

The Environmental Cleanup of Marine Corps Air Facility Tustin



September 1997

Tustin, California

No. 8

On September 12, 1997, MCAS Tustin became MCAF Tustin and Lieutenant Colonel Richard A. Bowen assumed the position of Officer-in-Charge. MCAF Tustin will remain under the military command of Commander, Marine Corps Air Bases Western Area, located at MCAS El Toro. Its mission in peacetime, as in war will remain; "to maintain and operate facilities and provide services and material to support operations of a Marine Aircraft Wing, or units thereof, and other activities and units designated by the Commandant of the Marine Corps in coordination with the Chief of Naval Operations." In July 1999 MCAF Tustin will close, and the property will be disposed of and reused in accordance with plans developed by the City of Tustin.

Groundwater Contamination and Cleanup – An Overview

This fact sheet summarizes the results of the Remedial Investigation at Marine Corps Air Facility (MCAF) Tustin that identified the types and extent of chemicals in the soil, and identified where chemicals have seeped into the groundwater over the years. This recently completed and comprehensive investigation is an integral step in the Marine Corps/Navy's successful cleanup of MCAF Tustin which will expedite base closure and property transfer.

Some chemicals that were once used in routine maintenance operations at the base were reported in the soil and groundwater. These chemicals currently pose no threat to human health or the environment; the impacted shallow groundwater **is not used for drinking water purposes**. A discussion of the specific chemicals and their potential health risks, and a prediction of their future movement (migration) in groundwater is presented in this fact sheet.

Based on the predicted migration of contaminated groundwater and further degradation of groundwater quality beneath the base, the Marine Corps/Navy is considering treating the groundwater at three locations to reduce the concentrations of chemicals to levels that meet federal drinking water standards. This action is necessary since the groundwater beneath the base is considered a suitable or potentially suitable drinking water supply. Other cleanup actions, such as natural dilution and groundwater containment, are also being considered.

In a continuing effort to inform the surrounding community about environmental conditions and restoration activities at MCAF Tustin, this fact sheet introduces and summarizes important groundwater issues. The Insert in this fact sheet explains what groundwater is and discusses the relationship between the water and soil beneath the base. You are encouraged to read the Insert first to better understand the results of the environmental investigations. For details on the environmental conditions at the base, a collection of reports and documents is available at the Information Repository listed in the Insert.

The Remedial Investigation

Historical activities at the base include more than 50 years of aircraft maintenance and support operations that used industrial solvents and other chemicals. In the past chemicals were spilled and leaked. Unlike the more environmentally sensitive procedures used today, past practices left chemicals in the soil at various locations, or sites. Some of these chemicals have since seeped, or

leached, through the soil into the shallow groundwater beneath the base.

During the early stages of MCAF Tustin's Installation Restoration Program, inspections were conducted at sites where the Marine Corps/Navy knew or suspected that chemicals had been used, spilled, or stored. From these initial inspections, the Marine Corps/

Navy narrowed down the list of sites to those where the presence of chemicals was verified. Some of these sites warranted no further action because no human health risks were identified; other sites required the extensive basewide Remedial Investigation because of potential health risks and the degradation of groundwater quality.

Combined with information from previous studies, the Remedial Investigation gave the Marine Corps/Navy a comprehensive "picture" of the conditions of soil and groundwater at the base. From this picture, the Marine Corps/Navy then estimated the potential health risks posed by chemicals in the soil and groundwater. The possibility that chemicals in the soil would continue to move into the groundwater and impact the shallow aquifer beneath the base was also evaluated.

Potential Health Risks

Human health risk assessments were conducted to determine if the chemicals in the soil and groundwater could pose a risk to human health, now or in the future. Because MCAF Tustin is closing and transferring property to the public, the risk assessment for soil was based on potential exposure to soil under current conditions and under a future **residential land use** scenario.

The risk assessment for groundwater considered current as well as future conditions and uses. The Orange County Water District, which manages the groundwater beneath the base, currently restricts the use of this water due, in part, to high levels of natural salts and general water hardness (nitrate and total dissolved solids). This restriction, therefore, eliminates any current exposure to people working or living anywhere on the base. The risk assessment for the future use of groundwater considered the State Water Resources Control Board's designation that the groundwater beneath the base is considered suitable, or potentially suitable, for municipal or domestic water supply (Resolution No. 88-63).

