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MCAS EL TORO
SSIC # 5090.3

JACOBS ENGINEERING GROUP INC.

CLEAN I TRANSMITTAL/DELIVERABLE RECEIPT

CONTRACT N68711-89-D-9296 DOCUMENT CONTROL No.: CLE-C01-01F145-S1-0010

TO: Commanding Officer
Naval Facilities Engineering Command
Southwest Division
Ms. Alice Barker, Code 0232.AB
Contracts Department, Building 131
1220 Pacific Highway
San Diego, California 92132-5187

DATE: 15 December 1995
CTO#: 0145
LOCATION: MCAS El Toro

FROM: John Dolegowski/Project Manager

Ken Tomeo/Resource Center Manager

DESCRIPTION: Agency/RAB Review Draft MCAS El Toro OU-1 Proposed Plan

TYPE: ___ Contract Deliverable X CTO Deliverable ___ Request for Change/ Project Note/Other (Circle one)

VERSION: Draft (e.g. Draft, Draft Final, Final, etc)

REVISION #: 0

ADMIN RECORD Yes X No ___ Category ___ Confidential ___
(PjM to identify) (C. Potter-code 1852.CP must be copied unless other CTO specific AR directions apply)

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(Required only for Deliverables and Cost Proposals)

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(As directed by SOW)

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	A. Piszkin - Code 1831.AP w/attach	J. Jimenez - DTSC w/attach
	R. Callaway - Code 09C.RC w/attach	L. Vitale - RWQCB w/attach
	V. Garelick - Code 1852.VG w/attach	RAB Committee Members w/attach
	L. Nuzum - Code 1831.LN w/attach	D. Richards - CH2M HILL/CVO w/attach
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	J. Joyce - Code 1832.JJ w/o attach	M. Huddleston - CH2M HILL w/o attach
	V. Parpiani - MCAS El Toro w/o attach	File - PMO w/attach
	E. Reinert - JEG w/o attach	File - CH2M HILL w/attach
	B. Arthur - EPA/SF w/attach	

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Name: ___

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JACOBS ENGINEERING GROUP INC.

CLEAN I TRANSMITTAL/DELIVERABLE RECEIPT

CONTRACT N68711-89-D-9296 DOCUMENT CONTROL No.: CLE-C01-01F145-S1-0010

TO: Mr. Vish Parpiani
Installation Restoration Program Manager
AC/S Environment 1 AU
MCAS El Toro
P.O. Box 95001
Santa Ana, Ca 92709-5001

DATE: 15 December 1995
CTO#: 0145
LOCATION: MCAS El Toro

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Ken Tomeo/Resource Center Manager

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E. Reinert - JEG w/o attach	File - CH2M HILL w/o attach
B. Arthur - EPA/SF w/o attach	

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Memorandum

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Date: 15 December 1995

From: F. Andrew Piszkin, P.E.
Southwest Division, Naval Facilities Engineering Command

Via: Joseph Joyce
BRAC Environmental Coordinator, MCAS El Toro

To: United States Environmental Protection Agency
California States Environmental Protection Agency
MCAS El Toro Restoration Advisory Board (OU-1 Subcommittee)

Subj: MCAS EL TORO DRAFT OPERABLE UNIT 1 INTERIM PROPOSED PLAN

1. This memorandum acts as the cover sheet to the attached draft Operable Unit 1 (OU-1) Proposed Plan for interim remedial action to clean up groundwater at Marine Corps Air Station (MCAS) El Toro. Please review the document and submit comments on or before **January 17, 1996.**

2. Please note that this is a primary document being submitted under the Federal Facility Agreement (FFA) for MCAS El Toro; it is not intended for public review at this time. The formal public review process for this document as well as the OU-1 Remedial Investigation, Human Health Risk Assessment, and Interim Action Feasibility Study reports is scheduled to take place in late February 1996.

3. If you have any questions or concerns on this draft document, please call me at 619/532-3346 or contact Mr. Joseph Joyce at 714/726-3370.

F. A. Piszkin

F. Andrew Piszkin, P.E.
Remedial Project Manager
MCAS El Toro

cc: Joseph Joyce

U.S. Marine Corps Proposed Plan for Interim Remedial Action To Clean Up Groundwater at MCAS El Toro

Draft

December 1995

What is the Purpose of This Proposed Plan?

The U.S. Marine Corps, a part of the Department of the Navy, is requesting comments from the public on this **Proposed Plan*** for an interim remedial action to clean up the contaminated regional **groundwater** at the Marine Corps Air Station (MCAS) El Toro, located in Orange County, California, as shown in Figure 1. The Department of the Navy is executing the cleanup at MCAS El Toro on behalf of the U.S. Marine Corps.

The purpose of this Proposed Plan is to:

- Describe the cleanup alternatives that have been analyzed
- Present the U.S. Marine Corps/ Navy's Preferred Alternative and explain the rationale for this preference
- Serve as a companion to the reports of the ongoing **Remedial Investigation and Feasibility Study** (RI/FS) and the Administrative Record file for MCAS El Toro
- Solicit public involvement in the selection of a cleanup remedy
- Fulfill the requirements of Section 117(a) of the **Comprehensive Environmental Response, Compensation, and Liability Act** (CERCLA)

Public Comment Period:
February 20 to March 20, 1996
Public Meeting:

_____, 1996
____ to ____ p.m.
(Location)

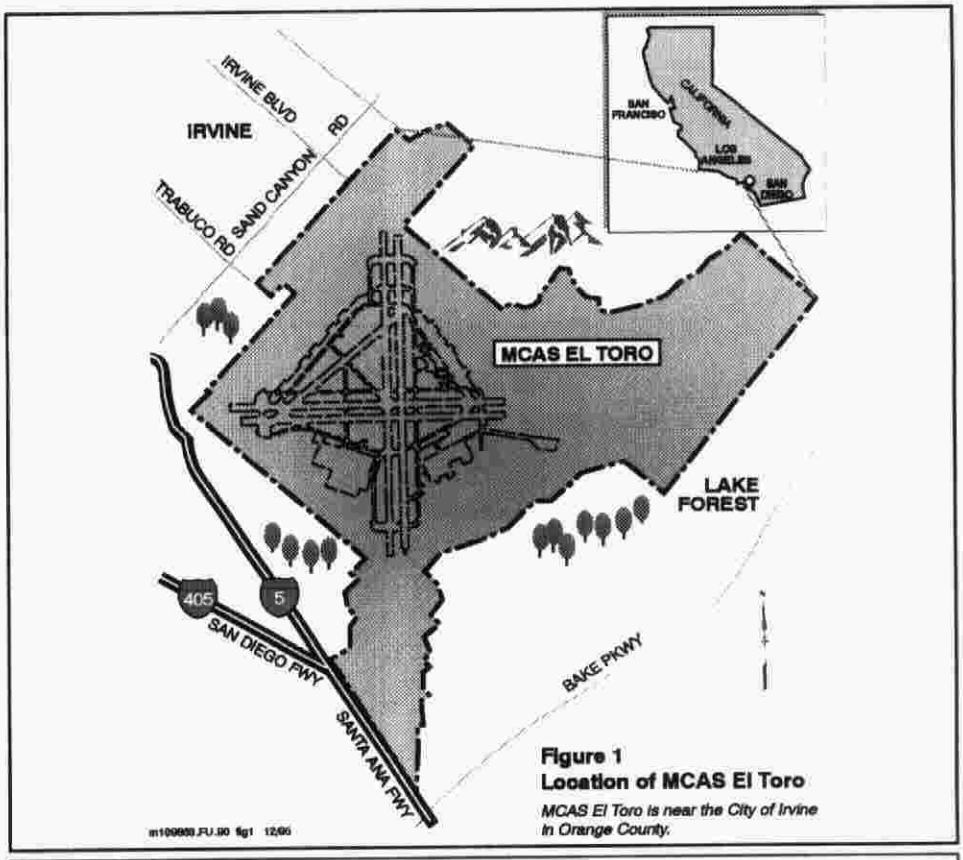

Figure 1
Location of MCAS El Toro
MCAS El Toro is near the City of Irvine in Orange County.

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*Words in **boldface** are defined in the glossary on page 16.

Additional details of the remedial action may be found in the RI/FS Report and the Administrative Record located at the Heritage Park Regional Library in Irvine, California.

Members of the community are encouraged to review and comment on the cleanup plan presented here. If you wish to find out more, you are invited to attend a public meeting on _____, 1996, at _____. This meeting is your chance to discuss this Proposed Plan with representatives of the U.S. Marine Corps/Navy and the Federal and State environmental agencies, to ask questions, and to voice any particular concerns you may have about the groundwater contamination and its cleanup at MCAS El Toro.

The public comment period for this Proposed Plan is from _____ to _____, 1996; you may send written comments to the U.S. Marine Corps/Navy representative listed on Page 16 using the return mailer provided.

Although the U.S. Marine Corps/Navy is recommending a "Preferred Alternative," the 11 other cleanup alternatives that were studied are also presented here. A final decision regarding the alternative to be implemented will not be made until comments from the public have been evaluated.

What is the Problem at MCAS El Toro?

