PUBLIC HEALTH ASSESSMENT

GEORGE AIR FORCE BASE
VICTORVILLE, CALIFORNIA

TABLES

Table 1.
EVALUATION OF POTENTIAL PUBLIC HEALTH HAZARDS AT GEORGE AIR FORCE BASE

Site	Reuse Parcel	Site Description / Waste Disposal History	Known or Suspected Hazardous Material	Investigation Results / Environmental Monitoring Results[1]	Corrective Activities and / or Current Status	Evaluation of Public Health Hazard[2]
OU 1: Northeast Disposal Area TCE Plume						
Northeast Disposal Area Trichloro-ethylene (TCE) Plume	A	A groundwater TCE plume is present in the upper and lower aquifers beneath the northeastern portion of the base and extends off site to the north. The plume covers approximately 600 acres. Perchloroethylene (PCE) has also been detected in the plume at lower concentrations.	TCE, PCE	**Groundwater:** TCE has been detected above comparison values (CVs) since 1983, when the first sampling was performed. George AFB samples 20 to 40 monitoring wells in and around the plume twice per year to monitor the effects of the groundwater extraction/treatment system.	George AFB installed and began operating nine groundwater extraction wells and an air stripper system in 1991 and added nine additional extraction wells in 1996. The wells are positioned to remove TCE from the upper aquifer and to contain the plume in the lower aquifer. The system is expected to operate for up to 30 years to reduce the TCE concentration to below the U.S. Environmental Protection Agency Maximum Contaminant Level (MCL) of 5 parts per billion (ppb).	This site poses no public health hazard. No drinking water wells have been affected by the contaminants and there are no downgradient wells at risk. The groundwater pump-and-treat system is expected to prevent contamination from migrating into the Mojave River.
SD-25	A	An industrial outfall and pipeline used since the 1940s to carry industrial wastes and stormwater into the storm	Petroleum, oil, and lubricants (POLs), fuels,	**Sediments:** In 1992, after remediation activities were complete, confirmatory samples of soil/sediment from the storm drains contained	Contaminated and potentially contaminated sediments were excavated from storm drains and	This site poses no public health hazard. There are no

		drain. The waste sources were disconnected from the storm drain in 1983 and connected to a sanitary sewer.	solvents, paint strippers	metals at levels consistent with background levels for typical desert soils.	perforated portions of the pipeline were removed and replaced with non-perforated pipe.	exposures to contamination from this site.
WP-26	C/D	Sewage treatment plant percolation ponds were used from the 1950s to 1980 for the discharge of treated wastewater.	Treated domestic and industrial waste effluent	**Subsurface soil:** Nitrates were detected above background levels. Metals were detected within the background range for typical desert soils.	The percolation ponds were used to discharge treated water from the Operable Unit (OU) 1 groundwater treatment system; groundwater downgradient of the ponds was monitored to ensure that nitrates in soil beneath the ponds did not affect the groundwater.	This site poses no public health hazard. There is no exposure to contamination from this site. Nitrates have not been detected in wells downgradient to the percolation ponds and the contaminated percolation ponds are no longer used.
OU 2: JP-4 Releases						
SS-30	C	Groundwater plume of JP-4 free product dissolved-phase benzene, toluene, ethylbenzene, and xylenes (BTEX) released from leaks in the liquid fuel distribution system.	JP-4, BTEX	**Surface soil:** Almost the entire area above OU 2 is covered by asphalt pavement. **Subsurface soil:** Estimated volumes of soil contaminated at concentrations above CVs: • benzene: 250,000 cubic yards • toluene: 315,000 cubic yards • ethylbenzene: 90,000 cubic yards • xylene: 120,000 cubic yards These volumes overlap to a large extent. **Groundwater:** The free product plume is estimated to contain approximately 350,000-400,000 gallons of jet fuel. Estimated volumes of groundwater contaminated at concentrations above CVs: • benzene: 1,975 acre-feet • toluene: 350 acre-feet • ethylbenzene: 100 acre-feet • xylene: 170 acre-feet These volumes overlap to a large extent.	George AFB operates six permanent extraction units, three mobile extraction units, and two bioventing systems to remove free product from wells within this plume. The mobile extraction units are rotated among various wells to maximize free-product recovery. Recent studies have determined that the groundwater plume is stable and that natural attenuation (with monitoring) would achieve cleanup within 50 years. The Air Force and regulators are reviewing natural attenuation as a cleanup strategy. Groundwater is sampled twice per year.	This site poses no public health hazard. There are no drinking water wells affected by this site. Studies indicate that the plume is not migrating. Regardless of whether natural attenuation or an active remediation strategy is chosen for this site, no human exposure to this contamination is expected.

