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INSTALLATION RESTORATION PROGRAM

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WILLIAMS AIR FORCE BASE, ARIZONA

FINAL
RECORD OF DECISION
OPERABLE UNIT 4 (OU-4)

CONTRACT NUMBER F41624-94-D-8047
DELIVERY ORDER 0011

Project No. 409881
April 2000

Williams Air Force Base, Arizona

FINAL
Record of Decision

Operable Unit 4 (OU-4)

Prepared for:

Air Force Center for Environmental Excellence
HSC/PKVCB
Headquarters Human Systems Center
Brooks Air Force Base, Texas 78235-5353
Delivery Order 0011

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Project No. 409881

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List of Acronyms

ABS	absorbed from soil
ACM	asbestos-containing material
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
AF	area of skin
AFB	Air Force Base
ARAR	applicable or relevant and appropriate requirement
ARPA	Archeological Resources Protection Act
AST	aboveground storage tank
ASU	Arizona State University
ATC	Air Training Command
AV	AeroVironment, Inc.
bgs	below ground surface
BHC	beta hexachlorocyclohexane
BTEX	benzene, toluene, ethyl benzene, and xylene
CDI	chronic daily intake
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CLP	Contract Laboratory Program
COPC	contaminant of potential concern
DDE	dichlorodiphenyldichloroethene
DDT	dichlorodiphenyltrichloroethane
DOD	U.S. Department of Defense
DOE	U.S. Department of Energy
DRO	diesel range organics
E/A	evaluation/assessment
Eh	oxidation/reduction potential
EM	electromagnetic
EPA	U.S. Environmental Protection Agency
ES	Engineering-Science, Inc.
ESD	Explanation of Significant Difference
FFA	Federal Facilities Agreement
FS	feasibility study

FSP	field sampling plan
GAF	gastrointestinal absorption factor
GPL	groundwater protection limit
HBGL	health-based guidance level
HEAST	health effects assessment summary tables
HI	hazard index
HQ	hazard quotient
HSP	health and safety plan
ILCR	incremental lifetime cancer risk
IR	intake rate
IRIS	integrated risk information systems
IRP	Installation Restoration Program
IT	IT Corporation
JP-4	jet petroleum grade 4
mg/kg	milligrams per kilogram
µg/kg	micrograms per kilogram
msl	mean sea level
NAGPRA	Native American Graves Protection and Repatriation Act
NHPA	National Historical Preservation Act
NCP	National Contingency Plan
NOAA	National Oceanic and Atmospheric Administration
NPL	National Priorities List
O&M	operation and maintenance
OU	Operable Unit
OWS	oil-water separator
PAH	polynuclear aromatic hydrocarbon
PCB	polychlorinated biphenyls
PLM	polarized light microscopy
POL	petroleum, oil, and lubrication
PPM	priority pollutant metal
PRG	preliminary remediation goals
PVC	polyvinyl chloride
QAPP	quality assurance project plan

QA/QC	quality assurance/quality control
RA	remedial action
RAB	Restoration Advisory Board
RCRA	Resource Conservation and Recovery Act
RfD	reference dose
RI	remedial investigation
RIR	remedial investigation report
RME	reasonable maximum exposure
ROD	record of decision
RWCD	Roosevelt Water Control District
SA	surface area of exposed skin
SARA	Superfund Amendment and Reauthorization Act
SF	slope factor
SHPO	State Historic Preservation Officer
SLRA	screening level risk assessment
SVOC	semivolatile organic compound
TBC	to be considered
TCLP	toxicity characteristic leaching procedure
TPH	total petroleum hydrocarbon
TRC	Technical Review Committee
TWG	Technical Working Group
UCL	upper confidence limit
USAF	U.S. Air Force
USGS	U.S. Geological Survey
UST	underground storage tank
UXO	unexploded ordnance
VEMUR	voluntary environmental mitigation use restriction
VOC	volatile organic compound
WWTP	wastewater treatment plant
yd^3	cubic yard

1.0 Declaration

1.1 Site Name and Location

Williams Air Force Base (AFB) is located in Maricopa County, Mesa, Arizona (Figure 1-1). The following sites constitute Operable Unit (OU)-4:

- Electroplating/Chemical Cleaning Shop (Facility 1085, Site SS-16)
- Oil/Water Separator (OWS) - Petroleum, Oil, and Lubricant (POL) Yard (Facility 550, Site SD-18)
- Former Skeet Range at the South Desert Village (Site SS-19)
- Firing Range/Skeet Range (Facility 927, Site SS-20)
- Facilities 1020 and 1051 (Site SS-21)
- Aboveground Storage Tanks (AST) 556 and 557 (Site ST-22)
- Building 1069 (Site SS-23)
- Building 1010 (Site SS-24)
- Concrete Hardfill Area (Site LF-26)
- Facility 1004 (Site SS-33).

The sites selected for OU-4 were based on the results of the Facilities Assessment/Evaluation Assessment (E/A) conducted in 1992 and 1993, which resulted in 30 potentially-contaminated areas being identified at Williams AFB. The nature of the contaminants and their presence in shallow soil at ten of these areas lead to the determination that they should be grouped as OU-4 sites for further investigation.

1.2 Statement of Basis and Purpose

This record of decision (ROD) substantiates the selected remedy for the ten sites that constitute OU-4 at Williams AFB. The ROD was developed in accordance with the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendment and Reauthorization Act (SARA), and, to the extent practicable, the National Contingency Plan (NCP). This decision is based on the Administrative Record for this OU.

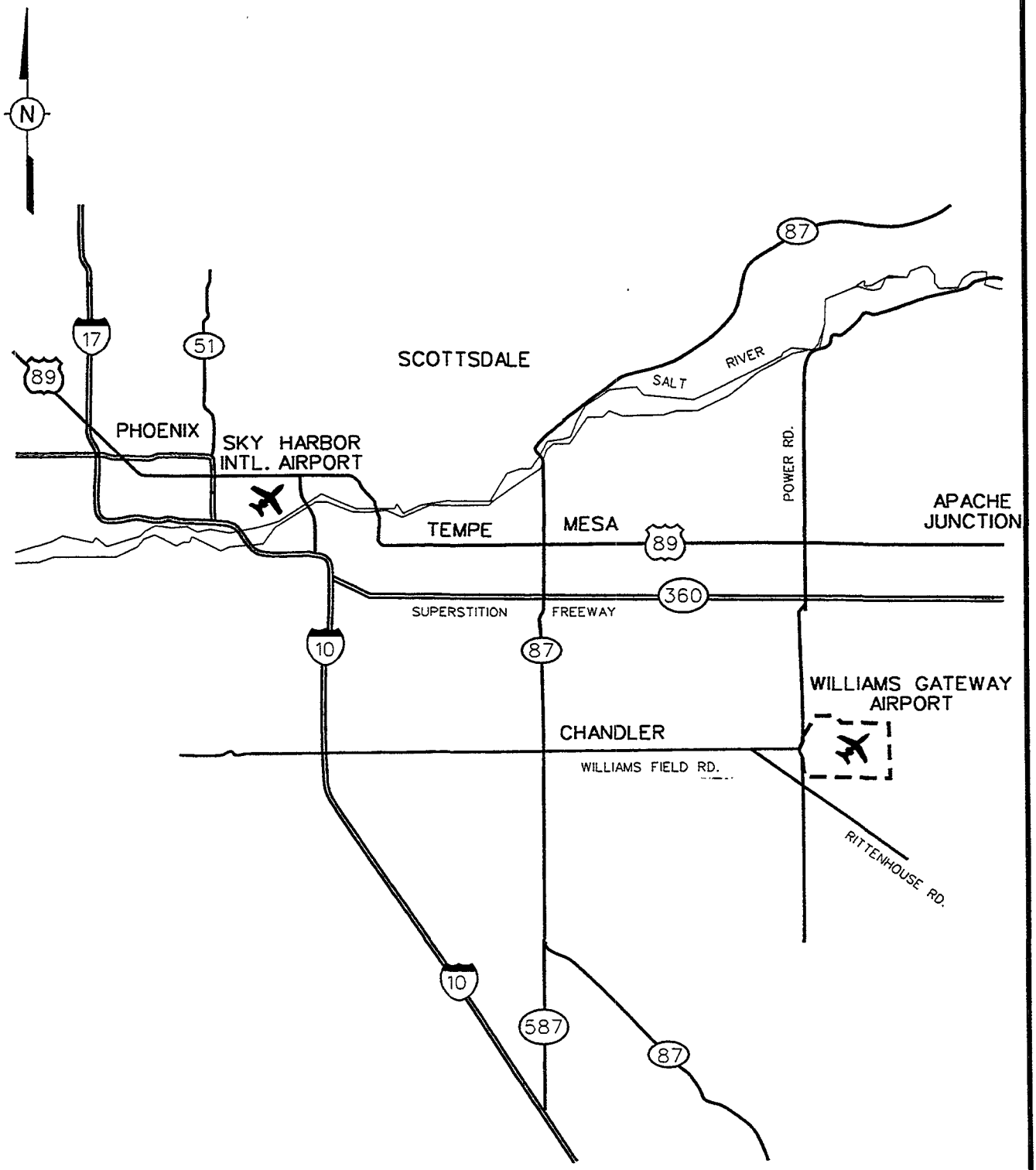

FIGURE 1-1
LOCATION MAP

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

SCALE
0 5 10 MILES

INTERNATIONAL
TECHNOLOGY
CORPORATION

STARTING DATE: 02/24/95	DATE LAST REV: JUL 1999	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD	DWG. NO.: \409881ES.426
DRAWN BY: D.HIGGS	DRAWN BY: DBILLING	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W.CARTER	PROJ. NO.: 409881

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The United States Environmental Protection Agency (EPA) and state of Arizona concur with the selected remedy for OU-4.

1.3 Assessment of the Site

A remedial investigation (RI) and feasibility study (FS) have been completed for all ten OU-4 sites, which are the subject of this ROD. Results of investigations and studies are reported in the OU-4 RI Report (RIR) (IT, 1997a) and the OU-4 FS Report (IT, 1997b). Investigations have documented that residual contamination at the following five sites will not pose an unacceptable risk to human health and the environment:

- OWS - POL Yard (Site SD-18)
- ASTs 556 and 557 (Site ST-22)
- Building 1069 (Site SS-23)
- Concrete Hardfill Area (Site LF-26)
- Facility 1004 (Site SS-33).

Arsenic and chromium concentrations in soil at the Electroplating/Chemical Cleaning Shop (Site SS-16) exceed the EPA Region IX residential preliminary remediation goals (PRG) and Arizona Department of Environmental Quality (ADEQ) health-based guidance levels (HBGL), but are below the nonresidential levels. Concentrations at Building 1010 (Site SS-24) in surface soil of dieldrin, alpha-chlordane, and gamma-chlordane, and in interior dust of several pesticide compounds exceed the EPA Region IX residential PRGs and Arizona HBGLs, but are below the nonresidential levels. Lead shot at the Former Skeet Range (part of Site SS-20), and lead bullets at Facilities 1020 and 1051 (Site SS-21) were observed on the ground surface, but proven to have not leached into the shallow subsurface soil. Because current and future use of the facilities and property at Site SS-16, Site SS-20, Site SS-21, and Site SS-24 will be for industrial purposes (i.e., nonresidential), institutional controls will be an adequate and sufficient response action to protect human health and the environment. The institutional controls will be in the form of a deed notice (Voluntary Environmental Mitigation Use Restriction [VEMUR]) and a deed restriction specifying nonresidential use.

Lead is present in surface soil at the Former Skeet Range at the South Desert Village (Site SS-19) and the Firing Range (part of Site SS-20) at levels that exceed the EPA Region IX residential PRGs and the Arizona HBGLs. The most significant exposure pathway is incidental ingestion of soil. Actual or threatened releases of hazardous substances from these sites, if not addressed by

implementing the response action selected in this ROD, may present an imminent and substantial endangerment to public health and the environment.

1.4 Description of the Selected Remedy

The selected remedy for OU-4 involves no action at certain sites, and specifies the remedial action (RA) at others. No RA is required for the following five sites:

- OWS - POL Yard (Facility 550, Site SD-18)
- ASTs 556 and 557 (Site ST-22)
- Building 1069 (Site SS-23)
- Concrete Hardfill Area (Site LF-26)
- Facility 1004 (Site SS-33).

The selected remedy for the following four sites is an RA that establishes institutional controls in the form of deed restrictions and the placement of a VEMUR. These institutional controls restrict the site to nonresidential use in the future.

- Electroplating/Chemical Cleaning Shop (Site SS-16)
- Former Skeet Range (Part of Site SS-20)
- Facilities 1020 and 1051 (Site SS-21)
- Building 1010 (Site SS-24).

The selected remedy is an RA in the form of engineering and institutional-controls for each of the following two sites:

- Former Skeet Range at the South Desert Village (Site SS-19)
- Firing Range (Part of Site SS-20).

The RA for Site SS-19 will consist of the removal of affected surface soil, the installation of a protective cap comprised of clean soil maintained at a thickness of no less than six inches, and the institution of site controls in the form of deed restrictions, a VEMUR, and required compliance with an approved operation and maintenance (O&M) manual. Excavated surface soil from the Former Skeet Range will be transported to licensed off-Base landfill facilities, and clean soil will be placed into the excavation as a cap.

Documents that allow human habitation of Site SS-19 include this ROD, the VEMUR, the O&M manual, the Quit Claim Deed between the U.S. Department of Education and Arizona State University (ASU), and the Agreement between ADEQ and ASU. The VEMUR, the O&M

manual, and the Agreement between ADEQ and ASU are attached to this ROD as Appendices A-2, A-3, and A-4, respectively.

The RA for the Firing Range at Site SS-20 will consist of the removal of affected surface soil and the institution of site controls in the form of deed restrictions and a VEMUR. Excavated soil from the Firing Range will be transported to licensed off-Base landfill facilities.

1.5 Declaration Statement

Sampling, analysis, and risk assessment associated with OU-4 have evaluated the health risks associated with exposure to contaminated soil at the ten OU-4 sites (IT, 1997a). The five no-action sites do not pose an unacceptable risk to human health or the environment under a conservative screening level residential exposure scenario; therefore, no RA is required. Because the concentrations of contaminants in the residual soil are within levels that do not pose an unacceptable risk to human health or the environment, the OU-4 no-action sites may be released for unrestricted use. Assessment of contamination at the remaining sites has documented exposure risk from contamination in surface soil only. Implementation of the selected remedy will remove available contaminants, or limit access to the contaminants by imposing engineering and institutional controls, and therefore reduce risk to acceptable levels.

No action is required for groundwater at OU-4 sites because soil contamination was limited to shallow surface soil (i.e., less than 25 feet). This does not represent a contaminant source to groundwater based on analysis in accordance with the Arizona Soil Remediation Standards Rules (ADEQ, 1996). Because this remedy will result in hazardous substances remaining in place at certain sites above residential health-based levels, i.e., those with engineering and institutional controls, the five-year reviews will address the action at those sites. At the time of the five-year reviews, the effectiveness of engineering and institutional controls will be evaluated.

This ROD for OU-4 at Williams AFB, Arizona may be executed and delivered in any number of counterparts, each of which when executed and delivered shall be deemed to be an original, but such counterparts shall together constitute one and the same document.

This Record of Decision for Operable Unit Number Four at Williams Air Force Base, Arizona is being signed concurrently by the Parties show. The inclusion of the original signature page for each of the Parties shall constitute a completely approved document.

Albert F. Lowas, Jr., ~~Acting~~ Director
U.S. Air Force, Base Conversion Agency

March 2, 2000
Date

(Signed Separately-See Other Signature Pages)

Acting Chief
Federal Facilities Cleanup Branch
U.S. Environmental Protection Agency, Region IX

Date

(Signed Separately-See Other Signature Pages)

Jacqueline E. Shafer, Director
Arizona Department of Environmental Quality

Date

(Signed Separately-See Other Signature Pages)

Rita Pearson, Director
Arizona Department of Water Resources

Date

This Record of Decision for Operable Unit Number Four at Williams Air Force Base, Arizona is being signed concurrently by the Parties shown. The inclusion of the original signature page for each of the Parties shall constitute a completely approved document.

(Signed Separately-See Other Signature Pages)

Albert F. Lowas, Jr., Director
U.S. Air Force, Base Conversion Agency

Date

Daniel A. Meer, Chief
Federal Facilities Branch
U.S. Environmental Protection Agency, Region IX

April 14, 2000
Date

(Signed Separately-See Other Signature Pages)

Jacqueline E. Shafer, Director
Arizona Department of Environmental Quality

Date

(Signed Separately-See Other Signature Pages)

Rita Pearson, Director
Arizona Department of Water Resources

Date

Final OU-4
Williams AFB, Arizona

This decision document, the Record of Decision, presents the selected remedial action plan for Operable Unit No. 4, Williams Air Force Base, Arizona. The document was developed in accordance with the rules and regulations of the Comprehensive Environmental Response, Compensation, and Liability Act of 1980, as amended by the 1986 Superfund Amendments and Reauthorization Act, and to the extent practicable, the National Contingency Plan. This decision document is based on information in the administration record for this operable unit.

The U.S. Air Force Base Conversion Agency, U.S. Environmental Protection Agency, and the State of Arizona concur on the selected remedies.

This decision document may be executed and delivered in any number of counterparts, each of which, when executed and delivered, shall be deemed to be an original, but such counterparts shall together constitute one and the same document.

Jacqueline E. Schafer, Director
Arizona Department of Environmental Quality

Aug. 16, 1999
Date

This Record of Decision for Operable Unit Number Four at Williams Air Force Base, Arizona is being signed concurrently by the Parties shown. The inclusion of the original signature page for each of the Parties shall constitute a completely approved document.

(Signed Separately-See Other Signature Pages)
Albert F. Lowas, Jr., Acting Director
U.S. Air Force, Base Conversion Agency

Date

(Signed Separately-See Other Signature Pages)
Acting Chief
Federal Facilities Cleanup Branch
U.S. Environmental Protection Agency, Region IX

Date

Jacqueline E. Shafer, Director
Arizona Department of Environmental Quality

Date

Rita Pearson, Director
(Signed Separately-See Other Signature Pages)
Rita Pearson, Director
Arizona Department of Water Resources

11/22/99
Date

2.0 Decision Summary

2.1 Site Name, Location, and Description

2.1.1 Name and Location

Williams AFB is located in Maricopa County, Arizona, approximately 30 miles southeast of Phoenix and just east of Chandler (Figure 1-1). The Base is relatively isolated from any large metropolitan area. Smaller urban areas such as Mesa, Chandler, Gilbert, and Apache Junction are located 5 to 15 miles north, northeast and northwest of the Base. The Queen Creek and Chandler Heights areas are approximately 5 miles south and west of the Base boundary, respectively. Table 2-1 lists these towns and others with distance and direction from Williams AFB; the population of the towns are included. These areas are separated from the Base by cultivated and uncultivated land.

2.1.2 Description

2.1.2.1 Demography and Land Use

Williams AFB was constructed on 4,042 acres of government land in 1941 to be used as a flight training base. Training activities with jet aircraft began in 1949. Runway and airfield operations, industrial areas, housing, and recreational facilities are located on the Base. In 1992, as a result of U.S. Department of Defense (DOD) downsizing, the Base was recommended for closure and subsequently closed September 30, 1993.

During its active status, 3,029 military personnel and 869 civilian employees were stationed at the Base. The total population actually living on Base, including dependents, was approximately 2,700. Many of the military personnel lived off Base in one of the surrounding areas. On an average workday, the population of the Base increased to more than 5,000 because of the influx of both civilian employees and military personnel living off Base (Cost Branch Controller Division, 1987).

The Base is surrounded primarily by agricultural land in a valley that has had a long history of intensive agricultural use, predominantly for crops of citrus, cotton, and alfalfa.

A development plan for the region (Sunregion Associates, 1987), if implemented, will dramatically alter the region surrounding Williams AFB. The portions of the development plan of most

Table 2-1

Cities Surrounding Williams Air Force Base, Arizona

City	Direction Relative to Williams AFB	Distance from Williams AFB (miles)	Population[a]
Apache Junction	North-Northeast	10	21,354
Chandler	West	5	119,227
Gilbert	Northwest	5	51,074
Mesa	North-Northwest	15	313,649
Queen Creek	South	5	3082
Tempe	Northwest	20	144,289
Phoenix	Northwest	25	1,048,949

[a]July 1, 1994 Census.

importance to the Base are the East Mesa Subarea Plan and the Queen Creek-Chandler Heights Plan. The former proposes development for portions of the City of Mesa, the Town of Gilbert, the City of Apache Junction, and the land area north of Williams AFB. The proposed land area for the Queen Creek-Chandler Heights Plan is east of Chandler, just south of the Base in the approximate location of the Town of Queen Creek. The plan is to develop the proposed area residentially and commercially over a 25-year period. If implemented, this development will dramatically impact the demographics and population around the Base.

The reuse transition of Williams AFB to the Williams Gateway Airport Authority will also impact the region. The airport infrastructure and runway facilities will be reused as Williams Gateway Airport, which is projected to become a passenger and cargo reliever airport for Phoenix Sky Harbor International Airport. Williams Campus is a consortium of educational institutions which include ASU - East and Maricopa County Community Colleges. This campus will become a major aviation educational, training, and research center, with an anticipated student population of 20,000 students. The Gila River Indian Community operates the Williams Golf Course, and is planning development of a 144-acre parcel along the southern portion of the Base.

Because of the size of the Base and the close relative proximity of the ten OU-4 sites, site-specific demographics are the same as that discussed above.

2.1.2.2 Climate

The climate of Williams AFB is similar to that of Phoenix and the rest of the Salt River Valley. The temperature ranges from very hot in the summer to mild in winter. Rain comes mostly in two seasons: from late November until early April, and in July and August. Average annual precipitation is approximately 7.1 inches. Humidity ranges from approximately 30 percent in winter to 10 percent in summer. Williams AFB is also characterized by light winds. The mean annual pan evaporation is approximately 100 inches and the annual lake evaporation for the area is approximately 72 inches (National Oceanic and Atmospheric Administration, 1977).

2.1.2.3 Geology

Williams AFB lies in the eastern portion of the Basin and Range Physiographic Lowlands Province of south-central Arizona, which is located in the Salt River Valley. The local topography is controlled by large-scale normal faulting that has resulted in the formation of broad, flat, alluvial-filled valleys separated by steep isolated hills and mountain ranges. Arizona Department of Water Resource's hydrologic maps show the Base bounded to the north by the

Usery Mountains, to the east by the Superstition Mountains, to the south by the Santan Mountains, and to the west by South Mountain.

The topography of the Base slopes gently to the west with a generally less than 1 percent grade. Elevations range from 1,326 feet above mean sea level (msl) on the west side of the Base to 1,390 feet above msl at the southeast corner of the Base.

According to Laney and Hahn (1986), the area of the Base is underlain by six geologic units: crystalline rocks, extrusive rocks, red unit, lower unit, middle unit, and upper unit. The crystalline and extrusive rocks compose the surrounding mountains and the basement complex underlying the consolidated and unconsolidated sediments of the valley. The four units overlying the basement complex are of sedimentary origin and have the surrounding mountains and local drainage as their source areas.

The red unit immediately overlies the basement complex and is composed of well-cemented breccia, conglomerate, sandstone, and siltstone of continental origin with interbedded extrusive flow rocks. The lower unit overlies the red unit and consists of playa, alluvial fan, and fluvial deposits with evaporites and interbedded basaltic flows present in lower sections (Laney and Hahn, 1986). The middle unit overlies the lower unit and is composed of playa, alluvial fan, and fluvial deposits with no associated evaporites. The middle unit received its sediment primarily from the Salt River, whereas the red and lower units had the local mountains as the principal source. The youngest unit in the stratigraphic sequence is referred to as the upper unit. This unit consists of channel, floodplain, terrace, and alluvial fan deposits of largely unconsolidated gravel, sand, silt, and clay.

Two major soil associations are found in the vicinity of Williams AFB. The Mohall-Contine Association is found over much of the Base, and the Gillman-Estrella-Avondale Association is found at the southern boundary of the Base. The Mohall-Contine and the Gillman-Estrella-Avondale Associations have generally the same characteristics, being well drained and nearly level with slopes of less than one percent.

Because of the uniform nature of the Basewide geology and the fact that the ten sites included in OU-4 are in close relative proximity, the site-specific geology is the same as that discussed above.

2.1.2.4 Hydrogeology

Groundwater elevation contour maps have been produced for the western half of the Base, where groundwater monitoring wells exist. This information is presented in the OU-1 and OU-2 RI reports (IT, 1992a,b), and the OU-3 RIR (IT, 1994a). The maps indicate that groundwater flows to the north and east on a Basewide scale. These maps are consistent with other groundwater elevation contour maps presented for the area (Laney and Hahn, 1986; AeroVironment, Inc. [AV], 1987). Because the contaminants detected at the OU-4 sites, such as metallic lead and pesticides, have been proven by sampling to be restricted to the surface soil, leaching to groundwater has been eliminated as a pathway, and no monitoring wells have been required by any approved work plans.

A general rise in groundwater elevations has been observed in monitoring periods from December 1989 to present at a rate of three to five feet per year. Rising groundwater levels may be attributed to decreased local pumping due to urbanization and larger surface water use, increased recharge from additional agricultural irrigation, and increased recharge from unusually rainy periods over the past 10 to 15 years.

There are at least 90 domestic permitted wells within a three-mile radius of the Base. These wells are not affected by contamination at OU-4.

2.1.2.5 Surface Water

There are no major surface water bodies within a ten-mile radius of the Base. The Base lies between the 100-year and 500-year flood level for streams in the Gila River Basin (U.S. Department of Housing and Urban Development, 1979). Storm drainage on the Base is directed to a combination of open channels used to drain most of the Base and underground drainage structures. Storm drainage from the Base flows either to the Roosevelt Water Control District (RWCD) floodway that flows southward in the vicinity of the Base or directly to the floodway west of the Base, or into the wastewater treatment plant. None of the sites within OU-4 were expected to produce surface water contamination, and no sampling of surface water was performed.

2.2 Site History and Enforcement Activities

2.2.1 History

Williams AFB was a flight training base that opened in 1942. It was immediately commissioned as a flight training school, and training activities with jet aircraft began in 1949. Throughout its

history, pilot training was the primary activity at Williams AFB. At various times, bombardier, bomber pilot, instrument bombing specialist, and fighter gunnery training schools were also housed on Base. Over the years, a wide variety and large number of aircraft have been housed at Williams AFB.

2.2.2 Installation Restoration Program

The Installation Restoration Program (IRP) was implemented by the DOD in 1980 to identify and control environmental contamination from past hazardous materials use and disposal activities at USAF installations. The IRP is DOD's equivalent of the national Superfund program. SARA, passed by Congress in 1986, required cleanup of federal facilities to meet Superfund requirements.

2.2.2.1 IRP Phase I

IRP guidance was received at Williams AFB in July 1983 and the initial assessment study (designated as Phase I) was completed by Engineering-Science, Inc. (ES) (ES, 1984). Based on a review of available records pertaining to chemical handling and disposal practices, interviews with site personnel, and a site survey of activities at Williams AFB, the study identified nine potential sites where hazardous materials have been handled or disposed.

2.2.2.2 IRP Phase II

A second investigation (designated as Phase II) was conducted by AV from September 1984 to December 1985 (AV, 1986). This investigation was initiated to confirm the information in the ES report and to verify the presence and quantify the extent of contamination. In 1987, AV completed an additional investigation (Phase II, Stage 2) to define the most likely pathways for contaminant migration from each site and to confirm the presence or absence of contamination along those pathways.

In 1987, as a result of AV investigations, IT, under a contract with Martin Marietta Energy Systems, Inc. through the Hazardous Waste Remedial Actions Program, performed a simple remedial action (IT, 1987a) involving design of soil cementing and a concrete capping for a portion of a former drainage system. Plans and specifications were issued in September 1987 (IT, 1987b) and the work was completed that year.

In October 1988, the Air Training Command (ATC) contracted Martin Marietta Energy Systems and its subcontractor, IT, through the U.S. Department of Energy to complete the RI/FS, proposed plan, and ROD at Williams AFB. As part of these efforts, a work plan and quality

assurance project plan (QAPP) (IT, 1991a), which includes a health and safety plan (HSP), and an FSP (IT, 1991b), were issued. The continuation of the RI was initiated in January 1989. The sites investigated include the nine original sites plus four underground storage tank (UST) sites.