Since 1985, portions of the groundwater underneath MCAS El Toro (the Station) and underneath the City of Irvine have been known to be contaminated with solvents. The suspected cause of this contamination is past operational activities and waste disposal practices at the Station.

The **contaminants** found in the groundwater are mostly **volatile organic compounds** (VOCs). VOCs are solvents that quickly evaporate at room temperature, so they exist in both liquid and gas forms. They are often used in dry cleaning, metal plating, and metal degreasing. Because of the toxicity of VOCs, environmental regulatory agencies limit the amount of VOCs permitted in drinking water to very low levels.

The VOCs most commonly detected in the groundwater and addressed by this interim action are listed in Table 1 along with the maximum contaminant levels (MCLs) set for each by Federal and State regulators as drinking water standards.

The exact source of the VOCs in the regional groundwater near MCAS El Toro has not yet been pinpointed, but studies have shown that, over the years, hazardous chemicals spilled or released there have seeped down through the soil into the region's groundwater. The resulting plume of contaminated groundwater has gradually spread westward under the City of Irvine.

None of the contaminated water being drawn from local irrigation wells is being used as drinking water. However, the local water districts want to ensure a plentiful future supply of drinking water. To use the groundwater in this area, they will need to extract (pump out) groundwater and clean it up to meet the quality standards for drinking water set by environmental agencies.

The U.S. Marine Corps/Navy wants to begin to remove the VOC contamination in groundwater before its ongoing environmental investigations at the Station are complete. Therefore, this cleanup action is being called an "**interim action**" because there are groundwater problems in other areas of the Station that will be addressed separately.

An "interim" action allows the U.S. Marine Corps/Navy to proceed

Table 1
Criteria and Standards for VOCs Most Commonly Detected in Groundwater at MCAS El Toro

Chemical VOC	Concentration (ppb)	
	U.S. EPA Maximum Contaminant Level (MCL)	California Maximum Contaminant Level (MCL)
Benzene	5	1
Carbon tetrachloride	5	0.5
1,1-Dichloroethylene	7	6
cis-1,2-Dichloroethylene	70	6
trans-1,2-Dichloroethylene	100	10
Tetrachloroethylene (PCE)	5	5
Trichloroethylene (TCE)	5	5

Sources:
For U.S. EPA MCLs: Safe Drinking Water Act, 40 CFR 141, July 1, 1992.
For California MCLs: "California Drinking Water Quality Standards," *Environmental Reporter*, July 31, 1992.

Note: The U.S. Marine Corps/Navy cleanup standard is the more stringent of the federal and state MCLs.

What is Groundwater?

Groundwater is water that occurs beneath the surface of the land within the pores and open spaces of soil and rock. Groundwater comes from rain and surface water (streams, rivers, lakes, etc.) that seep into the ground.

Groundwater flows both horizontally and vertically. Its movement is determined by the type of soil and rock, as well as the amount of rainfall and the presence of surface water. Groundwater moves slowly through some layers of soil, such as clay and silt, and moves more quickly through others, such as sand and gravel. But it moves very slowly compared to surface waters, usually no more than 1 to 10 feet per day.

Groundwater is an important resource. It provides water for many purposes, including irrigation and domestic uses. The supply of groundwater changes, depending on long-term weather cycles and the amount extracted (pumped out) by wells. In times of drought, some wells may "go dry" as the water recedes deeper.

quickly to address the groundwater problem. Following completion of the investigations underway at the Station, additional "final" action will be taken, if needed.

The U.S. Marine Corps/Navy's goal is to take remedial action to capture and remove contaminants from groundwater and to prevent them from spreading further.

The objectives of this interim action are to:

- Reduce concentrations of VOCs in the area of concern in the shallow groundwater and in the deep groundwater downgradient of the source areas to Federal or State cleanup levels.
- Contain migration of VOCs above cleanup levels in the deep groundwater within the area of concern.
- Prevent domestic use of groundwater containing VOCs above cleanup levels.

What is the History of MCAS El Toro?

MCAS El Toro was established in 1943 to train Marine Corps pilots. In 1950, the Station was selected for development as a master jet air station and permanent center for Marine aviation activities on the west coast. The facility's 4,700 acres include runways and flightline areas, maintenance areas, fueling facilities, a medical clinic, a golf course, barracks for over 5,000 Marines, and housing for 2,000 dependents. (About 2,800 military personnel and 1,900 civilians live off-site but work at the Station.)

Typical Station activities are aircraft and vehicle maintenance, aircraft fueling, and chemical storage. Many potentially hazardous substances (such as motor oil, jet fuels, antifreeze, cleaning solvents, and paints) have been commonly used and may have been the source of the groundwater contamination. These substances were probably released onto the ground through accidental spills, tank leaks, equipment cleaning, hosing down of fueling areas and fire-fighting training.

MCAS EL Toro has been designated by the Base Realignment and Closure (BRAC) Committee for closure in July 1999, and is currently undergoing a five-step closure process according to the BRAC Cleanup Plan Guidebook issued by the Department of Defense in Fall 1993. The imminent closure of the Station, in combination with EPA's stated policy of "bias for action," provide the impetus for proceeding with an interim action.

Most of the land now occupied by the Station was previously used for agriculture. Currently, some Station land is leased to private companies for farming and nurseries. Future uses of the Station land will change with the closure of the Station.

What Studies Have Been Done?

U.S. Marine Corps/Navy Assessment of Pollutants

From 1985 to 1986, as part of a U.S. Marine Corps/Navy-wide pollution control program, the U.S. Marine Corps/Navy began identifying potentially contaminated sites at MCAS El Toro.

Orange County Water District Detection of VOCs

At about the same time, the Orange County Water District discovered VOCs in water from one of its irrigation wells, about 3,000 feet west and downgradient of the Station. The water district launched its own investigation to find out where the VOCs were coming from, and how far they had spread throughout the regional groundwater.

U.S. Marine Corps/Navy Monitoring of VOCs

In 1987, the California Regional Water Quality Control Board, Santa Ana, required the U.S. Marine Corps/Navy to investigate if there were any VOCs in the groundwater along the southwestern boundary of the Station. The U.S. Marine Corps/Navy analyzed samples of groundwater and found that the shallow groundwater there contained VOCs. These findings suggested that the contamination of the regional groundwater could have been caused by Marine Corps activities at the Station.

Listing as EPA NPL Site

In early 1990, the U.S. Environmental Protection Agency (EPA) designated MCAS El Toro as an "NPL" site by putting the Station on its National Priorities List. As an NPL site, the Station follows a process specified by

CERCLA for the investigation and selection of a cleanup process (see Figure 2).

Later in 1990, the U.S. Marine Corps/Navy agreed (in a Federal Facility Agreement with the regulatory agencies) to conduct a special series of in-depth environmental studies, together known as a Remedial Investigation/Feasibility Study (RI/FS). This agreement also set specific schedules and milestones for the U.S. Marine Corps/Navy's cleanup process.

The U.S. Marine Corps/Navy completed Phase I of the Remedial Investigation in January 1993. As shown in Figure 3, the area studied included all of MCAS El Toro, plus an off-Station area in Irvine that is bounded by Harvard Avenue, Trabuco Road, and the San Diego Freeway (I-405). Surface water samples were also collected south of I-405 from San Diego Creek. Background metals samples were collected in the Santa Ana Mountain foothills and east and southeast of the Station. The area of concern addressed by the interim-action cleanup described in this Proposed Plan is outlined with a dashed line in Figure 3.

Sites and Operable Units

Twenty-five sites at the Station were identified as possible sources of contamination. To make it easier to investigate and later clean up these sites, they were grouped into three **operable units** (OUs):

- **OU-1** addresses regional groundwater contamination.
- **OU-2** deals with specific sites on-Station where subsurface soil contamination is believed to be a continuing source of groundwater contamination. OU-2A comprises the suspected sources of the regional VOC groundwater plume addressed by OU-1. OU-2B addresses the Station landfills which appear to be sources of groundwater contamination and OU-2C addresses the landfills which do not appear to be sources of groundwater contamination.
- **OU-3** comprises all other sites that may contain contaminants in a medium other than groundwater, such as soil or surface water.

The evaluations presented in this Proposed Plan are intended to help select a cleanup alternative that will be implemented through a legal document called an Interim Record of Decision (ROD). An Interim ROD officially documents the interim cleanup action to be implemented at a site or operable unit.

The Phase II Remedial Investigation (1995) will include collection of data for all three OUs. Separate feasibility Studies will be developed and a **Record of Decision** (ROD) will be prepared for OU-2 and OU-3. The U.S. Marine Corps/Navy will solicit public comments on cleanup alternatives for OU-2 and OU-3 upon completion of their separate Feasibility Studies. A final site-wide ROD will confirm or modify the OU-1 Interim ROD as well as the RODs for OU-2 and OU-3. (See Figure 2.)

Because OU-1 does not geographically include all groundwater contamination at MCAS El Toro, the ROD for OU-1 will be an interim ROD. However, sufficient data exist to select a cleanup remedy for the OU-1 VOC groundwater contamination, and the remedial action to be implemented is expected to be a final action for the area of concern.