				Limited areas of PCE and TCE contamination were also detected and are addressed as part of OU 3 (Site OT-69).		
ST-57	C	Fuel pit leaks, from 1979 to 1981, caused by faulty construction.	JP-4	Site is addressed as part of Site SS-30.	Site is addressed as part of Site SS-30.	This site poses no public health hazard. See Site SS-30.
SS-58	C	Building 690 gasoline spill.	Leaded fuels	Site is addressed as part of Site SS-30.	Site is addressed as part of Site SS-30.	This site poses no public health hazard. See Site SS-30.
ST-54	D	A pipeline leak of an unknown quantity of jet fuel in 1980 from Building 708.	Fuels	Site is addressed as part of Site SS-30.	Site is addressed as part of Site SS-30.	This site poses no public health hazard. See Site SS-30.
ST-67	C	Liquid fuel distribution system, consisting of 25,000 feet steel pipe running from the bulk storage tank farm to the aircraft parking ramp and operational apron.	Fuels	Site is addressed as part of Site SS-30.	Site is addressed as part of Site SS-30.	This site poses no public health hazard. See Site SS-30.
OU 3: All Other Sites						
DP-02	A	Paints and pesticides were disposed of at this site.	Pesticides, leaded paint	Site inspection and photograph review indicate that this site is contained within LF-14.	No further action (NFA) recommended. Site is addressed under LF-14.	This site poses no public hazard. See LF-14.
DP-03	A	Photographs indicate that the site was an acid and oil burial area active from the early 1950s to the mid-1960s. This site is one of the suspected source areas for the OU 1 TCE plume.	Acids (hydrochloric, sulfuric), oil, fuel, unidentified drums	**Soil gas:** BTEX were detected. **Surface soil:** Polycyclic aromatic hydrocarbons (PAHs) were detected above CVs. No metals or volatile organic compounds (VOCs) were detected. **Subsurface soil:** PAHs were detected above CVs. No VOCs were detected. Metals were detected within the background range.	A 2-foot soil cover was installed and access is restricted by fencing and posting. One monitoring well downgradient from the site is sampled yearly.	This site poses no public health hazard. Access to the site has been limited and contaminants were detected at levels that do not pose a public health hazard. Access to contaminated soil is now restricted by the installed cover.
				Soil gas: BTEX were detected. **Surface soil:** Metals were detected within the background range. Pesticides and polychlorinated biphenyls (PCBs) were detected below CVs. No VOCs or semivolatile organic compounds	A 2-foot soil cover was installed and access is restricted	This site poses no public health hazard. Access to the site has been limited and

DP-04	A	Pesticide and oil reportedly were buried at the site.	Pesticides, waste oil	(SVOCs) were detected. **Subsurface soil:** Two metals exceeded background levels. No VOCs, SVOCs, pesticides, or PCBs were detected. **Groundwater:** VOCs detected in groundwater at this site are addressed as part of OU 1.	by fencing and posting. One monitoring well downgradient from the site is sampled yearly.	contaminants were detected at levels that do not pose a public health hazard. Access to soil is now restricted by the installed cover.
DP-60	A	Sewage sludge was dumped in this area. Aerial photographs showed discolored soils at this location.	Sewage sludge	**Soil gas:** TCE was detected. **Surface soil:** No metals were detected above background levels. **Groundwater:** TCE detected in groundwater is addressed in OU 1.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. Contaminated groundwater is addressed as part of OU 1.
FT-19a	A	Fire training area where fuels and waste oils were pumped into a bermed area and burned.	Waste oils, fuel	**Soil gas:** TCE, PCE, and 1,1,1-trichloroethane (TCA) were detected. **Surface soil:** VOCs, SVOCs, and dioxins were detected below CVs. **Subsurface soil:** Metals were detected above background levels and CVs. VOCs were detected below CVs. High levels of total petroleum hydrocarbons (TPH) were detected.	A bioventing system was installed and is operating. Groundwater is monitored as part of the OU 1 TCE plume.	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. The site is scheduled to remain part of airfield operations.
FT-19b	A	Area was used for disposal and burning of hospital wastes such as syringes and vials.	Waste oils, fuel, hospital wastes	**Soil gas:** TCE, PCE, chloroform, TCA, dichloroethene (DCE), carbon tetrachloride, methylene chloride, and BTEX were detected. **Surface soil:** Beryllium was detected above CVs. Other metals were detected above background levels. Dioxins were detected below CVs. **Subsurface soil:** VOCs and SVOCs were detected below CVs. TPH was detected.	Surface soil with medical waste was excavated. The feasibility study determined that no further action except monitoring was required. Groundwater is monitored as part of the OU 1 TCE plume.	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. The site is scheduled to remain part of airfield operations.
		Fire training area		**Soil gas:** PCE, TCA, and chloroform were detected. **Surface soil:** VOCs, SVOCS, and dioxins	A soil vapor extraction system	This site poses no public health hazard. Access to the site is limited and

FT-19c	A	where fuels and waste oils were pumped into a bermed area and burned.	Waste oils, fuel	were detected below CVs. Metals were detected above background levels. **Subsurface soil:** Metals were detected above background levels. High levels of TPH were detected.	was installed and is operating. Groundwater is monitored as part of the OU 1 TCE plume.	contaminants were detected at levels that do not pose a public health hazard. The site is scheduled to remain part of airfield operations.
LF-14	A/D	Base landfill	All base wastes (lube oil, paint, lacquer, naphthalene, PD-680, TCE, cleaning fluids, batteries, fire-fighting foam, hydraulic fluid, etc.)	**Soil gas:** BTEX, PCE, TCE, and TCA were detected. **Surface soil:** PAHs exceeded CVs. Metals were detected above background levels. Pesticides were detected below CVs. **Subsurface soil:** Metals were detected above background levels. SVOCs were detected below CVs. No VOCs, pesticides, or PCBs were detected. **Groundwater:** Metals were detected slightly above background levels. No VOCs, SVOCs, pesticides, or PCBs were detected.	The existing soil cover was rehabilitated and access is restricted by fencing and posting. Two monitoring wells downgradient from the site are sampled yearly.	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. Access to contaminated soil is restricted by the rehabilitated cover.
LF-35	A/D	Landfill	Wood, debris containing asbestos, fiberglass	Investigation determined that the waste at this site is nonhazardous if undisturbed.	Access and land use restrictions were instituted and warning signs were posted.	This site poses no public health hazard. Access to the site is restricted, and the site is scheduled to remain part of airfield operations.
LF-36	A	Construction debris/borrow pit	Pavement, rock	Investigation determined that the waste at this site was nonhazardous.	NFA	This site poses no health hazard. Waste at this site is nonhazardous.
LF-43	A	Rubble disposal	Rubble	This site is located within Site DP-04.	NFA. This site is addressed as part of Site DP-04.	This site poses no public health hazard. See Site DP-04.
LF-45	A	Construction demolition	Construction and demolition materials	This site is located within Site DP-03.	NFA. This site is addressed as part of Site DP-03.	This site poses no public health hazard. See Site DP-03.
SD-18	A/B	Site was reportedly used for surface disposal of jet fuel and oil from 1965 to 1966.	Jet fuels, oil	**Surface soil:** No VOCs or SVOCs were detected. Metals were within the background range. **Subsurface soil:** No VOCs were detected.	NFA	This site poses no public health hazard. Contaminants were detected at levels that do not pose a public health hazard.