2.2.3 Federal Facilities Agreement

Williams AFB was added to the National Priorities List (NPL) on November 21, 1989. The NPL primarily serves as an information tool for EPA to identify sites that possibly warrant further investigation and remedial action. As a consequence of inclusion on the NPL listing, negotiations were completed and a Federal Facilities Agreement (FFA) was signed on September 21, 1990. The FFA establishes a cooperative and participatory framework among the federal and state agency members, defines their roles and responsibilities, and develops a process to resolve any disputes that may arise during the study and execution phases of the IRP. In addition, the FFA prioritizes and schedules the investigation and remedial actions at Williams AFB through the designation of OUs that aid in managing these activities. Parties to the FFA include the USAF, the EPA, the ADEQ, and the Arizona Department of Water Resources (ADWR).

2.2.4 OU-1

OU-1 was created to address eight areas identified in previous investigations, plus four UST areas (IT, 1992a; 1994b,c). A ROD for OU-1 was signed May 18, 1994.

2.2.5 OU-2

OU-2 comprised the groundwater contamination and shallow (less than 25 feet) soil contamination beneath the Liquid Fuels Storage Area (IT, 1992b,c,d). A ROD for OU-2 was signed in December 1992. Deep soil at ST-12 from (25 feet to groundwater) was incorporated into OU-3 for final characterization of the vertical and areal extent of contamination. Once this characterization was completed, the deep soils were reincorporated into OU-2 via an OU-2 ROD amendment. The OU-2 ROD amendment was signed in August 1996.

2.2.6 OU-3

OU-3 was created to investigate sites not included in OU-1, the portion of the storm line from Building 53 to the headworks of SD-09, and the Fire Protection Training Area No. 2. A ROD for OU-3 was signed in May 1996.

2.2.7 Facilities Assessment

In 1992, after the Base was nominated for closure, there was a question of whether all the areas on the Base with potential contamination had been included in the administrative record. This

question led to the facilities assessment, which began in February 1992 and was concluded in 1993 (IT, 1993a).

The facilities assessment report documented the actions that have been taken to assess facilities not included under the IRP. The report also reviewed the background of each facility and any contamination that might pose a risk to human health or the environment at that location. This process resulted in assessing 92 facilities/areas. Forty-nine facilities/areas were recommended to be eliminated from further consideration, 29 were recommended for further investigation, 12 were recommended for inclusion as part of the State Compliance Program, one was recommended for addition as an IRP site, and one area was already identified as an IRP site. One additional area was subsequently added to the areas recommended for further investigation, increasing the number for further investigation to 30.

2.2.8 Evaluation/Assessment

In 1993, field and sampling activities were conducted by IT at the 30 areas designated for the E/A. The purpose of this investigation was to evaluate the areas for the presence or absence of contamination that may have resulted from operations at the Base. The resultant E/A report (IT, 1994d) summarizes the results of this investigation. Areas where the presence and extent of contamination was confirmed were recommended for limited removal action and/or risk screening and were designated as OU-5 sites. Areas recommended for further investigation under CERCLA were designated as OU-4 sites.

2.2.9 Environmental Baseline Survey

An Environmental Baseline Survey (EBS) was performed in 1993 by Halliburton NUS Corporation (HNUS) in order to document the physical condition of Air Force real property at the Base resulting from the past storage, use, and disposal of hazardous substances and petroleum products. The survey was performed through the use of interviews, records searches, and site inspections, and resulted in a report (HNUS, 1993a,b) that documented property status by category. Property designated Categories 1 through 4 was available for immediate transfer. Property designated Category 5 was that property where a release of a hazardous substance or petroleum product is known to have occurred and removal and/or remedial action is underway. Property designated Category 6 was that property where a release is known to have occurred but response actions have not yet been implemented, and property designated Category 7 was unevaluated or required additional evaluation. Properties designated Categories 5 and 6 were assigned to ongoing or future OU investigations.

2.2.10 E/A Phase 2, Category 7 Areas

The facilities/areas and aerial-photography-defined areas that were designated Category 7 in the EBS were re-evaluated after the initial E/A activities, and reassigned in a Category 7 work plan/ field sampling plan (IT, 1995a). Five Category 7 facilities/areas and two aerial-photography-defined areas were investigated by IT in 1995. Results of Category 7 investigations were reported in a final report (IT, 1995b). All investigated sites were approved for no further action.

2.2.11 OU-5

Removal actions were performed at OU-5 sites in 1995, and documented in the OU-5 RIR (IT, 1996a). A ROD for OU-5 was signed on March 5, 1998.

2.2.12 OU-4

This ROD addresses remedial investigations and proposed remedies for OU-4, which is composed of the following sites:

- Electroplating/Chemical Cleaning Shop (Facility 1085, Site SS-16)
- OWS - POL Yard (Facility 550, Site SD-18)
- Former Skeet Range at the South Desert Village (Site SS-19)
- Firing Range/Skeet Range (Facility 927, Site SS-20)
- Facilities 1020 and 1051 (Site SS-21)
- ASTs 556 and 557 (Site ST-22)
- Building 1069 (Site SS-23)
- Building 1010 (Site SS-24)
- Concrete Hardfill Area (Site LF-26)
- Facility 1004 (Site SS-33).

Figures 2-1A and 2-1B show the locations of these sites on Williams AFB. Details of past waste practices, environmental investigations, enforcement activities, and remedial actions for each OU-4 site follow.

2.2.12.1 Electroplating/Chemical Cleaning Shop (Facility 1085, Site SS-16)

Site Description and History. The Electroplating/Chemical Cleaning Shop (Facility 1085) is located just southwest of Taxiway B, between Taxiway No. 1 and Taxiway No. 6 (Figure 2-1A). Electroplating and chemical cleaning were performed in the facility since 1961. Underground storage tanks associated with plating waste have been identified and removed under the IRP.

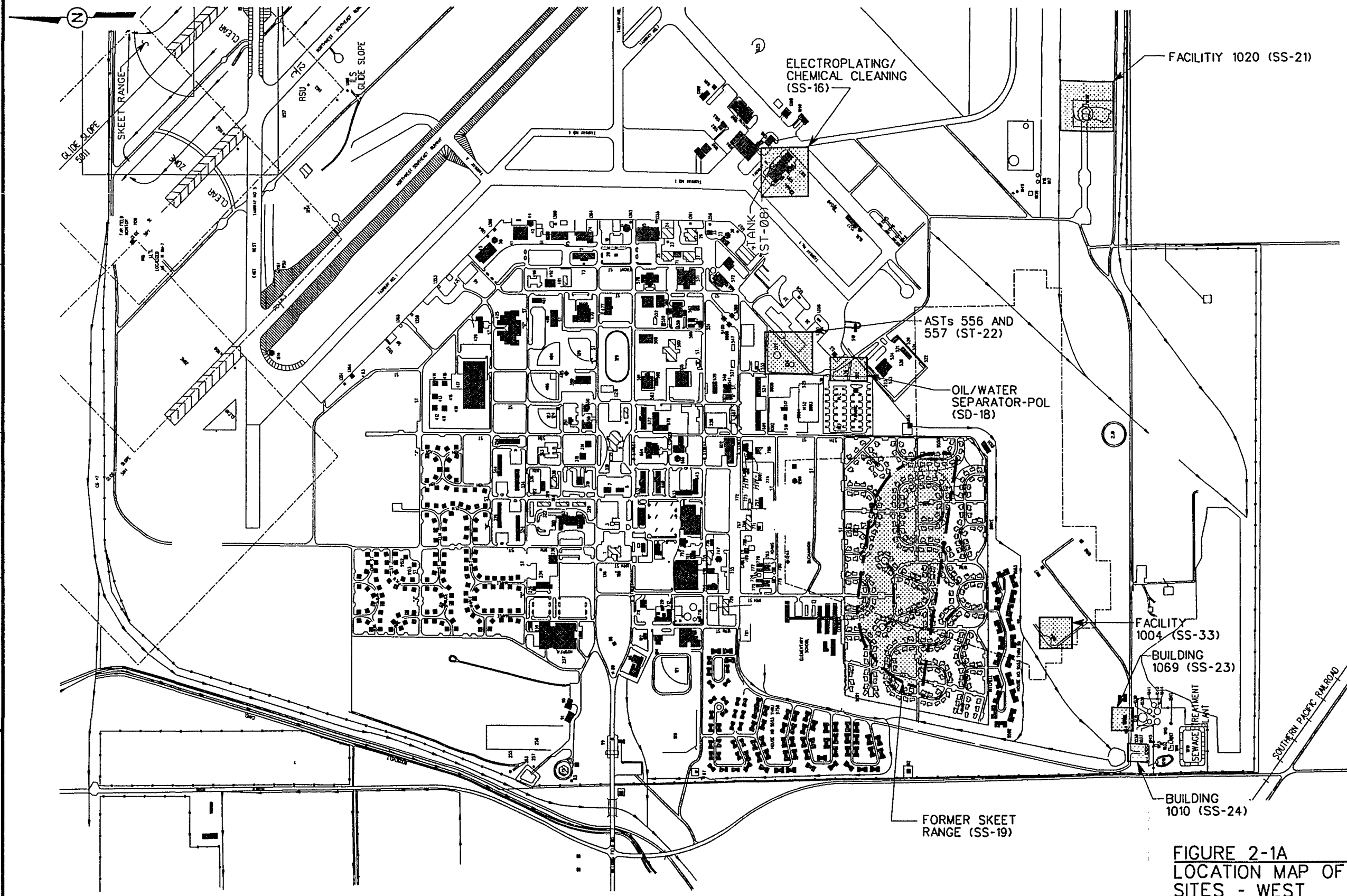


FIGURE 2-1A
LOCATION MAP OF OU-4
SITES - WEST

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL
TECHNOLOGY
CORPORATION

STARTING DATE: 6/19/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD	DWG. NO.: 409881ES.427
DRAWN BY: D. BILLINGLSEY	DRAWN BY:	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W.CARTER	PROJ. NO.: 409881

FILENAME:409881ES.427 13:37:50 Jun. 19, 1997 DLB

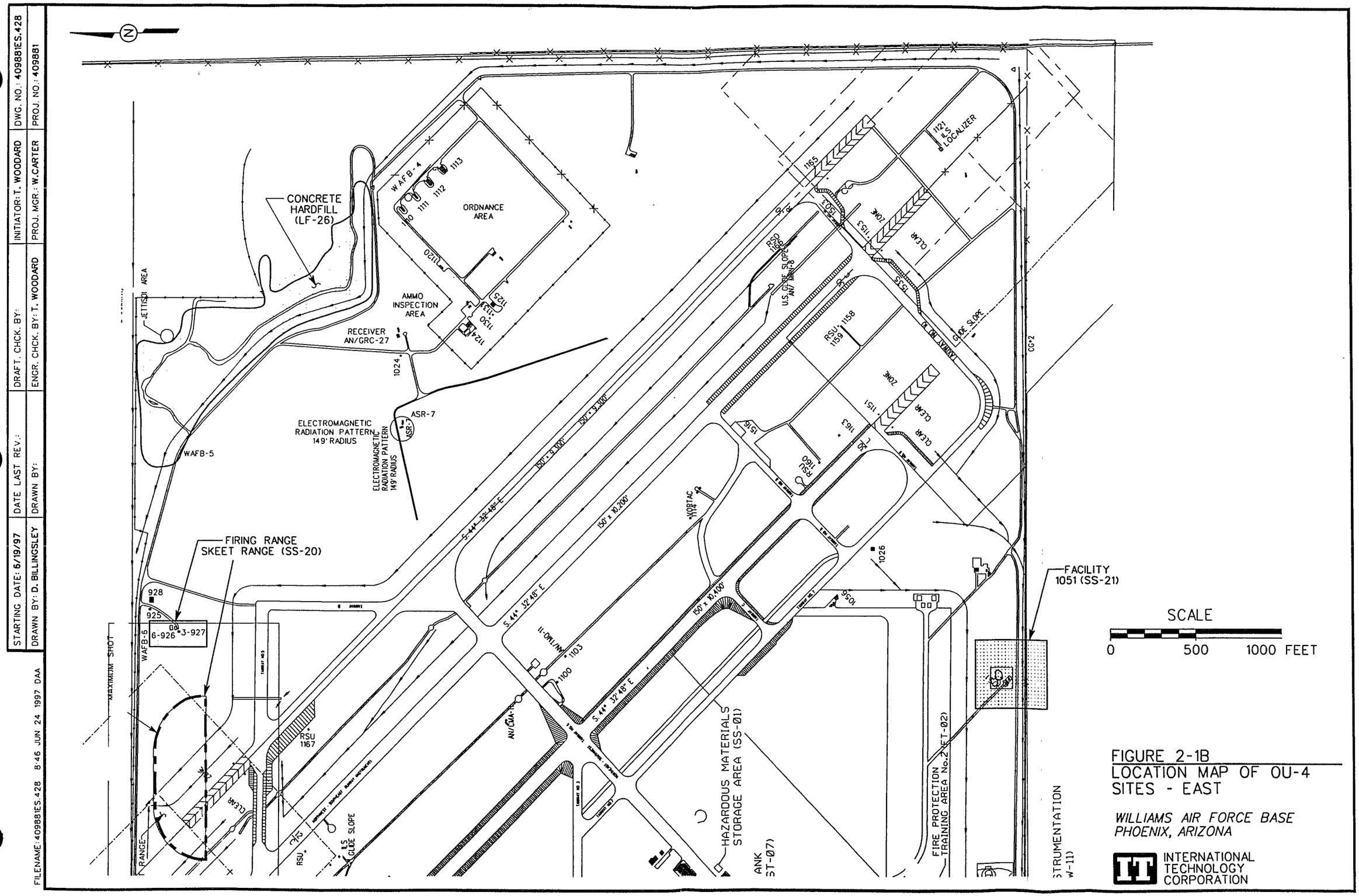


FIGURE 2-1B
LOCATION MAP OF OU-4 SITES - EAST

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 6/19/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W. CARTER
			DWG. NO.: 409881ES.428
			PROJ. NO.: 409881

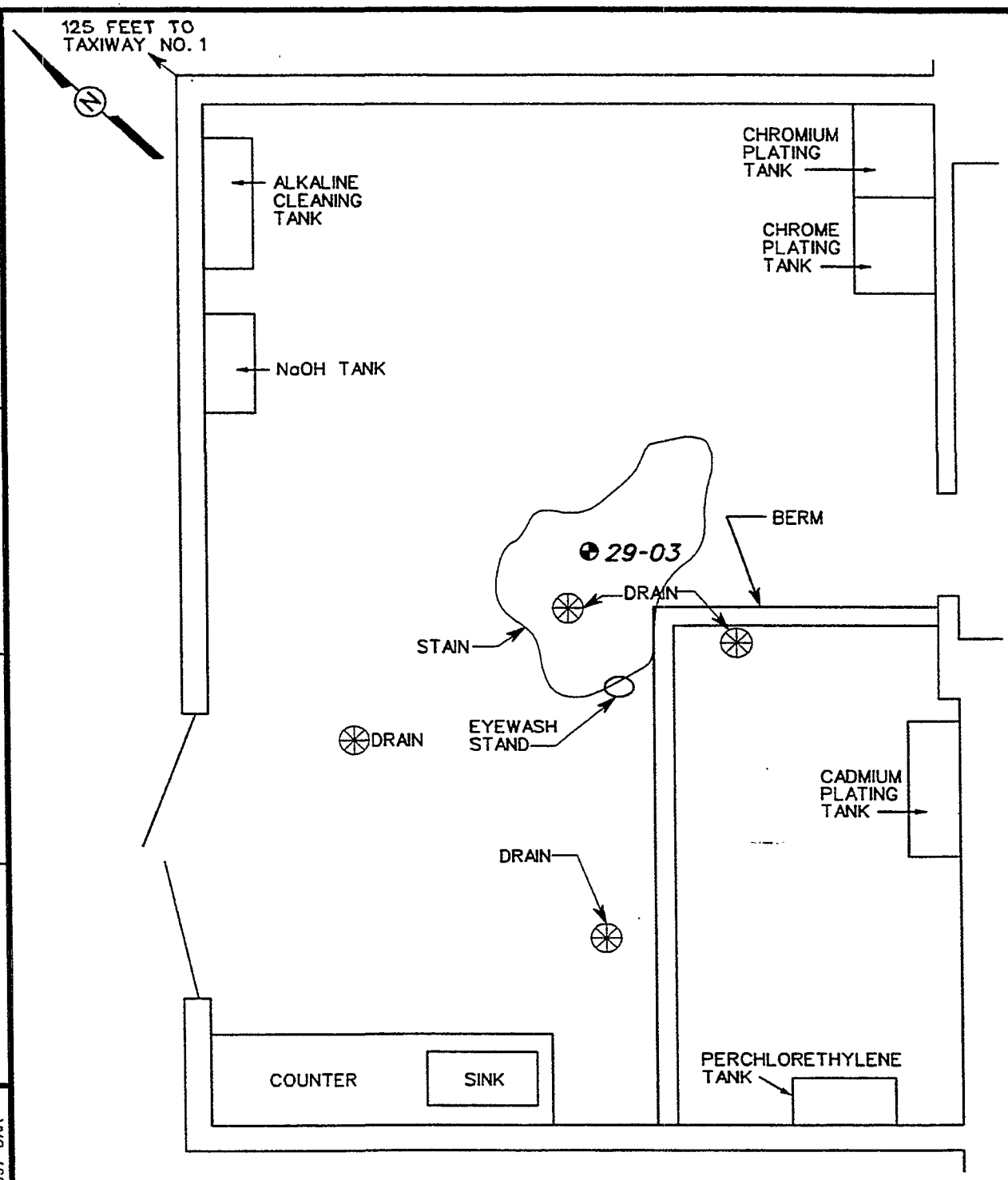
FILENAME: 409881ES.428 8:46 JUN 24 1997 DAA

E/A Investigation and Results. During the E/A, a soil sample collected beneath the concrete floor of the electroplating room (Figure 2-2A) returned values for arsenic and beryllium that were above EPA Region IX residential PRGs and Arizona residential HBGLs, but were within Base-specific and regional background ranges. An attempt to collect a soil sample beneath the concrete floor of the chemical cleaning room (Figure 2-2B) was unsuccessful, but solvent odors were noted during the attempt. Both the electroplating room and the chemical cleaning room were recommended for further investigation under OU-4.

OU-4 Investigation and Results. Additional soil sampling was performed in September 1995, in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d). Concrete floors were cored to allow drill access for five borings in the electroplating room and six borings in the chemical cleaning room (Figures 2-3A and 2-3B). Soil borings were drilled to 50 feet below ground surface (bgs). Soil samples from the electroplating room were analyzed for volatile organic compounds (VOC) and metals, and samples from the chemical cleaning room were analyzed for VOCs only.

Analytical results of subsurface sampling are listed and discussed in the OU-4 RIR (IT, 1997a), and document low to moderate values of certain VOCs (toluene, TCE, and PCE) to depths of 10 feet bgs, and low to moderate values of certain metals (arsenic, beryllium, chromium, and lead) at various depths. None of the detected VOCs exceeded EPA Region IX residential PRGs, Arizona residential HBGLs, or Arizona minimum groundwater protection levels (GPL). Chromium values do not exceed the EPA Region IX residential PRG, the Arizona residential HBGL, or the Arizona minimum GPL. Arsenic and beryllium values exceed EPA Region IX residential PRGs and Arizona residential HBGLs, but fall below regional background levels. The lead value (403 mg/kg) from the depth of one foot at Boring BH-01 exceeds the EPA Region IX residential PRG (400 mg/kg), the Arizona residential HBGL (400 mg/kg), and the Arizona minimum GPL (290 mg/kg).

Supplemental Investigation and Results. In April 1997, supplemental soil sampling and analysis was conducted at the electroplating shop to obtain additional data to support the calculation of a site-specific GPL for lead. Three original samples and one field duplicate sample were collected from depths of 10, 15, and 50 feet bgs in a borehole located just outside the electroplating shop. All samples were analyzed for total and toxicity characteristic leaching procedure (TCLP) metals. The calculated site-specific GPL for lead, as reported in the OU-4 RIR (IT, 1997a) is 646.5 mg/kg. The maximum detected value from Borehole BH-01 of 403



LEGEND:

PREVIOUS STUDY SAMPLE LOCATIONS

SCALE

0 4 8 FEET

FIGURE 2-2A
ELECTROPLATING SHOP,
FACILITY 1085, SS-16

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL
TECHNOLOGY
CORPORATION

STARTING DATE: <6/19/97>>	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W.CARTER
			DWG. NO.: 409881ES.429
			PROJ. NO.: 409881

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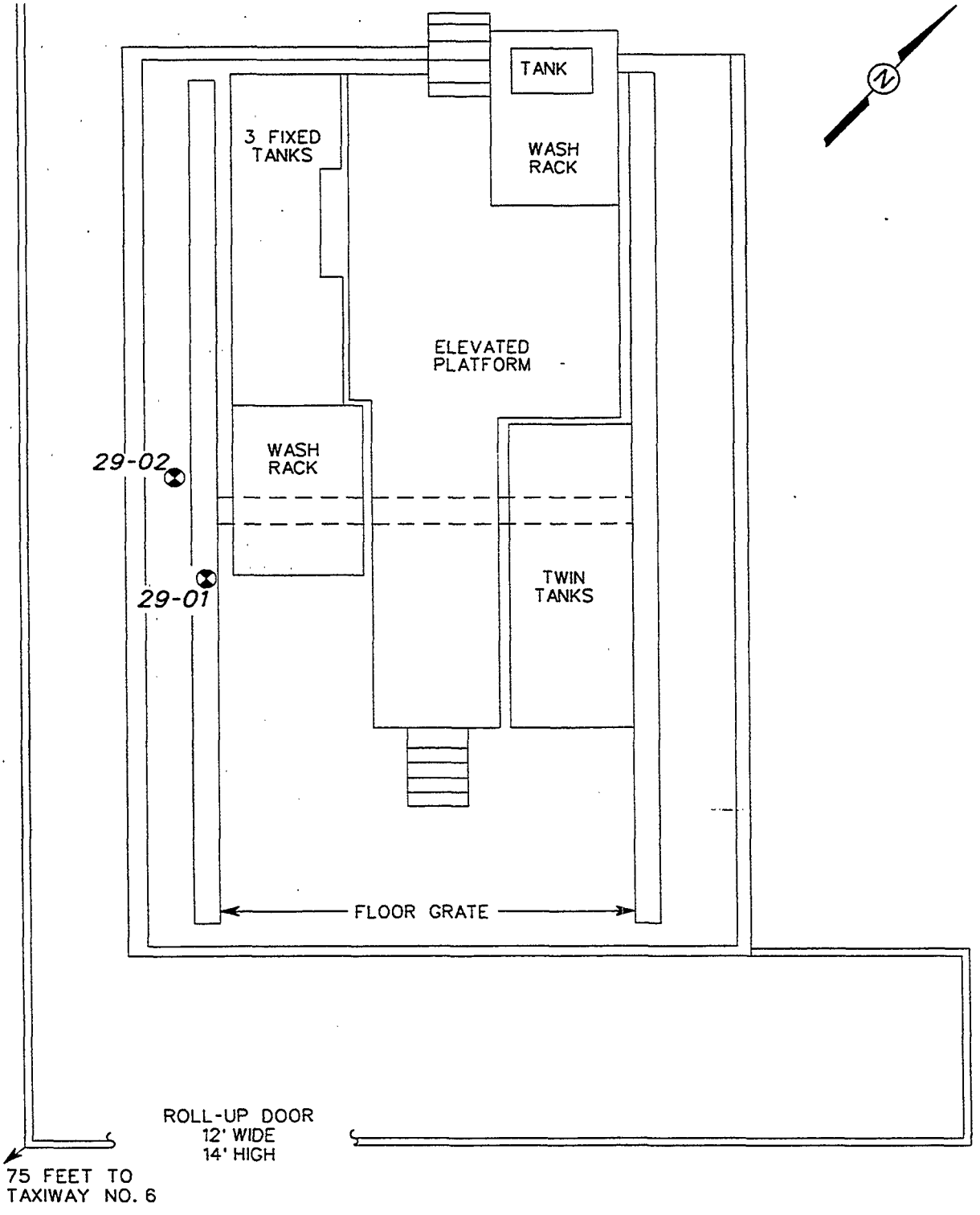


LEGEND:

⊗ PREVIOUS STUDY SAMPLE LOCATIONS

SCALE

0 20 40 FEET

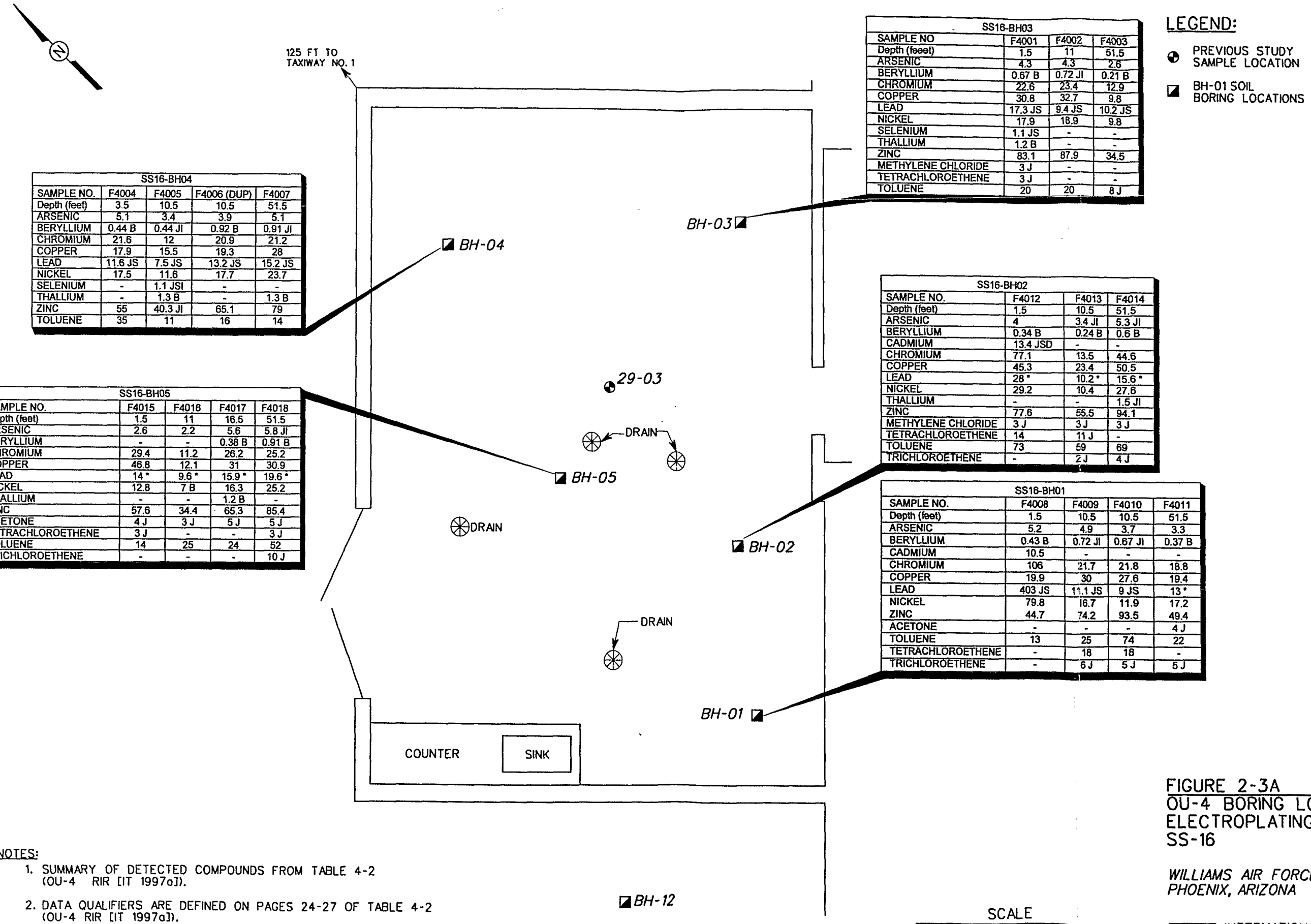
FIGURE 2-2B
CHEMICAL CLEANING ROOM, FACILITY 1085, SS-16

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 6/19/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD	DWG. NO.: 409881ES.430
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T WOODARD	PROJ. MGR.: W. CARTER	PROJ. NO.: 409881