Groundwater Sampling and Testing

In the Phase I Remedial Investigation, the U.S. Marine Corps/Navy installed 95 groundwater monitoring wells to tap into the groundwater at different locations and depths below ground surface. These wells are located throughout MCAS El Toro and outside the Station boundaries. About 400 samples of groundwater were collected from these wells and from other pre-existing wells owned by the U.S. Marine Corps/Navy, the Orange County Water District, and others.

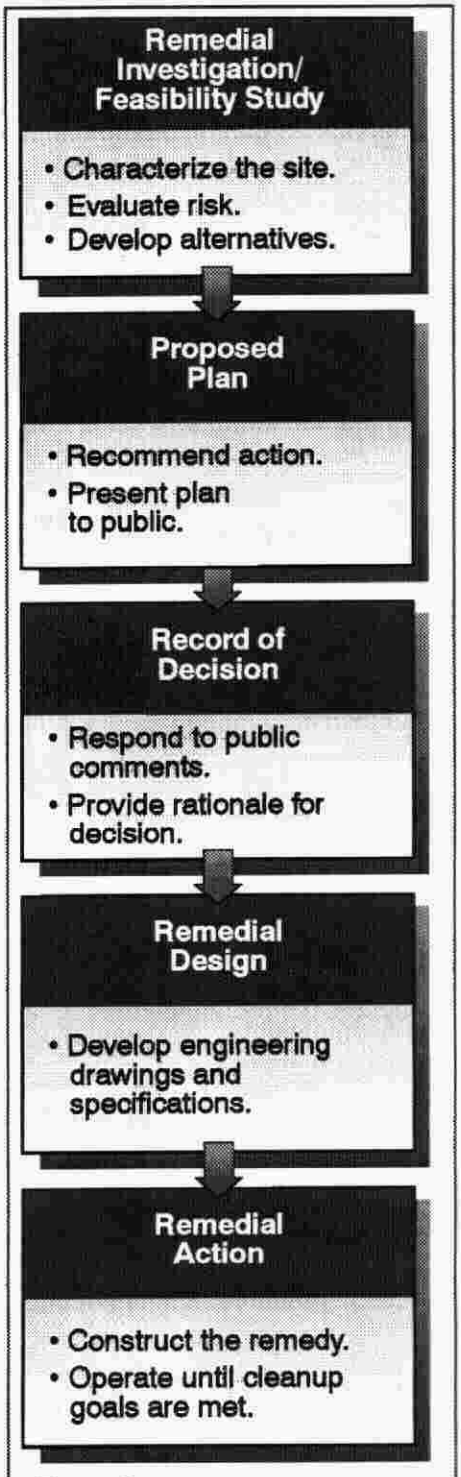

Figure 2
EPA's CERCLA Process for NPL Site Cleanups
At MCAS El Toro, the U.S. Marine Corps/Navy is following the EPA's CERCLA process for cleaning up an NPL site.
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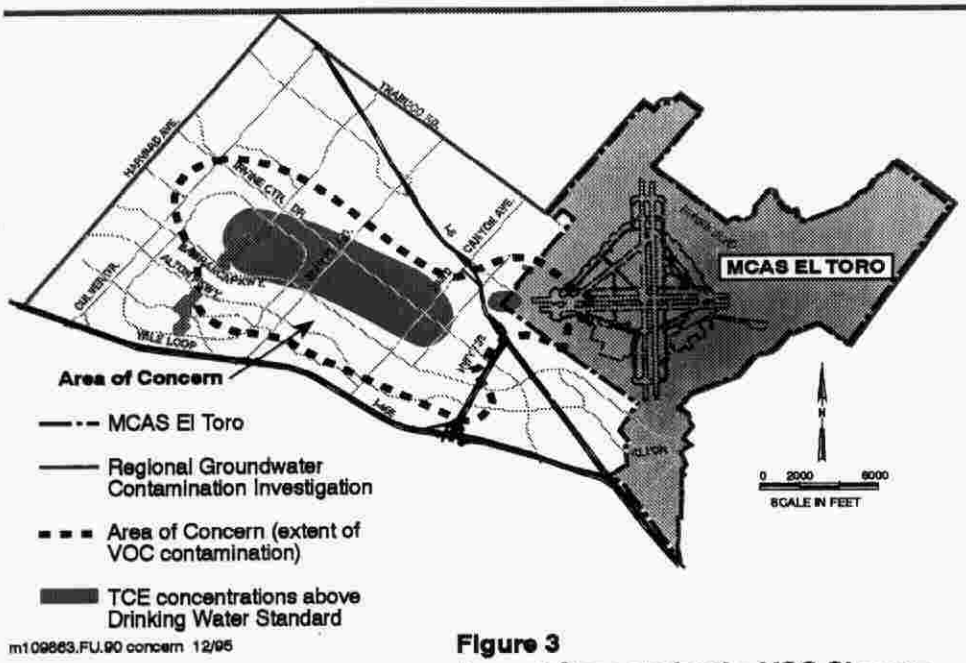


Figure 3
Area of Concern for the VOC Cleanup
The U.S. Marine Corps/Navy has studied the groundwater contamination both on-Station (under MCAS El Toro) and off-Station (under the City of Irvine).

Each groundwater sample was then tested for more than 130 chemical contaminants, such as different VOCs, **petroleum hydrocarbons**, pesticides, metals, and salts. For each sample, the measured concentration (level) of each detected chemical was entered into a computerized database. The chemical concentrations were then compared to the Federal and State standards for drinking water, and the chemicals were mapped as contaminant plumes in the groundwater.

What Are the Contaminants and How Far Has the Contamination Spread?

This Proposed Plan is based on results of the Phase I Remedial Investigation, which included two rounds of groundwater sampling, and investigations conducted by the Orange County Water District. Figure 3 shows the extent of VOC contamination, referred to as the "area of concern."

Types of Contaminants Found

The VOCs that were found most often and at the highest levels in the groundwater were:

Trichloroethylene (TCE)
Tetrachloroethylene (PCE)
1,1-Dichloroethylene (1,1-DCE)
1,2-Dichloroethylene (1,2-DCE)
Carbon tetrachloride (CTC)
Benzene

Source Areas of VOCs

The sources of the regional groundwater contamination are concentrated in the southwestern portion of MCAS El Toro, although VOCs are also found in groundwater elsewhere at the Station. Although the exact locations of these source areas are still being determined, the presence of VOCs in that area is consistent with previous MCAS El Toro activities involving potentially hazardous substances.

Contamination Levels, Extent, and Migration

At this time, the contamination has reached the shallow groundwater beneath the Station and outside the Station to the west, and is also in the deeper groundwater west of the Station. TCE is the most widespread chemical contaminant; generally, the other VOC contaminants are found only within the TCE plume. The concentrations of VOCs on-Station are greater in shallow groundwater (which is found at approximately 80 to 110 feet depth) than they are in deeper groundwater (which is found at approximately 300 to 350 feet depth). Figure 4 shows the location of VOCs in groundwater.

The highest TCE concentration detected at MCAS El Toro, 2,000 parts per billion (ppb), was not in the OU-1 area of concern. It was found in the shallow groundwater in the source area on-Station that will be addressed in OU-2. Off-Station, the concentration of TCE in the shallow groundwater is below the drinking water standard of 5 ppb, except at two wells which are on the Station boundary. In the deep off-Station groundwater, TCE was detected between 20 and 35 ppb in one area, but occurs mostly at concentrations below 5 ppb.

PCE was detected in the on-Station shallow groundwater at concentra-

Drinking Water Standards vs. Detectable Concentrations

It is important to distinguish between the maximum concentrations (levels) of chemical contaminants that are permitted by governmental drinking water standards and the concentrations that can be detected by sensitive laboratory instruments, which are usually much lower than the drinking water standards. Cleanup levels are often set at the drinking water standards because these standards are considered protective of human health.

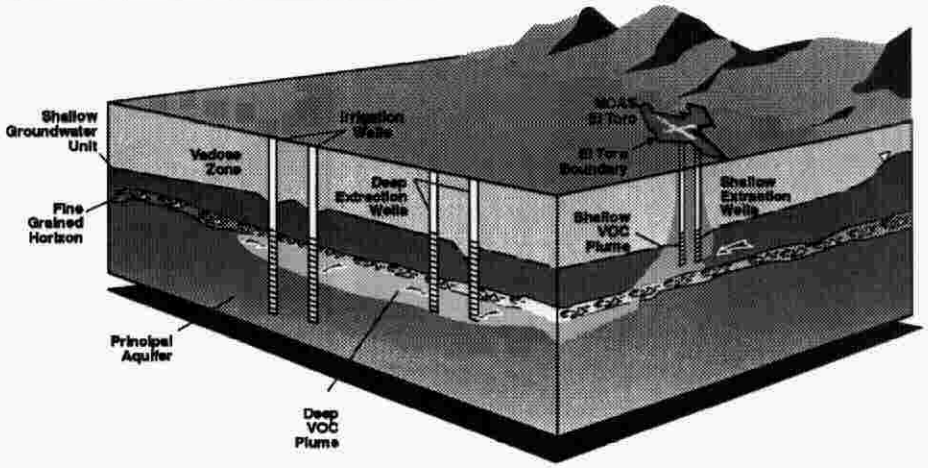
tions up to 58 ppb, but was not detected in deep groundwater. The highest concentration of 1,1-DCE, 8 ppb, was found in the on-Station shallow groundwater. The only off-Station detection of 1,1-DCE was at the Station boundary at 2.1 ppb and below. The highest concentration of 1,2-DCE in the shallow groundwater (9 ppb) was detected on the Station boundary; in deep groundwater the highest concentration (5.4 ppb) was detected approximately 2 miles west of the Station. Carbon tetrachloride was detected at levels up to 26 ppb in the shallow groundwater on-Station; however, it was not detected off-Station or in deep groundwater.