SD-41	A	Rip-rap for industrial drain discharge	Small empty cans, construction debris, asphalt, concrete, and rubble	Investigation determined that the waste at this site was nonhazardous.	NFA	This site poses no public health hazard. Waste at this site is nonhazardous.
LF-37	B	This site was suspected to have been a landfill in the mid-1960s. There were unverified reports that trash and aircraft parts were dumped there in the 1940s.	Concrete, asphalt, rubble	**Soil gas:** BTEX, TCE/PCE, and DCE/TCA were detected. **Surface soil:** No VOCs were detected. **Subsurface soil:** VOCs were detected below CVs. **Groundwater:** No VOCs, SVOCs, pesticides, or PCBs were detected. Metals were detected at or below background levels.	NFA	This site poses no public health hazard. Contaminants were detected at levels that do not pose a public health hazard.
LF-38	B	Trash disposal	Trash	**Surface soil:** Metals were detected above background levels. No VOCs, SVOCs, pesticides, or PCBs were detected. **Subsurface soil:** Metals were detected slightly above background levels. No VOCs, SVOCs, pesticides, or PCBs were detected. Test pits showed no debris, drums, or soil staining.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard.
OT-50	B	Garage-like building containing an earth embankment and sand pile used for aircraft gun alignment.	Bullet fragments	**Surface soil:** Elevated copper and lead levels were detected in the sand pile.	NFA	This site poses no public health hazard. Access to the site is limited. Though the structure will remain for the time being (in case a future military contractor decides to reuse it), it will probably be removed eventually to make room for warehouses.
OT-51	B	Jet engine test cells facilities. Periodic fuel spills reportedly occurred, including an 8,000-gallon spill in the 1950s. Heavy soil staining was observed beneath	Fuels	**Surface soil:** BTEX were detected below CVs. TPH was detected. A "hot spot" of TPH was detected near Building 819. **Subsurface soil:** BTEX were detected below CVs. TPH was detected. **Groundwater:** Benzene was detected	Two underground storage tanks (USTs) used to collect waste fuel were removed. A bioventing system has reduced most of the contaminants in the groundwater; the Air Force may use oxygen enhancement if needed to complete the groundwater	This site poses no health hazard. Access to the site is limited and remediation is expected to reduce soil and groundwater contamination to

		a section of a surface-drainage trench.		above CVs near the hot spot. Toluene and xylenes were detected below CVs.	clean up. Groundwater is sampled from four monitoring wells three times per year.	concentrations that do not pose a public health hazard.
SS-59	B	Building 819, near the engine test cells.	Fuels	This site is addressed as part of Site OT-51.	NFA. This site is addressed as part of Site OT-51.	This site poses no public health hazard. See Site OT-51.
FT-20	C	Abandoned fire training area used from 1940 to 1970.	Waste oils, fuels	**Soil gas:** TCE was detected. **Surface soil:** Metals were detected slightly above background levels. **Subsurface soil:** Metals were detected slightly above background levels.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. This site is scheduled to remain part of airfield operations.
LF-13	C	Original base landfill, closed in 1946, was used for trash disposal until 1950. Miscellaneous dumping occurred there until the mid-1950s.	POLs, incinerator ash, unknown materials	**Soil gas:** BTEX, PCE/TCE, and DCA/TCA/Freon were detected. **Surface soil:** Metals were detected slightly above background levels. No SVOCs, pesticides, or PCBs were detected. **Subsurface soil:** Metals were detected slightly above background levels. No VOCs were detected. Test pits showed concrete rubble but no drums or soil staining. **Groundwater:** TCE was detected and is addressed as part of OU 1. Metals were detected slightly above background levels.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard.
OT-69	C	PCE/TCE groundwater plumes	PCE, TCE	**Groundwater:** OT-69 consists of several small, localized TCE and PCE plumes. TCE was detected above CVs. Concentrations were highest in the upper 6 feet of the aquifer and decreased to non-detectable at 30 feet and deeper below the water table. TCE concentrations in the vadose zone were lower than the concentrations in groundwater; therefore, it was determined that soil	Natural attenuation, monitoring, and restrictions on groundwater use were instituted. Groundwater is sampled at the	This site poses no public health hazard. No drinking water wells are affected, and no new wells

				contamination does not pose a source for further groundwater contamination. Fate and transport modeling determined that percolation from the OU 1 treatment system will reduce TCE concentrations at OT-69 to below the MCL (5 ppb) within 2 years.	plumes one or more times per year.	will be installed in the area.
SS-21	C	Tip tank drainage area	Fuels	**Subsurface soil:** Low concentrations of TPH were detected. VOCs were not detected. Trenches showed a buried layer of asphalt and one area of stained soil.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. This site is scheduled to remain part of airfield operations.
SS-24	C	Building 580 transformer storage	Transformer oils	**Surface soil:** No PCBs were detected.	NFA	This site poses public health hazard. No contamination was detected.
SD-28	C	Abandoned drain pit/dry well	Fuels	A geophysical survey of the area failed to detect a drain pit or dry well.	NFA	This site poses no public health hazard. Existence of the site could not be verified.
SS-55	C/D	Collection point for fuel that was spilled from a 5,000 gallon fuel truck.	Fuels	**Surface soil:** TPH was not detected. **Subsurface soil:** TPH was not detected.	NFA	This site poses no public health hazard. No contamination was detected.
ST-56	C	Building 690 jet fuel pipeline leak. Quantity of fuel lost was suspected to be at least 1,000 gallons.	Jet fuel JP-4	**Surface soil:** TPH was not detected. **Subsurface soil:** TPH was not detected. **Groundwater:** Groundwater samples were not collected. The water table (upper aquifer) is an estimated 145 feet below ground surface.	NFA	This site poses no public health hazard. No contamination was detected in soil. Due to the depth of the water table, it is unlikely that groundwater was affected by any spilled jet fuel.
WP-29	C	Eight sludge drying beds adjacent to the former sewage treatment plant. The beds were used for drying	Sanitary and industrial	**Surface soil:** Metals were detected above background levels.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that

