Alternative G3

These sites are discussed together, because the two buildings are located close together, and a groundwater modeling computer program used in the WABOU FS predicted that a single extraction well would capture the contaminated groundwater from *both* sites.

The groundwater contaminants found beneath Buildings 905 and 916 are pesticides and the chlorinated solvent, TCE. The older pesticides at Building 905 are resistant to natural breakdown processes, so Alternative G2 may not be successful in stopping future plume migration.

According to the results of the computer modeling, Alternative G3 is capable of capturing the groundwater plumes from both sites with only one extraction well. Therefore, it is the preferred alternative. Figure 8 presents the conceptual layout of Alternative G3.

The estimated cost of Alternative G3 over a 30-year period is \$568,000. The cleanup may take 5 to 10 years.

Water Treatment and Disposal

Travis AFB has gained considerable technical experience with groundwater treatment systems in the NEWIOU. An appropriate groundwater treatment technology will be chosen for each treatment plant, based on its ability to remove the contaminants from

extracted groundwater and meet treated water discharge requirements. A cost effective method of disposing treated water is to use it as irrigation water during the dry summer months and to discharge it into Union Creek during the wet winter months. This approach is proposed for the four WABOU groundwater sites, but at times treated water may need to be discharged into Union Creek during the dry summer months. Before the water reaches Union Creek, it is tested to verify that it meets appropriate water quality standards. Discharges of treated water to Union Creek are subject to approval by the RWQCB.

The Final Decision

The Air Force will make a final decision on the interim groundwater actions in the WABOU, based on the technical reports in the **Administrative Record** as well as public and state acceptance. Comments received on this Proposed Plan during the public comment period from April 8, 1998 to May 8, 1998 will indicate the level of public acceptance. The decisions will be formally documented in the WABOU Groundwater IROD. The responses to public comments will be published in a section of the IROD called the Responsiveness Summary. The Air Force expects to sign the IROD in October 1998, after which it will be made available for review at the Information Repository. The Air Force also will inform the community of the selected interim groundwater actions through announcements in the Vacaville and Fairfield newspapers.

What Can I Do?

As a member of the local community, your thoughts on the cleanup issues presented in this Proposed Plan are important to the decisionmaking process. You have several options available to ensure that your voice is heard.



Talk to us. There will be time during the public meeting on April 23, 1998 to let us know what you think of the proposed actions. Can't attend the meeting? Then call the Travis AFB Environmental Management Office, and ask for Dixie Porter, our Community Relations Specialist, or contact Jose Salcedo, the DTSC Project Manager. Their phone numbers are on the back cover.



Write to us. Some people are not comfortable talking in public, so you could write your comments and drop them off at the meeting. Or you could mail your comments to either Dixie or Jose. Their addresses are on the back cover.



Send us E-mail. Dixie and Jose also respond to E-mail from the public. Their E-mail addresses are on the back cover.

Thank you in advance for your time and support of these important issues that affect us all.

Glossary

Activated Carbon—A specially treated material that attracts contaminants. Activated carbon is often used to remove organic contaminants from air and water.

Administrative Record—All documents that have a legal bearing and were used to make decisions on cleanup actions.

Feasibility Study (FS)—A cost and engineering study that looks at all of the possible cleanup options that are available and evaluates their ability to clean up contamination at a site.

Groundwater—Underground water that fills spaces between soil particles and openings in rocks. The top of this body of water is often called the water table.

Information Repository—A location in a public building, such as a library, where community members can review IRP documents. The Travis AFB Information Repository is located in the Vacaville Public Library.

Interim Action—An action taken to clean up the environment before the final cleanup decisions are made.

Maximum Contaminant Level (MCL)—The maximum permissible level of a contaminant in water delivered to any user of a public water system. Both the U.S. EPA and the State of California establish MCLs. Generally, when the state and the federal MCLs for the same contaminant differ, the lower concentration is used.

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

Operable Unit (OU)—A geographic area that contains one or more cleanup sites. Often the sites within the operable unit have similar characteristics, such as contaminants, industrial processes or location.

Part Per Billion (ppb)—A unit of measurement used to express low concentrations of contaminants. One ppb of Compound X is equal to one ounce of Compound X in one billion ounces of water. Here is another way to look at it: if one drop of Compound X is mixed in an Olympic-size swimming pool, the water will contain about 1 ppb of Compound X.

Part Per Trillion (ppt)—A unit of measurement used to express very low concentrations of contaminants. One ppt of Compound X is equal to one ounce of Compound X in one trillion ounces of water. Here is another way to look at it: if one drop of Compound X is mixed in the water from 1,000 Olympic-size swimming pools, the water will contain about 1 ppt of Compound X.

Plume—A body of groundwater in which contaminants are dissolved.

Remedial Investigation (RI)—An environmental study that is used to identify the nature and extent of contamination at a site.

Restoration Advisory Board (RAB)—A group of interested community members and federal and state government representatives who provide valuable community input into the investigation and cleanup activities on Travis AFB.

Public Meeting

7:00 p.m. - 23 April 1998
Fairfield/Suisun Community Center
1000 Kentucky St.
Fairfield, CA

Location of Information Repository

Vacaville Public Library
1020 Ulatis Drive
Vacaville, CA 95688

Mon. & Thurs. 12-9
Tues. & Wed. 10-6
Sat. 10-5
Closed Friday and Sunday

(707) 449-6290



Dixie Porter, Public Affairs

60 AMW/EMR
580 Hickam Avenue
Travis AFB CA 94535-2176

(707) 424-3375

porter@enviro.travis.af.mil

Jose Salcedo, DTSC Project Manager

10151 Croydon Way, Suite 3
Sacramento, CA 95827-2106

(916) 255-3741

jsalcedo@juno.com