FILENAME:409881ES.430 15:54:32 Jun. 19, 1997 DLB



SS16-BH03			
SAMPLE NO	F4001	F4002	F4003
Depth (feet)	1.5	11	51.5
ARSENIC	4.3	4.3	2.6
BERYLLIUM	0.67 B	0.72 JI	0.21 B
CHROMIUM	22.6	23.4	12.9
COPPER	30.8	32.7	9.8
LEAD	17.3 JS	9.4 JS	10.2 JS
NICKEL	17.9	18.9	9.8
SELENIUM	1.1 JS	-	-
THALLIUM	1.2 B	-	-
ZINC	83.1	87.9	34.5
METHYLENE CHLORIDE	3 J	-	-
TETRACHLOROETHENE	3 J	-	-
TOLUENE	20	20	8 J

LEGEND:

PREVIOUS STUDY SAMPLE LOCATION

BH-01 SOIL BORING LOCATIONS

SS16-BH04				
SAMPLE NO.	F4004	F4005	F4006 (DUP)	F4007
Depth (feet)	3.5	10.5	10.5	51.5
ARSENIC	5.1	3.4	3.9	5.1
BERYLLIUM	0.44 B	0.44 JI	0.92 B	0.91 JI
CHROMIUM	21.6	12	20.9	21.2
COPPER	17.9	15.5	19.3	28
LEAD	11.6 JS	7.5 JS	13.2 JS	15.2 JS
NICKEL	17.5	11.6	17.7	23.7
SELENIUM	-	1.1 JSI	-	-
THALLIUM	-	1.3 B	-	1.3 B
ZINC	55	40.3 JI	65.1	79
TOLUENE	35	11	16	14

SS16-BH02			
SAMPLE NO.	F4012	F4013	F4014
Depth (feet)	1.5	10.5	51.5
ARSENIC	4	3.4 JI	5.3 JI
BERYLLIUM	0.34 B	0.24 B	0.6 B
CADMIUM	13.4 JSD	-	-
CHROMIUM	77.1	13.5	44.6
COPPER	45.3	23.4	50.5
LEAD	28 *	10.2 *	15.6 *
NICKEL	29.2	10.4	27.6
THALLIUM	-	-	1.5 JI
ZINC	77.6	55.5	94.1
METHYLENE CHLORIDE	3 J	3 J	3 J
TETRACHLOROETHENE	14	11 J	-
TOLUENE	73	59	69
TRICHLOROETHENE	-	2 J	4 J

SS16-BH05				
SAMPLE NO.	F4015	F4016	F4017	F4018
Depth (feet)	1.5	11	16.5	51.5
ARSENIC	2.6	2.2	5.6	5.8 JI
BERYLLIUM	-	-	0.38 B	0.91 B
CHROMIUM	29.4	11.2	26.2	25.2
COPPER	46.8	12.1	31	30.9
LEAD	14 *	9.6 *	15.9 *	19.6 *
NICKEL	12.8	7 B	16.3	25.2
THALLIUM	-	-	1.2 B	-
ZINC	57.6	34.4	65.3	85.4
ACETONE	4 J	3 J	5 J	5 J
TETRACHLOROETHENE	3 J	-	-	3 J
TOLUENE	14	25	24	52
TRICHLOROETHENE	-	-	-	10 J

SS16-BH01				
SAMPLE NO.	F4008	F4009	F4010	F4011
Depth (feet)	1.5	10.5	10.5	51.5
ARSENIC	5.2	4.9	3.7	3.3
BERYLLIUM	0.43 B	0.72 JI	0.67 JI	0.37 B
CADMIUM	10.5	-	-	-
CHROMIUM	106	21.7	21.8	18.8
COPPER	19.9	30	27.6	19.4
LEAD	403 JS	11.1 JS	9 JS	13 *
NICKEL	79.8	16.7	11.9	17.2
ZINC	44.7	74.2	93.5	49.4
ACETONE	-	-	-	4 J
TOLUENE	13	25	74	22
TETRACHLOROETHENE	-	18	18	-
TRICHLOROETHENE	-	6 J	5 J	5 J

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

FIGURE 2-3A
OU-4 BORING LOCATIONS, ELECTROPLATING SHOP, SS-16

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO.: 409881ES.431 | PROJ. NO.: 409881
INITIATOR: T. WOODARD | PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: | ENGR. CHCK. BY: T. WOODARD
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 6/19/97 | DRAWN BY: D. BILLINGSLEY
FILENAME 409881ES.431 8:53 JUN 24 1997 DAA

SS16-BH10					
SAMPLE NO.	F4019	F4020	F4021	F4022	F4023
Depth (feet)	1.5	8.5	36.5	51.5	51.5
TETRACHLOROETHENE	200 D	5 J	10 J	-	-
TOLUENE	120 JB	39 JB	-	-	-
TRICHLOROETHENE	13	-	4 J	-	-

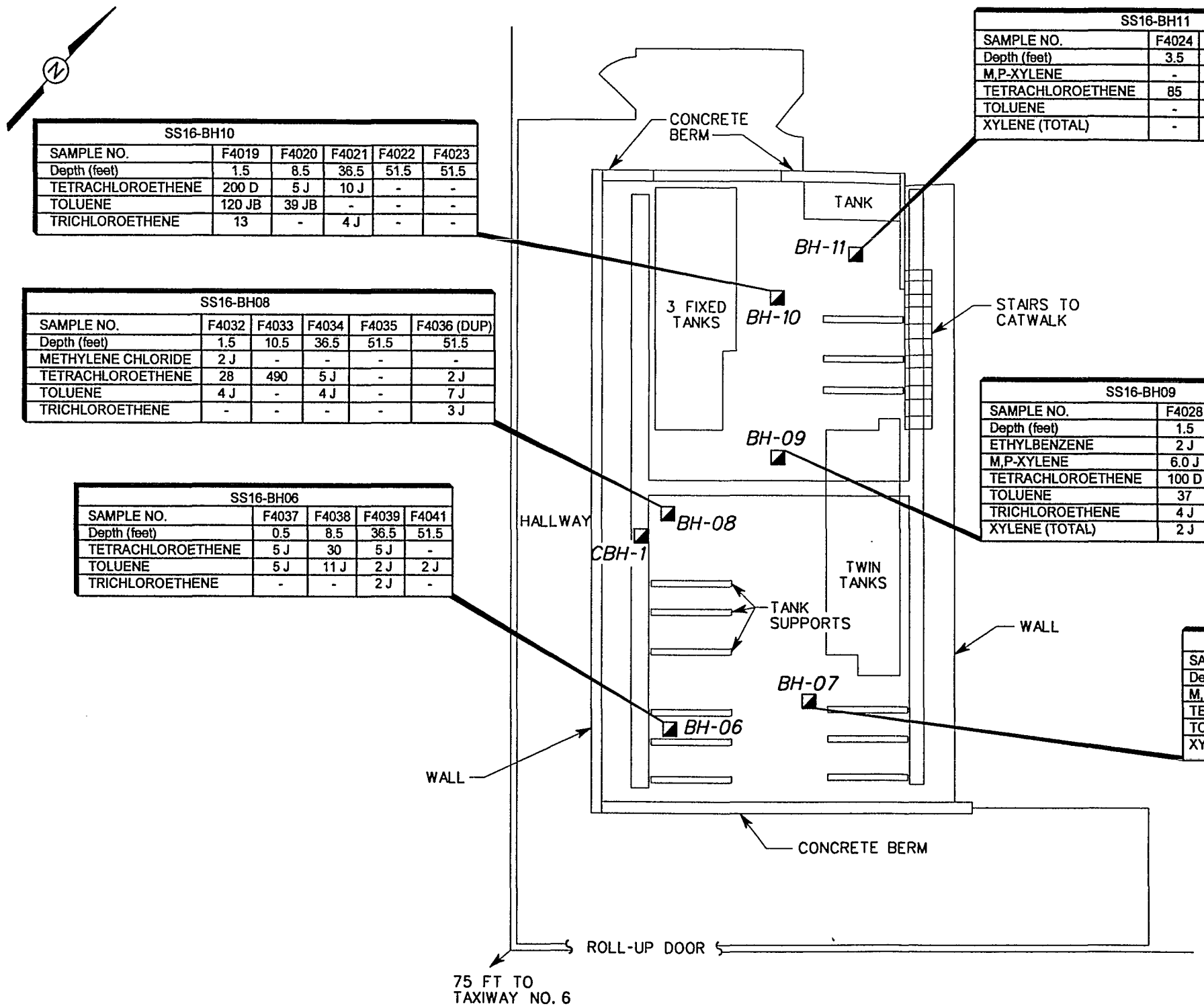
SS16-BH08					
SAMPLE NO.	F4032	F4033	F4034	F4035	F4036 (DUP)
Depth (feet)	1.5	10.5	36.5	51.5	51.5
METHYLENE CHLORIDE	2 J	-	-	-	-
TETRACHLOROETHENE	28	490	5 J	-	2 J
TOLUENE	4 J	-	4 J	-	7 J
TRICHLOROETHENE	-	-	-	-	3 J

SS16-BH06				
SAMPLE NO.	F4037	F4038	F4039	F4041
Depth (feet)	0.5	8.5	36.5	51.5
TETRACHLOROETHENE	5 J	30	5 J	-
TOLUENE	5 J	11 J	2 J	2 J
TRICHLOROETHENE	-	-	2 J	-

SS16-BH11				
SAMPLE NO.	F4024	F4025	F4026	F4027
Depth (feet)	3.5	8.5	31.5	51.5
M,P-XYLENE	-	2.0 J	-	-
TETRACHLOROETHENE	85	12	3 J	-
TOLUENE	-	10 J	-	2 J
XYLENE (TOTAL)	-	0.6 J	-	-

SS16-BH09				
SAMPLE NO.	F4028	F4029	F4030	F4031
Depth (feet)	1.5	10.5	31.5	51.5
ETHYLBENZENE	2 J	-	-	-
M,P-XYLENE	6.0 J	-	-	-
TETRACHLOROETHENE	100 D	13	3 J	-
TOLUENE	37	-	-	-
TRICHLOROETHENE	4 J	-	-	-
XYLENE (TOTAL)	2 J	-	-	-

SS16-BH07			
SAMPLE NO.	F4042	F4043	F4044
Depth (feet)	1.5	10.5	51.5
M,P-XYLENE	2.0 J	-	-
TETRACHLOROETHENE	60	7 J	-
TOLUENE	24	5 J	-
XYLENE (TOTAL)	0.7 J	-	-



LEGEND:

- BH-10 SOIL BORING LOCATION
- CBH-1 CONCRETE BORING LOCATION

NOTES:

1. FINAL BORING LOCATIONS AFTER REMOVAL OF ELEVATED PLATFORMS AND WASHRACKS
2. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
4. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

SCALE

0 20 40 FEET

FIGURE 2-3B
OU-4 BORING LOCATIONS, CHEMICAL CLEANING ROOM, SS-16

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO.: 409881ES.432 | PROJ. NO.: 409881
INITIATOR: T. WOODARD | PROJ. MGR.: W.CARTER
DRAFT. CHCK. BY: | ENGR. CHCK. BY: T. WOODARD
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 6/19/97 | DRAWN BY: D. BILLINGSLEY
FILENAME: 409881ES.432 8:56 JUN 24 1997 DAA

mg/kg does not exceed the calculated GPL, so groundwater will not be impacted by lead from this site.

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was acceptable risk from contaminants of potential concern (COPC) to occupational workers in a nonresidential scenario at Site SS-16. An RA in the form of recording a VEMUR and establishing deed restrictions to nonresidential use is selected as the preferred alternative to eliminate unacceptable risk to human health and the environment at this site.

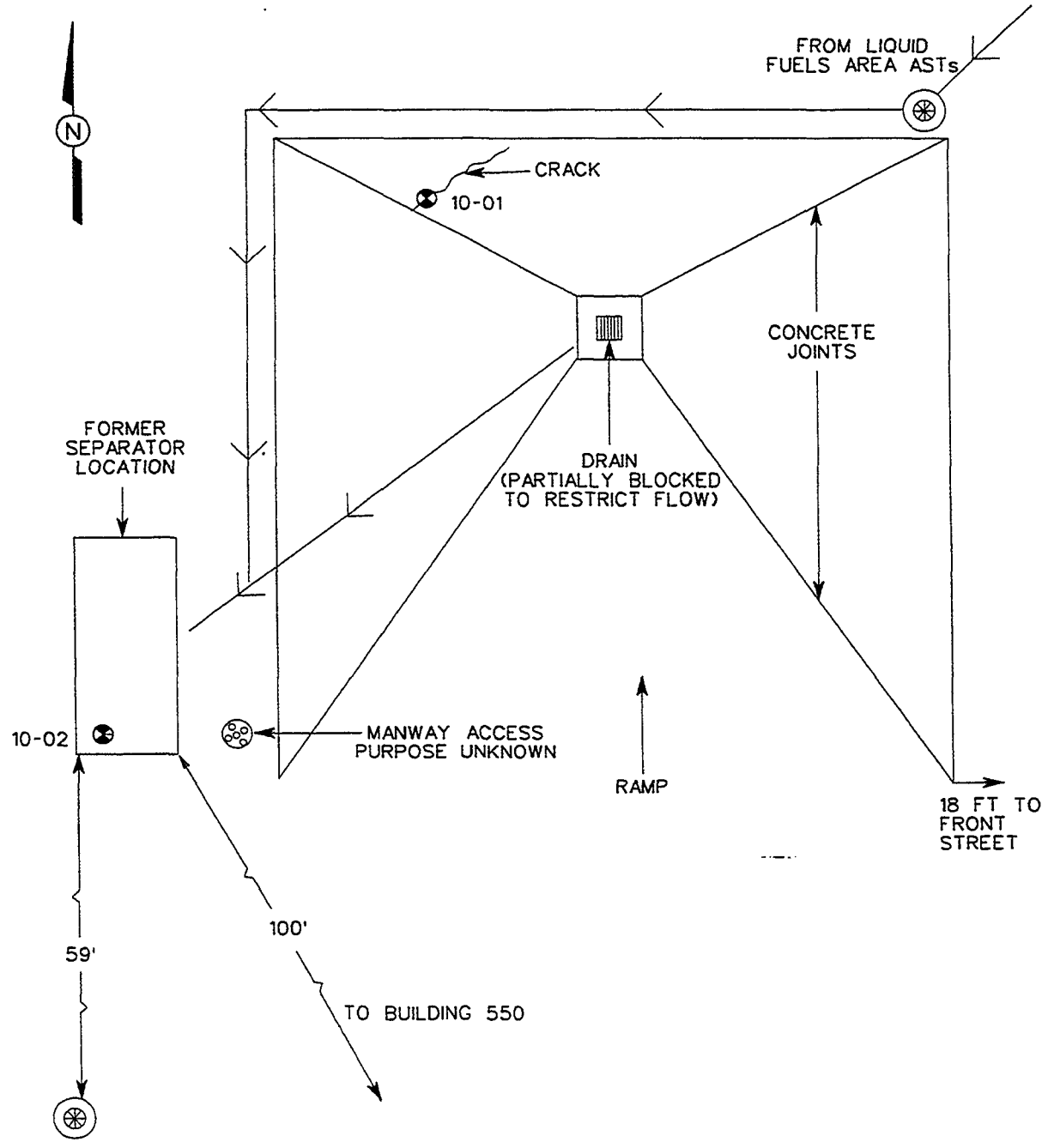
2.2.12.2 OWS - POL Yard (Facility 550, Site SD-18)

Site Description and History. This facility was used in aircraft refueling operations while the Base was active. The OWS was located at the west side of a concrete pad used to wash down refueling trucks (Figure 2-4). The waste stream included water, oil, grease, and detergent.

E/A Investigation and Results. The OWS was removed during a Base-wide program, and a hydrocarbon odor was noted. The soil beneath the former location of the OWS, and the soil beneath the wash pad were sampled and analyzed for total petroleum hydrocarbons (TPH) and VOCs (Figure 2-4). TPH results from the sample collected below the former OWS exceeded the Arizona underground storage tank regulatory guideline of 100 milligrams per kilogram (mg/kg), and the area was recommended for further investigation under OU-4.

OU-4 Investigation and Results. Additional soil sampling was performed in September 1995, in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d). Five soil borings were drilled to a depth of 51 feet bgs (Figure 2-5), and soil samples were collected every five feet for field VOC screening. Thirteen samples were analyzed for TPH, semivolatile organic compounds (SVOC), and benzene, toluene, ethyl benzene, and xylenes (BTEX). Analytical results, as reported in the OU-4 RIR (IT, 1997a), indicate the presence of BTEX compounds, SVOCs, and TPH at a depth of 21 feet bgs in one borehole (BH-05; drilled through the former location of the OWS).

The concentrations of those compounds detected in BH-05 do not exceed the appropriate and existing EPA Region IX residential PRGs and Arizona residential HBGLs. The risk assessment in Chapter 4.0 will develop PRGs and HBGLs for those compounds for which PRGs and HBGLs have not been established. Similarly, reported concentrations of detected compounds for which Arizona minimum GPLs have been developed are less than these GPL values. For naphthalene,



LEGEND:

VALVE

PREVIOUS STUDY SAMPLE LOCATIONS

PIPING TO SEPARATOR

SCALE

0 10 20 FEET

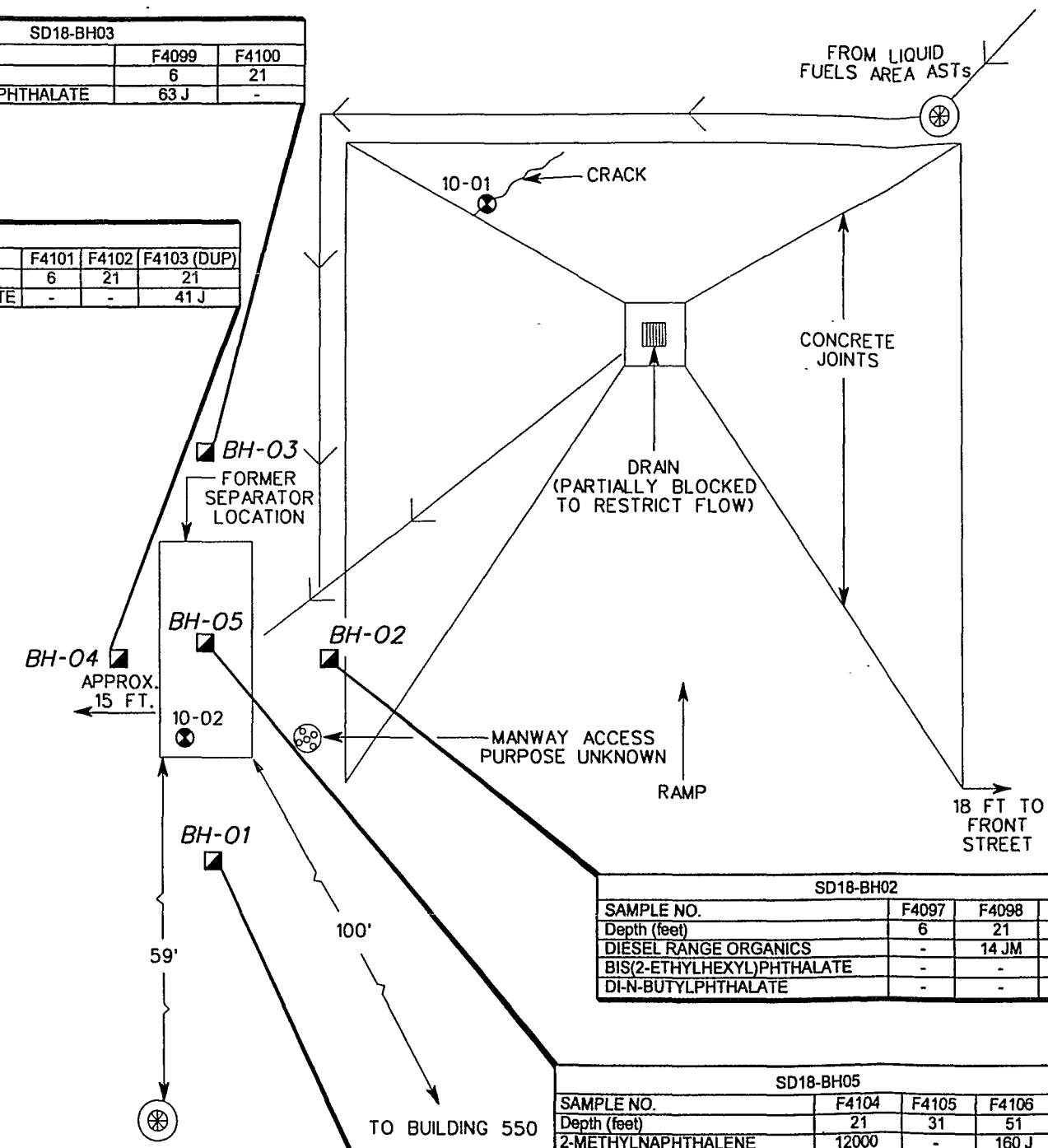
FIGURE 2-4
OWS-POL, FACILITY 550, SD-18

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 6/20/97 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: T. WOODARD | DWG. NO.: 409881ES.433
DRAWN BY: D. BILLINGSLEY | DRAWN BY: | ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881

FILENAME: 409881ES.433 08:54:59 Jun. 20, 1997 DLB



SD18-BH03		
SAMPLE NO.	F4099	F4100
Depth (feet)	6	21
BIS(2-ETHYLHEXYL)PHTHALATE	63 J	-

SD18-BH04			
SAMPLE NO.	F4101	F4102	F4103 (DUP)
Depth (feet)	6	21	21
BIS(2-ETHYLHEXYL)PHTHALATE	-	-	41 J

SD18-BH02			
SAMPLE NO.	F4097	F4098	F4093 (DUP)
Depth (feet)	6	21	21.5
DIESEL RANGE ORGANICS	-	14 JM	-
BIS(2-ETHYLHEXYL)PHTHALATE	-	-	120 J
DI-N-BUTYLPHTHALATE	-	-	140 J

SD18-BH05			
SAMPLE NO.	F4104	F4105	F4106
Depth (feet)	21	31	51
2-METHYLNAPHTHALENE	12000	-	160 J
BIS(2-ETHYLHEXYL)PHTHALATE	410	40 J	63 J
DIESEL RANGE ORGANICS	1700 JM	-	29 JM
NAPHTHALENE	3000 JI	-	-
PHENANTHRENE	600	-	-
1,2,4 TRIMETHYLBENZENE	51000	-	-
1,3,5 TRIMETHYLBENZENE	17000	-	-
ETHYLBENZENE	38000	-	-
M,P-XYLENES	38000	-	-
O-XYLENES	18000	-	-
TOLUENE	10000	-	-

SD18-BH01				
SAMPLE NO.	F4092	F4094	F4095	F4096
Depth (feet)	11	31.5	36	51.5
DIESEL RANGE ORGANICS	8.8 JM	-	-	-
BIS(2-ETHYLHEXYL)PHTHALATE	-	58 J	-	-

LEGEND:

- SOIL BORING LOCATIONS
- VALVE
- PREVIOUS STUDY SAMPLE LOCATION
- PIPING TO SEPARATOR

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (DIESEL RANGE ORGANICS) AND ug/kg (ORGANICS).

SCALE

0 10 20 FEET

FIGURE 2-5
OU-4 BORING LOCATIONS, OWS-POL, SD-18

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 6/20/97 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: T. WOODARD | DWG. NO.: 4098BIES.434
DRAWN BY: D. BILLINGSLEY | DRAWN BY: | ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W.CARTER | PROJ. NO.: 409881

FILENAME: 4098BIES.434 10:53 6/27/97 DLB

a derived GPL indicates that groundwater is not threatened by the residual contaminant at the site (IT, 1997a).

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was no unacceptable risk from COPC for either residential or nonresidential land use at Site SD-18. The selected remedy for this site is no action.

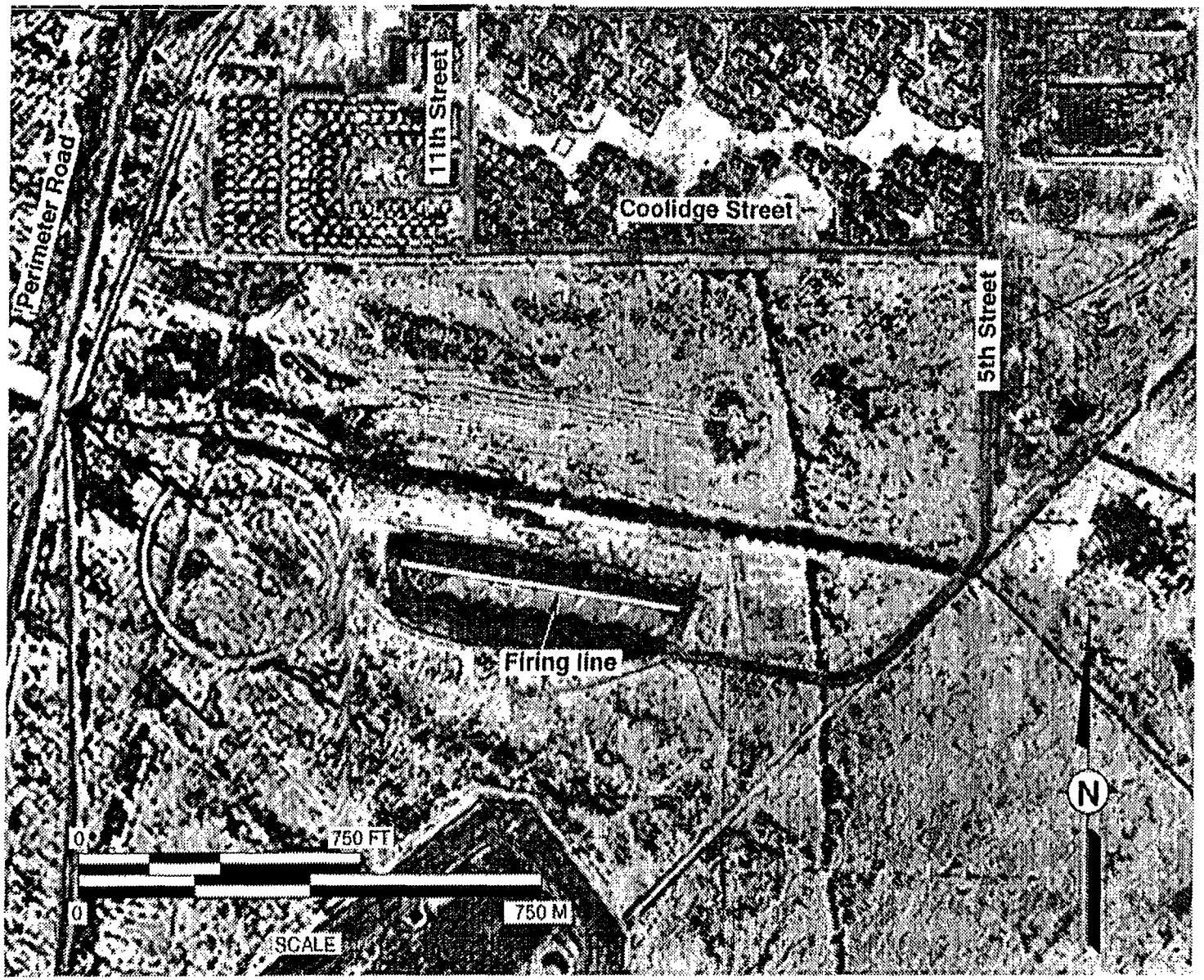
2.2.12.3 Former Skeet Range at the South Desert Village (Site SS-19)

Site Description and History. A six-station Skeet Range located south of Coolidge Street, between 5th Street and Perimeter Road, is a prominent feature in aerial photographs of Williams AFB dated 1949 (Figure 2-6). The site was demolished and graded in 1950, prior to construction of the Base housing units now known as the South Desert Village. Figure 2-7 is an aerial photograph dated 1954 of the same area, with the location of the Former Skeet Range transposed onto it.

E/A Investigation and Results. The location of the firing line was transposed from the aerial photographs onto a map of the South Desert Village. Five soil samples were collected from a depth of 1 feet bgs at locations selected to be representative of the area affected by lead shot (Figure 2-8), and analyzed for metals. Analysis returned one lead value that exceeded the Base-specific background range, the regional background range, and the EPA Region IX residential PRG and Arizona residential HBGL of 400 mg/kg. Based on this finding, the site was recommended for further investigation during OU-4.