		sanitary and industrial sludges. (The majority of this sludge was from residential waste.)	sludge	SVOCs were detected below CVs.		do not pose a public health hazard. This site is scheduled to remain part of airfield operations.
WP-32	C	Leach field for disposal of sanitary wastes and minor aircraft maintenance waste. Types, quantities, and time periods are unknown.	Sanitary wastes, minor aircraft maintenance wastes	**Soil gas:** No VOCs were detected. **Surface soil:** Metals were detected above background levels. PAHs were detected above CVs.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. This site is scheduled to remain part of airfield operations.
WP-68	D	Concrete-walled paint disposal pit with an unlined bottom.	Paints	**Surface soil:** Metals were detected above background levels. SVOCs were detected below CVs.	NFA	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. This site is scheduled to remain part of airfield operations.
DP-01	D	Paint drum burial	Leaded paint	**Subsurface soil:** Soil borings and trenches showed no indication of paint dumping. Existence of the site is suspect.	NFA	This site poses no public health hazard. Existence of the site is suspect.
DP-46	D	Buried F-111 aircraft wreckage.	Aircraft wreckage. It is unknown if the wreckage contains hazardous material. The aircraft wings, however, may contain asbestos.	Geophysical survey detected what is thought to be the aircraft wreckage. Shallow soil borings indicate the wreckage is covered by at least 3 feet of fill material.	NFA. The Air Force will institute a deed restriction when it transfers the property to prohibit disturbance of the wreckage through construction, digging, etc.	This site poses no public health hazard. Access to the site was limited in the past and is now restricted by 3 feet of cover. A deed restriction is also planned.
DP-47	D	Aircraft parts burial	Miscellaneous aircraft parts	Geophysical survey and test pits failed to locate buried aircraft parts. Existence of the site is suspect.	NFA	This site poses no public health hazard. Existence of the site is suspect.
				Soil gas: BTEX and TCE were detected. **Surface soil:** Metals		

LF-12	D	Landfill used from 1953 to 1957. Site may have been used to burn waste with waste oils in the 1950s. Site was used for disposal of trash and rubble from the 1960s-1970s, and street sweepings in the 1980s.	All base wastes (lube oil, paint, lacquer, naphthalene, PD-680, TCE, cleaning fluids, batteries, fire-fighting foam, hydraulic fluid, etc.)	were detected slightly above background levels. Dioxins were detected below CVs. No VOCs, SVOCs, pesticides, or PCBs were detected. **Subsurface soil:** No VOCs, SVOCs, pesticides, or PCBs were detected. **Groundwater:** Petroleum hydrocarbons were detected in downgradient monitoring wells. Metals were detected above CVs in unfiltered samples from downgradient monitoring wells. The Air Force attributed this to the high turbidity of these samples--metal concentrations in the one filtered duplicate sample did not exceed any CVs.	Surface controls were installed, the existing soil cover was rehabilitated, and access is restricted by fencing and posting. One monitoring well downgradient from the site is sampled yearly.	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. There is no exposure to groundwater from this site. If the Air Force relinquishes this property it will apply deed restrictions to prevent disturbance of the landfill.
LF-39	D/J	From 1944 to 1965, this site was reportedly used for disposal of construction debris and rubble. Trash may have been dumped and burned there in the early 1950s.	Construction debris, rubble	**Soil gas:** BTEX were detected. **Subsurface soil:** Metals were detected slightly above background levels in soil cores collected during installation of monitoring wells. No VOCs were detected. Test pits did not show debris, drums, or any other buried materials.	NFA. Two monitoring wells downgradient from the site are sampled yearly.	This site poses no public health hazard. Contaminants were detected at levels that do not pose a public health hazard.
LF-44	D	Miscellaneous trash and rubble disposal	Trash, rubble	**Surface soil:** Lead was detected slightly above background levels. No SVOCs, pesticides, or PCBs were detected. **Subsurface soil:** Metals were detected slightly above background. No VOCs, SVOCs, pesticides, or PCBs were detected.	The Air Force has placed a deed restriction on the site to restrict access and prohibit future digging, drilling, and other activities.	This site poses no public health hazard. Access to the site is restricted and contaminants were detected at levels that do not pose a public health hazard.
OT-48	D	Reported munitions disposal area	Munitions	This site was determined to be part of Site SS-23. No munitions or unexploded ordnance were encountered during investigation of the site.	NFA. This site as addressed as part of Site SS-23.	This site poses no public health hazard. No munitions were encountered at the site. See Site SS-23.
SD-27	D	Abandoned drain pit/dry well (4 foot diameter, 30 feet deep) used for disposal of waste oil from equipment maintenance.	Waste POLs	**Subsurface soil:** VOCs were detected below CVs. Metals were detected above background levels. No significant contamination was detected, however, in soil samples from beneath the dry well,	NFA	This site poses no public health hazard. Contaminants disposed of in the dry well did