Of those sites investigated in the Remedial Investigation, the shallow groundwater beneath Sites 3, 12, and 13 South was found to have been impacted. The three sites are shown in Figure 2 of the Insert. The chemicals that were in the soil at Sites 3, 12, and 13 South have seeped into the groundwater and have impacted or degraded the potential water supply beneath the sites. Because of this impact and the possibility that the chemicals will migrate off-base, the Marine Corps/Navy is considering actions to clean up the groundwater beneath these sites (see pages 3 and 4).

An ecological (plant and animal) risk assessment was performed at a site (Site 5) where potentially sensitive habitats were identified. The results of this assessment indicated that the ecology would not be harmed due to the presence of chemicals (no ecological risks).

Groundwater Movement

The Remedial Investigation also verified the rates and direction of groundwater flow and predicted the movement of chemicals in the groundwater with the use of a "fate and transport" model. From this mathematical model, it was concluded that 1) contaminated groundwater has not moved off the base; 2) the chemicals have not impacted the deeper regional aquifer beneath the base; and 3) contamination in the shallow aquifer would not reach the regional aquifer in the future. However, the model did predict that chemicals in the shallow aquifer beneath Sites 3, 12, and 13 South may reach the base boundaries in approximately 15 to 40 years. Plumes beneath these sites containing trichloroethene (TCE), Freon, and 1,2,3-trichloropropane (TCP) are estimated to be moving at a rate of 30 to 100 feet per year. A plume is an area within groundwater that contains chemicals and that generally moves in the direction of, and with, the groundwater flow.

The results of the risk assessments and groundwater modeling for soil and groundwater are summarized in the Summary of Site Remedial Investigation and described in detail in the 1996 *Draft Remedial Investigation Report*, which is available at the Information Repository listed in the Insert.

Chemicals in the Groundwater

Of the chemicals from past base operations that were reported in the groundwater, the industrial solvents trichloroethene (TCE) and 1,2,3-trichloropropane (TCP) are of concern and warrant further attention. These and other commonly used solvents are organic compounds that were frequently used for machinery and parts degreasing, paint stripping, and other industrial cleaning operations. TCE and TCP are not naturally occurring chemicals and are known cancer-causing chemicals above certain levels. The coolant Freon was also commonly reported in groundwater, but below levels that pose a risk to human health.

Summary of Site Remedial Investigation

The following is a brief summary of the soil and groundwater conditions and potential human health risks for Sites 3, 12, and 13 South. For a detailed discussion of the other sites evaluated in the Remedial Investigation that did not require further environmental action, please refer to the documents available at the Information Repository. The chemical levels or concentrations summarized here are expressed in "parts per billion", or ppb, a unit commonly used to measure concentrations of chemicals. For example, 1 ounce of TCE in 1 billion ounces (or 7.5 million gallons) of water is 1 ppb.

Installation Restoration Program Site 3 — Paint Stripper Disposal Area

Soil

The solvent TCE is the most common solvent of concern reported to be in the soil at Site 3. The health risk assessment (under the residential land use scenario) determined that the concentrations of TCE at this site, as it exists today, do not pose a threat to human health. Under the future **residential land use** scenario, which is compatible with the future "Community Core" land use designation for the site, it was determined that the potential health risks are within a range considered protective of human health by the U.S. Environmental Protection Agency (U.S. EPA) and the California Environmental Protection Agency (Cal-EPA).

Groundwater

TCE in the groundwater was reported at levels ranging from 3 ppb to 1,600 ppb. This range exceeds the federal drinking water standard for TCE. However, groundwater does not currently pose a threat to human health because it is not used for human consumption and people are unlikely to come into contact with it.

It was also predicted that the TCE plume could reach the downgradient base boundary (near the southeast corner of the base) in approximately 15 years, and Peters Canyon Channel in approximately 40 years.