OU-4 Investigation and Results. Between the completion of the E/A investigation and the commencement of the OU-4 investigation, the Base was closed and the South Desert Village was vacated. The OU-4 investigation at the South Desert Village was planned to investigate the presence of lead in soil through sampling and chemical analysis of 23 neighborhood-wide borings. The approved OU-4 work plan (IT, 1995c) and field sampling plan (1995d) addressed only lead as a potential human health hazard.

During field location of OU-4 soil borings, visible lead shot and broken skeet targets were observed, brought to the surface by widespread rodent burrowing. Because lead-shot contamination was visible, the sampling approach for this site was modified by the Air Force to evaluate whether lead had leached toward groundwater. Five soil samples were collected six inches below any detected lead pellets and shipped for laboratory analysis to test for lead



Date of Photograph: February 18, 1949

FIGURE 2-6
AERIAL PHOTOGRAPH OF FORMER SKEET RANGE, SS-19

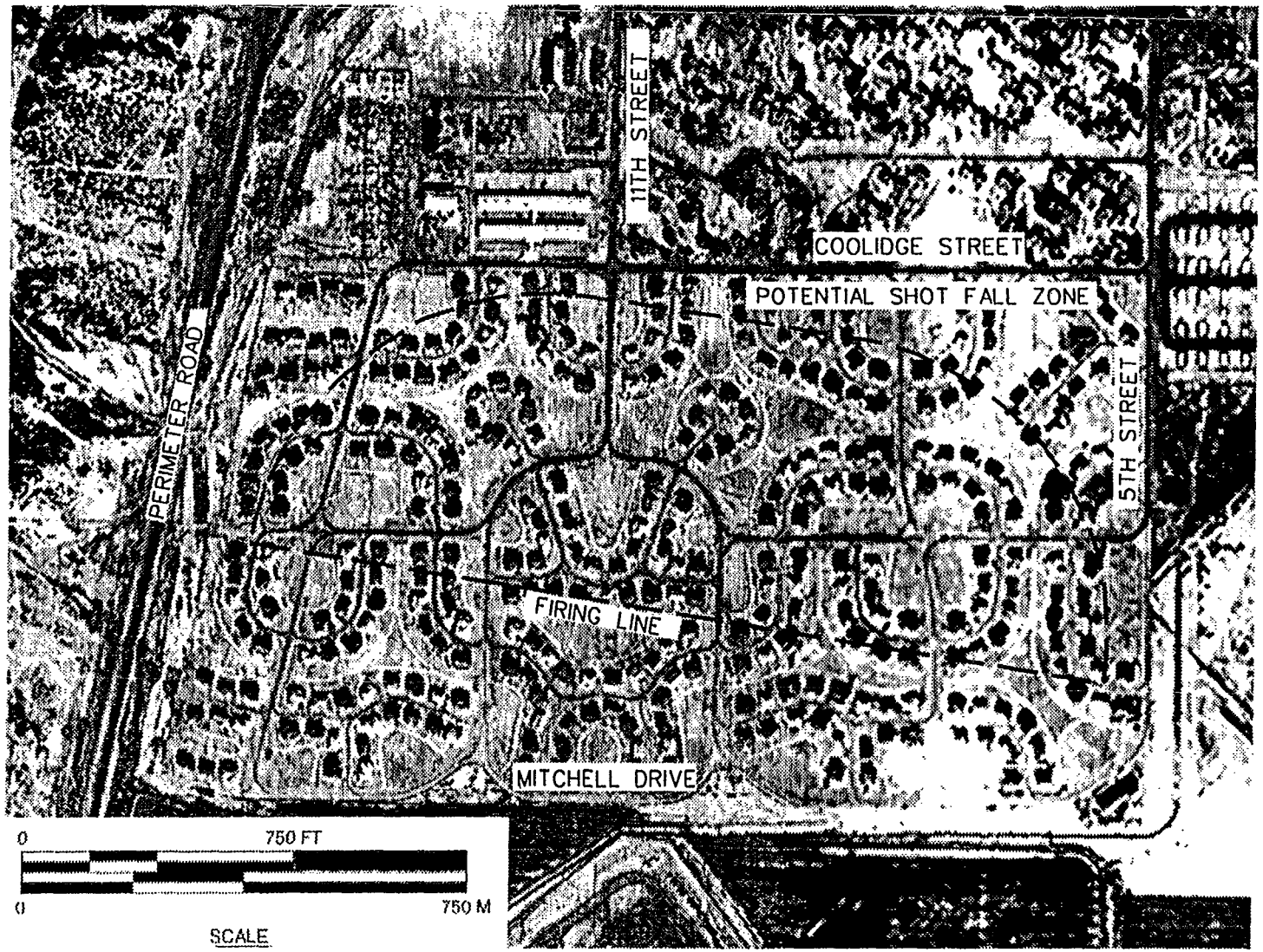
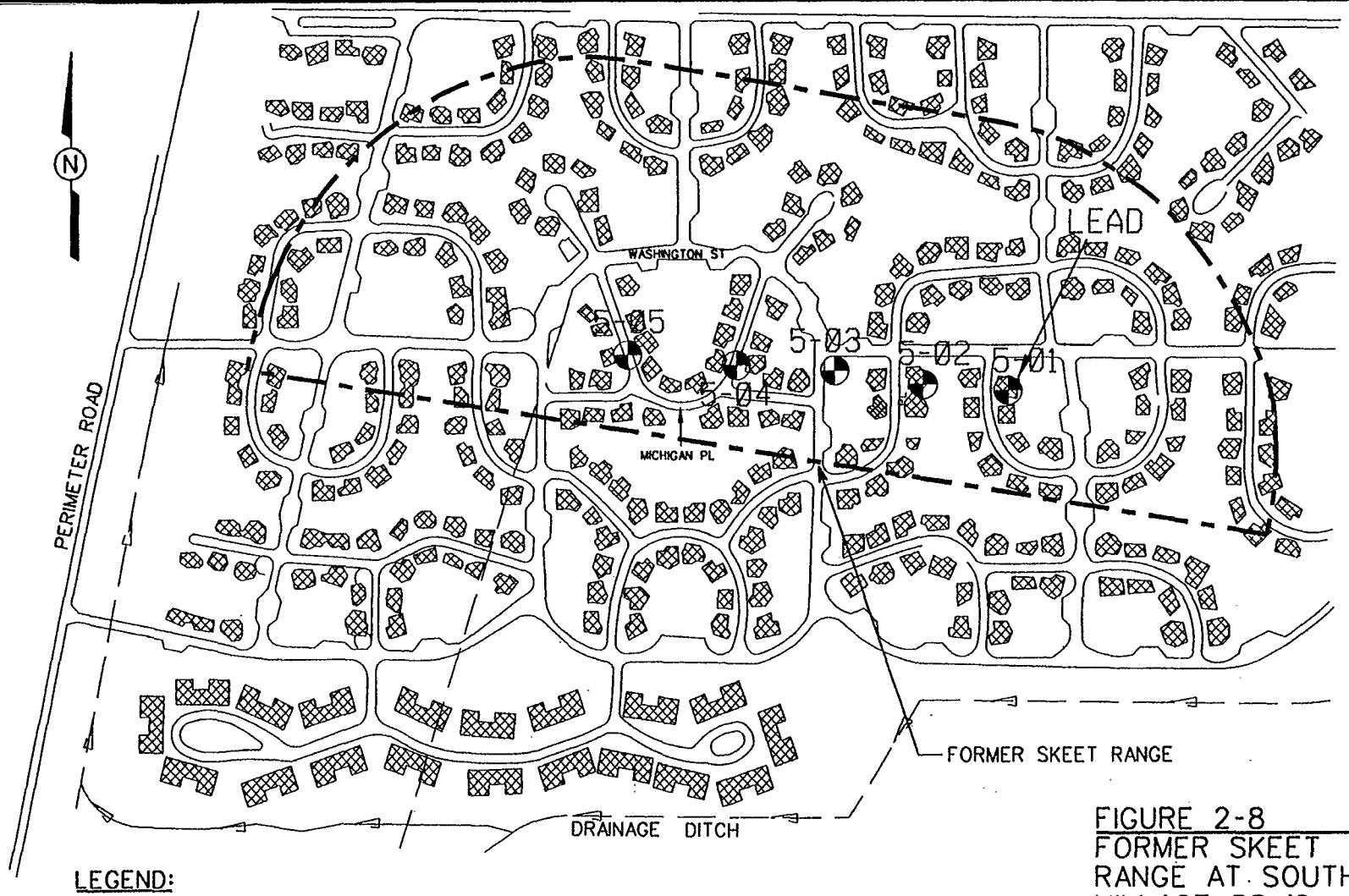


FIGURE 2-7
AERIAL PHOTOGRAPH OF SOUTH DESERT VILLAGE, SS-19

STARTING DATE: 11/30/94	DATE LAST REV.:	DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: T. WOODARD	DWG. NO.: 409881ES.437
DRAWN BY: D. AGUILAR	DRAWN BY:	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W. CARTER	PROJ. NO.: 409881

FILENAME: 409881ES.437 8:41 JUN 25 1997 DLB



LEGEND:

PREVIOUS STUDY SAMPLE LOCATIONS

SCALE:

0 100 200 FEET

FIGURE 2-8
FORMER SKEET RANGE AT SOUTH DESERT VILLAGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

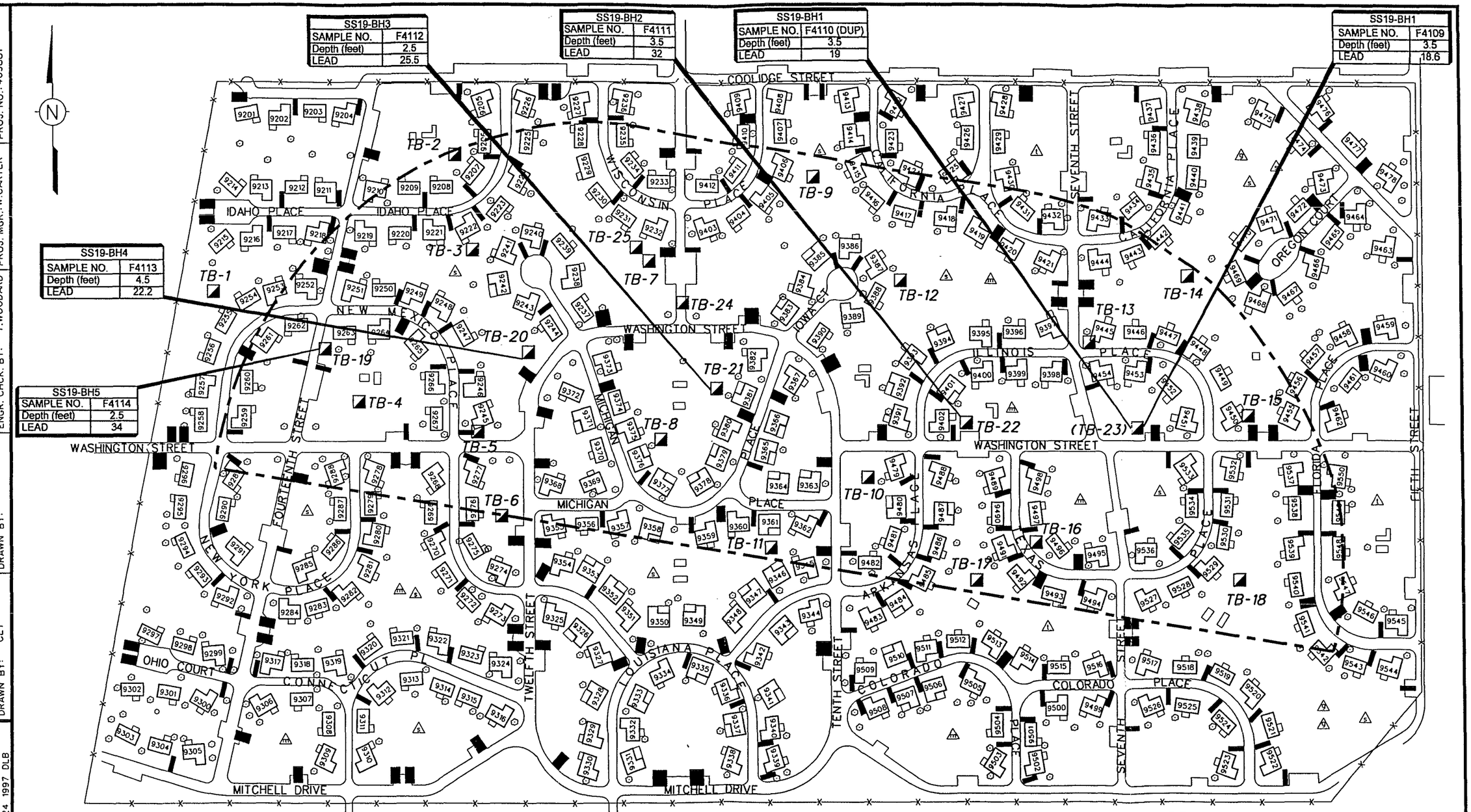
leaching. Analytical results, as reported in the OU-4 RIR (IT, 1997a) documented that all lead values fell within the Base-specific range, and were below the EPA Region IX residential PRG, the Arizona residential HBGL, and the Arizona minimum GPL. This established that lead contamination was not a threat to groundwater at the site. In addition, soil samples were collected for lead pellet counting from four different depths at 25 locations (Figure 2-9).

Because of the widespread lead-shot contamination visible on the surface of the site, a supplemental investigation was proposed to determine the aerial and vertical extent of lead contamination.

Supplemental Investigation and Results. A supplemental investigation was performed in January and February of 1996, in accordance with an approved work plan/field sampling plan addendum (IT, 1996b). Nearly 1,100 locations were bored with a hand auger in six-inch lifts to a total depth of 2 feet bgs, and approximately 100 locations were bored to a total depth of 4 feet bgs (Figure 2-10). All samples were wet sieved through a U.S. Standard No. 16 sieve, and the remaining lead pellets counted and documented. Shot density maps that showed the aerial and vertical extent of lead shot across the site were prepared, and are presented in Appendix E of the OU-4 RIR (IT, 1997a). The shot density map representing the top six inches of soil is presented in Figure 2-11.

Although it can be established that lead from lead shot is not a threat to groundwater at the site, the lead shot in the surface soil represents a potential health risk to residents of the South Desert Village. Risk-based PRGs for lead (as lead shot) in soil could not be quantified for the site, because of a lack of empirical data. As outlined in the OU-4 FS Report (IT, 1997b), the EPA Region IX PRG and the Arizona HBGL for lead in soil in a residential scenario is 400 mg/kg. This level was adopted as a surrogate PRG for an upperbound estimate of lead available for ingestion, and a conversion of lead pellet abundance to potential lead in soil was performed (IT, 1997b). Lead pellet count data was then used to generate a map of the South Desert Village that indicated the area where lead values in soil could be expected to exceed the PRG (Figure 2-12).

The selected remedy for this site is two-fold. One part of the remedy will be an RA in the form of excavation, removal, and replacement of the top six inches of soil within the 400 mg/kg area, except soil under roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patios. The replacement soil and the roadways, sidewalks, house foundations and slabs, paved parking areas and concrete patios will be an engineering control in the form of a protective cap over the remaining contamination. The second part of the remedy will be institutional



NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997A]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

LEGEND

- APPROXIMATE BOUNDARY OF SKEET RANGE SHOT FALL
- SHALLOW BORING LOCATIONS
- TB-1 TEST BOREHOLE
- F4914 SAMPLE LOCATION
- TEMPORARY FENCING
- GATES
- CONCRETE PARKING AREAS
- SINGLE FAMILY HOUSES

SCALE

0 200 400 FEET

FIGURE 2-9
OU-4 BORING LOCATIONS
FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 10/30/95 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: T.WOODARD | DWG. NO.: 409881ES.438
DRAWN BY: CET | DRAWN BY: | ENGR. CHCK. BY: T.WOODARD | PROJ. MGR.: W.CARTER | PROJ. NO.: 409881

FILENAME: 409881ES.438 10:20 JUN 24 1997 DLB

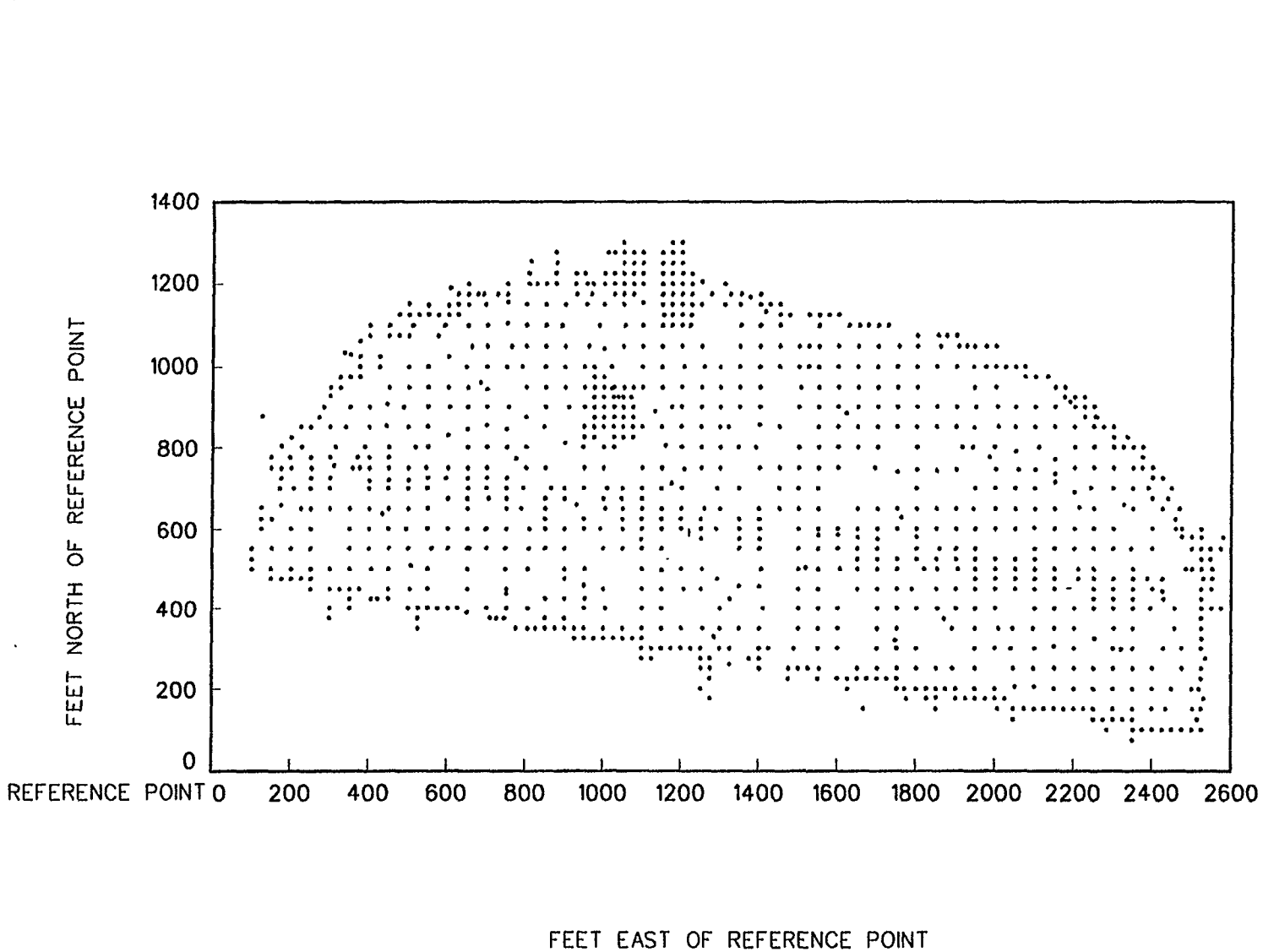
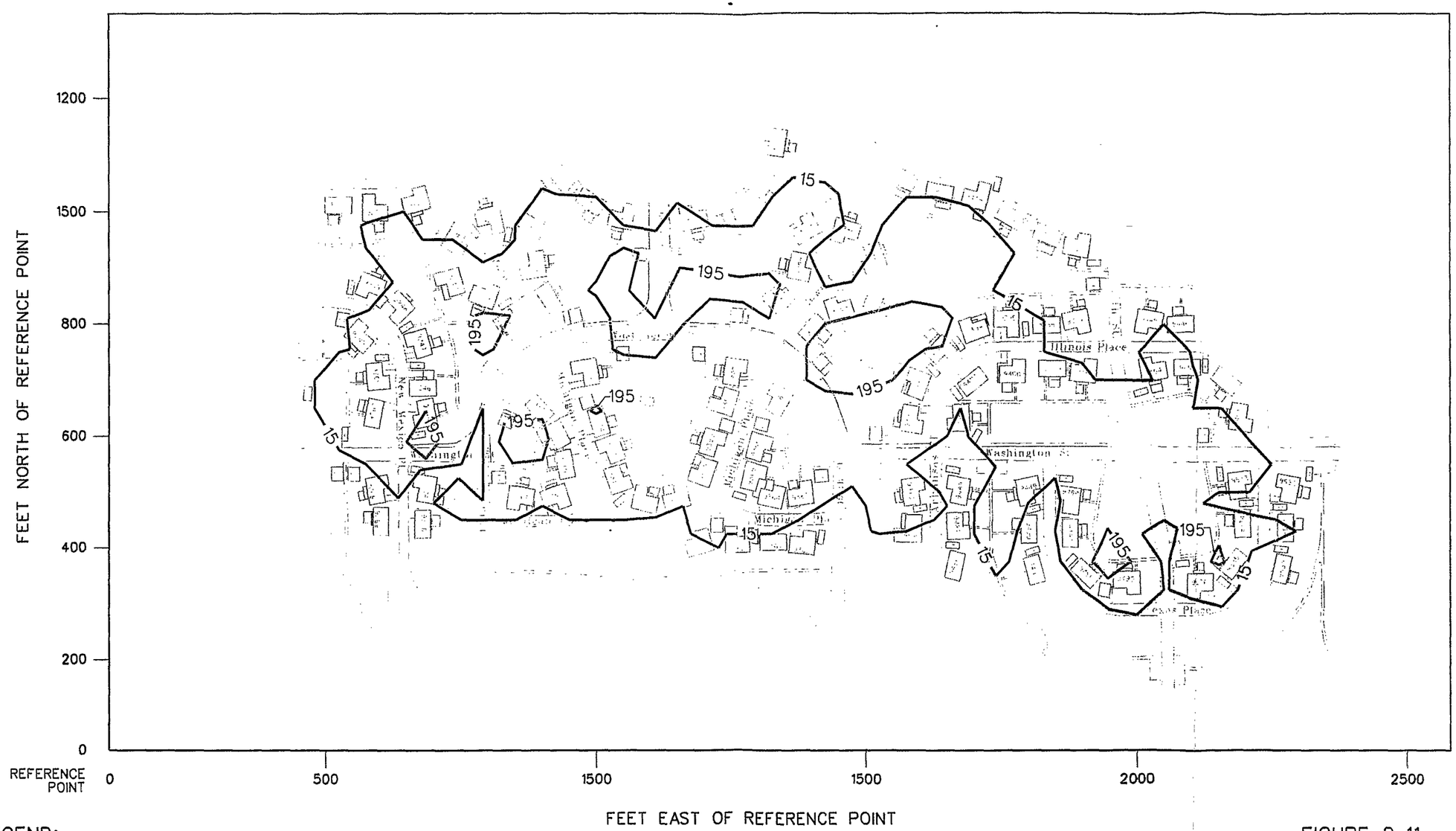


FIGURE 2-10
SUPPLEMENTAL BORING LOCATIONS, FORMER SKEET RANGE, SS-19



LEGEND:

—15— LEAD UNIT COUNT PER SAMPLE

FIGURE 2-11
LEAD SHOT ABUNDANCE IN TOP 6" OF SOIL, FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 01/07/98	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: S. CUIA	DWG. NO.:...\409881es.513
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W. CARTER	PROJ. NO.: 409881

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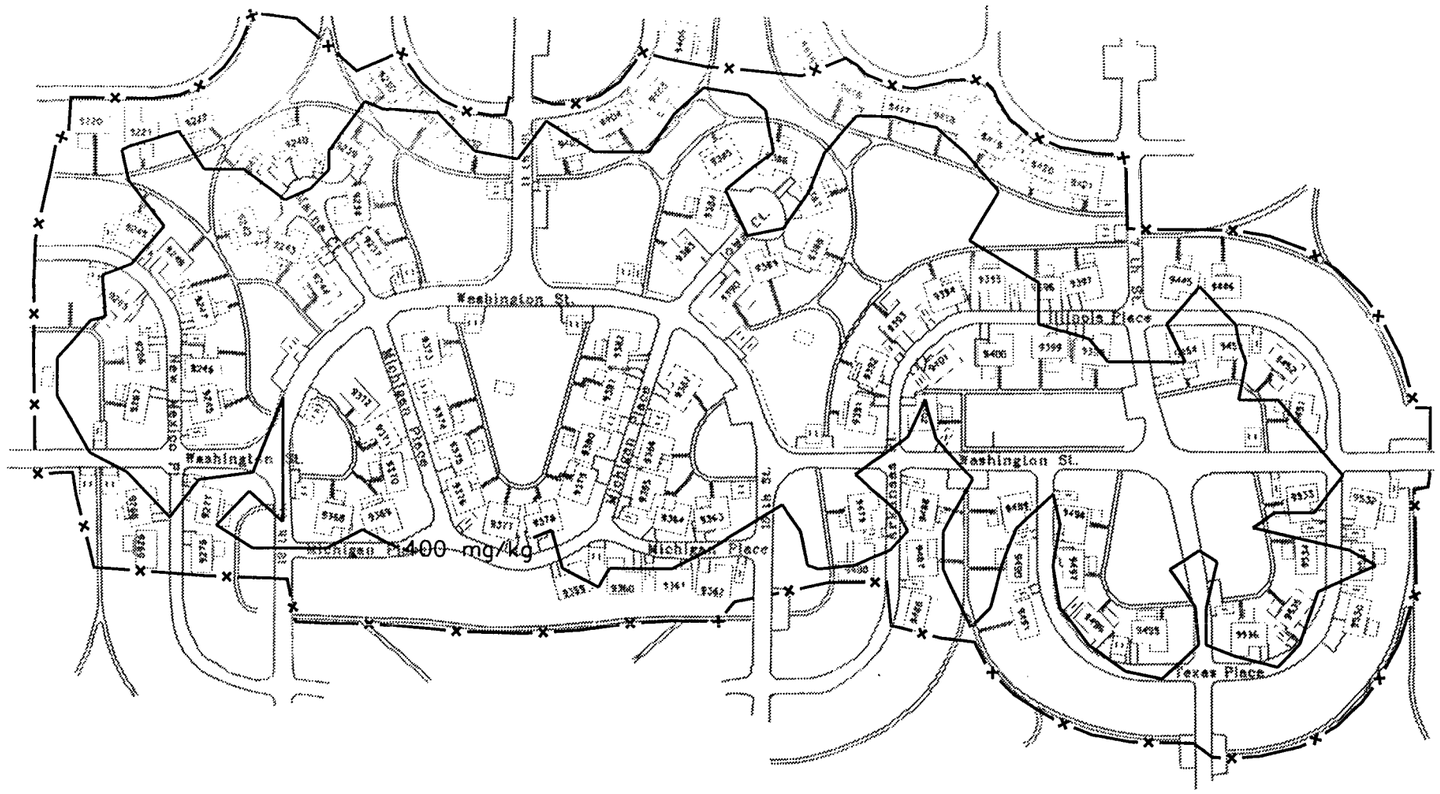

LEGEND

- —X— FENCED BOUNDARY
- CONCRETE PARKING AREAS
- SINGLE FAMILY HOUSES
- PICNIC AREA
- 400 mg/kg LEAD IN SOIL

SCALE

0 200 400 FEET

FIGURE 2-12
AREAS CONTAINING +400 mg/kg LEAD, FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY:		INITIATOR: T.WOODARD	DWG. NO.: 38Bles 489
ENGR. CHCK. BY: T.WOODARD		PROJ. MGR.: W.CARTER	PROJ. NO.: 409881
STARTING DATE: 12/31/97	DATE LAST PL.		
DRAWN BY: D. BILLINGSLEY	DRAWN BY:		

24 MAR 98
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controls in the form of the VEMUR, which defines the affected area as a nonresidential area, and deed restrictions to bind owners to provisions of the O&M manual, included in Appendix A-3.