		The well was pumped out, backfilled, compacted, and paved when abandoned.		and it was determined that there had been no vertical migration of contamination beneath the well. The water table is approximately 110 feet below the bottom of the dry well.		not migrate to groundwater. Contaminated subsurface soil is inaccessible.
SS-23	D	Salvage yard/hazardous waste storage area used for recovery and temporary storage of waste oils and solvents. Small spills may have occurred here. Drummed waste was stored on concrete pads and waste oil was stored in an aboveground storage tank.	Waste oils, solvents	**Surface soil:** Chromium and lead were detected above background levels. **Subsurface soil:** Chromium and lead were detected above background levels.	Aboveground storage tanks and the drum storage pads were removed.	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. This site is now used to store construction equipment and material storage for the airport.
SS-53	D	Jet fuel spill	Fuels	Stressed vegetation or other evidence of a spill could not be identified through site inspection and photograph review.	NFA	This site poses no public health hazard. Existence of the site could not be verified.
WP-16	D	POL leach field for truck maintenance area	POLs	Review of facility records failed to identify a potential contamination source area.	NFA	This site poses no public health hazard. Existence of the site could not be verified.
WP-17	D	POL leach field	POLs	**Surface soil:** No VOCs or metals were detected. **Subsurface soil:**. Metals were detected above background levels. VOCs were detected below CVs.	Bioventing system was installed and is operating.	This site poses no public health hazard. Access to the site is limited and contaminants were detected at levels that do not pose a public health hazard. This site is scheduled to remain part of airfield operations.
OT-22	F/J	Golf course that was irrigated with water from the sewage treatment plant percolation ponds (Site WP-26).	Sanitary sewer effluent	Soil samples collected from Site WP-26 did not indicate the presence of contamination; therefore, there appears to be no possible source of contamination for Site OT-22.	NFA	This site poses no health hazard. No source of potential contamination could be identified for this site.
		Landfill used	Jet engine starter cartridges which	Site is addressed as	Site is addressed as	The site poses no apparent past public health hazard

DP-10	K	from 1978 to 1981 (at least).	contained residues from standard explosive mixtures.	part of Site LF-07.	part of Site LF-07.	and no present or future public health hazard. See Site LF-07.
DP-15	K	Munitions/oil possibly buried in a trench.	Small arms munitions residue, waste oil	Site is addressed as part of Site LF-07.	Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
DP-33	K	Grenade practice range, closed in 1966 or 1967.	Grenade debris, paint cans	Site is addressed as part of Site LF-07.	Munitions debris was removed. Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
DP-34	K	Munitions may have been used at this site until the early 1970s.	Practice bombs, small arms cartridges	Site is addressed as part of Site LF-07.	Munitions debris was removed. Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
LF-07	K	Base landfill. This site encompasses most of the other sites in the Southeast Disposal Area (SEDA). All the SEDA sites, therefore, were addressed together in the investigation activities for Site LF-07.	Domestic wastes, waste oil, fuels, other hazardous wastes	**Soil gas:** BTEX, PCE/TCE, and DCE/TCA/carbon tetrachloride were detected. **Surface soil:** Metals were detected above background levels. One pesticide was detected above CVs. Dioxins were detected below CVs. **Subsurface soil:** Metals were detected above background levels. Toluene was detected below CVs. No SVOCs, pesticides, or PCBs were detected. **Groundwater:** Metals were detected above background in unfiltered samples, but were not detected above background in filtered samples.	A fence was installed and the existing soil cover was rehabilitated. Two monitoring wells downgradient from the site are sampled yearly for indicator parameters.	The site poses no apparent past public health hazard and no present or future public health hazard. Although this site was used in the past as a recreational area for hunters and dirt bikers, exposure to soil during recreational activity is assumed to have been infrequent and of short duration. Access to contaminated soil is now restricted by the rehabilitated cover and the federal prison now under construction at the site.
LF-08	K	Disposal area for JP-4 and leaded gasoline sludge.	JP-4 and leaded gasoline sludge	Site is addressed as part of Site LF-07.	Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard.

						See Site LF-07.
LF-11	K	Landfill	Paper	Because wastes reportedly buried at this site were limited to paper, further investigation was not performed.	Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
RW-09	K	Radioactive disposal area used from 1965 to 1970. Precise volume of waste, if any, is unknown.	Low-level radioactive wastes, unidentified chemicals	Investigation activities included walk-over and drive-over radiological surveys, trenching, and excavation of over 4,000 cubic yards of soil. Three small radioactive objects were recovered, leading to the conclusion that RW-09 was not a disposal site for significant amounts of radioactive materials.	Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
SS-52	K	Creosote spill area from creosote operations prior to 1960.	Creosote	Site is addressed as part of Site LF-07.	Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
WP-40	K	Chemical toilet sludge	Chemical toilet waste sludge	Site is addressed as part of Site LF-07.	Site is addressed as part of Site LF-07.	The site poses no apparent past public health hazard and no present or future public health hazard. See Site LF-07.
OT-49	none	Residue from numerous aircraft crashes.	Aircraft residue	The existence of this site is not documented and its location could not be verified.	NFA	The site poses no public health hazard. Existence of the site could not be verified.
OT-61	none	Shop waste disposal area	Cleansers, solvents	A record search failed to locate or verify the existence of a centralized shop waste disposal area.	NFA	The site poses no public health hazard. Existence of the site could not be verified.
OT-62	none	Rinse water disposal pit	Pesticides	One possible pesticide rinse water disposal pit was identified during a site inspection. This pit was found to be structurally sound; it is therefore unlikely that this pit leaked pesticides into the surrounding soil. No samples were collected.	NFA	This site poses no public health hazard. No evidence of surface soil contaminants were found and all wastes removed and the site was paved over.
OT-64	none	Transformer sites	PCB oils	Oil leaks from any malfunctioning transformers could not be located or verified.	NFA	The site poses no public health hazard. Existence of the site could not be verified.