Installation Restoration Program Site 12 — Drum Storage Area No. 2

Soil

The most common chemical of concern reported to be in the soil at Site 12 is TCE. The health risk assessment (under the residential land use scenario) determined that the concentrations of TCE at this site, as it exists today, do not pose a threat to human health. Under the future **residential land use** scenario, the potential risks are within a range

considered protective of human health by the U.S. EPA and Cal-EPA.

Groundwater

TCE in the groundwater was reported at levels ranging from 7 ppb to 3,900 ppb. As with Site 3, groundwater does not currently pose a threat to human health because it is not used for human consumption and people are unlikely to come into contact with it.

It was also estimated that the TCE plume will mix, or commingle, with the Site 3 TCE plume within the next 30 years. The commingled plume could move off-base at a concentration above the federal drinking water standard for TCE (5 ppb).

For the same reasons stated for Site 3, the Marine Corps/Navy is considering actions to reduce TCE to a level that meets the federal drinking water standard and prevent the commingling of the two plumes.

Groundwater, Site 3 and Site 12 —

With the intent of meeting the Santa Ana Regional Water Quality Control Board's policy of restoring, to the extent practicable, groundwater beneficial uses, and the Marine Corps/Navy's goal of preventing or minimizing the spread of groundwater contamination, actions are being considered to reduce TCE to 5 ppb — the federal drinking water standard, and to protect future drinking water resources.

Installation Restoration Program Site 13 South — Temporary Storage Area and Wash Area

Soil

TCE and TCP are the most common chemicals of concern to be reported in the soil at this site. The health risk assessment (under the residential land use scenario) determined that these solvents do not pose a threat to human health as the site exists today. Under

the future **residential land use** scenario, the potential risks are within a range considered protective of human health by the U.S. EPA and Cal-EPA. It was determined, however, that the TCE and TCP in the soil may continue to seep into the shallow aquifer for up to 30 years, and therefore options for cleaning up this soil prior to property transfer are currently being considered.

Groundwater

TCE in the groundwater was reported at levels ranging from 1 ppb to 300 ppb, and TCP levels ranged from 2 ppb to 350 ppb. The measured concentrations of TCE exceeded the federal drinking water standards of 5 ppb. There is no acceptable level of TCP under the federal drinking water standards. However, groundwater does not currently pose a threat to human health because it is not used for human consumption and people are unlikely to come into contact with it.

It was also estimated that TCP, moving at a rate of approximately 100 feet per year, will move off-base and reach Barranca Channel within approximately 40 years.

Actions are also being considered to reduce TCE to 5 ppb, restore the beneficial uses of groundwater, and prevent the spread of TCE and TCP from beneath Site 13 South. The specific cleanup goal for TCP has yet to be established.

The deeper regional aquifer, presently used for agricultural and drinking water purposes, does not contain chemicals from Sites 3, 12 and 13 South. The actions being considered by the Marine Corps/Navy

are intended to cleanup and prevent the further contamination in the shallow aquifer beneath the three sites.

The Next Step

Based on the results of the Remedial Investigation, the Marine Corps/Navy has proceeded with the next step of the environmental restoration process—the preparation of a Feasibility Study. The Feasibility Study process includes setting remedial or cleanup objectives, and evaluating and selecting technologies and alternatives to eliminate or reduce chemicals in the soil and groundwater.

Representatives from federal and state environmental regulatory agencies have reviewed the *Draft Feasibility Study Report*. After the completion of additional groundwater investigations and the further evaluation of cleanup alternatives, the Marine Corps/Navy will incorporate agency comments on the *Draft Feasibility Study Report* and issue a second draft of the Report that will identify treatment alternatives for the soil at Site 13 South and for groundwater at all three sites. During a formal public comment period, the public will have the opportunity to review and comment on the Proposed Plan, which summarizes the Marine Corps/Navy's preferred alternative(s).

Your understanding, comments and opinions are an essential part of any environmental cleanup effort. For additional information on the Remedial Investigation results, or to contact a project representative, please see the “For Additional Information” section in the Insert of this Fact Sheet.