Benzene was detected at a maximum concentration of 730 ppb in shallow groundwater in an on-Station source area that will be addressed in OU-2. It was not detected off-Station or in the deep groundwater. These concentrations are based on two rounds of groundwater sampling.

The plume of groundwater contamination in which TCE levels are higher than permitted by drinking water standards originates from the southwestern portion of the Station (Figure 3). Shallow groundwater with TCE concentrations that are lower than the drinking water standards extends west of the Station, past Jeffrey Road in Irvine. Deeper groundwater with TCE concentrations that are higher than drinking water standards extends as far as 2.5 miles west of the Station. The deeper groundwater beyond Culver Drive, about 3 miles west of the Station, has TCE contamination that is detectable, but at levels lower than drinking water standards.

Is There Any Risk to Human Health?

The U.S. Marine Corps/Navy performed a health **risk assessment** to determine whether the regional groundwater contamination could be a significant risk to human health. The assessment was based on current uses of the groundwater and on potential future uses, such as for drinking and washing. The groundwater does not pose a risk to human health while it is in the ground.



m110001.ME.30/region grndwtr 9/95vjh

Figure 4
VOC Contamination in Groundwater at MCAS El Toro

The VOCs are in shallow groundwater beneath MCAS El Toro, and have reached both shallow and deeper groundwater off-Station to the west.

This study, called the Baseline Human Health Risk Assessment, examines two measures of risk: cancer risk and non-cancer effects. The risk assessment assumes that untreated groundwater is used for drinking and other domestic uses.

- The first measure of risk estimates the possibility that one more occurrence of cancer will result from exposure to untreated groundwater. In California, the probability of developing cancer from all causes is approximately 250,000 out of 1,000,000 (1 out of 4). A risk assessment estimates the *additional* risk due to chemical exposure. This is called the excess lifetime cancer risk. A risk of 1 out of 1,000,000 means that one more person out of a group of 1,000,000 could develop cancer from the chemical exposure.
- For MCAS El Toro OU-1, two types of risk estimates were calculated. One estimate was based on average water consumption, the second was based on a much higher consumption rate, called the *reasonable maximum exposure*. These estimates indicate that, for the *reasonable maximum exposure*, groundwater from 4 of 93 wells exceeds an excess lifetime cancer risk value of one in 10,000. Groundwater from 47 of 93 wells exceeds the one in 1 million risk level. The primary VOCs responsible for these risk levels are TCE and benzene. Under an *average exposure scenario*, the one in 1 million risk value is exceeded by groundwater from 28 wells, and the 1 in 10 thousand risk level is not exceeded.
- The second measure of risk estimates the potential for non-cancer effects (such as harm to the liver) if contaminated groundwater is served to consumers without being treated to reduce contaminants. A hazard index greater than 1.0 indicates there may be some risk of health effect. Groundwater from 8 of 93 wells exceeds a non-cancer hazard index of 1.0 for a *reasonable maximum exposure scenario*. Under an *average exposure scenario*, groundwater from 5 of 93 wells exceeds a Hazard Index of 1.0.

Currently, no known domestic well is using the contaminated groundwater for consumption or washing. At the furthest western limit of the regional TCE plume, some groundwater with trace levels of TCE is currently being pumped and used for irrigation.

However, the TCE levels are so low that both EPA and the state have concluded that any risk to human health or the environment is negligible. TCE is also present in groundwater that is pumped into North Lake in Irvine, but at levels that are within drinking water standards; again, the risk is believed to be negligible.

For a detailed discussion of this risk evaluation, please refer to the Operable Unit 1 Baseline Human Health Risk Assessment, dated 15 February 1995, in the **Administrative Record**.

Why Do We Need an Interim Remedial Action?

The U.S. Marine Corps/Navy wants to begin remediating the VOC contamination in groundwater at MCAS El Toro and beneath the City of Irvine as soon as possible. Because OU-1 does not geographically include all groundwater contamination at MCAS El Toro, this is considered an "interim" action.

The U.S. Marine Corps/Navy has determined that the Phase I data, combined with historical data, are sufficient to go ahead with selection and implementation of a remedy for regional VOC contamination at this time, rather than wait for completion of the Phase II RI or resolution of OCWD's plans for the Irvine Desalter Project (IDP). Recent EPA policy and guidance continue to emphasize the time and cost savings of implementing early or interim remedial actions, such as limiting the spread of contaminated groundwater.

What Will the Interim Action Entail?

This Proposed Plan addresses:

- The groundwater in the southwestern portion of the Station and west of the Station
- VOCs found in that groundwater to date
- VOCs detected in the future (if any)

VOCs generally have similar characteristics, so that the methods evaluated to treat the VOCs that have been found so far are expected to also treat other, similar VOCs that may be found in the future.

TCE is the most widespread chemical found in the groundwater, both on-Station and to the west of the Station. In the OU-1 area of concern, the other VOCs are found only within the TCE plume. Because VOCs are relatively similar in their behavior in groundwater, addressing the movement and spread of TCE will also address the other VOCs within the TCE groundwater plume. Therefore, the focus of this Proposed Plan is VOCs in general, and TCE in particular.

What Are the U.S. Marine Corps/Navy's Cleanup Standards?

To set cleanup standards, the U.S. Marine Corps/Navy used:

- The remedial action (cleanup) objectives
- **Applicable or relevant and appropriate requirements** (ARARs)
- The conclusions of the Baseline Human Health Risk Assessment

For groundwater and reuse of treated water, the objective is to protect human health by preventing exposure at concentrations that pose an adverse health risk; groundwater must be cleaned up to levels that protect human health. To protect human health, the cancer-causing chemicals (such as TCE) in potential drinking water supplies must be reduced to a level that lowers the excess lifetime cancer risk to between 1 in 10,000 and 1 in 1,000,000. The risk assessment shows that the MCLs, which are Federal and State drinking water standards established in 40 CFR §141.61(a) and Title 22 CCR §64444.5, respectively, will be protective of human health. Therefore, the U.S. Marine Corps/Navy selected Federal or State MCLs, whichever was most stringent, as cleanup standards for groundwater. Additional information on development of cleanup standards and evaluation of ARARs can be found in the OU-1 **Interim Action Feasibility Study**.

For other chemicals that are not cancer-causing, contamination must be cleaned up to levels that reduce their Hazard Index to less than 1.

Table 1 presents the cleanup standards that the U.S. Marine Corps/Navy has identified for VOCs. The U.S. Marine Corps/Navy's cleanup standards for VOCs in groundwater at MCAS El Toro have been established at concentrations that protect human health. The cleanup standards specify the concentration of VOCs in the groundwater that will remain after the remedial action is complete.

In addition to the remedial action objectives, and the standards described by Federal and State MCLs, the U.S. Marine Corps/Navy seeks to comply with other environmental standards that protect the groundwater quality for future use. For example, remedial alternatives that include pumping out and treating the groundwater, then injecting it back into the ground, will comply with the requirements of the State Water Resources Control Board Resolution 68-16 (antidegradation policy). Resolution 68-16 requires that the groundwater be treated prior to reinjection to a level that will not degrade groundwater quality.

The groundwater at MCAS El Toro has some constituents other than VOCs, such as nitrates and salts, whose presence is unrelated to Station activities. These constituents are present throughout the area at varying levels. The reinjection locations have been chosen to prevent introduction of those constituents at concentrations higher than those already in the groundwater in the reinjection area.

What Are the U.S. Marine Corps/Navy's Cleanup Alternatives?

Once contaminants reach groundwater, it is difficult to remove them entirely. A common approach is to pump the contaminated groundwater out of the ground, bringing the contaminants with it. In recent years, with the increased interest in environmental cleanup, new methods have been developed for introducing various chemicals, including oxygen, into the ground to treat the contamination that remains there. Some of these methods are already effective for particular situations, and others hold promise for future use.

During the Feasibility Study for this Interim Action, more than 20 potential remedial actions and technologies were evaluated. These included technologies to contain contaminants, remove contaminants, treat the groundwater in place (*in situ* treatment), treat extracted groundwater, and a variety of ways to use or dispose of extracted and treated groundwater. Each of these technologies was screened on the basis of its effectiveness, implementability, and cost, consistent with EPA and NCP guidance feasibility studies. The most effective technologies were retained for further evaluation. Table 2 lists the technologies evaluated.

Computer modeling was used to develop the remedial alternatives described in this Proposed Plan. A model called CFEST, developed by the U.S. Department of Energy, was used to model groundwater flow rates and direction and the movement of groundwater contamination over the next 20 years. TCE concentrations were used to model the VOC contamination. By varying the location and number of wells, the model was used to develop a variety of alternatives with various goals, such as maximum rate of contaminant removal, prevention of migration of contaminants, and minimum cleanup time.