OT-65	none	Nine fortified hangars were used for storage of miscellaneous materials (barbed wire, PVC pipe, sewer pipe, fire hydrants, fertilizer). One hangar was used as an explosive ordnance detonation range.	Explosive ordnance, fertilizer, miscellaneous materials	**Surface soil:** Arsenic was detected slightly above background levels.	NFA	This site poses no public health hazard. Contaminants were detected at levels that do not pose a public health hazard. No reuse has been planned for this site.
OT-66	none	Stormwater discharge from residential areas to drainage areas.	Fuel, non-point source discharges	**Surface soil:** Metals were detected slightly above background levels. SVOCs were detected below CVs.	NFA	This site poses no public health hazard. Contaminants were detected at levels that do not pose a public health hazard. No reuse has been planned for this site.
SD-42	Off-site	Rip-rap around off-base water supply wells	Empty cans, construction debris	It was determined that the waste at this site (concrete, clay pipe, debris) was nonhazardous.	NFA. Material was removed.	The site poses no public health hazard. Waste material at the site was nonhazardous.
ST-31	N/A	Removed, abandoned USTs	Removed, abandoned USTs	USTs have been removed.	NFA. USTs were taken off site.	The site poses no public health hazard. No contamination has been identified and the USTs have been taken off site.
WP-63	none	Sewage sludge disposal areas	Sewage sludge	A record search failed to locate or verify the existence of any sewage sludge burial sites along any perimeter roads.	NFA	The site poses no public health hazard. Existence of the site could not be confirmed.

[1] See Appendix B for explanation of comparison values.
[2] No residential reuse has been planned for the base. In its public health evaluations of these sites, therefore, ATSDR assumes industrial rather than residential reuse. In its public health evaluations, ATSDR considers access to most areas of the base to be limited because George AFB remains fenced in and access to the base is controlled by security guards.
N/A = not applicable

Sources: Earthtech, 1993; IT, 1995, 1996; Montgomery Watson, 1994, 1996, 1997a, 1997c; U.S. Air Force, 1997a, 1997b, 1998a, 199b, 1998c.

Table 2.
EXPOSURE PATHWAYS AT GEORGE AIR FORCE BASE

Pathway Name	Exposure Pathway Elements						Comments
	Source of Contamination	Environmental Medium	Point of Exposure	Route of Exposure	Time of Exposure	Exposed Population	

Completed Exposure Pathways							
None	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Potential Exposure Pathways							
Off-site groundwater: VOCs contamination	Contaminated soil and groundwater at George AFB	Groundwater	Drinking water pumped from aquifers near George AFB.	Ingestion Dermal contact Inhalation	**Past, present, and future:** VOCs have not been detected in off-site drinking water supply wells.	Consumers of drinking water pumped from aquifers near George AFB	Two supply wells at the Victor Valley Wastewater Reclamation Authority (VVWRA) treatment plant, north of George AFB, are in the path of the OU 1 TCE plume. These wells are not used to supply drinking water, however. No other known drinking water wells are in the path of groundwater contaminant plumes from George AFB. A pump-and-treat system was installed to clean up the OU 1 TCE plume and should prevent contaminants from migrating to the Mojave River, which is an important water supply for downstream communities.
Potential Exposure Pathways (continued)							
	Historical spills and disposal of hazardous materials (fuels, oil, solvents, paints,	Surface and	Landfills and other disposal areas that	Ingestion	**Past:** No historical soil data are available for the base, so past exposures cannot be confirmed or quantified. **Present and future:** Exposure to workers at the base through	**Past:** George AFB personnel and residents, including children. **Present and future:** Workers for Southern	Soil contamination has been detected above comparison values (CVs) in very few areas of George AFB. Access to most areas of contamination is limited and the contaminant levels detected do not pose a

On-site soil	munitions, debris, etc.) in landfills, waste pits, and other disposal areas throughout the base.	subsurface soil	may have been used for recreation.	Dermal contact	industrial use does not pose a public health hazard. Children attending the schools on base are not exposed to contamination either on school grounds or on the route to the school.	California International Airport and other tenants of the base; children attending the two schools located at the base.	health hazard, to either children or adults, through short-term exposure. Exposure to contaminated soil through future industrial reuse of the base is not expected to pose a public health hazard.
Potential Exposure Pathways (continued)							
Radiological exposure	Historical disposal of small amounts low-level radioactive waste (e.g., aircraft dials, circuit breakers, and engine gear boxes) in the Southeast Disposal Area (SEDA) and munitions disposal areas.	Low-level radioactive waste and surrounding soil	Waste disposal areas	Dermal contact Ingestion Inhalation	**Past:** Radioactive waste sites may have been accessible in the past to hunters, dirt bikers, and other recreational users. **Present and future:** All potential radioactive waste disposal areas have been surveyed and cleared of radioactive material (only a small amount was found). The SEDA is fenced and its landfill cover has been rehabilitated. Air Force property south of Air Base Road (including the SEDA) has been transferred to the Federal Bureau of Prisons and will be the site of a prison that is currently under construction.	Hunters, dirt bikers, and other recreational users who may have accessed these disposal areas.	A small amount of radioactive material was discovered and removed from a portion of the SEDA. Radiation surveys and exploratory soil excavation have indicated that this area was not used for the disposal of significant quantities of radioactive waste. Although people using the area for recreation in the past may have been exposed to small amounts of radioactive material, any such exposures would have been infrequent and of short duration and would not be expected to pose a health hazard.

N/A = not applicable

FIGURES

Figure 1. Vicinity Map

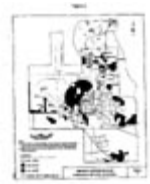

Figure 2. Operable Unit (OU) Site Locations

Figure 3. Land Use in the Vicinity of George Air Force Base

Figure 4. Approximate Locations of Known Municipal and Domestic Water Supply Wells in the Vicinity of George Air Force Base

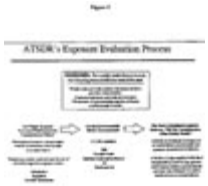

Figure 5. ATSDR's Exposure Evaluation Process

Figure 6. Major Hydrogeologic Features in the Mojave River Basin

Figure 7. Simplified Conceptual Hydrogeologic Cross Section

Figure 8. Operable Unit 1 TCE Plume, October 1996

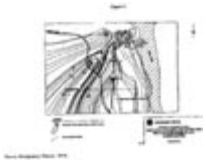

Figure 9. Simulated Flowlines and Extraction Well Capture Zones at OU 1 Lower Aquifer

APPENDICES

APPENDIX A: Glossary

Acute
Occurring over a short time, usually a few minutes or hours. An *acute* exposure can result in short-term or long-term health effects. An *acute* effect happens a short time (up to 1 year) after exposure.

