

EXECUTIVE SUMMARY

This report describes the methods used and the findings of the remedial investigation at Operable Unit 2 at Hill Air Force Base, Utah (Hill AFB). Hill AFB was placed on the National Priorities List in July of 1987, and Operable Unit 2 (OU 2) is one of seven operable units being investigated for contamination associated with the disposal of hazardous waste. Operable Unit 2 has been defined as including the former Chemical Disposal Pit 3 area and an area referred to as Perimeter Road. The Perimeter Road area has been investigated and found free of contamination, except in those areas currently being investigated as part of other operable units. Therefore, while the title of this report refers to OU 2, the primary purpose of this report is to discuss findings associated with the investigation at Chemical Disposal Pit 3. However, the field activities and a summary of the findings and recommendations from work conducted along Perimeter Road are presented. Unlined earthen trenches were used for the disposal of spent liquid degreasing solvents (primarily trichloroethylene) at Chemical Disposal Pit 3, and the primary contaminants of interest at OU 2 are chlorinated organic solvents.

Hill AFB lies on a topographic high approximately 300 feet above the Weber River Valley, which is located immediately north and east of the base. OU 2 is remotely located on the far eastern boundary of the base approximately one third of the distance down the hillslope separating Hill AFB from the Weber River Valley.

Groundwater at OU 2 occurs in the shallow subsurface in the uppermost unconfined aquifer in a series of sand, gravel, and clay deposits and flows to the northeast. This shallow aquifer is separated from deeper regional drinking water sources by several hundred feet of principally low permeability clays. A number of seeps and springs occur during wet seasons on the face of the hillslope east of (off-base) the site. Because the dominant lithologies in the unsaturated soils above the uppermost aquifer are highly permeable fine to coarse-grained unconsolidated sands and gravels, contaminants introduced into these shallow deposits have infiltrated downward to the water table.

Because the chlorinated organic solvents historically disposed of at the site have densities greater than water and are generally only slightly water soluble, these contaminants have migrated through the water column in the shallow aquifer and have accumulated in sufficiently large quantities to form a dense non-aqueous phase liquid (DNAPL) layer measuring up to several feet thick immediately on top of the underlying low permeability zone as well as in the coarser grained sand layers within this zone.

The controlling factor in the distribution of the DNAPL at OU 2 is the surface geometry of the underlying low permeability clay formation. Field investigations of the geology beneath the site have found a depressional area in the top of this clay formation which has created the potential for "pooling" of the DNAPL in a trough trending northwest to southeast along the center of the site (coincidental to the approximate trench locations). This trough appears to contain a reservoir of DNAPL which is acting as a continual source of dissolved contaminants to the shallow groundwater moving through the area. Evidence also exists that suggests that the seeps and springs on the hillslope below OU 2 are hydraulically connected to the shallow groundwater, the principal evidence being the presence of known OU 2 site-related

contaminants in several of those seeps. Figure ES-1 contains a generalized cross-section of the OU 2 area.

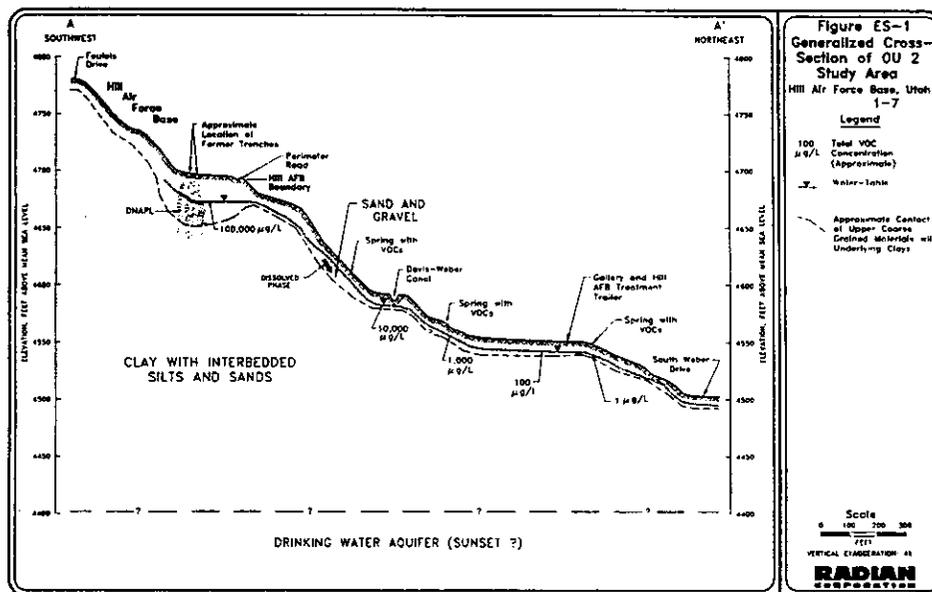


Figure ES-1. Generalized Cross-Section

The principal organic contaminants at OU 2 are the following chlorinated compounds: trichloroethylene, tetrachloroethylene, methylene chloride, and 1,1,1-trichloroethane. Soils at this site are contaminated with levels of trichloroethylene up to 880 mg/kg, tetrachloroethylene up to 200 mg/kg, methylene chloride up to 3.3 mg/kg, and 1,1,1-trichloroethane up to 100 mg/kg. Groundwater contamination on base includes levels of trichloroethylene up to 235,000 µg/L, tetrachloroethylene up to 8,900 µg/L, methylene chloride up to 59,000 µg/L, and 1,1,1-trichloroethane up to 62,000 µg/L. Groundwater contaminated with chlorinated organic solvents covers an area of approximately 6 acres on base, and approximately 30 acres off base. The following contaminants have been detected in off-base seeps and springs: methylene chloride up to 4,300 µg/L; tetrachloroethylene up to 1,900 µg/L; 1,1,1-trichloroethane up to 11,000 µg/L, and trichloroethylene up to 170,000 µg/L. However, the spring that contained these elevated contaminant concentrations went dry several years ago and has not been observed flowing since. Currently, all off-base springs and seeps with contaminant concentrations in excess of federal primary drinking water standards (MCLs) are treated at the source with carbon filtration systems.