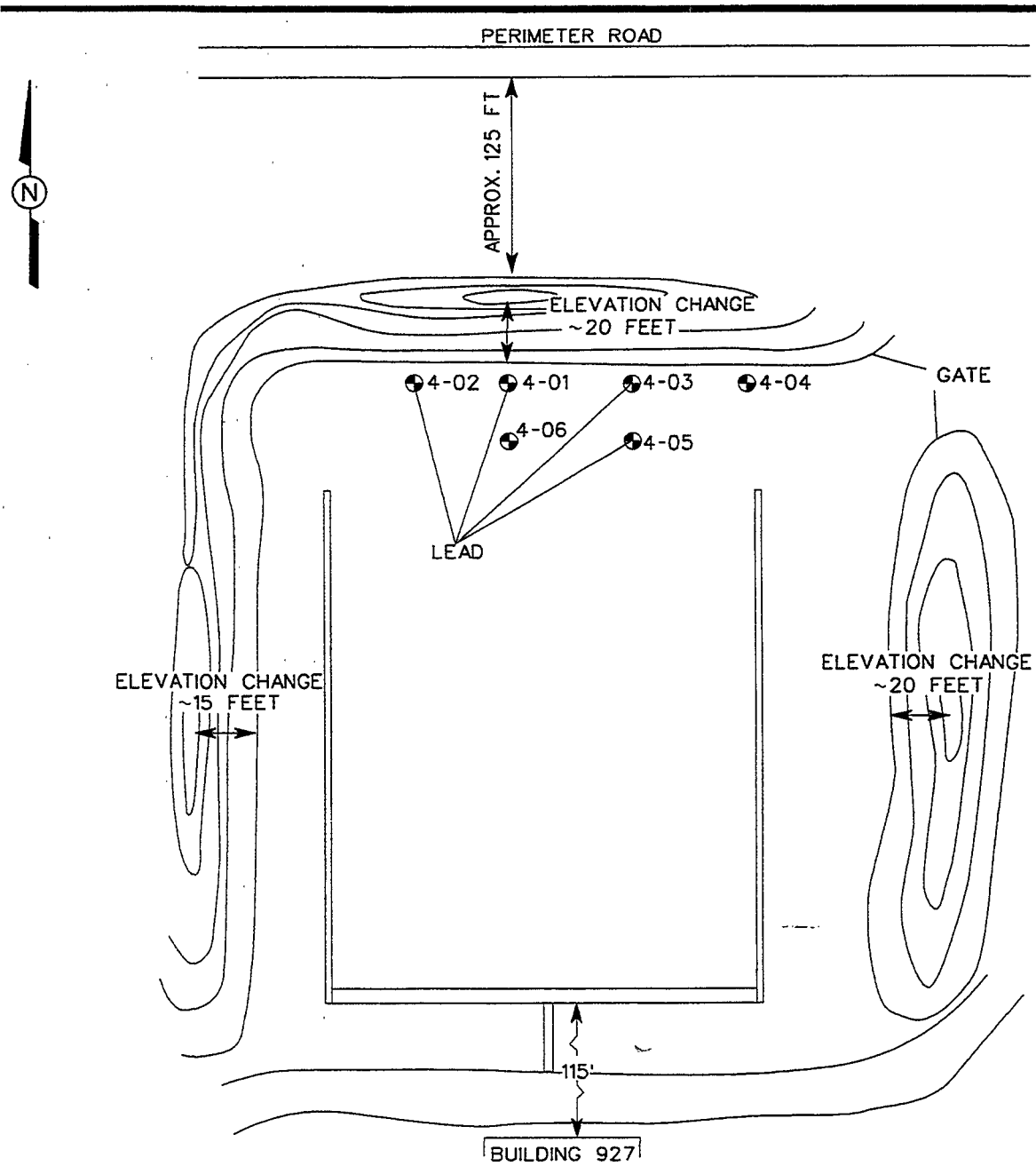
Although the VEMUR will specify nonresidential use, the South Desert Village may be inhabited provided that the frequent and repeated contact with the soil has been limited through the engineering and institutional controls described above. The protective cap will be inspected periodically for damage, and maintained in accordance with the approved O&M Manual (Appendix A). The scale of rodent burrowing that first brought the lead shot to light is not expected to continue after the installation of the cap, because the removal of the lawn and top soil will remove the dead grass food source of the rodents. In addition, the added pressure of human inhabitation is expected to greatly reduce or eliminate the burrowing rodent population.

2.2.12.4 Firing Range/Skeet Range (Facility 927, Site SS-20)

Site Description and History. The Firing Range (Facility 927) and nearby Skeet Range, are located on the northern edge of the Base, just south of Perimeter Road, and north of the intersection of Taxiway No. 5 and the east runway (Figure 2-1B). The Firing Range was in operation for small arms target practice from 1961 to 1992. The Skeet Range location is visible on aerial photographs from the same time frame, and was demolished during construction of the east runway.

E/A Investigation and Results. Visual inspection of the earthen backstop at the Firing Range revealed evidence of lead bullets of various calibers, and visual inspection of the Skeet Range indicated the presence of expended shotgun shells and broken clay targets. Samples were collected from surface soils at six locations at the Firing Range, and two locations at the Skeet Range (Figure 2-13A and 2-13B). Soil from the Firing Range was screened to remove bullet fragments. Samples were analyzed for total lead, and returned values above base-specific and regional background ranges, and above EPA Region IX residential PRGs and Arizona residential HBGLs. The areas were recommended for further investigation in OU-4.

OU-4 Investigation and Results. Additional soil sampling was performed in September 1995, in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d). At the Firing Range, thirteen borings were sampled at depths of 1, 2, and 3 feet bgs (Figure 2-14A). These borings included locations on the floor of the Firing Range and locations in the earthen backstop. Lead fragments from bullets were not separated from the soil before analysis.



LEGEND:

PREVIOUS STUDY SAMPLE LOCATIONS

SCALE

0 40 80 FEET

FIGURE 2-13A
FIRING RANGE
FACILITY 927, SS-20

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 12/31/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T.WOODARD
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T.WOODARD	PROJ. MGR.: W.CARTER
			DWG. NO.:\409881ES.490
			PROJ. NO.: 409881

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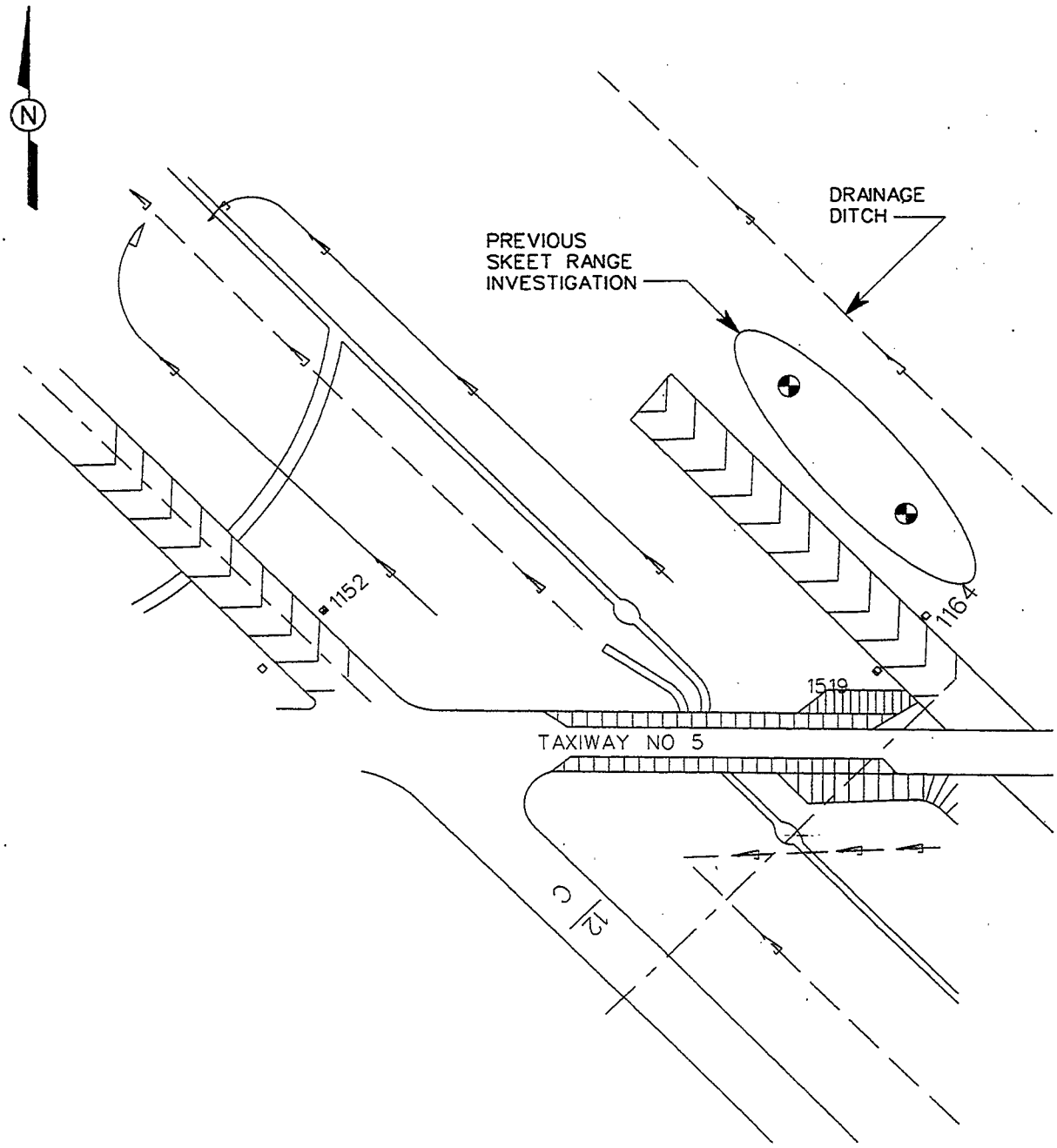

LEGEND:

PREVIOUS STUDY SAMPLE LOCATIONS

SCALE

0 400 800 FEET

FIGURE 2-13B
SKEET RANGE, SS-20

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 12/31/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T.WOODARD	DWG. NO.: \409881ES.491
DRAWN BY:D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T.WOODARD	PROJ. MGR :W.CARTER	PROJ. NO.: 409881

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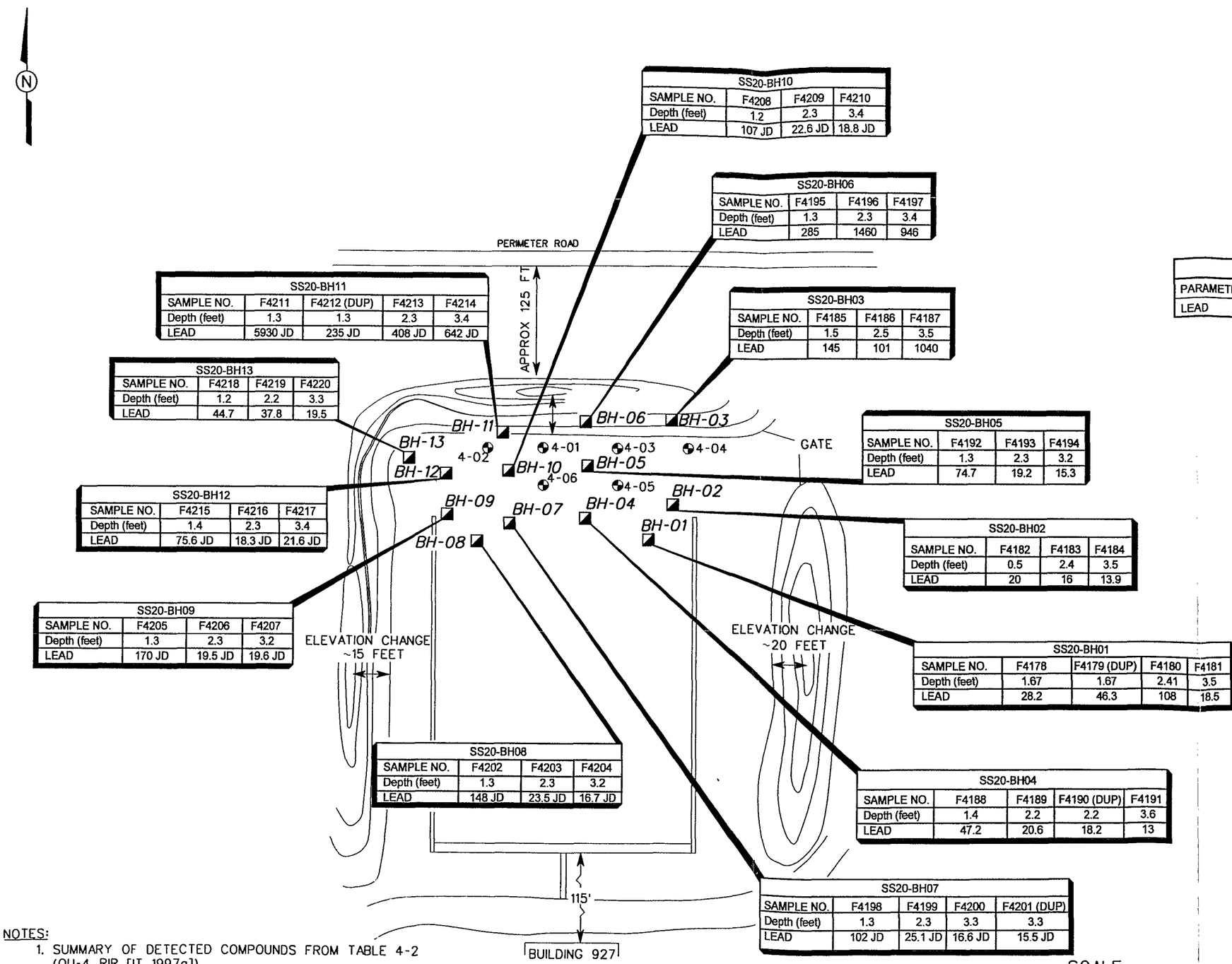


SS20-BH10			
SAMPLE NO.	F4208	F4209	F4210
Depth (feet)	1.2	2.3	3.4
LEAD	107 JD	22.6 JD	18.8 JD

SS20-BH06			
SAMPLE NO.	F4195	F4196	F4197
Depth (feet)	1.3	2.3	3.4
LEAD	285	1460	946

SS20-BH11				
SAMPLE NO.	F4211	F4212 (DUP)	F4213	F4214
Depth (feet)	1.3	1.3	2.3	3.4
LEAD	5930 JD	235 JD	408 JD	642 JD

SS20-BH03			
SAMPLE NO.	F4185	F4186	F4187
Depth (feet)	1.5	2.5	3.5
LEAD	145	101	1040

SS20-BH13			
SAMPLE NO.	F4218	F4219	F4220
Depth (feet)	1.2	2.2	3.3
LEAD	44.7	37.8	19.5

SS20-BH05			
SAMPLE NO.	F4192	F4193	F4194
Depth (feet)	1.3	2.3	3.2
LEAD	74.7	19.2	15.3

SS20-BH12			
SAMPLE NO.	F4215	F4216	F4217
Depth (feet)	1.4	2.3	3.4
LEAD	75.6 JD	18.3 JD	21.6 JD

SS20-BH02			
SAMPLE NO.	F4182	F4183	F4184
Depth (feet)	0.5	2.4	3.5
LEAD	20	16	13.9

SS20-BH09			
SAMPLE NO.	F4205	F4206	F4207
Depth (feet)	1.3	2.3	3.2
LEAD	170 JD	19.5 JD	19.6 JD

SS20-BH01				
SAMPLE NO.	F4178	F4179 (DUP)	F4180	F4181
Depth (feet)	1.67	1.67	2.41	3.5
LEAD	28.2	46.3	108	18.5

SS20-BH08			
SAMPLE NO.	F4202	F4203	F4204
Depth (feet)	1.3	2.3	3.2
LEAD	148 JD	23.5 JD	16.7 JD

SS20-BH04				
SAMPLE NO.	F4188	F4189	F4190 (DUP)	F4191
Depth (feet)	1.4	2.2	2.2	3.6
LEAD	47.2	20.6	18.2	13

SS20-BH07				
SAMPLE NO.	F4198	F4199	F4200	F4201 (DUP)
Depth (feet)	1.3	2.3	3.3	3.3
LEAD	102 JD	25.1 JD	16.6 JD	15.5 JD

LEGEND:

- PREVIOUS STUDY SAMPLE LOCATIONS
- SHALLOW BORING LOCATIONS

SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
LEAD	MG/KG	400	400	290

SCALE

0 40 80 FEET

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

FIGURE 2-14A
OU-4 BORING LOCATIONS
FIRING RANGE, SS-20

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: | INITIATOR: T. WOODARD | DWG. NO | 09 JAN 98
ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881
DATE LAST | STARTING DATE: 12/31/97 | 15:12:01
DRAWN BY: | DRAWN BY: D. BILLINGSLEY | 409881es.492

Because of a new interpretation of the aerial photographs, and a better understanding of the dimensions of the suspected shotfall zone at the Skeet Range, the quantity and location of borings was changed from that specified by the work plan and field sampling plan. Fourteen borings were sampled at a depth of 1.5 feet bgs to test for contaminant leaching from lead pellets locally observed on the soil surface (Figure 2-14B).

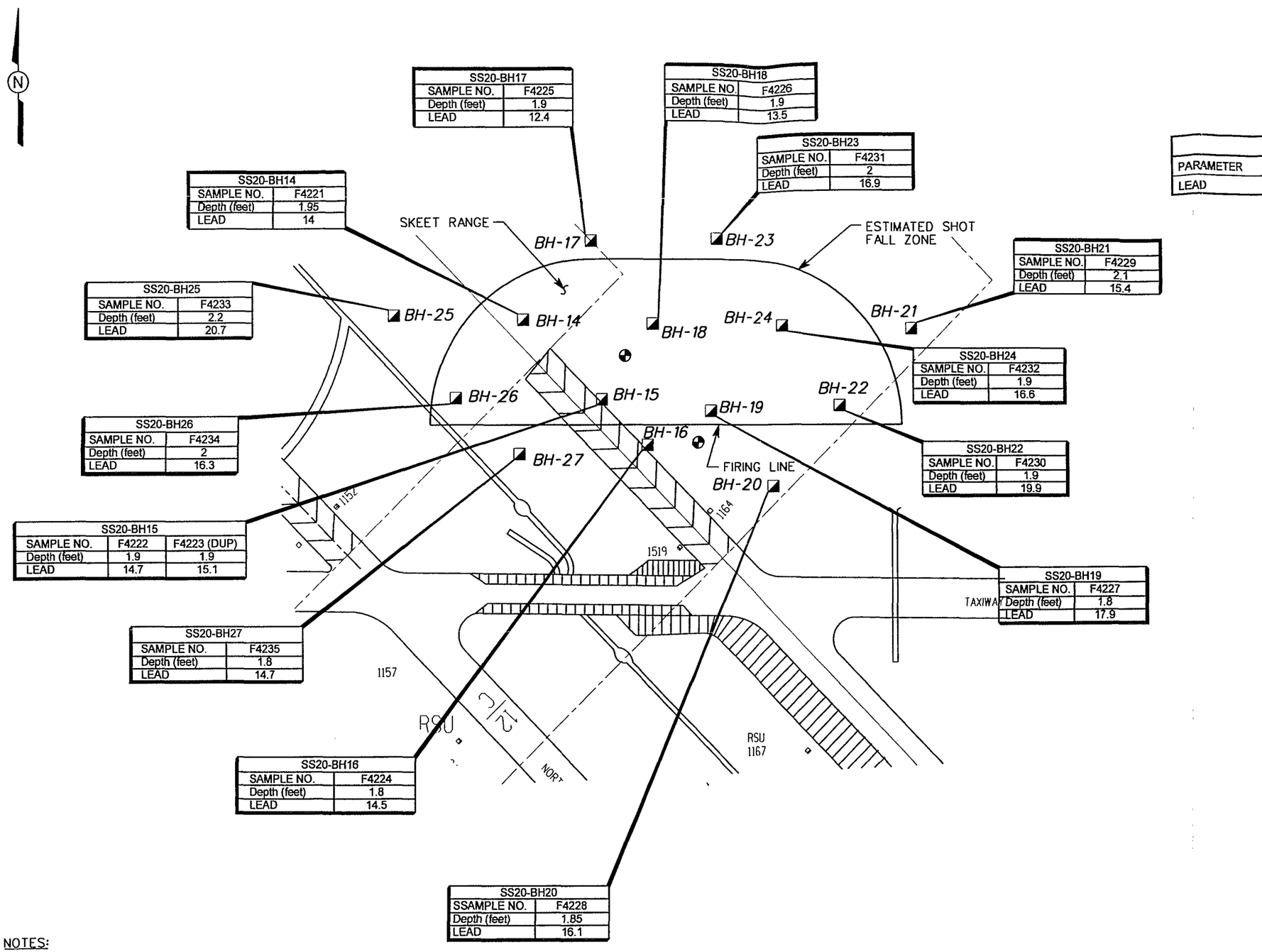
All soil samples were analyzed for total lead. Analytical results of samples collected at the Firing Range, as reported in the OU-4 RIR (IT, 1997a), indicate that lead concentrations decrease with depth from the floor of the Firing Range. None of the lead values from the Firing Range floor exceeded the EPA Region IX residential PRG, the Arizona residential HBGL, or the Arizona minimum GPL. Samples from the backstop exceed the PRG, the HBGL, and the minimum GPL. Two of the samples exceeded the calculated site-specific GPL of 1,340 mg/kg. The lead in the backstop represents a threat to human health, and may represent a threat to groundwater. The selected remedy for the Firing Range is an RA that includes removal and off-site disposal of the affected portion of the backstop, and the placement of institutional controls in the form of a VEMUR and a deed restriction on the future use of this site to nonresidential.

Analytical results of samples collected at the depth of 1.5 feet across the Skeet Range, as reported in the OU-4 RIR (IT, 1997a), indicate that lead has not leached from the pellets at the surface to the underlying soil. Lead values were all within the Base-specific background range, and below the EPA Region IX residential PRG, the Arizona residential HBGL, and the Arizona minimum GPL. Lead from the Skeet Range does not represent a threat to groundwater. Because of the observed lead pellets on the ground surface, however, an RA in the form of a VEMUR and a deed restriction on the future use of the site to nonresidential is proposed for the Skeet Range.

2.2.12.5 Facilities 1020, 1051, and Surrounding Areas (Site SS-21)

Site Description and History. Facility 1020, the Firing-In Buttress, was constructed in 1942. Facility 1051, the Bore Sighting Bunker, was constructed in 1958. Both facilities are located along South Perimeter Road near the south central part of the Base (Figure 2-15A and Figure 2-15B). Both facilities contained hazardous materials that have been removed (HNUS, 1993b).

The Facilities Assessment Report (IT, 1993a) reported that sand from the backstop with any lead rounds had been removed from the facilities, and that no bullets were visible on the nearby ground surface during a site inspection in 1992. Site inspection during the EBS in 1993,



SS20-BH17	
SAMPLE NO.	F4225
Depth (feet)	1.9
LEAD	12.4

SS20-BH18	
SAMPLE NO.	F4226
Depth (feet)	1.9
LEAD	13.5

SS20-BH23	
SAMPLE NO.	F4231
Depth (feet)	2
LEAD	16.9

SS20-BH14	
SAMPLE NO.	F4221
Depth (feet)	1.95
LEAD	14

SS20-BH21	
SAMPLE NO.	F4229
Depth (feet)	2.1
LEAD	15.4

SS20-BH25	
SAMPLE NO.	F4233
Depth (feet)	2.2
LEAD	20.7

SS20-BH24	
SAMPLE NO.	F4232
Depth (feet)	1.9
LEAD	16.6

SS20-BH26	
SAMPLE NO.	F4234
Depth (feet)	2
LEAD	16.3

SS20-BH22	
SAMPLE NO.	F4230
Depth (feet)	1.9
LEAD	19.9

SS20-BH15		
SAMPLE NO.	F4222	F4223 (DUP)
Depth (feet)	1.9	1.9
LEAD	14.7	15.1

SS20-BH19	
SAMPLE NO.	F4227
Depth (feet)	1.8
LEAD	17.9

SS20-BH27	
SAMPLE NO.	F4235
Depth (feet)	1.8
LEAD	14.7

SS20-BH16	
SAMPLE NO.	F4224
Depth (feet)	1.8
LEAD	14.5

SS20-BH20	
SSAMPLE NO.	F4228
Depth (feet)	1.85
LEAD	16.1

LEGEND:

- PREVIOUS STUDY SAMPLE LOCATIONS
- SHALLOW (1.5') BORING LOCATIONS

SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
LEAD	MG/KG	400	400	290

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

SCALE

0 400 800 FEET

FIGURE 2-14B
OU-4 BORING LOCATIONS
SKEET RANGE, SS-20

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: | DWG. NO. :=81es 493
ENGR. CHCK. BY: T. WOODARD | INITIATOR: T. WOODARD
PROJ. MGR.: W. CARTER | PROJ. NO.: 409881
STARTING DATE: 12/31/97 | DATE LAST
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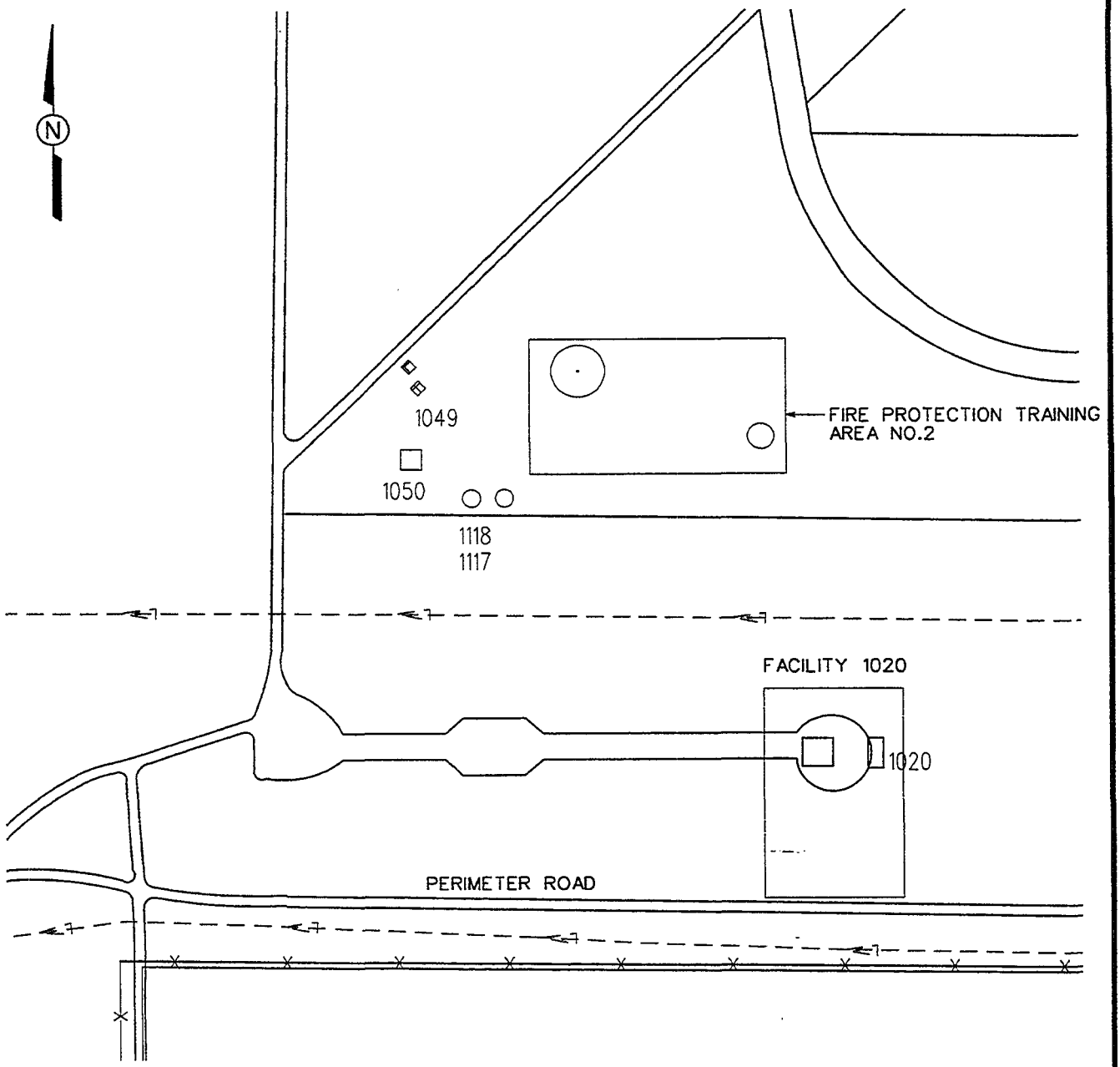