Background Level
A typical or average level of a chemical in the environment. *Background* often refers to naturally occurring or uncontaminated levels.

Carcinogen
Any substance that may produce cancer.

CERCLA
The Comprehensive Environmental Response, Compensation, and Liability Act of 1980, also known as Superfund. This is the legislation that created ATSDR.

Chronic
Occurring over a long period of time (more than 1 year).

Comparison Values
Estimated contaminant concentrations in specific media that are not likely to cause adverse health effects, given a standard daily ingestion rate and standard body weight. The *comparison values* are calculated from the scientific literature available on exposure and health effects.

Concentration
The amount of one substance dissolved or contained in a given amount of another. For example, sea water contains a higher concentration of salt than fresh water.

Contaminant
Any substance or material that enters a system (the environment, human body, food, etc.) where it is not normally found.

Dermal
Referring to the skin. *Dermal* absorption means absorption through the skin.

Dose
The amount of substance to which a person is exposed. *Dose* often takes body weight into account.

Environmental contamination
The presence of hazardous substances in the environment. From the public health perspective, *environmental contamination* is addressed when it potentially affects the health and quality of life of people living and working near the contamination.

Exposure
Contact with a chemical by swallowing, by breathing, or by direct contact (such as through the skin or eyes). *Exposure* may be short term (acute) or long term (chronic).

Hazard
A source of risk that does not necessarily imply potential for occurrence. A hazard produces risk only if an exposure pathway exists, and if exposures create the possibility of adverse consequences.

Ingestion
Swallowing (such as eating or drinking). Chemicals can get in or on food, drink, utensils, cigarettes, or hands where they can be ingested. After *ingestion*, chemicals can be absorbed into the blood and distributed throughout the body.

Inhalation

Breathing. Exposure may occur from inhaling contaminants because they can be deposited in the lungs, taken into the blood, or both.

Media
Soil, water, air, plants, animals, or any other parts of the environment that can contain contaminants.

Minimal Risk Level (MRL)
An *MRL* is defined as an estimate of daily human exposure to a substance that is likely to be without an appreciable risk of adverse effects (noncancer) over a specified duration of exposure. *MRLs* are derived when reliable and sufficient data exist to identify the target organ(s) of effect or the most sensitive health effect(s) for a specific duration via a given route of exposure. *MRLs* are based on noncancer health effects only. *MRLs* can be derived for acute, intermediate, and chronic duration exposures by the inhalation and oral routes.

National Priorities List (NPL)
The Environmental Protection Agency's (EPA) listing of sites that have undergone preliminary assessment and site inspection to determine which locations pose immediate threat to persons living or working near the release. These sites are most in need of cleanup.

No Apparent Public Health Hazard
Sites where human exposure to contaminated media is occurring or has occurred in the past, but the exposure is below a level of health hazard.

No Public Health Hazard
Sites for which data indicate no current or past exposure or no potential for exposure and therefore no health hazard.

Plume
An area of chemicals in a particular medium, such as air or groundwater, moving away from its source in a long band or column. A *plume* can be a column of smoke from a chimney or chemicals moving with groundwater.

Potential/Indeterminate Public Health Hazard
Sites for which no conclusions about public health hazard can be made because data are lacking.

Potentially Exposed
The condition where valid information, usually analytical environmental data, indicates the presence of contaminant(s) of a public health concern in one or more environmental media contacting humans (i.e., air, drinking water, soil, food chain, surface water), and there is evidence that some of those persons have an identified route(s) of exposure (i.e., drinking contaminated water, breathing contaminated air, having contact with contaminated soil, or eating contaminated food).

Public Availability Session
An informal, drop-by meeting at which community members can meet one-on-one with ATSDR staff members to discuss health and site-related concerns.

Public Health Action
Designed to prevent exposures and/or to mitigate or prevent adverse health effects in populations living near hazardous waste sites or releases. Public health actions can be identified from information developed in public health advisories, public health assessments, and health consultations. These actions include recommending the dissociation (separation) of individuals from exposures (for example, by providing an alternative water supply), conducting biologic indicators of exposure studies to assess exposure, and providing health education for health care providers and community members.

Public Health Assessment
The evaluation of data and information on the release of hazardous substances into the environment in order to assess any current or future impact on public health, develop health advisories or other recommendations, and identify studies or actions needed to evaluate and mitigate or prevent human health effects; also, the document resulting from that evaluation.

Public Health Hazard
Sites that pose a public health hazard as the result of long-term exposures to hazardous substances.

Route of Exposure
The way in which a person may contact a chemical substance. For example, drinking (ingestion) and bathing (skin contact) are two different *routes of exposure* to contaminants that may be found in water.

Superfund
Another name for the Comprehensive Environmental Response, Compensation, and Liability Act of 1980

(CERCLA), which created ATSDR.

Volatile organic compounds (VOCs)
Substances containing carbon and different proportions of other elements such as hydrogen, oxygen, fluorine, chlorine, bromine, sulfur, or nitrogen; these substances easily become vapors or gases. A significant number of the *VOCs* are commonly used as solvents (paint thinners, lacquer thinner, degreasers, and dry cleaning fluids).