For relatively low levels of VOCs in deep groundwater (which is the situation at MCAS El Toro), groundwater extraction is the most effective action. Groundwater would be extracted from strategically located wells to reduce the level of VOCs and to control their spread.

Except for the **"No Action"** alternative, each of the 12 cleanup alternatives has three components:

- Extracting groundwater
- Treating the extracted groundwater to meet water quality standards for disposal or for use
- Disposing of or using the treated groundwater

The 12 cleanup alternatives were developed in groups:

- **No Action.** EPA regulations require the U.S. Marine Corps/Navy to evaluate what would happen if no action were taken so that it can compare its cleanup options against this baseline condition. (*Alternative 1*)
- **MCAS El Toro Project.** Four cleanup alternatives were evaluated that would rely entirely on new wells installed by the U.S. Marine Corps/Navy to clean up the groundwater. (*Alternatives 2A, 2B, 2C, and 2D*)
- **Irvine Desalter Project (IDP).** This is a project being considered by the Orange County Water District and Irvine Ranch Water District to pump local groundwater and treat it to drinking water standards. The U.S. Marine Corps/Navy evaluated how much of the VOC contamination the wells for this project could be expected to clean up. (*Alternative 3*)
- **MCAS El Toro Project and IDP.** Six combinations of new U.S. Marine Corps/Navy wells and planned IDP wells were evaluated. (*Alternatives 4A, 4B, 5A, 5B, 6A, and 6B*)

Table 2
Technologies Evaluated for OU-1 Interim Action

Containment
Hydraulic Containment (wells)
Physical Barriers (slurry wall)
Removal of Contaminants
Groundwater Extraction (wells)
In-Situ Treatment
Natural Attenuation
Treatment of Groundwater in Place (air sparging or bioremediation)
Ex-Situ Treatment
Physical Treatment of Extracted Groundwater (carbon adsorption, air stripping, steam stripping)
Chemical Treatment of Extracted Groundwater (oxidation)
Biological Treatment of Extracted Groundwater (bioremediation)
Air Emission Controls and Treatment (adsorption, catalytic conversion, thermal destruction)
Discharge/Use
Discharge to Publicly Owned Treatment Works
Discharge to Surface Waters
Reinjection of Treated Groundwater
Evaporation Ponds
Beneficial Use (domestic, irrigation, etc.)

Alternative 1: No Action

This alternative represents the current situation at the Station. If no action is taken by the U.S. Marine Corps/Navy, or other public agency, existing agricultural wells would continue to pump groundwater; there would be no pumping of groundwater by the U.S. Marine Corps/Navy, and no local water supply system to remove VOCs or to control groundwater flow. The VOCs present in the groundwater would continue to spread. As VOCs spread from the source area on-Station, contamination off-Station would increase. After an extremely long time (hundreds of years), the VOC concentration would decrease to less than MCLs because of dilution and natural processes that break down chemicals like VOCs. These processes are known as intrinsic remediation.

Alternative 1 will not satisfy the remedial objectives of the OU-1 Interim Action, or the regulatory requirements for protection of groundwater resources. To date, no known wells have been used to supply drinking water within the areas of concern. The County limits access to the groundwater by requiring permits for installation of new wells. However, existing drinking water wells could eventually be affected if no action is taken.

Alternative 2A: MCAS El Toro Project

Alternative 2A entails construction of a U.S. Marine Corps/Navy groundwater extraction and treatment system to contain high concentrations of VOCs in the shallow groundwater in the southwestern portion of the Station, and to reduce VOC concentrations in the deeper groundwater. Groundwater would be extracted from both the shallow and deep zones, and conveyed to separate MCAS El Toro treatment facilities to remove VOCs before pumping the treated water back into the groundwater (called "reinjection"). The shallow groundwater treatment system would employ **air stripping**, followed by granular activated carbon adsorption. The flow rate through the shallow groundwater treatment system would be about 1,260 gallons per minute (gpm). The deep groundwater would be extracted at about 2,000 gpm, and would be treated by an air stripper equipped with a vapor-phase activated carbon unit to control air emissions. There would be no Irvine Desalter Project in operation.

Alternative 2A would comply with the remedial objectives of the interim action, and with regulatory requirements, by containing and remediating contamination in the shallow and deep groundwater. Treated groundwater would be reinjected in accordance with State and Federal requirements, including the Water Board's Resolution 68-16 which is the State's policy preventing degradation of groundwater. The air stripping systems would be designed to comply with Federal and State air pollutant emission requirements.

Alternative 2B: MCAS El Toro Project With an Additional Well

Alternative 2B is identical to Alternative 2A, except that an additional, existing well (18_ET1) would be used to extract deep groundwater for treatment. This additional well would add about 1,000 gpm to the total flow from the deep groundwater, and would increase the rate of VOC removal from the deep groundwater by 50 percent. The extraction and treatment system for the deep groundwater would be increased in capacity by 50 percent, but would be otherwise unchanged. The extraction and treatment system for the shallow groundwater would be the same as in Alternative 2A. There would be no Irvine Desalter Project in operation.

Alternative 2C: MCAS El Toro Project With Seasonal Use

Alternative 2C is identical to Alternative 2B, except that treated groundwater from the deep groundwater system would be used for irrigation during 6 months of the year. The treated water would be conveyed about 1 mile to the irrigation line operated by The Irvine Company at Culver Drive. The Irvine Company would be accountable for compliance with any regulatory requirements related to the use or discharge of the irrigation water.

During the winter months, the treated groundwater would be reinjected into deep groundwater, as in Alternative 2B. There would be no Irvine Desalter Project in operation.

Alternative 2D: MCAS El Toro Project With Continuous Use

Alternative 2D is identical to Alternative 2B, except that treated groundwater from the deep groundwater system would be provided to a local water purveyor for additional treatment for beneficial use. The shallow groundwater extraction, treatment, and reinjection system would be identical to Alternative 2A. The deep groundwater extraction and treatment system would be identical to Alternative 2B.

For treated water that would be put into a public water supply, all legal requirements for drinking water in existence at the time that the water is served would have to be met by the water purveyor. EPA considers serving of the water to the public (at the tap) to be "off-site". (See discussion of "on-site" vs. "off-site" in box on Page 10.) The purveyor would be accountable (in an agreement with the U.S. Marine Corps/Navy) for compliance with all regulations related to treatment, use, or discharge of the water. There would be no Irvine Desalter Project in operation.

Alternative 3: Irvine Desalter Project (IDP)

This alternative would use some of the VOC-related components of the planned Irvine Desalter Project (IDP), as presented in the *Irvine Desalter Project Preliminary Design Report* (Orange County Water District, 30 March 1994). The IDP is an independent project planned to provide a local potable (drinkable) water supply source. The extracted

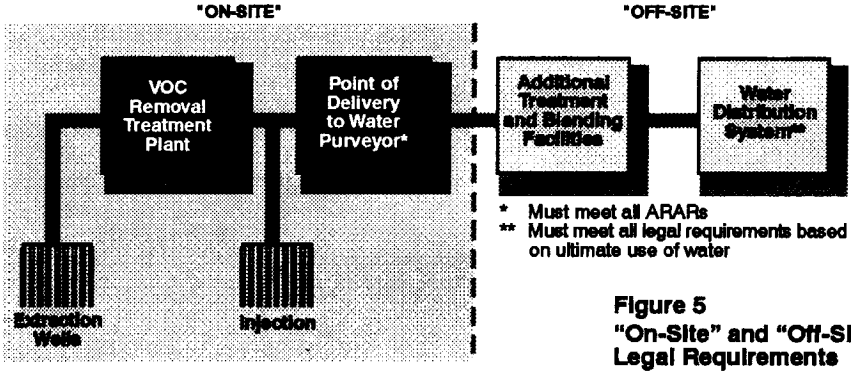


Figure 5
"On-Site" and "Off-Site" Legal Requirements
Various legal requirements apply to "on-site" and "off-site" facilities.

"On-site" vs. "Off-site"

The environmental investigation and cleanup at MCAS El Toro is being conducted under the requirements of CERCLA. At CERCLA sites, Federal and State environmental regulations are evaluated somewhat differently than at non-CERCLA sites. Most environmental regulations are intended to prevent releases of hazardous materials to the environment by specifying design features, controls, and operations plans that add to the safety of the site. Because CERCLA sites are defined as uncontrolled hazardous waste sites and the spill or release has already occurred, many regulations do not directly apply. To ensure that the intent of the environmental regulations is met, CERCLA specifies that "on-site" remedial actions should comply with all Federal and State environmental requirements that are directly **applicable** to the site (except for administrative requirements, such as permits), and also to those that are considered **relevant** and **appropriate** because they apply to similar situations. Together, these are referred to as applicable or relevant and appropriate requirements (ARARs).