LEGEND:

FENCE

SCALE

0 300 600 FEET

FIGURE 2-15A
FACILITY 1020, SS-21

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 12/31/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W. CARTER
			DWG. NO.: \409881ES.494
			PROJ. NO.: 409881

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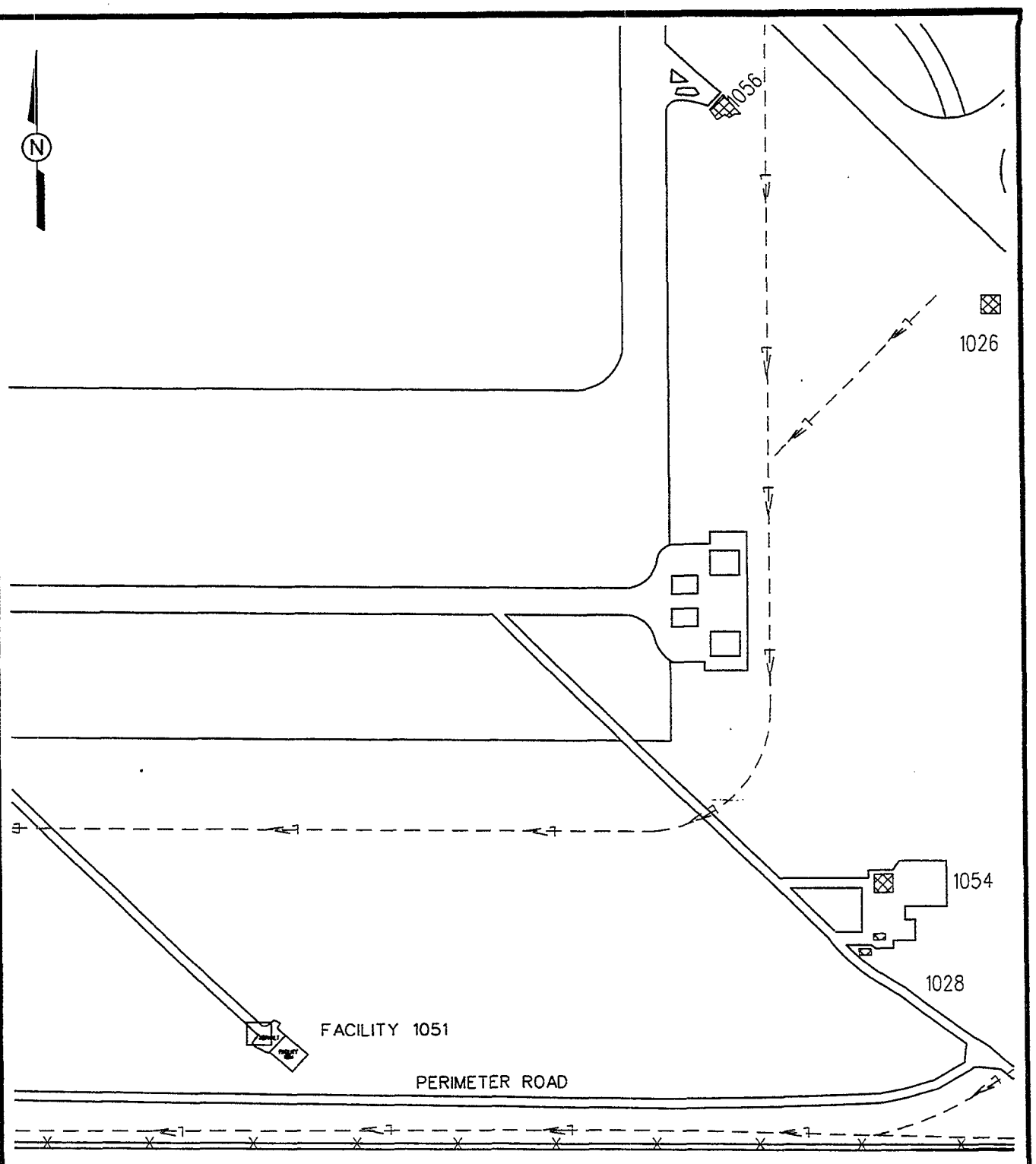

LEGEND:

FENCE

FIGURE 2-15B
FACILITY 1051, SS-21

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

SCALE
0 300 600 FEET

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 12/31/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T.WOODARD	DWG. NO.:\409881ES.495
DRAWN BY:D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T.WOODARD	PROJ. MGR.:W.CARTER	PROJ. NO.: 409881

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however, documented the presence of spent bullets and shell casings on the surface near both facilities, and spilled paint on the ground surface near Facility 1051 (HNUS, 1993b). The lack of site-specific sampling and analysis for lead in surface soil presented a data gap. Because of this data gap, the areas were recommended for further investigation under OU-4.

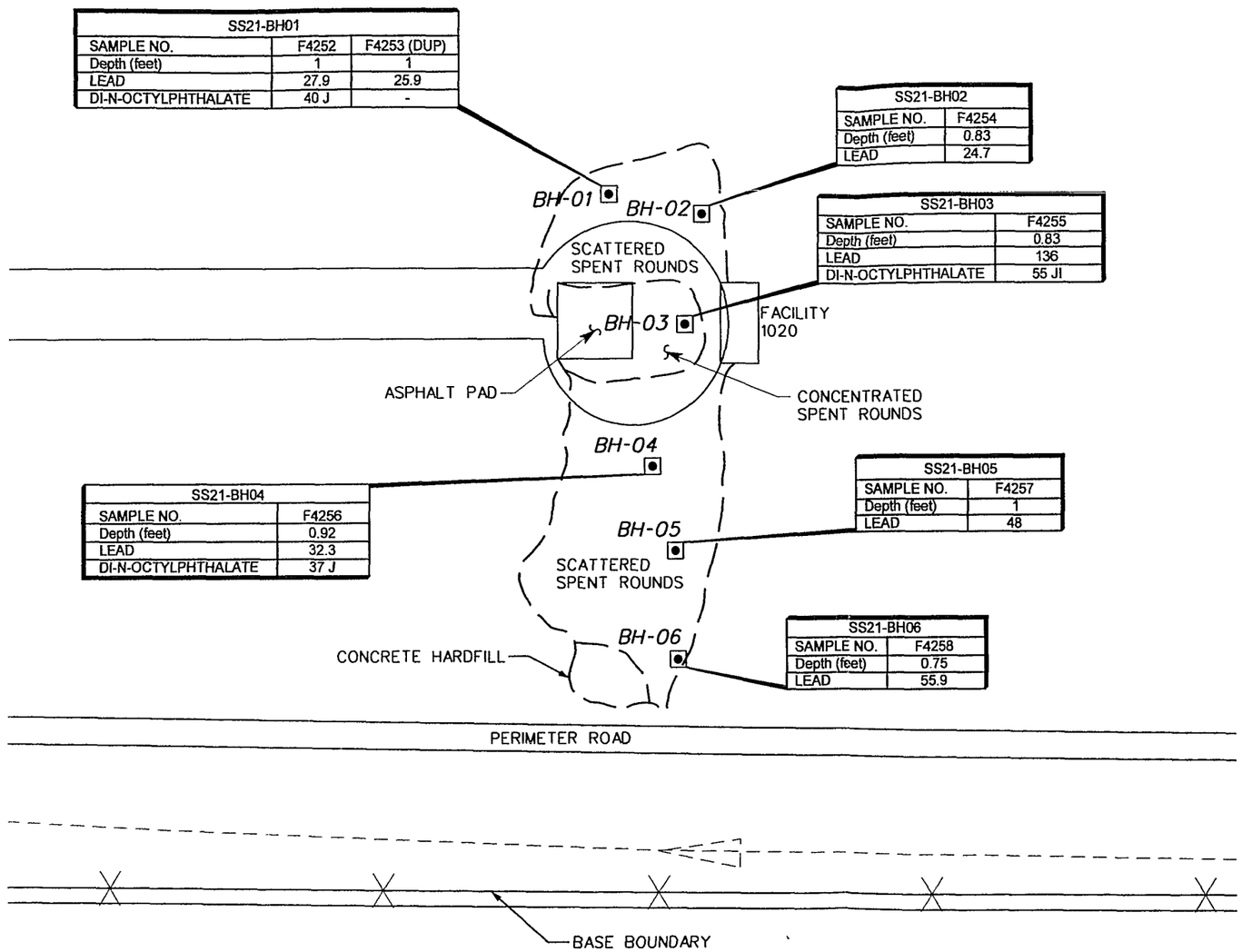
OU-4 Investigation and Results. Prior to sampling, a site inspection was performed to document the extent of spent bullets, shell casings, and disturbed and/or nonindigenous surface soil in the vicinity of the facilities. The interpretation of the findings was that the removed soil had been spread out in a thin layer in the vicinity of each bunker. Findings were mapped and sampling locations were selected based on the maps (Figure 2-16A and 2-16B). Six shallow soil borings were drilled around each facility in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d), and soil samples were collected from each boring at a depth of 0.5 to 1.0 feet bgs, which was below any observed bullets or casings. Soil samples were analyzed for total lead and SVOCs. Analytical results, as reported in the OU-4 RIR (IT, 1997a), indicate that lead concentrations fall within the regional background range, and below the EPA Region IX residential PRG, the Arizona residential HBGL, and the Arizona GPL. Four SVOCs (e.g., benzo[a]anthracene and benzo[a]pyrene) were detected in low concentrations at Facility 1051.

Unexploded Ordnance (UXO) Investigation. In 1996, site walkovers of both facilities were performed in conjunction with other Basewide UXO removal actions to confirm the absence of UXO. No spend rounds of high-caliber explosive ammunition were found. A visual and geophysical survey was performed in the vicinity of Facility 1020 to investigate a report from a former USAF member that outdated ammunition had been buried in nearby trenches. The survey and subsequent exploratory trenching found no evidence of buried ammunition, as documented in the UXO removal report (IT, 1996c).

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was no unacceptable risk from COPC for either residential or nonresidential land use at Site SS-21. Because of the observed bullets on the ground surface, however, an RA in the form of a VEMUR and a deed restriction on the future use of the site to nonresidential is proposed for these sites.

2.2.12.6 ASTs 556 and 557 (Site ST-22)

Site Description and History. AST 556 was constructed in 1962, and has a capacity of 420,000 gallons. AST 557 was constructed in 1954, and has a capacity of 840,000 gallons. The



SS21-BH01		
SAMPLE NO.	F4252	F4253 (DUP)
Depth (feet)	1	1
LEAD	27.9	25.9
DI-N-OCTYLPHTHALATE	40 J	-

SS21-BH02	
SAMPLE NO.	F4254
Depth (feet)	0.83
LEAD	24.7

SS21-BH03	
SAMPLE NO.	F4255
Depth (feet)	0.83
LEAD	136
DI-N-OCTYLPHTHALATE	55 JI

SS21-BH04	
SAMPLE NO.	F4256
Depth (feet)	0.92
LEAD	32.3
DI-N-OCTYLPHTHALATE	37 J

SS21-BH05	
SAMPLE NO.	F4257
Depth (feet)	1
LEAD	48

SS21-BH06	
SAMPLE NO.	F4258
Depth (feet)	0.75
LEAD	55.9

LEGEND:

DRAINAGE

FENCE

SHALLOW SOIL SAMPLES

SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
LEAD	MG/KG	400	400	290
DI-N-OCTYLPHTHALATE	UG/KG	2300000	1300000	-

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

SCALE

0 100 200 FEET

FIGURE 2-16A
OU-4 BORING LOCATIONS
FACILITY 1020, SS-21

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: T.WOODARD | DWG. NO.: 409881.496
ENGR. CHCK. BY: T.WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881
STARTING DATE: 12/31/97 | DATE LAST
DRAWN BY: D. BILLINGSLEY | DRAWN BY:
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LEGEND:

SHALLOW SOIL SAMPLES

GRAVEL BANK

SS21-BH09	
SAMPLE NO.	F4261
Depth (feet)	1
LEAD	19
BENZO(A)ANTHRACENE	45 J
BENZO(A)PYRENE	47 J
BENZO(B)FLUORANTHENE	79 J
CHRYSENE	74 J

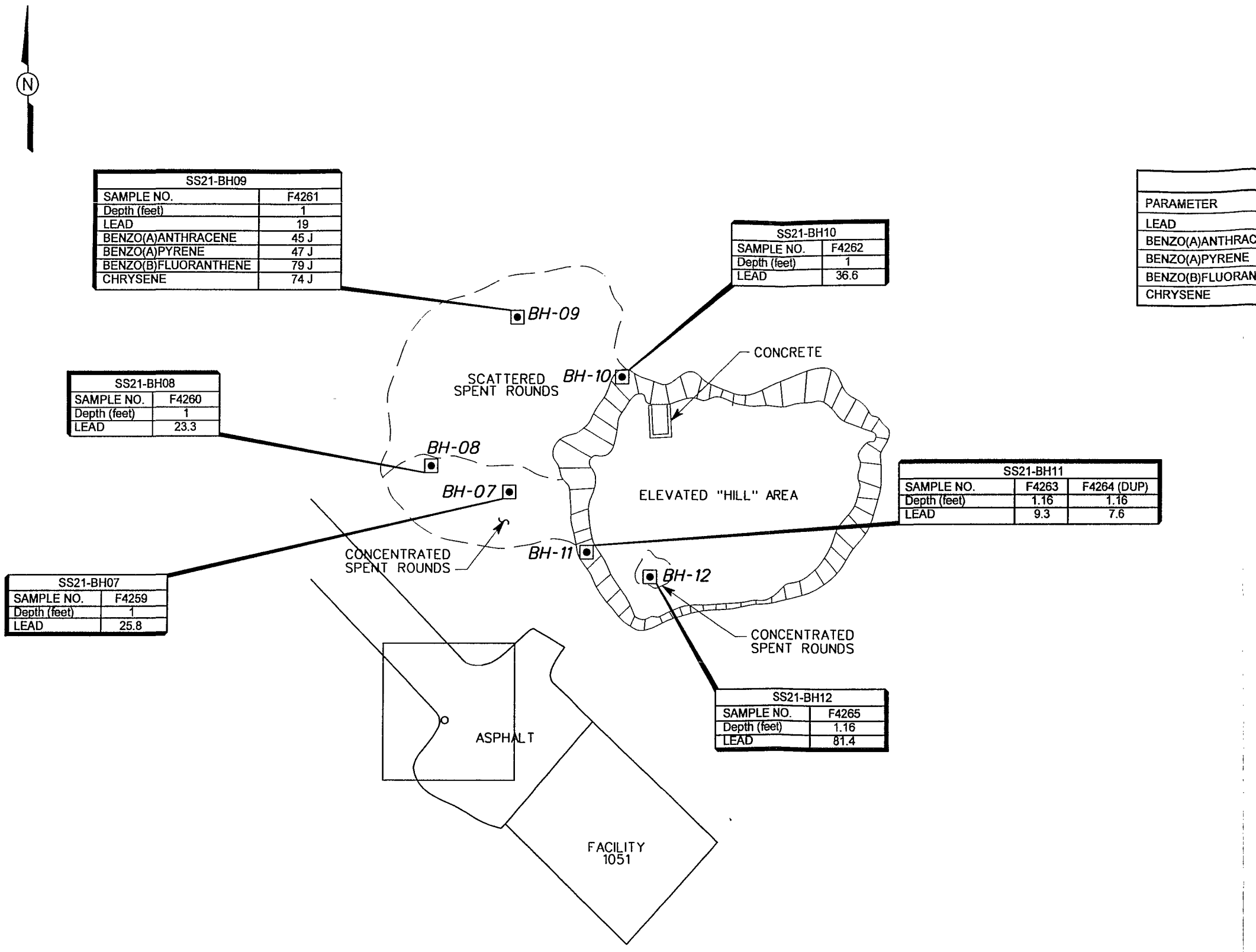
SS21-BH10	
SAMPLE NO.	F4262
Depth (feet)	1
LEAD	36.6

SS21-BH08	
SAMPLE NO.	F4260
Depth (feet)	1
LEAD	23.3

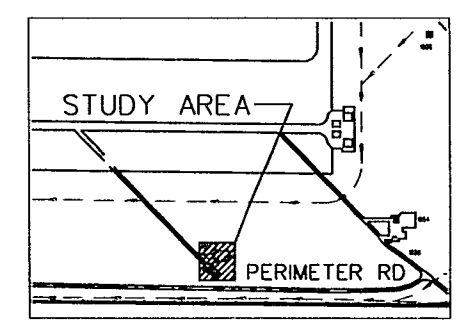
SS21-BH11		
SAMPLE NO.	F4263	F4264 (DUP)
Depth (feet)	1.16	1.16
LEAD	9.3	7.6

SS21-BH07	
SAMPLE NO.	F4259
Depth (feet)	1
LEAD	25.8

SS21-BH12	
SAMPLE NO.	F4265
Depth (feet)	1.16
LEAD	81.4



SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
LEAD	MG/KG	400	400	290
BENZO(A)ANTHRACENE	UG/KG	1100	610	-
BENZO(A)PYRENE	UG/KG	190	61	-
BENZO(B)FLUORANTHENE	UG/KG	1100	610	-
CHRYSENE	UG/KG	110000	24000	-



KEY PLAN

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

SCALE

0 40 80 FEET

FIGURE 2-16B
OU-4 BORING LOCATIONS
FACILITY 1051, SS-21

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: T. WOODARD | DWG. NO.
ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881
DRAWN BY: | STARTING DATE: 12/31/97 | DATE LAST
DRAWN BY: D. BILLINGSLEY | 09 JAN 98 | 13:51:22
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ASTs are located near the intersection of 3rd Street and Front Street (Figure 2-17). Both tanks formerly contained jet petroleum grade 4 (JP-4) fuel, but have been emptied and are currently out of service. No sampling data regarding past fuel spills/releases at the site was available, so the site was recommended for further investigation under OU-4.

OU-4 Investigation and Results. Seven soil borings were drilled and sampled around the two ASTs, in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d). Six boreholes were drilled to a depth of 51 feet bgs, and one was drilled to a depth of 101 feet bgs (Figure 2-18).

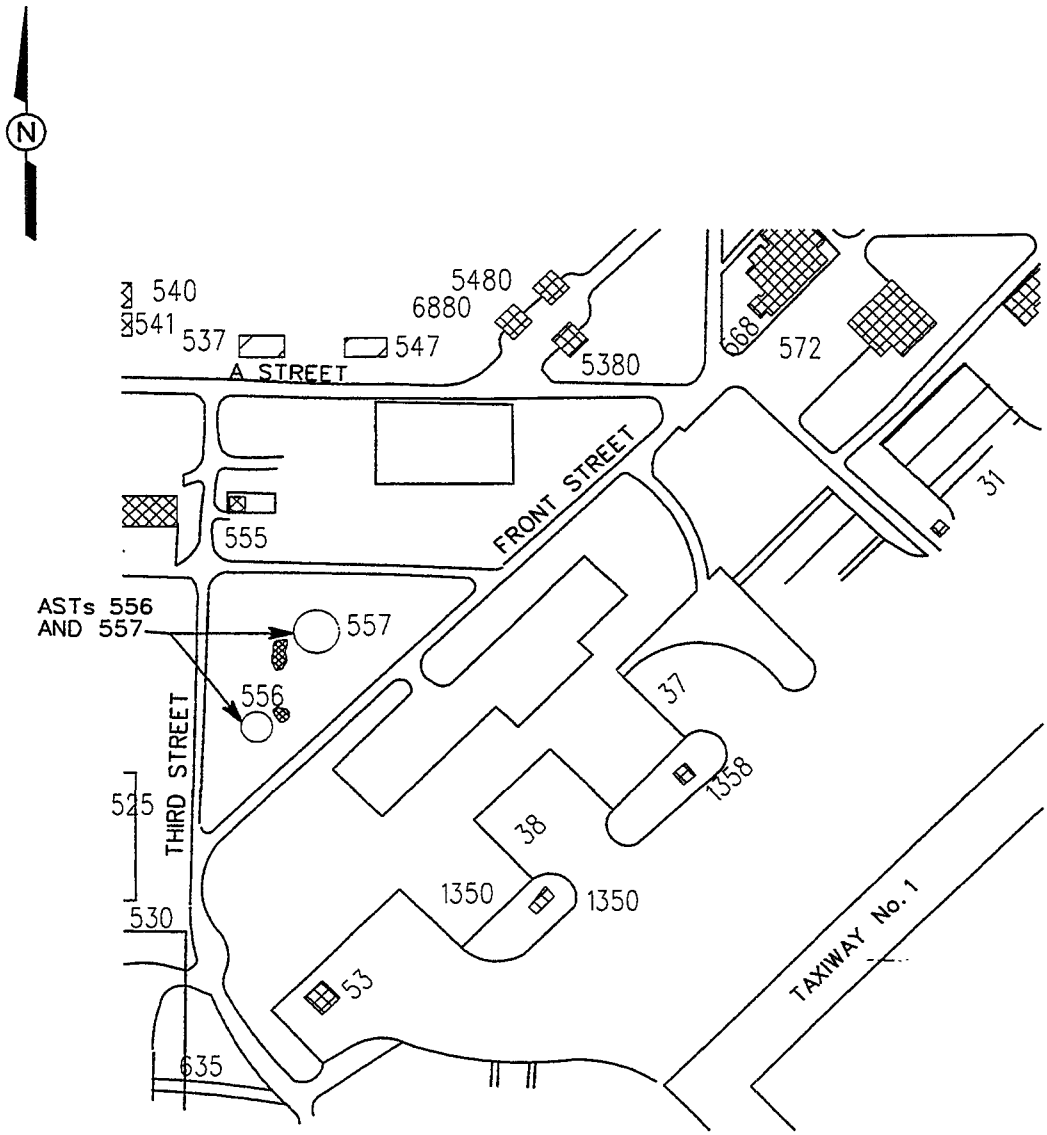
Analytical results, as reported in the OU-4 RIR (IT, 1997a), detected residual fuel components (e.g., JP-4, ethyl benzene, xylene) in two of the seven borings: in BH-03 at a depth of 5 feet bgs, Addddand in BH-02 at a depth of 36 feet bgs. Detected concentrations of ethyl benzene and xylene do not exceed either the EPA Region IX residential PRGs, the Arizona residential HBGLs, or the Arizona minimum GPLs, and represent no threat to the groundwater beneath the site.

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was no unacceptable risk from COPC for either residential or nonresidential land use at Site ST-22. The selected remedy for this site is no action.

2.2.12.7 Building 1069 (Site SS-23)

Site Description and History. Building 1069, constructed in 1987 and known as the Base Engineering Maintenance Facility, is located near the southwest corner of the Base, just north of Perimeter Road (Figure 2-19). The facility includes a fenced yard, which contained four ASTs: two 550-gallon tanks containing unleaded gasoline, one 650-gallon tank containing diesel, and another 1,000-gallon diesel tank. A diesel spill from the 1,000-gallon tank occurred in July 1991. The soil in the area of the spill was removed by USAF personnel, and the remaining soil was sampled. During the EBS, the sampling data from the removal could not be located (HNUS, 1993a).

All ASTs have been removed from the site. A standpipe located near the northwest corner of the building, possibly associated with a UST and an OWS, was observed during a site walkover in 1995. Because of the sampling data gap involving the diesel spill in the fenced yard, and because



LEGEND:

AREAS OF PAST SPILLS

SCALE

0 300 600 FEET

FIGURE 2-17
ASTs 556 AND 557, ST-22

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 12/31/97	DATE LAST REV:	DRAFT. CHCK. BY:	INITIATOR: T.WOODARD
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T.WOODARD	PROJ. MGR.:W.CARTER
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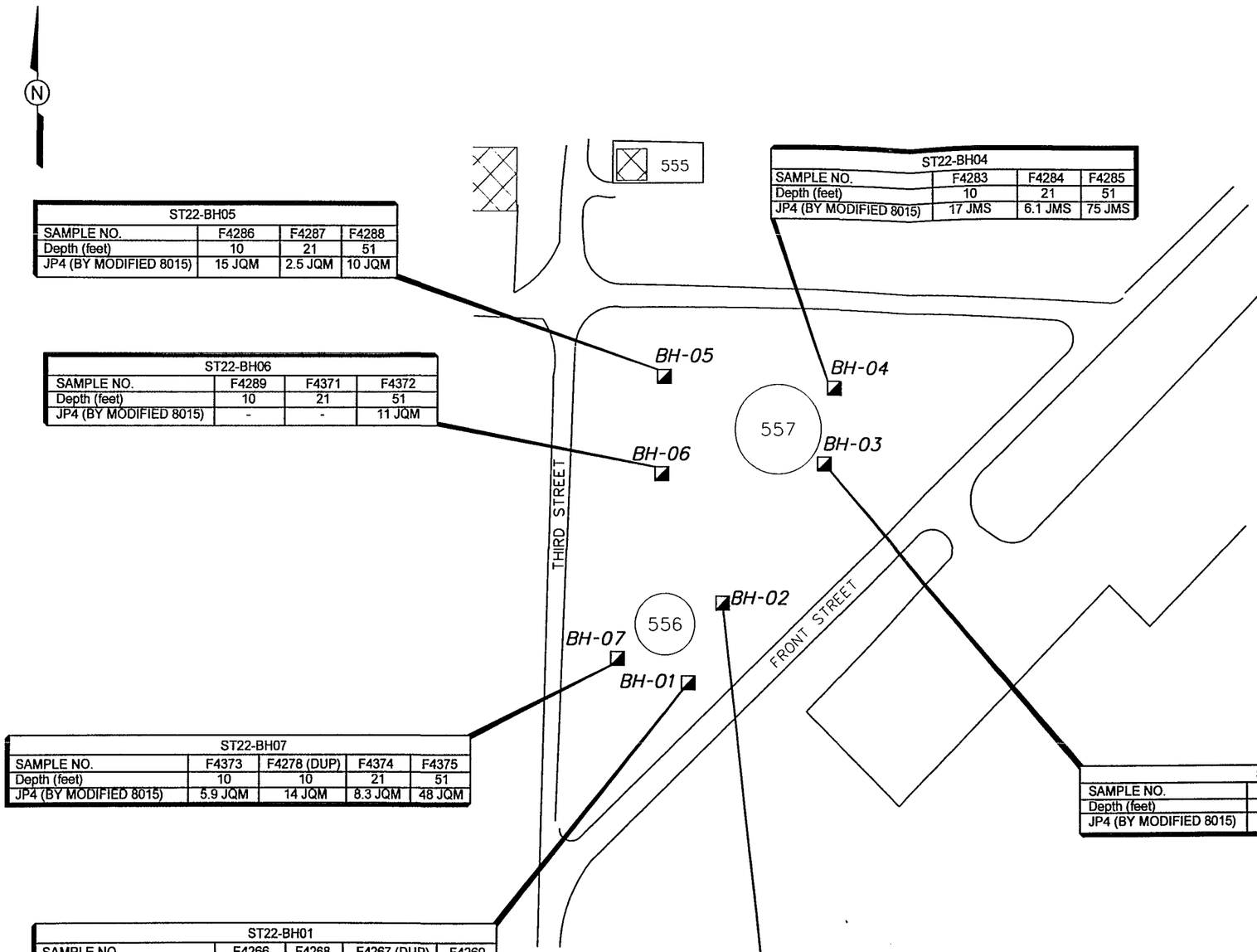

ST22-BH05			
SAMPLE NO.	F4286	F4287	F4288
Depth (feet)	10	21	51
JP4 (BY MODIFIED 8015)	15 JQM	2.5 JQM	10 JQM

ST22-BH06			
SAMPLE NO.	F4289	F4371	F4372
Depth (feet)	10	21	51
JP4 (BY MODIFIED 8015)	-	-	11 JQM

ST22-BH04			
SAMPLE NO.	F4283	F4284	F4285
Depth (feet)	10	21	51
JP4 (BY MODIFIED 8015)	17 JMS	6.1 JMS	75 JMS

ST22-BH07				
SAMPLE NO.	F4373	F4278 (DUP)	F4374	F4375
Depth (feet)	10	10	21	51
JP4 (BY MODIFIED 8015)	5.9 JQM	14 JQM	8.3 JQM	48 JQM

ST22-BH01				
SAMPLE NO.	F4266	F4268	F4267 (DUP)	F4269
Depth (feet)	10	21	51	51
JP4 (BY MODIFIED 8015)	10 JMS	13 JMS	10 JMS	7 JMS

ST22-BH03				
SAMPLE NO.	F4279	F4280	F4281	F4282 (DUP)
Depth (feet)	5.5	21	51	51
JP4 (BY MODIFIED 8015)	350 JMS	7.4 JMS	0.0 RS	0.0 RS

ST22-BH02								
SAMPLE NO.	F4270	F4271	F4272	F4273	F4274	F4275	F4276	F4277
Depth (feet)	10	36	41	61	71	81	91	101
JP4 (BY MODIFIED 8015)	11 JMS	130 JMS	31 JMS	9.7 JMS	120 JMS	7.5 JMS	7.7 JMS	0.0 RS
1,2,4 TRIMETHYLBENZENE	-	4700	-	-	-	-	-	-
1,3,5 TRIMETHYLBENZENE	-	3500	-	-	-	-	-	-
ETHYLBENZENE	-	1200	-	-	-	-	-	-
M,P-XYLENES	-	2100	-	-	-	-	-	-
O-XYLENES	-	1300	-	-	-	-	-	-

LEGEND:

SOIL BORING LOCATIONS

556 ABOVEGROUND STORAGE TANK (AST)

SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
JP4 (BY MODIFIED 8015)	MG/KG	NIA	NIA	-
1,2,4 TRIMETHYLBENZENE	UG/KG	NIA	NIA	-
1,3,5 TRIMETHYLBENZENE	UG/KG	NIA	NIA	-
ETHYLBENZENE	UG/KG	12000000	2900000	120000
M,P-XYLENE	UG/KG	NIA	NIA	-
O-XYLENE	UG/KG	NIA	NIA	-

SCALE

0 100 200 FEET

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS AND TPH AS JP-4) AND ug/kg (ORGANICS).

