EXECUTIVE SUMMARY

Following conclusion of the remedial investigation field efforts (October, 1994), a groundwater monitoring program was implemented at the Tooele Army Rail Shop (TARS) and Bamberger Pond, Operable Unit 5 (OU 5), Hill Air Force Base, Utah (Hill AFB). Since inception of the program in the fall of 1994, the main objective has been to track the nature and extent of a trichloroethene (TCE) groundwater plume which extends from the TARS approximately one mile west to the city of Clinton, Utah. Another equally important objective of the OU 5 groundwater monitoring program has been to gather additional data on contaminants of concern (COCs) identified in OU 5 groundwater. In 1996 and 1997, groundwater data were also collected for the purpose of evaluating intrinsic remediation of the TCE plume at OU 5. To date, a total of eight distinct groundwater sampling events have been conducted at OU 5 as part of the monitoring program, ranging from October 1994 (Round 1) through September 1997 (Round 8). Groundwater data presented in this report were generated through sampling events conducted in March 1997 (Round 7) through September 1997 (Round 8).

Groundwater data from Round 8 was used to update the existing TCE plume map at OU 5. Comparison of the updated plume map with the Fall 1996 TCE plume map indicates no significant changes in the overall shape or dimensions of the TCE plume. A review of TCE groundwater data from October 1993 through September 1997 revealed an order of magnitude decrease in TCE concentrations within the suspected source area. Further down-gradient from the source region, the TCE concentrations have remained nearly constant, although data indicate that the plume may be slightly increasing in areal extent. The magnitude of decrease in TCE concentrations within the suspected source area suggests a reduction of mass loading of TCE to the aquifer. The reduction of TCE concentrations in the source area may indicate that the primary TCE source has been removed and reductive dehalogenation and natural attenuation is occurring.

The TCE degradation by-products, namely cis-dichloroethene (cis-DCE) and trans-dichloroethene (trans-DCE) were detected within the TCE plume at the TARS and have been detected since the beginning of the long-term monitoring program. Cis-DCE concentrations qualitatively mirror TCE concentrations at OU 5; higher concentrations of cis-DCE are found in regions with the highest TCE concentrations. The presence of these compounds may indicate microbial degradation of the TCE plume at OU 5 by various metabolic pathways. As expected, cis-DCE concentrations are higher than TCE concentrations in the direct vicinity of the aeration curtain. This is likely the result of enhanced degradation of TCE due to residual biopolymer slurry that remained for 12 months in the aeration curtain before the system was started. The slurry likely served as a carbon substrate for bacteria to metabolize, and under anaerobic conditions, TCE served as an electron acceptor.

Specific parameters were recorded during Rounds 7 and 8 sampling that appear to support the hypothesis that the TCE plume is being reductively dehalogenated in some portions of the plume at TARS. Review of the spatial relationship of these parameters with the TCE plume indicates some locations with depressed dissolved oxygen concentrations (<1 mg/L) within the plume, allowing for anaerobic conditions to exist and the potential for reductive dehalogenation to occur. The presence of total organic carbon and methane in

groundwater provide supporting evidence that primary substrates and degradation byproducts exist, allowing multiple metabolic pathways for degradation of TCE.

Several other volatile organic compounds (VOCs) which also are COCs were detected in low concentrations compared to TCE during the last sample round. These included 1,1,1-trichloroethane (TCA), chloroform, and 1,1-dichloroethene (DCE). None of these VOCs exceeded their respective maximum contaminant levels (MCLs). Two VOCs, carbon tetrachloride and tetrachloroethene (PCE) were detected within the TCE plume above their MCLs of 5 micrograms per liter (µg/L). Carbon tetrachloride was detected approximately one mile west of the suspected TCE source area at a concentration of 6.43 µg/L. PCE was also detected approximately one mile west of the suspected TCE source area at a concentration of 193 µg/L (U5-141). PCE has consistently been present in U5-141 since the monitoring program began. In order to address the presence of PCE, it is recommended that the up-coming off-base investigation at OU9 include this area as part of the investigation. In addition to carbon tetrachloride and PCE, vinyl chloride (MCL of 2 ug/L) was detected in U5-132 at a concentration of 12 ug/L. The occurrence of vinyl chloride is most likely due to reductive dehalogenation of TCE in the presence of residual biopolymer slurry that was used in the construction of the aeration curtain, located approximately 10 feet east of U5-132. Previous sample results have not indicated the presence of vinyl chloride in the groundwater at OU5. Refer to Section 5 of this report for recommendations regarding on-going groundwater monitoring at the TARS.

Arsenic, identified in groundwater at Bamberger Pond, was detected in all of the wells at Bamberger Pond (11 total) in September 1997. The data indicated the presence of arsenic at a concentration exceeding its MCL (50 ug/L) in U5-111, U5-112, and U5-182. In September 1997, arsenic was detected in U5-111, U5-112, and U5-182, at concentrations of 58.1 ug/L, 75.9 ug/L, and 114 ug/L, respectively. Analysis of samples collected from these wells in 1996 and 1997 indicate that there may be a seasonal relationship with arsenic concentrations at Bamberger Pond. Additional groundwater data should be collected during future sampling events to determine trends in arsenic concentrations at these locations. A Geoprobe study is underway to determine the arsenic and manganese concentrations as a function of depth beneath Bamberger Pond. These new data will support the continued evaluation of background (natural occurring) arsenic and manganese concentrations that exist above their respective MCLs. The data will also aid in determining whether the redox potential in the shallow groundwater is affecting the solubility of arsenic in the formation. Based on these data, Hill AFB should continue with quarterly groundwater monitoring at Bamberger Pond. Refer to Section 5 of this report for additional recommendations regarding on-going groundwater monitoring at Bamberger Pond.