Any portion of a remedial action that occurs "off-site" is subject to all Federal and State environmental requirements that are directly **applicable**, including administrative permits. Therefore, the operations of independent water purveyors that might accept treated groundwater are subject to all **applicable** Federal and State environmental regulations, because they are "off-site" under the definition of the CERCLA site.

groundwater would be conveyed to a treatment facility, where VOCs would be removed by an air stripper system equipped with a **vapor-phase activated carbon** adsorption system to control emissions. The water would then be conveyed to the IDP facility for further treatment to remove salts, metals, and nitrates. The shallow groundwater would not be pumped and treated separately in this alternative. The groundwater modeling conducted by the U.S. Marine Corps/Navy indicates that the IDP wells alone would not entirely prevent VOCs from migrating beyond the groundwater extraction area.

Requirements such as the State Drinking Water Act MCLs, the Federal Safe Drinking Water Act, and the State Action Levels would apply to the operation of the IDP. The water purveyor, in operating the IDP, would be accountable for compliance with any regulatory requirements related to treatment, use, or discharge of the water. In any agreement between the U.S. Marine Corps/Navy and the purveyor, the U.S. Marine Corps/Navy will require the purveyor to meet all such requirements.

Alternative 4A: Reduced IDP/MCAS El Toro On-Station System Without Pretreatment

Alternative 4A would use many of the same components of the IDP extraction and treatment system as does Alternative 3, while adding extraction of shallow groundwater. The shallow groundwater extracted on-Station would be conveyed to a VOC treatment facility. There, VOCs would be removed from shallow and deep groundwater in an air stripper system equipped with a vapor-phase activated carbon adsorption system to control emissions. The water would then be conveyed to the IDP facility for further treatment. Shallow groundwater extraction would be limited to 600 gpm, to keep the total flow to the IDP facility within the 5,700-gpm capacity of its design.

Groundwater modeling suggests that existing pumping would be required from the downgradient agricultural wells to capture the VOCs. As part of Alternative 4A, the U.S. Marine Corps/Navy would require the owners of these wells to agree to pump them at their current rate. Water from these wells would not need to be treated prior to use.

Requirements such as the State Drinking Water Act MCLs, the Federal Safe Drinking Water Act, and the State Action Levels would apply to the operation of the IDP. The water purveyor, in operating the IDP, would be accountable for compliance with any regulatory requirements related to treatment, use, or discharge of the water. In any agreement between the U.S. Marine Corps/Navy and the purveyor, the U.S. Marine Corps/Navy would require the purveyor to meet all such requirements.

Alternative 4B: Reduced IDP/MCAS El Toro On-Station System With Pretreatment

Alternative 4B is identical to Alternative 4A except that shallow ground-

water would be pretreated on-Station to reduce VOCs before conveyance to the VOC treatment facility for combined shallow and deep groundwater. Because the shallow groundwater has higher concentrations of VOCs than does the deep groundwater, pretreatment of the shallow groundwater would add a safety margin for treatment of the VOCs.

Alternative 5A: IDP/MCAS El Toro Project With Continuous Groundwater Injection

This alternative was developed to evaluate the effect on an independent MCAS El Toro Project when the IDP is also in operation. Both the MCAS El Toro Project and the IDP would proceed independently. The MCAS El Toro Project would be identical to Alternative 2A, and the IDP would be identical to Alternative 3.

Alternative 5A would comply with the remedial objectives of the Interim Action, and with regulatory requirements by containing and remediating contamination in the shallow and deep groundwater. Treated groundwater would be reinjected in accordance with state and Federal requirements, including the Water Board's Resolution 68-16. The air stripping systems would be designed to comply with Federal and State emission requirements.

Alternative 5B: IDP/MCAS El Toro Project With Seasonal Use

Alternative 5B is identical to Alternative 5A except that, during the summer (6 months), treated water from the deep groundwater would be used for irrigation. The treated water would be conveyed approximately 1 mile to the irrigation pipeline operated by The Irvine Company at Culver Drive. The Irvine Company would be accountable for compliance with any regulatory requirements related to the use or discharge of the irrigation water. In any agreement between the U.S. Marine Corps/Navy and The Irvine Company, the U.S. Marine Corps/Navy would require The Irvine Company to meet all such requirements.

Alternative 5B would comply with the remedial objectives for the interim action, and with regulatory requirements in the same manner as would Alternative 5A.

Alternative 6A: MCAS El Toro Project and Partial IDP With Discharge to IDP Only

In Alternative 6A, both shallow and deep groundwater would be extracted and conveyed to a single treatment facility for removal of VOCs. The flowrate from the shallow groundwater extraction system would be 1,260 gpm. Deep groundwater would be extracted, using a combination of MCAS El Toro Project wells and OCWD wells. Total flow from the deep groundwater would be 4,440 gpm.

Alternative 6A would comply with the remedial objectives of the Interim Action, and with regulatory requirements by containing and remediating contamination in the shallow and deep groundwater.

Alternative 6B: MCAS El Toro Project and Partial IDP With Injection of Shallow Groundwater

Alternative 6B combines components of the MCAS El Toro Project and the IDP system. Shallow groundwater would be extracted from MCAS El Toro Project wells on-Station, and conveyed to an on-Station treatment facility to remove VOCs. The treated groundwater would then be reinjected into the groundwater. The shallow groundwater treatment system would employ air stripping, followed by granular activated carbon adsorption. The flow rate through the shallow groundwater treatment system would be approximately 1,260 gallons per minute (gpm). Deep groundwater would be extracted from a combination of MCAS El Toro and OCWD wells at a flow rate of 5,700 pgm, and conveyed to a treatment facility for VOC removal.

How Were the Cleanup Alternatives Evaluated?

To identify and select a cleanup measure that would address the groundwater contamination at MCAS El Toro, the U.S. Marine Corps/Navy first considered a wide range of cleanup technologies that could reduce the risk posed by contaminants at the site. The U.S. Marine Corps/Navy then evaluated the technologies to determine which would be most effective. Some of the cleanup technologies were eliminated during the initial screening of the methods because they would not effectively address contamination, could not be used at the site, or would have excessive costs compared to another method that would achieve the same degree of protection. The remaining cleanup technologies were then combined into the cleanup alternatives described above. These alternatives were screened to identify the most promising, which were then evaluated using the nine criteria summarized in Table 3.

How Do the Cleanup Alternatives Compare?

The U.S. Marine Corps/Navy recommends Alternative 6A (MCAS El Toro Project and Partial Irvine Desalter Project With Discharge to IDP Only) as its Preferred Alternative for an interim-action remedy to clean up the regional VOC-contaminated groundwater at MCAS El Toro. (See Figure 6.) To reach this conclusion, the U.S. Marine Corps/Navy initially evaluated each of the 12 alternatives for effectiveness, implementability, and cost. Alternatives 2C, 3, 4A, 4B, 5A, and 5B were screened out as less effective, or because they would incur additional cost without providing any additional benefit. Alternative 6A is implementable only with a settlement between the U.S. Marine Corps/Navy and OCWD to operate the pump and treatment system. If a settlement is not reached, the U.S.

Marine Corps/Navy proposes selection of Alternative 2A for this interim remedial action. (See Figure 7.)

Alternatives 2A, 2B, 2D, 6A, and 6B were evaluated in detail, by the criteria required by EPA (see Table 3). Alternatives 2D, 6A, and 6B would treat the extracted groundwater to reduce VOCs to a concentration considered by the State and EPA to be safe for domestic use. Alternatives 2A and 2B would avoid domestic use by reinjecting the groundwater after treatment to remove VOCs. Except for Alternative 1 (No Action), it is expected that all of the alternatives would eventually meet the remedial objectives and comply with regulatory requirements. Both Alternatives 2A and 6A would include extraction from both shallow and deep groundwater; the rate of extraction would be higher for 6A, resulting in a higher rate of contaminant removal.

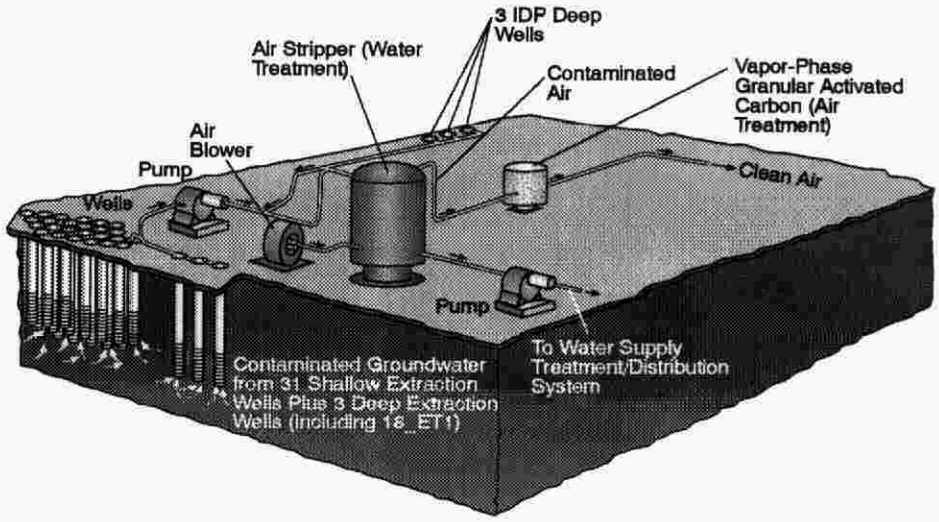


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Figure 6 - Alternative 6A
The U.S. Marine Corps/Navy's Preferred Alternative (6A)

Alternative 6A was selected for its overall cleanup effectiveness and cost-benefit ratio.