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GROUNDWATER

The eastern portion of the Los Angeles Basin, in which MCAF Tustin is located, consists of a series of uneven and mixed layers of sediments that were deposited over thousands of years. These sediment layers typically contain pockets, or lenses, of gravel and sands surrounded by smaller, finer-grained materials like silts and clays. Groundwater originates when rain and surface water (streams, rivers, and lakes) seep downward into the ground and fill the open spaces between soil particles. With time, the soil sediments become saturated when most of the open spaces, once filled with air, are replaced by water. The sediment layers where the water completely replaces the air spaces are called the **saturated zone**. The sediment layers above the saturated zone that still contain mostly air between the soil particles, make up the **unsaturated zone**. The **water table**, as is illustrated in Figure 1, marks the separation between the saturated and unsaturated zones.

When water seeps into the soil, it mainly flows downward through the unsaturated zone due to gravity. As the bottom-most sediment layers become saturated, the water begins to flow almost horizontally discharging into streams, rivers, reservoirs, or oceans in down-gradient or lowland areas.

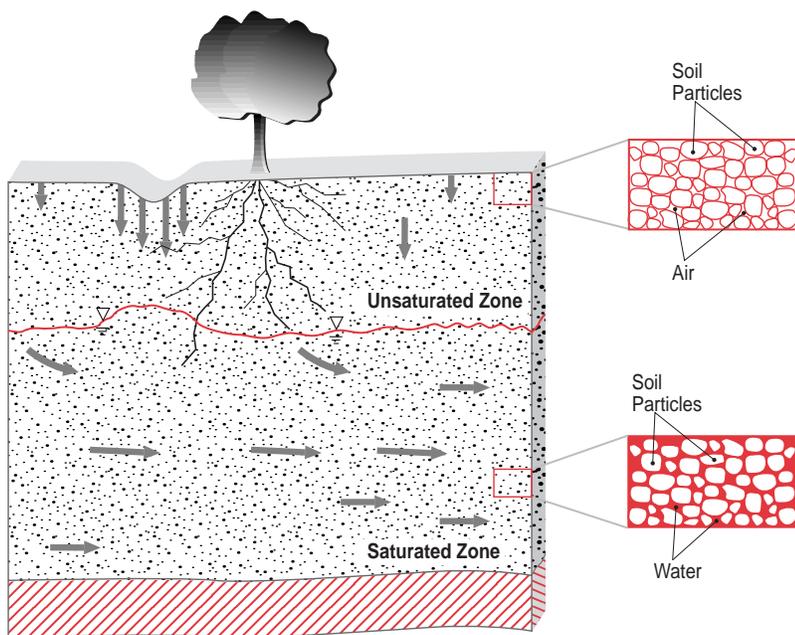
Groundwater typically moves slowly in comparison to surface water in streams, rivers, and drainage channels. It also moves slower through finer-grained clay and silt, and faster through coarser-grained sand and gravel due to the larger openings between these materials.

HYDROGEOLOGY

Hydrogeological conditions, or the interrelationship between soil and groundwater, under MCAF Tustin have been studied extensively. Based on these studies, the general groundwater conditions beneath the base have been defined. A schematic drawing illustrating the hydrogeological conditions beneath the base is shown in Figure 2.

Here, groundwater is found in two aquifers. An aquifer is an underground soil layer that can store and transmit water. Beneath the base, the upper aquifer (designated the shallow aquifer) extends to a depth of approximately 100 feet below the ground surface and includes three water-bearing zones, as illustrated in Figure 2.

The water-bearing zones in the shallow aquifer beneath the base consist primarily of fine-grained soils (silts and clays) with some discontinuous pockets, or lenses, of coarse-grained soils (gravel and sands). The gravel and sand lenses range from about 1 foot to 10 feet in



Legend
 ▽ Water Table → Water Movement [Sand/Silt/Clay/Gravel] [Impermeable Zone or Barrier]
 (not to scale)