FIGURE 2-18
OU-4 BORING LOCATIONS
ASTs 556 AND 557, ST-22

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: | INITIATOR: T. WOODARD | DWG. NO. - 381es.499
ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881
STARTING DATE: 12/31/97 | DATE LAST
DRAWN BY: D. BILLINGSLEY | DRAWN BY:
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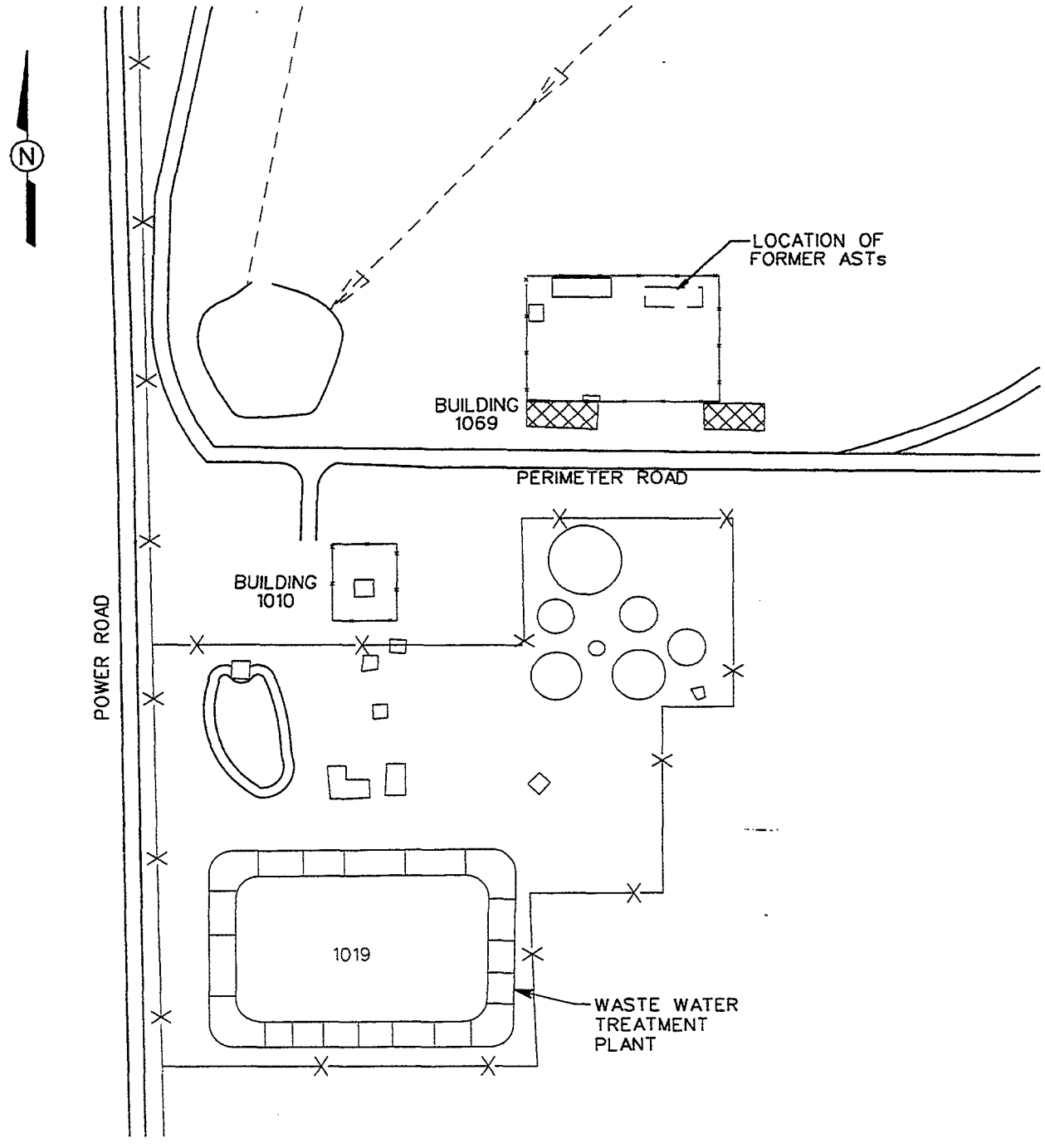

LEGEND:

FENCE

SCALE

0 200 400 FEET

FIGURE 2-19
BUILDING 1069, SS-23

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL
TECHNOLOGY
CORPORATION

STARTING DATE: 12/31/97	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: T.WOODARD
DRAWN BY: D. BILLINGSLEY	DRAWN BY:	ENGR. CHCK. BY: T.WOODARD	PROJ. MGR.: W.CARTER
			DWG. NO.: \409881ES.500
			PROJ. NO.: 409881

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of the possibility of a UST and an OWS associated with a floor trench in the drive-in bay of the building, the area was recommended for further investigation under OU-4.

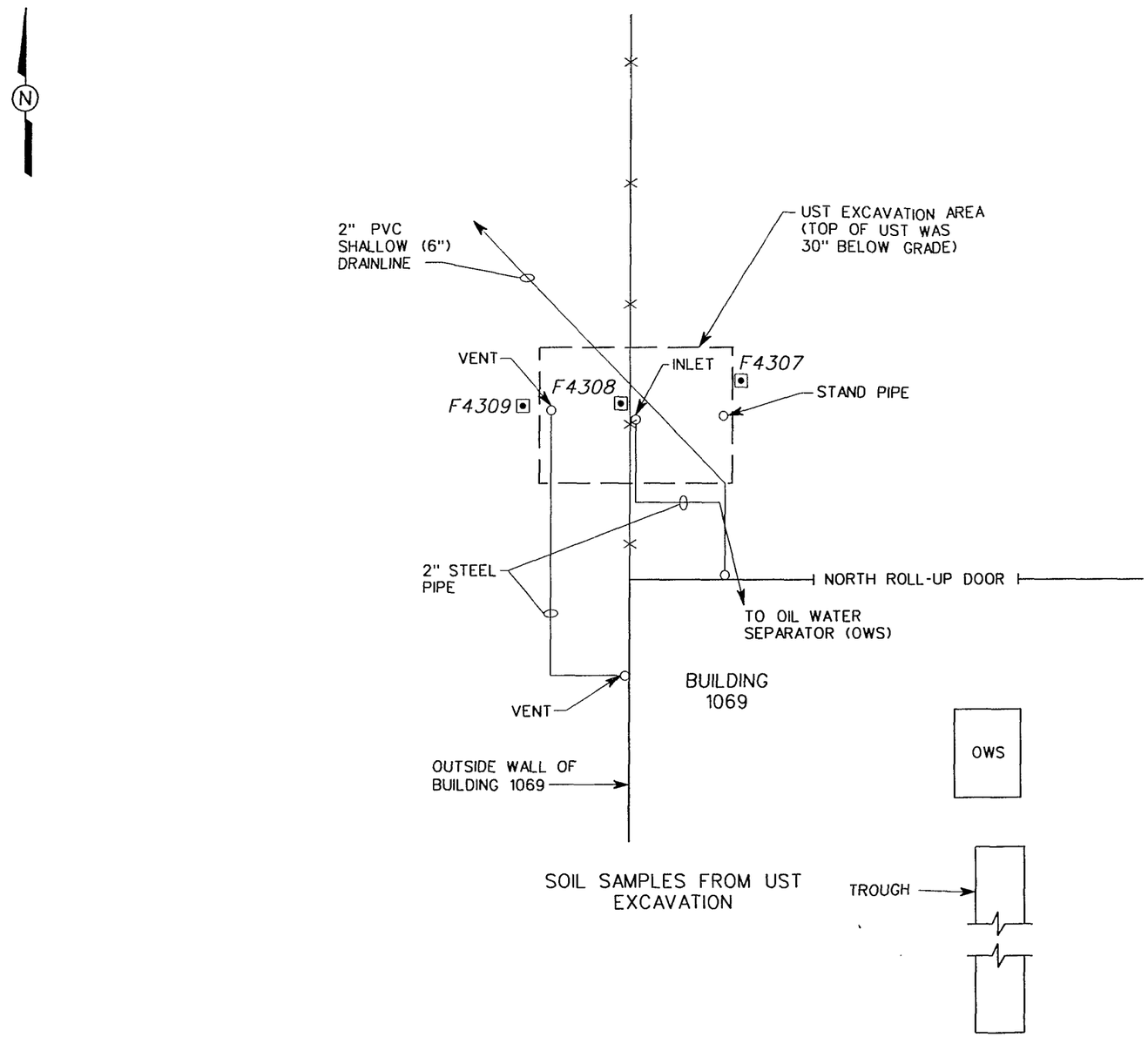
OU-4 Investigation and Results. The UST/OWS/floor trough in the drive-in bay was investigated, and the location of the diesel spill was sampled, both in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d). A 500-gallon UST associated with the OWS was removed, and soil beneath it was sampled (Figure 2-20A). Four soil samples were collected near the floor trough in the drive-in bay, at depths of one and four feet below the concrete floor (Figure 2-20B). Seven soil samples were collected from a depth of 4 feet bgs in the vicinity of the diesel spill (Figure 2-20C). Samples were variously analyzed for TPH, SVOCs, and VOCs.

Analytical results of sampling below the UST, as reported in the OU-4 RIR (IT, 1997a), verified that the UST had not leaked, and that the underlying soil was not impacted. Results of samples collected in the vicinity of the floor trough in the drive-in bay reported a strong detection of TPH and toluene from the one-foot sample in borehole BH-10, but the concentrations from the four-foot sample were much reduced. None of the detected compounds in BH-10 exceeded the EPA Region IX residential PRGs or the Arizona residential HBGLs. Results of samples collected from the diesel spill area in the fenced yard verified that all of the contaminated soil had been removed during the initial cleanup. Local low concentrations of TPH were detected, but were below the EPA Region IX residential PRG, the Arizona residential HBGL, and the Arizona minimum GPL.

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was no unacceptable risk from COPC for either residential or nonresidential land use at Site SS-23. The selected remedy for this site is no action.

2.2.12.8 Building 1010 (Site SS-24)

Site Description and History. Building 1010 is known as the Pesticide (Entomology) Shop, and is located near the southwest corner of the Base, south of Perimeter Road and north of the Base wastewater treatment plant (Figure 2-21). It was constructed in 1983, and contained various hazardous materials: nonfriable asbestos-containing materials, polychlorinated biphenyls (PCB)(less than 50 mg/kg), and pesticides (HNUS, 1993b). Because no sampling data for contamination evaluation existed for the building and the surrounding fenced yard, the area was recommended for further investigation under OU-4.



LEGEND:

SOIL SAMPLE LOCATIONS TAKEN BENEATH REMOVED UST

FENCE

SCALE

0 5 10FEET

NOTE: NO COMPOUNDS WERE DETECTED AT THESE SAMPLE LOCATIONS.

FIGURE 2-20A
OU-4 UST INVESTIGATION,
BUILDING 1069, SS-23

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 01/5/98	DATE LAST
DRAWN BY: D. BILLINGSLEY	DRAWN BY:
DRAFT. CHCK. BY: C. TUMLIN	INITIATOR: T. WOODARD
ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W. CARTER
DWG. NO.:	PROJ NO.: 409881

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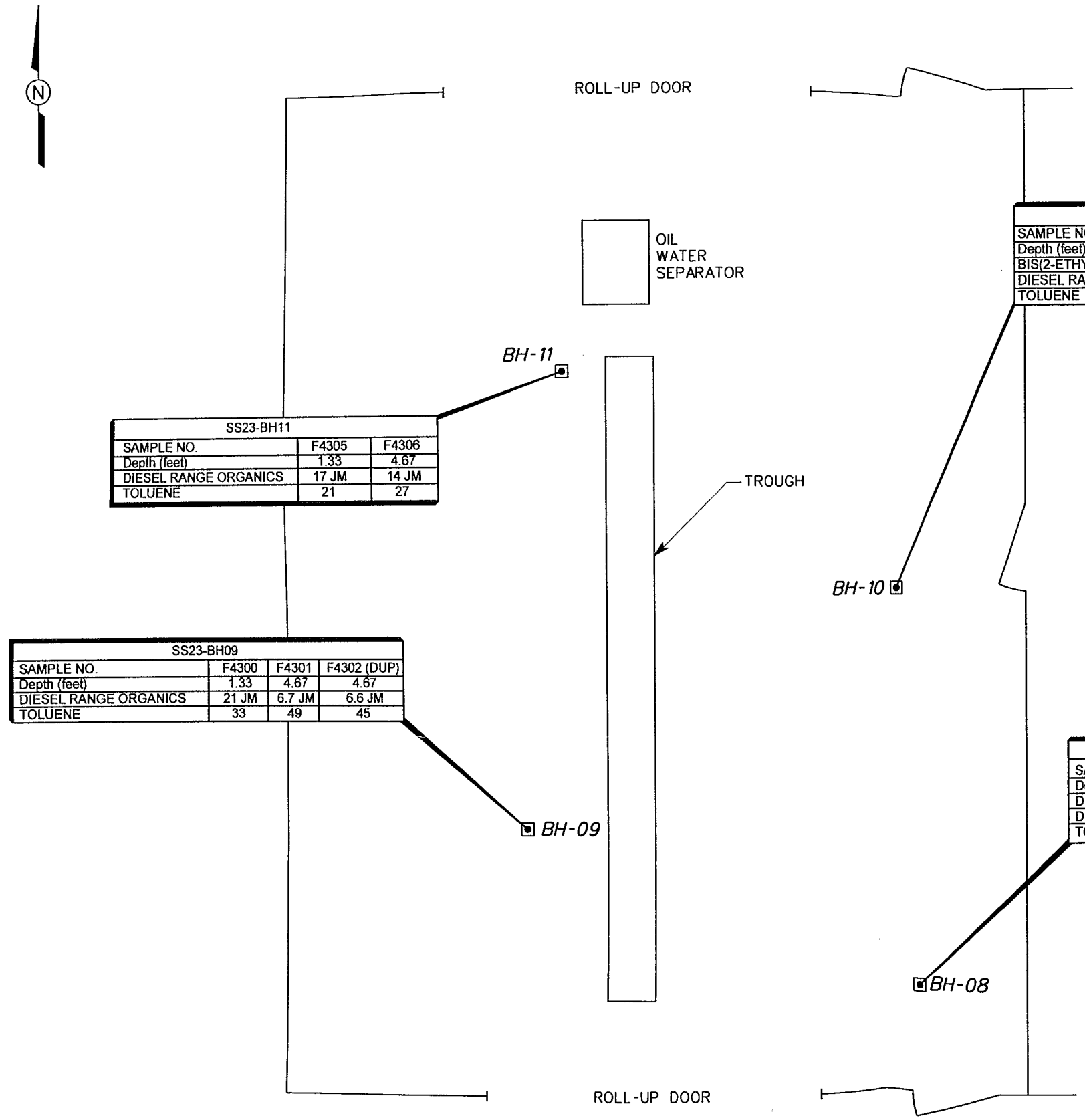

SS23-BH11		
SAMPLE NO.	F4305	F4306
Depth (feet)	1.33	4.67
DIESEL RANGE ORGANICS	17 JM	14 JM
TOLUENE	21	27

SS23-BH09			
SAMPLE NO.	F4300	F4301	F4302 (DUP)
Depth (feet)	1.33	4.67	4.67
DIESEL RANGE ORGANICS	21 JM	6.7 JM	6.6 JM
TOLUENE	33	49	45

SS23-BH10		
SAMPLE NO.	F4303	F4304
Depth (feet)	1.33	4.67
BIS(2-ETHYLHEXYL)PHTHALATE	57 JI	-
DIESEL RANGE ORGANICS	2100 JM	34 JM
TOLUENE	330	20

SS23-BH08		
SAMPLE NO.	F4298	F4299
Depth (feet)	1.33	4.67
DI-N-OCTYLPHTHALATE	35 JC	-
DIESEL RANGE ORGANICS	22 JM	19 JM
TOLUENE	15	37

LEGEND:

⊡ SHALLOW SOIL SAMPLE LOCATIONS

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (DIESEL RANGE ORGANICS) AND ug/kg (OTHER ORGANICS).

		SCREENING LEVELS		
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	97000	32000	-
DI-N-OCTYLPHTHALATE	UG/KG	2300000	1300000	-
DIESEL RANGE ORGANICS	MG/KG	NIA	NIA	-
TOLUENE	UG/KG	23000000	1900000	400000

SCALE

0 5 10 FEET

FIGURE 2-20B
OU-4 DRIVE-IN BAY INVESTIGATION, BUILDING 1069. SS-23

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: T. WOODARD | DWG. NO. | :tes 502
ENGR. CHCK. BY: T. WOODARD | PROJ. MGR: W. CARTER | PROJ NO 409881
STARTING DATE: 01/05/98 | DATE LAST
DRAWN BY: D. BILLINGSLEY | DRAWN BY:
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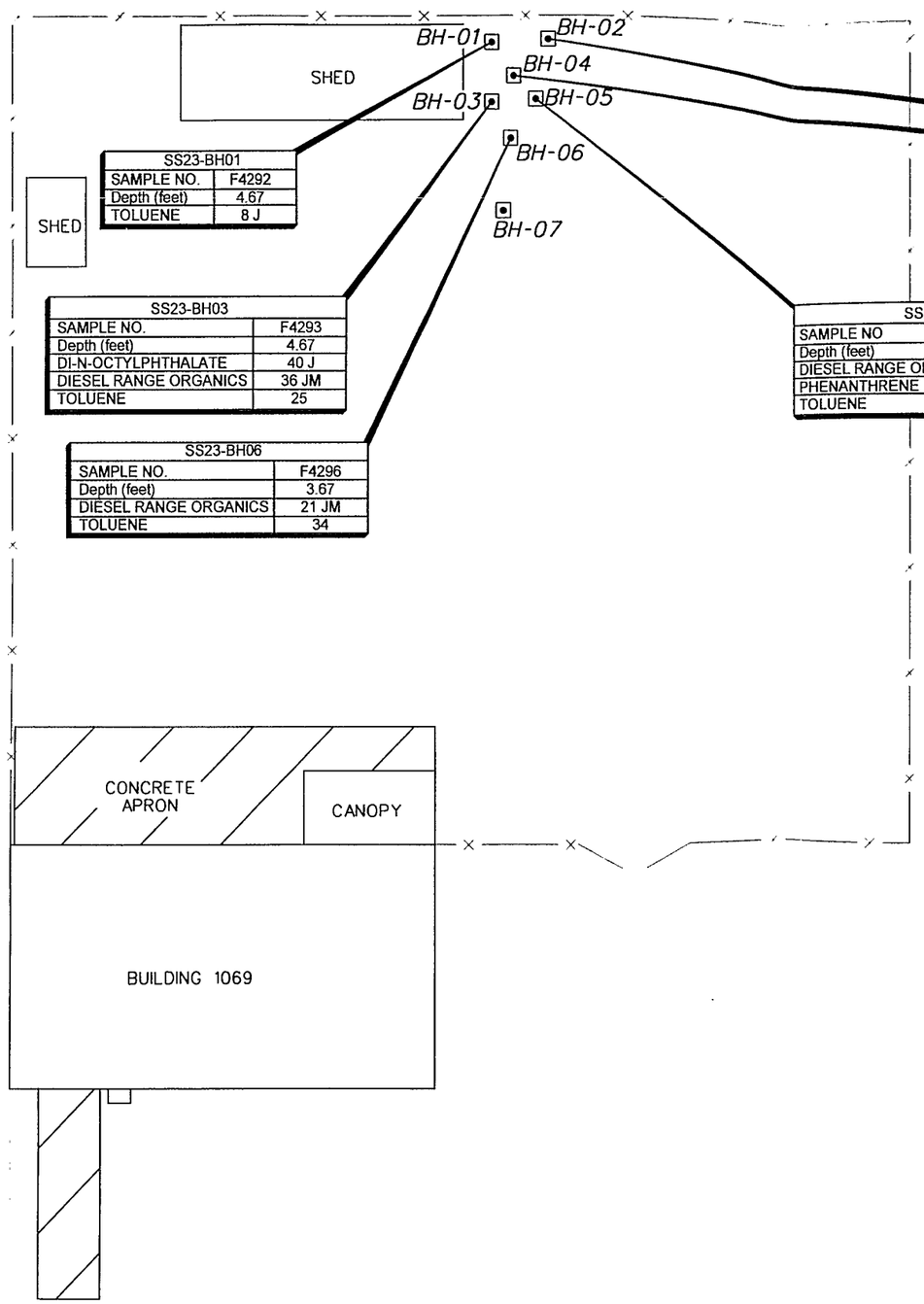

SS23-BH01	
SAMPLE NO.	F4292
Depth (feet)	4.67
TOLUENE	8 J

SS23-BH02		
SAMPLE NO.	F4290	F4291 (DUP)
Depth (feet)	4.67	4.67
DI-N-OCTYLPHTHALATE	46 J	-
DIESEL RANGE ORGANICS	8.6 JM	11 JM
TOLUENE	28	52

SS23-BH03	
SAMPLE NO.	F4293
Depth (feet)	4.67
DI-N-OCTYLPHTHALATE	40 J
DIESEL RANGE ORGANICS	36 JM
TOLUENE	25

SS23-BH04	
SAMPLE NO.	F4294
Depth (feet)	4.67
DIESEL RANGE ORGANICS	49 JM
TOLUENE	49

SS23-BH05	
SAMPLE NO	F4295
Depth (feet)	4.67
DIESEL RANGE ORGANICS	41 JM
PHENANTHRENE	47 J
TOLUENE	28

SS23-BH06	
SAMPLE NO.	F4296
Depth (feet)	3.67
DIESEL RANGE ORGANICS	21 JM
TOLUENE	34

LEGEND

SHALLOW SOIL SAMPLE LOCATIONS

FENCE

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. NO COMPOUNDS WERE DETECTED FROM BOREHOLE BH-07 (SAMPLE F4297).
3. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
4. UNITS ARE IN mg/kg (DIESEL RANGE ORGANICS) AND ug/kg (OTHER ORGANICS).

SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
DI-N-OCTYLPHTHALATE	UG/KG	2300000	1300000	-
DIESEL RANGE ORGANICS	MG/KG	NIA	NIA	-
PHENANTHRENE	UG/KG	NIA	NIA	-
TOLUENE	UG/KG	23000000	1900000	400000

SCALE

0 50 100 FEET

FIGURE 2-20C
OU-4 DIESEL SPILL INVESTIGATION, BUILDING 1069, SS-23

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO: 4C9881es.503
PROJ. NO.: 4C9881
INITIATOR: T. WOODARD
PROJ. MGR.: W. CARTER
DRAFT. CHCK. BY: C. TUMLIN
ENGR. CHCK. BY: T. WOODARD
STARTING DATE: 01/05/98
DRAWN BY: D. BILLINGSLEY
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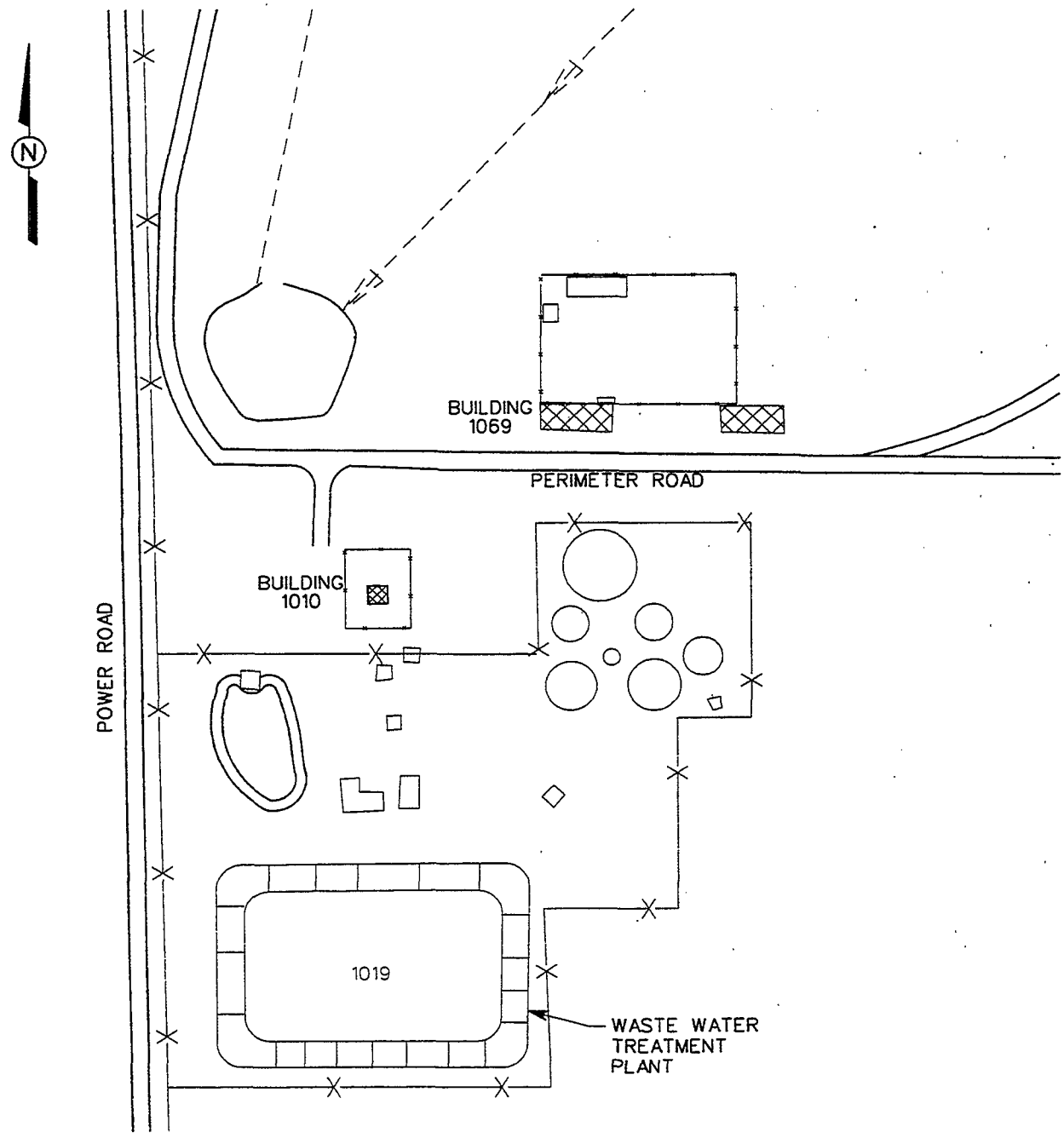

LEGEND:

FENCE

SCALE

0 200 400 FEET

FIGURE 2-21
BUILDING 1010, SS-24

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 01/05/98 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: T. WOODARD | DWG. NO.: \409881ES.504
DRAWN BY: D. BILLINGSLEY | DRAWN BY: | ENGR. CHCK BY: T. WOODARD | PROJ. MGR.: W.CARTER | PROJ. NO.: 409881

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OU-4 Investigation and Results. The north bay of Building 1010 and the surrounding fenced yard were sampled in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d). Twelve shallow soil borings located in the yard were drilled and sampled from depths ranging from 0.35 to 3.7 feet bgs (Figure 2-22A). Two of the borings were located in an area noted during a site walkover as having a surface stain. Twelve hexane-saturated wipe samples were collected from stained concrete, painted wood, and steel surfaces in the north bay of the building (Figure 2-22B). Samples were variously analyzed for VOCs, SVOCs, TPH, and pesticides/PCBs.