Alternatives 2A, 2B, 2D, and 6B would be slightly more effective than Alternative 6A at reducing the extent of the shallow groundwater contamination. Alternatives 2B, 2D, 6A, and 6B would be roughly equivalent in reducing the extent of contamination in the deep groundwater. Because Alternative 2A would have a lower pumping rate for deep groundwater, its rate of contaminant removal

Table 3–EPA Criteria Used to Evaluate Cleanup

1. **Overall Protection of Human Health and the Environment:** Addresses whether a cleanup method provides adequate protection and describes how risks presented by each pathway of exposure are eliminated, reduced, or controlled through water treatment, engineering controls, or institutional controls.
2. **Compliance with ARARs:** Addresses whether a cleanup method will meet all ARARs (Federal and State environmental requirements) and/or provides grounds for invoking a waiver.
3. **Long-Term Effectiveness and Permanence:** Refers to the ability of a cleanup method to maintain reliable protection of human health and the environment over time, after the cleanup action is completed.
4. **Reduction of Toxicity, Mobility, or Volume Through Treatment:** Refers to the anticipated ability of a cleanup method to reduce the toxicity, mobility, or volume of the contaminants present at the site through treatment.
5. **Short-Term Effectiveness:** Addresses the period of time needed to complete the cleanup, and any adverse impacts on human health and the environment that may result during the construction and operation period.
6. **Implementability:** Refers to the technical and administrative feasibility of a cleanup method, including the availability of the materials and services required by the method.
7. **Cost:** Evaluates the estimated capital and operation and maintenance costs of each cleanup method.
8. **State Acceptance:** Indicates whether the State of California agrees to the preferred cleanup method.
9. **Community Acceptance:** Indicates whether public concerns are addressed by the cleanup method, and whether the community has a preference for a cleanup method. Public comment is an important part of the final decision. This Proposed Plan is the U.S. Marine Corps/Navy's request to the community to comment on the proposed cleanup methods.

would be somewhat lower. However, Alternative 2A would be more cost-effective than 2B or 6B, and easier to implement than 2D. Groundwater modeling suggests that Alternative 2B would have the fastest cleanup time, Alternatives 2A and 2D would be next, and Alternatives 6A and 6B would follow. However, these estimates are approximate.

Ranking of Alternatives by EPA Criteria

Table 4 summarizes the evaluation and ranking process for the alternatives. The alternatives were first compared using each criterion, and then ranked against each other by how well they would satisfy each criterion. Table 4 summarizes the ranking system by showing four levels of performance: good, moderate, fair, and least-acceptable.

EPA Criterion	Remedial Alternative 1	2A	2B	2D	6A	6B
1. Overall Protectiveness	○	●	●	●	●	●
2. Compliance with ARARs	○	●	●	●	●	●
3. Long-Term Effectiveness and Permanence	○	◕	●	◕	◕	●
4. Reduction of Mobility, Toxicity, or Volume	○	◕	●	●	●	●
5. Short-Term Effectiveness (cleanup time)	○	◕	●	◕	◒	◒
6. Implementability	●	◕	◕	◒	◕	◒
7. Cost	●	◕	○	◕	●	◒
8. State Acceptance	TBD	TBD	TBD	TBD	TBD	TBD
9. Community Acceptance	TBD	TBD	TBD	TBD	TBD	TBD

Remedial Alternatives:

1 No Action
2A MCAS El Toro Project without 18_ET1
2B MCAS El Toro Project with 18_ET1
2D MCAS El Toro Project with Continuous Use
6A MCAS El Toro Project and Partial IDP with Discharge to IDP Only
6B MCAS El Toro Project and Partial IDP with Injection of Shallow Groundwater

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● Good performance
◕ Moderate performance
◒ Fair performance
○ Least-acceptable performance

TBD To Be Determined

Table 4
Summary of Evaluation of Cleanup Alternatives
The U.S. Marine Corps/Navy used the EPA's criteria to evaluate cleanup alternatives.

How Much Will Cleanup Cost?

The total estimated present-worth costs of the alternatives that were evaluated in detail over a 40-year operating period (excluding No Action) range from less than $34 million to $63 million, as shown in Table 5. "Present worth" is defined as the amount of money that would pay for the entire project construction and operation if it were invested today. The present worth of the Preferred Alternative (6A) would be $33.8 million; that of the Secondary Alternative (2A) would be $54.3 million. These estimates include capital costs over 40 years. Additional details of the cost estimates are included in the OU-1 Interim Action Feasibility Study Report.

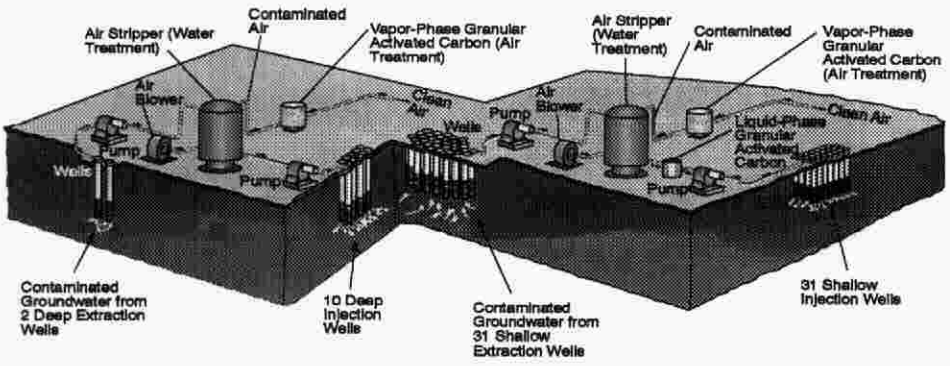

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Figure 7
The U.S. Marine Corps/Navy's Secondary Cleanup Alternative (2A)
Alternative 2A is an effective method of meeting the remedial goals for this interim action.

Evaluation of Preferred Alternative by EPA Criteria

The following is a brief discussion of how the U.S. Marine Corps/Navy's Preferred Alternative (6A) and Secondary Alternative (2A) would meet the nine EPA evaluation criteria. Alternative 6A is illustrated in Figure 5, and Alternative 2A is illustrated in Figure 6.

Overall Protection of Human Health and the Environment. Both Alternatives 6A and 2A would provide overall protection of human health by containing the VOC contamination in its present area, reducing the concentrations of VOCs in the deep and shallow groundwater, and controlling access to the contaminated

groundwater. Once VOCs in the groundwater are reduced to MCLs, both alternatives would remain protective over the long term.

Compliance with ARARs. It is expected that both Alternatives 6A and 2A would meet the remedial goals for this Interim Action and comply with regulatory requirements. The MCLs established by the Federal and State governments and the water quality standards stated in the Water Quality Control Plan for the Santa Ana River Basin would be met when the groundwater cleanup standards are met. The time period required for compliance would be significant, because the volume of VOC-contaminated groundwater is large. In the interim, these alternatives would rely on controls (such as well permits) to prevent domestic use of contaminated groundwater. Both alternatives could be implemented to comply with the requirements specific to the location of the treatment facilities and with air emission limits. For a more detailed discussion of regulatory requirements, refer to the OU-1 Interim-Action Feasibility Study.

Long-Term Effectiveness and Permanence. Results from groundwater modeling suggest that, after 20 years, both Alternatives 6A and 2A would have significantly reduced the VOC contamination in both the shallow and deep groundwater. However, Alternative 2A would be slightly less effective than Alternative 6A, because of its slightly lower rate of groundwater extraction (and therefore, contaminant extraction). Both alternatives would be permanently effective in reducing the mass of contaminants in the groundwater.

Reduction of Toxicity, Mobility, or Volume of Contaminants Through Treatment. Alternative 6A would be expected to remove approximately 12,000 pounds of TCE from the shallow and deep groundwater in the first 20 years of operation. Alternative 2A would be expected to remove approximately 11,000 pounds of TCE during the same period.

Short-Term Effectiveness. Both Alternatives 6A and 2A would require significant periods of time to meet the remedial objectives for cleanup of the groundwater. In the short term, they would be equally effective, and no adverse, short-term health effects would be anticipated.

Implementability. For both alternatives, implementation would involve acquisition of property and easements, possible coordination regarding transportation right-of-ways, and groundwater monitoring to ensure that the extraction system operates as intended and to document the eventual attainment of remedial objectives. The technologies that would be employed are standard, proven technologies that are considered technically feasible. But for Alternative 6A, the U.S. Marine Corps/Navy and OCWD would have to reach agreement to resolve various operational, financial, and liability concerns in order to execute a formal, legal settlement regarding operation of the IDP. Without such a settlement, Alternative 6A could not be implemented.