Chromium is the most prevalent inorganic contaminant at the OU 2 site, being detected at elevated concentrations in surface soils and at concentrations exceeding MCLs in several test wells. Nickel, lead, and cadmium have also been detected in the shallow groundwater at levels greater than MCLs or proposed MCLs.

A conceptual site model (Figure ES-2) has been developed to graphically display the potential contaminant migration pathways at OU 2 which may result in exposure to human populations or wildlife in the area immediately adjacent to this site. The predominant pathway by which off-base receptors would be exposed to contaminants from OU 2 is through leaching from the site to underlying groundwater followed by transport to a potable well, agricultural well, or surface water bodies. The presence of the DNAPL in the area immediately below the former disposal trenches is providing a continual source of dissolved constituents to the shallow groundwater at OU 2 and is a potential threat to the deeper groundwater underlying the site (currently used as a source of drinking water). The USAF recognizes this fact and is currently in the process of implementing an Interim Remedial Action in an effort to reduce or remove this DNAPL.

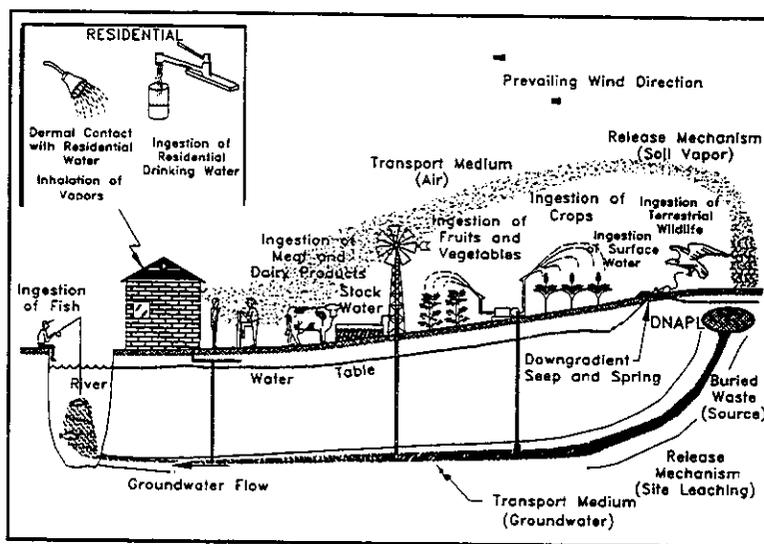


Figure ES-2. Conceptual Site Model

The risk assessment considered three human populations: 1) off-site residents in areas downwind and downgradient from OU 2; 2) future on-site residents assuming that Hill AFB is closed and residential development occurs prior to complete site remediation; and 3) future on-site construction workers, again assuming that the base closes and residential development occurs prior to complete site remediation. For off-site residents, the risk assessment evaluates both current exposures and exposures that may occur in the future.

Estimated carcinogenic risk values for current off-site residents are below the Superfund risk range site remediation goal of 10^{-4} (1 in 10,000) to 10^{-6} (1 in 1,000,000). Hazard indices (a numerical value for noncarcinogenic risk) for this population are also below the Superfund site remediation goal of 1. Estimated risk values for the future residential scenarios (both off-site and on-site) exceed both the Superfund risk range site remediation goal (for carcinogenic effects) and the Superfund hazard index goal (for noncarcinogenic effects). The risks are

generally driven by exposure to trichloroethylene via inhalation of vapor-phase chemicals while showering and ingestion of contaminated groundwater. Therefore, those populations which do not use shallow groundwater contaminated by OU 2 will not be exposed in these ways and will therefore not have the same level of risk. Interpretation of these results should be qualified by the uncertainties associated with estimating future concentrations of contaminants in drinking water and the air of a shower stall, which are fully discussed in the risk assessment report (Radian, 1992).

The estimated carcinogenic risk values for the future on-site construction worker are within the Superfund risk range site remediation goal; however, the values do exceed the 10^{-6} , the point of departure in determining remediation goals. Estimated hazard indices for this population exceed the Superfund site remediation goal for noncarcinogenic risk. The risks are dominated by inhalation of chromium VI in fugitive dust generated by construction activities. Interpretation of these results should be qualified by the large number of uncertainties in the methodologies used to estimate exposure concentrations for inorganic chemicals in general, and chromium VI in particular.

The EPA and State of Utah review of the "*Draft Remedial Investigation Report for Operable Unit 2*" resulted in the identification of several "data gaps" in the complete characterization of the site. Hill AFB is currently cooperating with the regulatory agencies to determine the appropriate actions required to fill these "gaps". As new site-related data are acquired, they will be incorporated into this Remedial Investigation report in the form of addenda.