APPENDIX B: Population and Housing Data; Census Tract Map

Population Data Table:
George Air Force Base, San Bernardino County

	George AFB	Adelanto	Victorville
Total persons	5,085	8,517	40,674
Total area, square miles	2.78	36.88	41.83
Persons per square mile	1,832	231	972
% Male	57.8	50.3	50.0
% Female	42.2	49.7	50.0
% White	70.5	70.8	73.1
% Black	16.1	14.0	9.6
% American Indian, Eskimo, or Aleut	0.8	1.5	1.1
% Asian or Pacific Islander	8.7	4.2	3.7
% Other races	3.9	9.5	12.6
% Hispanic origin	8.8	17.3	23.0
% Under age 10	25.0	25.5	19.7
% Age 65 and older	0.1	5.3	11.6

Source: Census of Population and Housing, 1990: Summary Tape File 1A (California) [machine-readable data files]. Prepared by the Bureau of the Census. Washington, DC: The Bureau [producer and distributor], 1991.

Housing Data Table:
George Air Force Base, San Bernardino County

	George AFB	Adelanto	Victorville
Households*	1,132	2,881	14,241
Persons per household	3.67	2.96	2.83
% Households owner-occupied	0.2	30.3	60.8
% Households renter-occupied	99.8	69.7	39.2
% Households mobile homes	0.0	14.0	11.9
% Persons in group quarters	18.3	0.0	1.0
Median value, owner-occupied households, $	55,000	70,400	102,800
Median rent paid, renter-occupied households, $	432	370	443

* A household is an occupied housing unit, but does not include group quarters such as military barracks, prisons, and college dormitories.

Source: Census of Population and Housing, 1990: Summary Tape File 1A (California) [machine-readable data files]. Prepared by the Bureau of the Census. Washington, DC: The Bureau [producer and distributor], 1991.

George Air Force Base: Intro Map

APPENDIX C: ATSDR's Comparison Values

The conclusion that a contaminant exceeds the comparison value does not mean that it will cause adverse health effects. Comparison values represent media-specific contaminant concentrations that are used to select contaminants for further evaluation to determine the possibility of adverse public health effects.

Cancer Risk Evaluation Guides (CREGs)

CREGs are estimated contaminant concentrations that would be expected to cause no more than once excess cancer in a million (10^{-6}) persons exposed over a lifetime. ATSDR's CREGs are calculated from EPA's cancer potency factors.

Environmental Media Evaluation Guides (EMEGs)

EMEGs are based on ATSDR minimal risk levels (MRLs) and factors in body weight and ingestion rates. An EMEG is an estimate of daily human exposure to a chemical (in mg/kg/day) that is likely to be without noncarcinogenic health effects over a specified duration of exposure.

Maximum Contaminant Level (MCL)

The MCL is the drinking water standard established by EPA. It is the maximum permissible level of a contaminant in water that is delivered to the free-flowing outlet. MCLs are considered protective of public health over a lifetime (70 years) for people consuming 2 liters of water per day.

Reference Media Evaluation Guides (RMEGs)

ATSDR derives RMEGs from EPA's oral reference doses. The RMEG represents the concentration in water or soil at which daily human exposure is unlikely to result in adverse noncarcinogenic effects.

APPENDIX D: Public Comments on the Public Health Assessment

The George AFB public health assessment was available for public review and comment from September 11, 1998 through October 11, 1998. The public comment period was announced in a press release dated September 4, 1998. Copies of the public health assessment were made available for review at the Adelanto and Victorville branches of the San Bernardino County Public Library and at the George AFB Library. The public health assessment was also sent to state and federal agencies and interested members of the general public.

A total of two agencies supplied written comments. The specific comments that were received either identified new information or suggested additions or corrections to the text to improve the clarity, completeness, or accuracy of a sentence or a paragraph. A summary of the comments and ATSDR's response is given below:

1. **Comment:** The JP-4 free product estimate has recently been revised from 350,000 - 400,000 to 750,000 - 800,000 gallons.

Response: The text was updated on pages 1, 7, and 18.

2. **Comment:** EPA does not agree that the OU-2 plume shows little or no migration. George AFB has agreed to put in additional monitoring wells to better define the plume.

Response: The text was updated to reflect these new developments. Unless data are developed that indicates the OU-2 plume is potentially endangering nearby drinking water wells, the public health evaluation of the OU-2 plume is not changed by this information.

3. **Comment:** The EPA is not satisfied that the OU-1 pump and treat system is not fully meeting the objective for that system for TCE removal in the upper aquifer and hydraulic control in the lower aquifer. George AFB is taking steps to optimize the operation of the pump and treat system and additional data may be needed.

Response: The text was revised to reflect these activities. Given that the character and migration of the OU-1 plume is monitored and there are no potential points of human exposure to the contaminants of this plume in close proximity, continued monitoring and regulatory oversight and controls will preclude a future potential pathway of human exposure to site contaminants at levels that may result in harmful health effects.

4. **Comment:** The EPA disagrees, on several grounds, that the JP-4 plume can be successfully cleaned-up natural attenuation within 50 years. EPA has requested that George AFB perform a soil vapor extraction pilot project to evaluate active source removal.

Response: The text has been modified to reflect these changes. As stated in response to Comment 2 above, the present information does not warrant a change in the public health evaluation of this plume and its public health implications.

5. **Comment:** Both the EPA and George Air Force Base supplied additional information and/or clarification regarding the pesticide rinsate pit (Site OT-62). Both agencies confirmed that when the site was investigated, the pit was found to be free of cracks or seams and that records indicated that rinsate water had been placed directly in the lined pit for evaporation. In 1992, all residual pit wastes were drummed and shipped to the Defense Reutilization and Marketing Office for proper disposal. Since no contamination or residue existed, the pit was determined to be a No Further Action site. The pit was then filled in and paved over with asphalt paving.

Response: Given the additional information and clarification, ATSDR has withdrawn its recommendation for sampling and further evaluation of Site OT-62. The text has been modified and corrected to reflect this additional information.

Table of Contents

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