Figure 1
 Occurrence and Movement of Groundwater Beneath MCAF Tustin

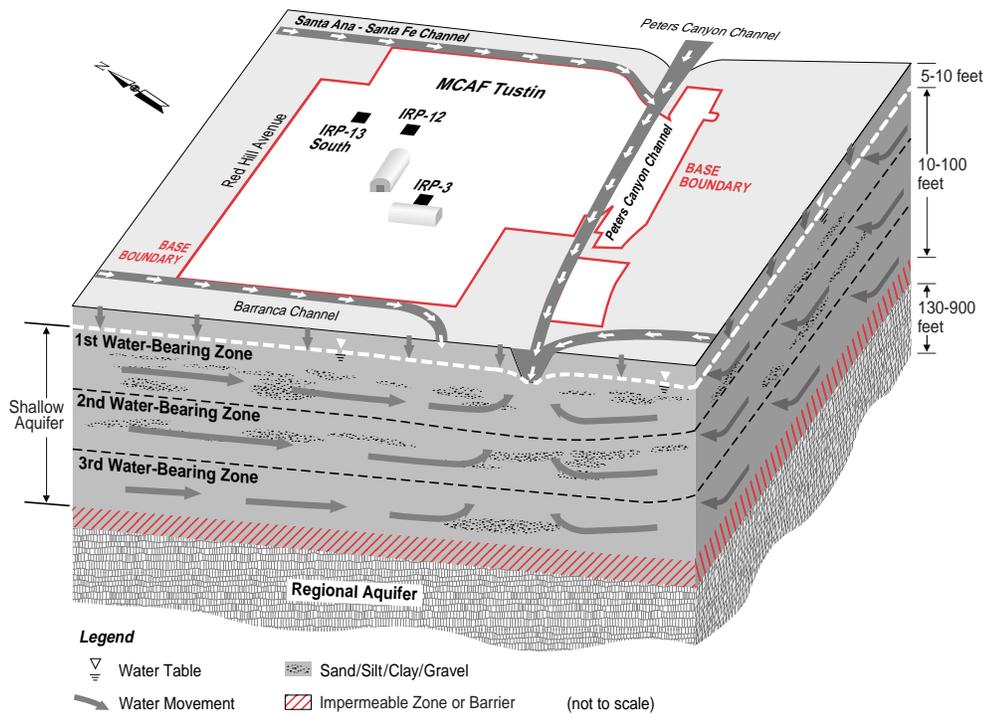


Figure 2
Groundwater Schematic of MCAF Tustin

thickness. The movement of groundwater occurs primarily through these coarser-grained sand and gravel lenses.

The deeper, or regional, aquifer beneath the base begins at depths of between 130 to 150 feet below ground surface. A continuous 10- to 30-foot-thick

clay layer acts as a natural barrier, or aquitard, to the movement of groundwater and separates the shallow and regional aquifers beneath the base. This means that water does not flow readily between the two aquifers.

Because groundwater in the shallow aquifer beneath the base contains high levels of natural salts and total dissolved solids, and yields little water when pumped, it has not been extracted, or used, for residential, industrial, or agricultural purposes. Although the Santa Ana Regional Water

Quality Control Board has designated all groundwater beneath MCAF Tustin as a potential source of drinking water supply, only the deeper, regional aquifer is now used for agricultural purposes and as a drinking water supply. No groundwater is currently extracted from directly beneath MCAF Tustin for drinking water purposes. Drinking water for the base is supplied by the Irvine Ranch Water District.

For Additional Information

The Marine Corps/Navy encourages community involvement in the decision-making process for the Installation Restoration Program at MCAF Tustin. If you have any questions or concerns about environmental activities at the base, or would like to be added to the mailing list, please feel free to contact any of the following project representatives:

- Ms. Desire Chandler, MCAF Tustin Base Realignment and Closure (BRAC) Environmental Coordinator, at 714-726-5836
- Captain Matt Morgan, Base Realignment and Closure Public Affairs Officer, at 714-726-3853
- Ms. Marsha Mingay, Public Participation Specialist, California Environmental Protection Agency, at 562-590-4881

Two documents that describe the groundwater investigations at MCAF Tustin, the 1995 *Final Expedited Site Characterization Report* and the 1996 *Draft Remedial Investigation Report*, are available in the Information Repository located at:

University of California, Irvine
Main Library
Government Publications Department
Call (714) 824-7362 or 824-6836
for current hours and directions.