Cost. For Alternative 6A, the estimated capital cost would be $16.5 million; the estimated annual operation and maintenance cost would be $0.9 million; and the present worth (calculated for 40 years with a 4 percent discount rate) would be $33.8 million. For Alternative 2A, the estimated capital cost would be $30.5 million; the estimated annual operation and maintenance cost would be $1.2 million; and the present worth (calculated for 40 years with a 4 percent discount rate) would be

Table 5
Estimated Costs for Cleanup Alternatives (in $ million)

Alternative	Capital Cost	Annual Operating Cost	Total Present Worth
2A	30.5	1.2	54.3
2B	34.7	1.4	63.0
2D	25.7	1.4	52.5
6A	16.5	0.9	33.8
6B	25.6	1.3	51.3

Note: These costs include installation and operation of shallow and deep groundwater extraction wells by the U.S. Marine Corps/Navy. The estimates for Alternatives 6A and 6B are based on a 0% U.S. Marine Corps/Navy cost for components that are shared with OCWD's water supply treatment and distribution system. The final settlement between the U.S. Marine Corps/Navy and OCWD may change this cost share.

$54.3 million. Details of the cost estimates are in the OU-1 Interim-Action Feasibility Study.

State Acceptance. [Acceptance by the State of California will be determined after review of the Interim-Action Feasibility Study by the environmental regulatory agencies.]

Community Acceptance. The U.S. Marine Corps/Navy will use comments received from the interested public on this Proposed Plan to evaluate the community acceptance of the Preferred or Secondary Alternative to clean up the groundwater.

How Will the U.S. Marine Corps/Navy Decide Between Alternatives 6A and 2A?

The U.S. Marine Corps/Navy is proposing a contingency Record of Decision (ROD) for this Interim Action at MCAS El Toro, whereby the U.S. Marine Corps/Navy would select a remedy for implementation (the Preferred Alternative), and also select a Secondary Alternative. The secondary remedy is the contingency measure, to be used if the first remedy could not be implemented. The contingency ROD will specify the criteria under which the secondary remedy would be implemented.

Generally, a contingency ROD is appropriate when there is uncertainty about whether a remedy can be implemented successfully. At MCAS El Toro, the uncertainty concerns the settlement to be reached between the U.S. Marine Corps/Navy and Orange County Water District for the operational, financial, and liability aspects of the components of the IDP related to VOC treatment. The U.S. Marine Corps/Navy is proposing a contingency ROD to ensure that, should no settlement be reached, a remedy could be implemented at the Station without further delay.

Because there is opportunity for public comment on both the Preferred and Secondary Alternatives for remedial action at this time, the U.S. Marine Corps/Navy does not anticipate providing an additional public comment period if the Secondary Alternative should be implemented.

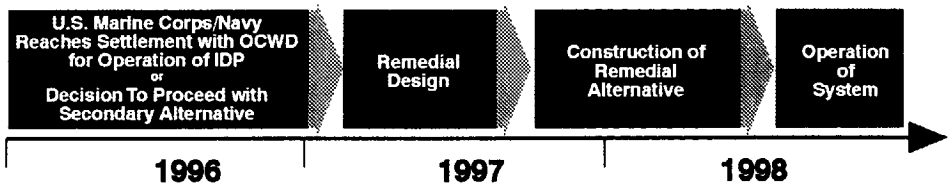

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Figure 8
Approximate Timeline for Cleanup
The U.S. Marine Corps/Navy's groundwater cleanup system could be in operation by 1998.

How Soon Will Cleanup Begin?

The approximate schedule for the groundwater cleanup process at MCAS El Toro is presented in Figure 8.

Glossary

Administrative Record: A collection of all documents relied upon to select a cleanup action.

Air Stripping: A method to remove VOCs from contaminated groundwater by transferring (stripping) the VOCs from water to air. The contaminated air can then be treated.

Applicable or Relevant and Appropriate Requirements (ARARs): The Federal and State environmental requirements that a selected remedy must meet. These requirements may vary among cleanup sites and remedial alternatives.

Area of Concern: Area of VOC groundwater contamination addressed by this OU-1 interim action.

Contaminants: Chemicals (elements or compounds) present in the groundwater which, if left in place at current levels, could adversely affect human health or the environment. Such chemicals include VOCs and petroleum hydrocarbons.

Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA): A Federal law that addresses the funding for and cleanup of abandoned or uncontrolled hazardous waste sites.

Feasibility Study: An evaluation of potential treatment methods and cleanup alternatives that can be used to clean up a site.

Groundwater: Underground water that fills pores in soils or openings in rocks to the point of saturation. Groundwater is often used as a source of drinking water through municipal or domestic wells.

Groundwater Monitoring: Ongoing collection of information about the environment that helps gauge the quality of groundwater and the effectiveness of a cleanup action.

Groundwater Monitoring Wells: Wells specially designed and designated for sampling groundwater to assess its quality.

Interim Action: A cleanup action that can be implemented quickly, and that (although not intended as a "final" site remedy) substantially reduces potential immediate, imminent, and/or substantial risks to human health and the environment, and is consistent with the anticipated final remedy.

Interim Action Feasibility Study: The Feasibility Study being undertaken by the U.S. Marine Corps/Navy for the proposed Interim Action at MCAS El Toro. The study is summarized in this Proposed Plan.

Operable Unit: A portion of an RI/FS designated for the purpose of accelerating the cleanup process.

Petroleum Hydrocarbons: Chemical compounds in petroleum products, such as those found in motor oil or gasoline.

Proposed Plan: A report specifically prepared for public review and comment that summarizes the content and conclusions of a Feasibility Study.

Record of Decision (ROD): A report documenting the final agency-approved remedial actions that will be required to clean up a particular National Priorities List (NPL) site.

Remedial Investigation: Exploratory inspection conducted at a site to determine the nature and extent of contaminants present.

Risk Assessment: An evaluation of the risk to human health and the environment resulting from exposure to hazardous substances.

Treatment: Methods used to reduce the toxicity or the amount of contaminants in groundwater.

Vapor-Phase Granular Activated Carbon (VGAC): A method that removes VOCs from contaminated air by adsorption.

Volatile Organic Compounds (VOCs): Solvents that quickly evaporate at room temperature; often used in dry cleaning, metal plating, and degreasing.

Your input on the proposed OU-1 interim action at MCAS El Toro is important to the U.S. Marine Corps/Navy. Your comments will make a difference in helping to select the best alternative for cleaning up the VOC-contaminated groundwater. You may use the next page to write your comments; if you need more space, please attach more pages. Comments must be postmarked by (_____), to be considered. Mail comments to:

Mr. Joseph Joyce
BRAC Environmental Coordinator
AC/S Environmental 1AU
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001
(714) 726-3470

The U.S. Marine Corps/Navy is publishing this Proposed Plan to meet the public participation requirements of Section 117(a) of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). The Plan was developed by the U.S. Marine Corps/Navy as lead agency, and with the support of the U.S. Environmental Protection Agency (EPA) and two California environmental agencies-the Department of Toxic Substances Control and the Regional Water Quality Control Board.

This document summarizes the numerous technical reports and evaluation of cleanup alternatives resulting from the U.S. Marine Corps/Navy's Remedial Investigation and Feasibility Study at the Marine Corps Air Station (MCAS) El Toro. These reports are part of the permanent Administrative Record for MCAS El Toro, which is open to the public at the information repository located at Heritage Park Library, Irvine, California.

If you are interested in the details of the groundwater investigation results and the cleanup alternatives, refer to the Operable Unit 1 (OU-1) Remedial Investigation/Feasibility Study Report, dated __ February 1996.

Use This Space Below To Write Your Comments

(Attach additional pages if you need more space.)

Name: _____

Address: _____

City: _____

State: _____ **Zip Code:** _____

Telephone: (____) _____

MAILING LIST COUPON

If you would like to submit comments on this document and/or be placed on the mailing list to receive information about environmental restoration activities at MCAS El Toro, please fill out this coupon and mail it to Mr. Joseph Joyce, BRAC Environmental Coordinator, AC/S, Environmental (1AU), MCAS El Toro, P.O. Box 95001, Santa Ana, CA 92709-5001

- ❑ Add me to the MCAS El Toro Installation Restoration Program mailing list.
- ❑ Add me to the MCAS El Toro Restoration Advisory Board mailing list so that I can receive board meeting notices, agendas, and minutes.
- ❑ Send me information on Restoration Advisory Board membership.

Name _____

Address _____

City _____ **State** _____ **Zip Code** _____

Affiliation (if applicable) _____ **Telephone ( )** _____

WHERE TO GET MORE INFORMATION

Copies of all documents and correspondence relating to the environmental cleanup activities at MCAS El Toro are available for public review at the information repository listed below.

Heritage Park Regional Library
14361 Yale Avenue
Irvine, California 92714
714/551-7151

If you have any questions regarding the environmental program at MCAS El Toro or would like additional information, please contact:

Mr. Joseph Joyce
BRAC Environmental Coordinator
AC/S, Environmental (1AU)
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001
(714)726-3470

Mr. Fraser Felter
Community Relations Coordinator
U.S. EPA
75 Hawthorne Street (H-1-1)
San Francisco, CA 94105
(800)231-3075

Captain Brad Bartlet
BRAC Public Affairs Officer
Marine Corps Air Bases, Western Area
MCAS El Toro
Santa Ana, CA 92709-5001
(714)726-3853

Commanding General
ATTN: Mr. Joseph Joyce
BRAC Environmental Coordinator
AC/S Environmental (1AU)
MCAS El Toro
P.O. Box 95001
Santa Ana, CA 92709-5001

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