Analytical results of soil sampling in the surrounding yard, as reported in the OU-4 RIR (IT, 1997a), documented the near-surface presence at scattered locations of four pesticides (alpha-chlordane, dieldrin, gamma-chlordane, and heptachlor) and one SVOC (pentachlorophenol) above EPA Region IX residential PRGs and Arizona residential HBGLs.

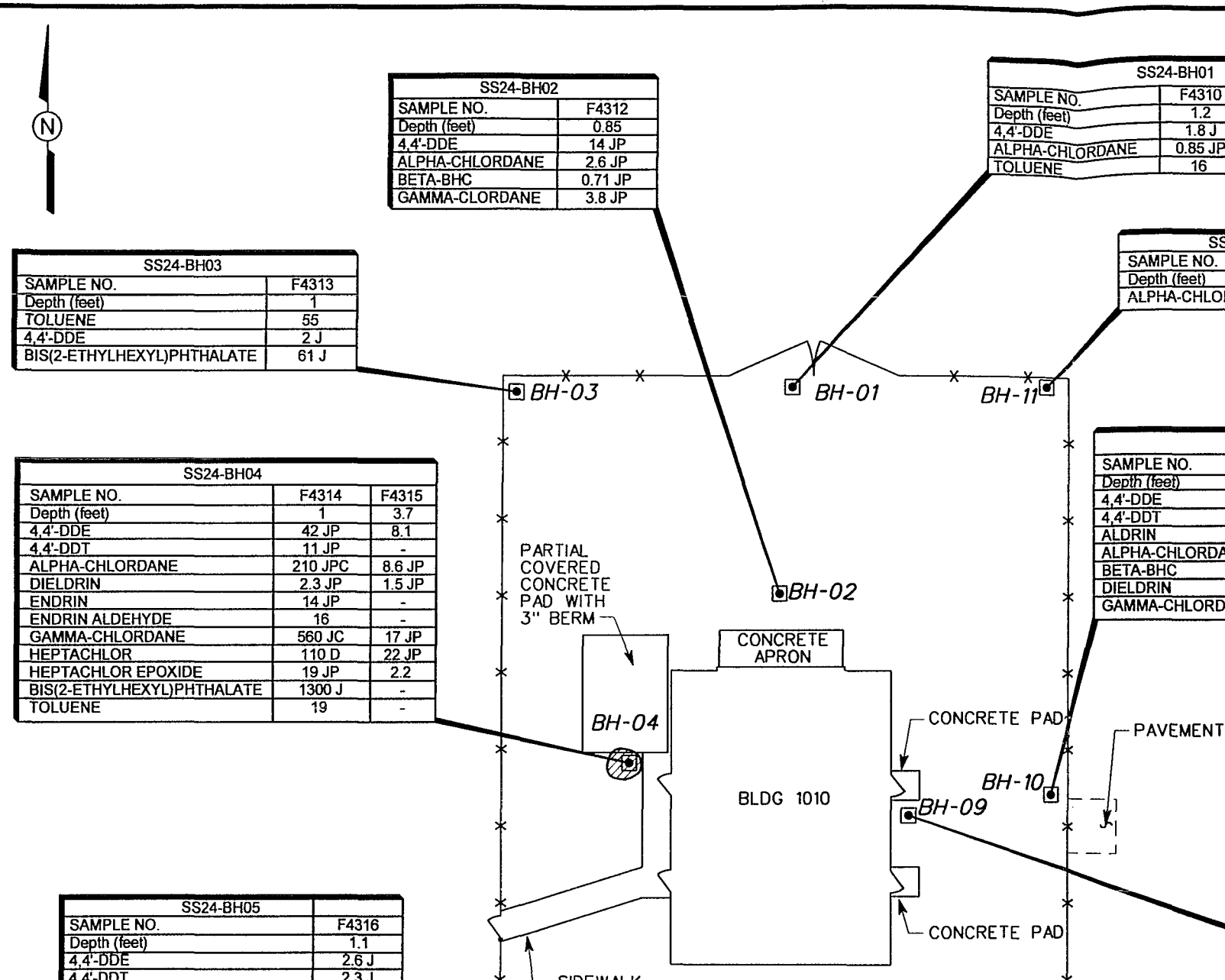
Analytical results of wipe samples from the north bay of the building, as reported in the OU-4 RIR (IT, 1997a), documented the presence of several pesticides in surface stains.

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was acceptable risk from COPC for an occupational worker in a nonresidential land use scenario at Site SS-24. An RA that will place institutional controls in the form of a deed restriction and a VEMUR for nonresidential use is the selected remedy to eliminate unacceptable risk to human health and the environment at this site.

2.2.12.9 Concrete Hardfill Area (Site LF-26)

Site Description and History. The Concrete Hardfill Area is located at the northeast corner of the Base, northeast of Perimeter Road (Figure 2-1B). The area was used for many years for the disposal of construction debris and material derived from the replacement of runways, e.g., concrete, asphalt, etc. A former Base employee reported seeing drums buried in the Concrete Hardfill Area.

E/A Investigation and Results. The Hardfill Area was inspected during an extensive walkover, and debris other than concrete was documented. This debris included vinyl asbestos-containing tile, asbestos-containing concrete pipe, empty drums, paint cans, and roofing tar buckets, and construction debris. Soil piles wrapped in plastic were noted to have been derived from the deepening of the Base golf course water hazards.



SS24-BH02	
SAMPLE NO.	F4312
Depth (feet)	0.85
4,4'-DDE	14 JP
ALPHA-CHLORDANE	2.6 JP
BETA-BHC	0.71 JP
GAMMA-CLORDANE	3.8 JP

SS24-BH01		
SAMPLE NO.	F4310	F4311 (DUP)
Depth (feet)	1.2	1.2
4,4'-DDE	1.8 J	-
ALPHA-CHLORDANE	0.85 JP	-
TOLUENE	16	15

SS24-BH03	
SAMPLE NO.	F4313
Depth (feet)	1
TOLUENE	55
4,4'-DDE	2 J
BIS(2-ETHYLHEXYL)PHTHALATE	61 J

SS24-BH11	
SAMPLE NO.	F4323
Depth (feet)	1.1
ALPHA-CHLORDANE	0.78 JP

SS24-BH04		
SAMPLE NO.	F4314	F4315
Depth (feet)	1	3.7
4,4'-DDE	42 JP	8.1
4,4'-DDT	11 JP	-
ALPHA-CHLORDANE	210 JPC	8.6 JP
DIELDRIN	2.3 JP	1.5 JP
ENDRIN	14 JP	-
ENDRIN ALDEHYDE	16	-
GAMMA-CHLORDANE	560 JC	17 JP
HEPTACHLOR	110 D	22 JP
HEPTACHLOR EPOXIDE	19 JP	2.2
BIS(2-ETHYLHEXYL)PHTHALATE	1300 J	-
TOLUENE	19	-

SS24-BH10		
SAMPLE NO.	F4321	F4322 (DUP)
Depth (feet)	1.1	1.1
4,4'-DDE	31	25
4,4'-DDT	8.5	9.3
ALDRIN	2.4	3.4
ALPHA-CHLORDANE	7.1 JP	8.4 JP
BETA-BHC	4 JP	7.2 JP
DIELDRIN	6.9	8.2
GAMMA-CHLORDANE	6.1 JP	7.1 JP

SS24-BH09	
SAMPLE NO.	F4320
Depth (feet)	0.35
4,4'-DDE	230 JP
4,4'-DDT	47 JP
ALPHA-CHLORDANE	1000 DJP
BETA-BHC	5.1 JP
DIELDRIN	540
GAMMA-CHLORDANE	1000 JC
HEPTACHLOR EPOXIDE	19 JP
BENZO(K)FLUORANTHENE	110 JI
CHRYSENE	54 J
TOLUENE	26

SS24-BH05	
SAMPLE NO.	F4316
Depth (feet)	1.1
4,4'-DDE	2.6 J
4,4'-DDT	2.3 J
BIS(2-ETHYLHEXYL)PHTHALATE	57 J

SS24-BH06	
SAMPLE NO.	F4317
Depth (feet)	1
4,4'-DDE	97
4,4'-DDT	23
DIELDRIN	34
TOLUENE	2 J

SS24-BH07	
SAMPLE NO.	F4318
Depth (feet)	1
TOLUENE	12

SS24-BH08	
SAMPLE NO.	F4319
Depth (feet)	1
4,4'-DDE	28 JS
4,4'-DDT	14 JSP
ALPHA-CHLORDANE	7.7 JSP
DIELDRIN	9.6 JS
ENDRIN ALDEHYDE	5.1 JSP
GAMMA-CHLORDANE	1.1 JS
HEPTACHLOR EPOXIDE	1.6 JSP
BIS(2-ETHYLHEXYL)PHTHALATE	65 J
PENTACHLOROPHENOL	3700 JC
TOLUENE	15

LEGEND:

- SHALLOW SOIL SAMPLE LOCATIONS
- FENCE
- STAINED SOIL

SCREENING LEVELS				
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
4,4'-DDE	UG/KG	4000	1300	-
4,4'-DDT	UG/KG	4000	1300	-
ALDRIN	UG/KG	80	26	-
ALPHA-CHLORDANE	UG/KG	1000	340	-
BETA-BHC	UG/KG	760	250	-
DIELDRIN	UG/KG	90	28	-
ENDRIN	UG/KG	35000	20000	45000
ENDRIN ALDEHYDE	UG/KG	NIA	NIA	-
GAMMA-CHLORDANE	UG/KG	1000	340	-
HEPTACHLOR	UG/KG	300	99	-
HEPTACHLOR EPOXIDE	UG/KG	150	49	-
BENZO(K)FLUORANTHENE	UG/KG	1100	6100	-
BIS(2-ETHYLHEXYL)PHTHALATE	UG/KG	97000	32000	-
CHRYSENE	UG/KG	110000	24000	-
PENTACHLOROPHENOL	UG/KG	11000	2500	-
TOLUENE	UG/KG	23000000	1900000	400000

SCALE

0 20 40 FEET

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

FIGURE 2-22A
OU-4 FENCED YARD INVESTIGATION, BUILDING 1010, SS-24

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: T. WOODARD | DWG. NO. 409881tes.505
ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.
STARTING DATE: 01/05/98 | DATE LAST
DRAWN BY: D. BILLINGSLEY | DRAWN BY:
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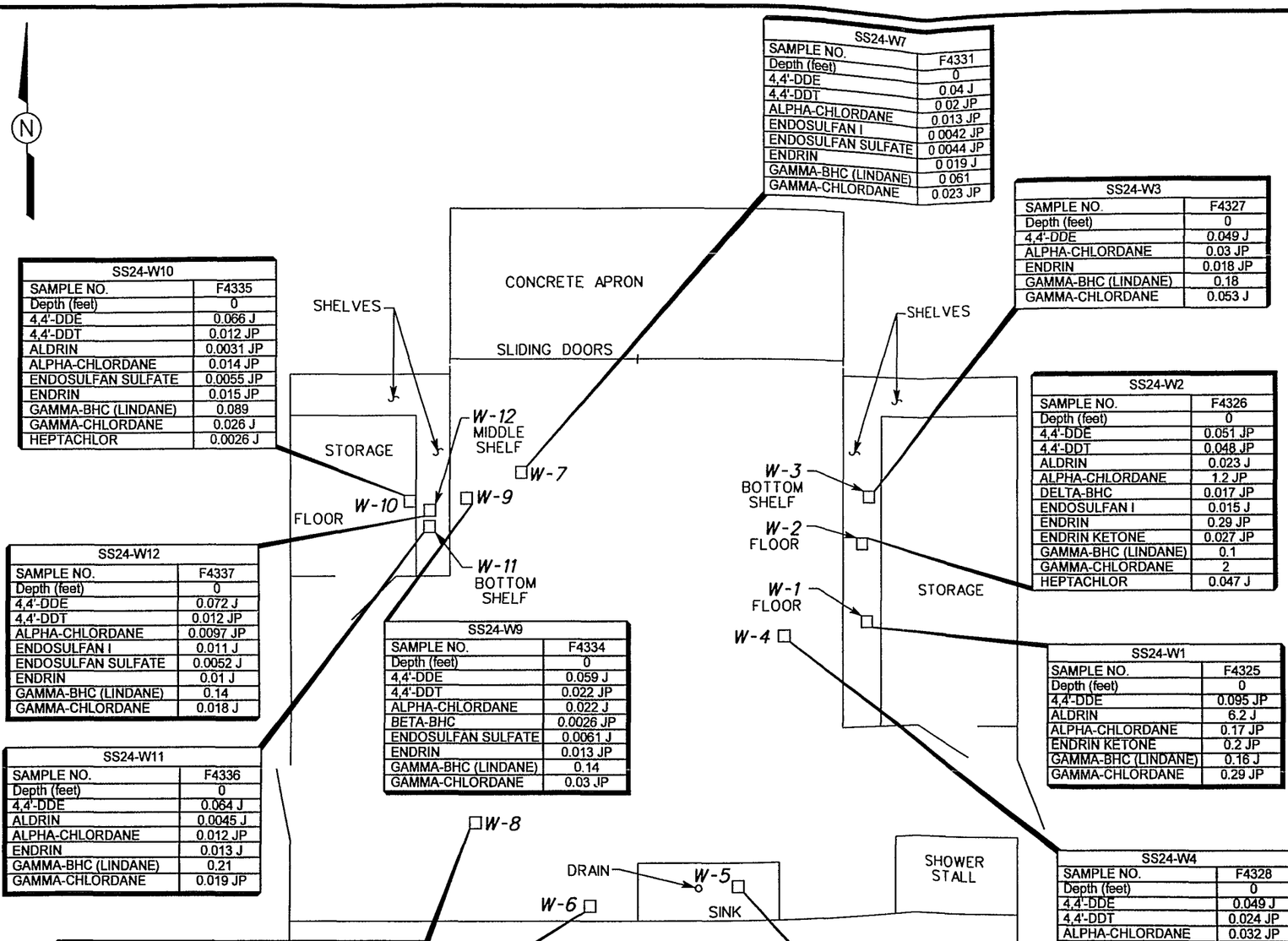

SS24-W7	
SAMPLE NO.	F4331
Depth (feet)	0
4,4'-DDE	0.04 J
4,4'-DDT	0.02 JP
ALPHA-CHLORDANE	0.013 JP
ENDOSULFAN I	0.0042 JP
ENDOSULFAN SULFATE	0.0044 JP
ENDRIN	0.019 J
GAMMA-BHC (LINDANE)	0.061
GAMMA-CHLORDANE	0.023 JP

SS24-W3	
SAMPLE NO.	F4327
Depth (feet)	0
4,4'-DDE	0.049 J
ALPHA-CHLORDANE	0.03 JP
ENDRIN	0.018 JP
GAMMA-BHC (LINDANE)	0.18
GAMMA-CHLORDANE	0.053 J

SS24-W10	
SAMPLE NO.	F4335
Depth (feet)	0
4,4'-DDE	0.066 J
4,4'-DDT	0.012 JP
ALDRIN	0.0031 JP
ALPHA-CHLORDANE	0.014 JP
ENDOSULFAN SULFATE	0.0055 JP
ENDRIN	0.015 JP
GAMMA-BHC (LINDANE)	0.089
GAMMA-CHLORDANE	0.026 J
HEPTACHLOR	0.0026 J

SS24-W2	
SAMPLE NO.	F4326
Depth (feet)	0
4,4'-DDE	0.051 JP
4,4'-DDT	0.048 JP
ALDRIN	0.023 J
ALPHA-CHLORDANE	1.2 JP
DELTA-BHC	0.017 JP
ENDOSULFAN I	0.015 J
ENDRIN	0.29 JP
ENDRIN KETONE	0.027 JP
GAMMA-BHC (LINDANE)	0.1
GAMMA-CHLORDANE	2
HEPTACHLOR	0.047 J

SS24-W12	
SAMPLE NO.	F4337
Depth (feet)	0
4,4'-DDE	0.072 J
4,4'-DDT	0.012 JP
ALPHA-CHLORDANE	0.0097 JP
ENDOSULFAN I	0.011 J
ENDOSULFAN SULFATE	0.0052 J
ENDRIN	0.01 J
GAMMA-BHC (LINDANE)	0.14
GAMMA-CHLORDANE	0.018 J

SS24-W9	
SAMPLE NO.	F4334
Depth (feet)	0
4,4'-DDE	0.059 J
4,4'-DDT	0.022 JP
ALPHA-CHLORDANE	0.022 J
BETA-BHC	0.0026 JP
ENDOSULFAN SULFATE	0.0061 J
ENDRIN	0.013 JP
GAMMA-BHC (LINDANE)	0.14
GAMMA-CHLORDANE	0.03 JP

SS24-W1	
SAMPLE NO.	F4325
Depth (feet)	0
4,4'-DDE	0.095 JP
ALDRIN	6.2 J
ALPHA-CHLORDANE	0.17 JP
ENDRIN KETONE	0.2 JP
GAMMA-BHC (LINDANE)	0.16 J
GAMMA-CHLORDANE	0.29 JP

SS24-W11	
SAMPLE NO.	F4336
Depth (feet)	0
4,4'-DDE	0.064 J
ALDRIN	0.0045 J
ALPHA-CHLORDANE	0.012 JP
ENDRIN	0.013 J
GAMMA-BHC (LINDANE)	0.21
GAMMA-CHLORDANE	0.019 JP

SS24-W4	
SAMPLE NO.	F4328
Depth (feet)	0
4,4'-DDE	0.049 J
4,4'-DDT	0.024 JP
ALPHA-CHLORDANE	0.032 JP
ENDOSULFAN I	0.0089 J
ENDOSULFAN SULFATE	0.008 JP
ENDRIN	0.013 JP
GAMMA-BHC (LINDANE)	0.11
GAMMA-CHLORDANE	0.06

SS24-W8		
SAMPLE NO.	F4332	F4333 (DUP)
Depth (feet)	0	0
4,4'-DDE	0.023 J	0.026 JS
4,4'-DDT	0.014 JP	0.017 JPS
ALDRIN	0.0032 JP	-
ALPHA-CHLORDANE	0.0074 JP	0.0076 JPS
ENDOSULFAN I	-	0.0048 JPS
ENDRIN	0.013 J	0.011 JPS
GAMMA-BHC (LINDANE)	0.032 J	0.034 JS
GAMMA-CHLORDANE	0.003 JP	0.0036 JPS
HEPTACHLOR	-	0.0036 JPS

SS24-W6	
SAMPLE NO.	F4330
Depth (feet)	0
4,4'-DDE	0.082 J
4,4'-DDT	0.02 JP
ALPHA-CHLORDANE	0.048 JP
ENDOSULFAN I	0.009 J
ENDOSULFAN SULFATE	0.01 JP
ENDRIN	0.015 JP
GAMMA-BHC (LINDANE)	0.19
GAMMA-CHLORDANE	0.086 J
HEPTACHLOR	0.0094 J

SS24-W5	
SAMPLE NO.	F4329
Depth (feet)	0
4,4'-DDE	0.07 J
4,4'-DDT	0.032 JP
ALPHA-CHLORDANE	0.022 JP
ENDOSULFAN I	0.012 J
ENDOSULFAN SULFATE	0.021 J
ENDRIN	0.017 JP
GAMMA-BHC (LINDANE)	0.17
GAMMA-CHLORDANE	0.042 J

LEGEND

□ W-1 WIPE SAMPLE LOCATIONS

	SCREENING LEVELS			
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
4,4'-DDE	UG/KG	4000	1300	-
4,4'-DDT	UG/KG	4000	1300	-
ALDRIN	UG/KG	80	26	-
ALPHA-CHLORDANE	UG/KG	1000	340	-
BETA-BHC	UG/KG	760	250	-
DELTA-BHC	UG/KG	NIA	NIA	-
ENDOSULFAN I	UG/KG	5800	NIA	-
ENDOSULFAN SULFATE	UG/KG	NIA	NIA	-
ENDRIN	UG/KG	35000	20000	45000
ENDRIN KETONE	UG/KG	NIA	NIA	-
GAMMA-BHC (LINDANE)	UG/KG	1000	340	88
GAMMA-CHLORDANE	UG/KG	1000	340	-
HEPTACHLOR	UG/KG	300	99	-

SCALE

0 5 10 FEET

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2. (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN mg/kg (METALS) AND ug/kg (ORGANICS).

FIGURE 2-22B
OU-4 NORTH BAY INVESTIGATION, BUILDING 1010, SS-24

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO.: 1995Sites.506 | PROJ. NO.: 409881
INITIATOR: T. WOODARD | PROJ. MGR.: W. CARTER
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: T. WOODARD
STARTING DATE: 01/05/98 | DATE LAST REV.
DRAWN BY: D. BILLINGSLEY | DRAWN BY:
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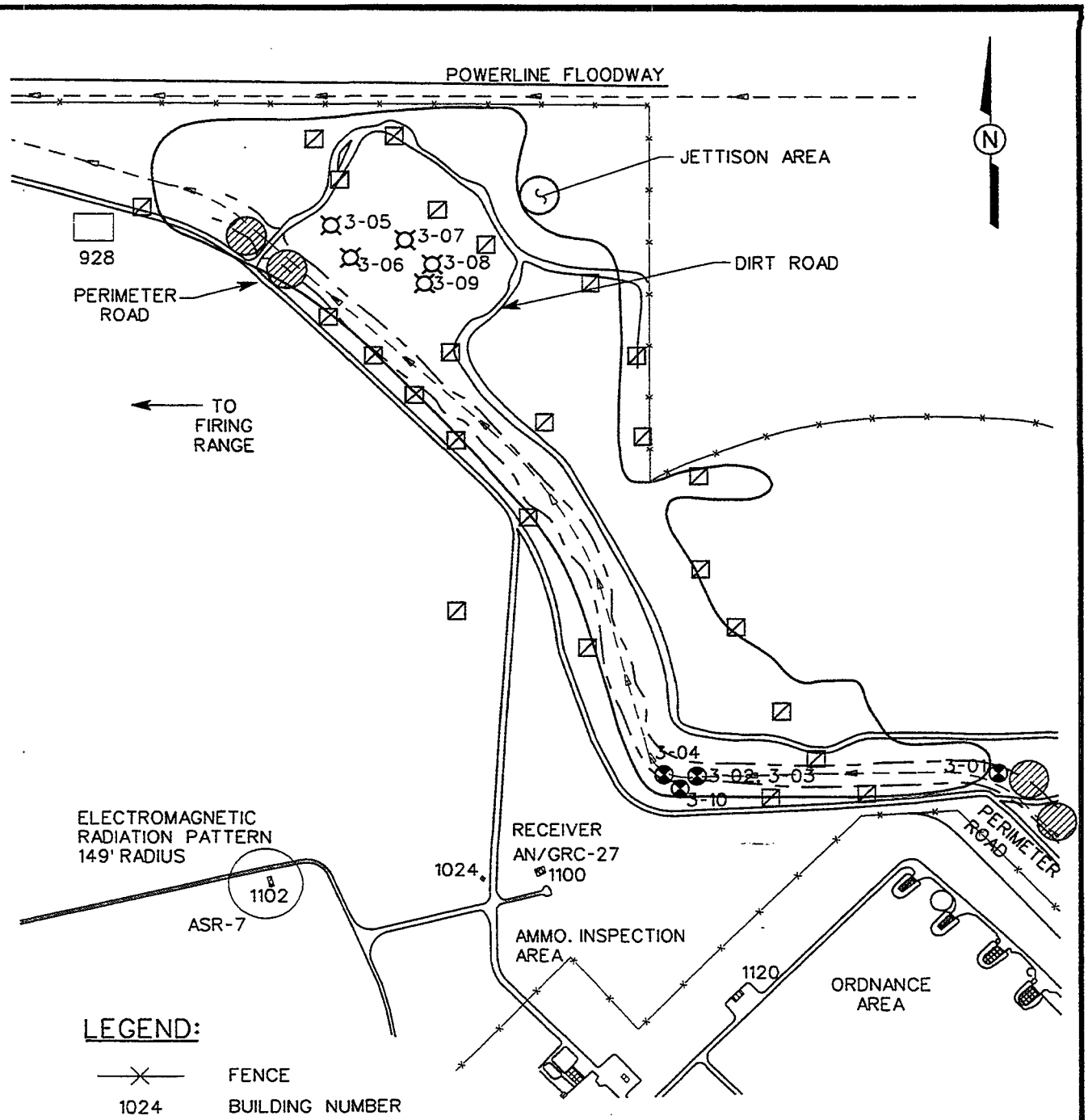
A search using geophysical techniques was conducted for buried drums, but none were located. Soil samples were collected beneath five drums located during the walkover, at depths of 1.5 to 3 feet bgs (Figure 2-23). Samples were analyzed for VOCs, SVOCs, and pesticides/PCBs. Analytical results indicted that soil beneath one drum exceeded the EPA Region IX residential PRG and the Arizona residential HBGL for dieldrin. The drum and underlying soil were recommended for a removal action under OU-5.

Four samples of suspected asbestos-containing materials (ACM) were collected and submitted for analysis by polarized light microscopy (PLM). The results of the PLM analysis confirmed that the vinyl tile, two types of concrete pipe, and wrapped insulation on a steam line all contained asbestos. All ACM at the Concrete Hardfill were considered to be nonfriable, but further investigation to document that the material is not becoming airborne was recommended under OU-4.

OU-4 Investigation and Results. Soil samples from 25 locations around the Concrete Hardfill Area were sampled in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d) (Figure 2-24A). Samples were analyzed for asbestos by PLM. As reported in the OU-4 RIR (IT, 1997a), asbestos was detected in none of the samples.

Compliance Verification Action. A compliance verification action was conducted in January and February 1997, to identify and remove all noninert material and special waste (e.g., ACM) from the Concrete Hardfill Area (IT, 1997c). In the course of the operation, friable ACM such as thermal system insulation and drywall seam tape was located and removed by a certified asbestos subcontractor. In addition, three PCB-containing capacitors were located and removed from the Concrete Hardfill Area, and transported off site to a licensed facility for destruction. Soil beneath the capacitor location was sampled and analyzed for pesticides/PCBs. Analytical results returned a value of 4,800 mg/kg Aroclor 1254. As part of the compliance verification action, the extent of PCB-contaminated soil was determined, and the affected soil was excavated and shipped off site to a licensed PCB-accepting waste facility. Soil samples that verified site cleanup were collected and analyzed for pesticides/PCBs (Figure 2-24B). Analytical results are included in the compliance verification report (IT, 1997c).

The baseline risk assessment performed in the OU-4 FS (IT, 1997b) concluded that there was no unacceptable risk from COPC for either residential or nonresidential land use at Site LF-26. The selected remedy for this site is no action.



LEGEND:

- FENCE
- 1024 BUILDING NUMBER
- DRAINAGE
- SOIL SAMPLE LOCATIONS 11/09/93, 11/10/93, AND 11/19/93
- PREVIOUS STUDY ASBESTOS SAMPLE LOCATIONS
- PREVIOUS STUDY GEOPHYSICAL SURVEY AREAS
- BORING LOCATIONS

SCALE

0 600 1200 FEET

FIGURE 2-23
CONCRETE HARDFILL AREA
LF-26

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DWG. NO.: \409881ES.507 | PROJ. NO.: 409881
INITIATOR: T. WOODARD | PROJ. MGR.: W. CARTER
DRAFT. CHCK. BY: C. TUMLIN | ENGR. CHCK. BY: T. WOODARD
DATE LAST REV.: | DRAWN BY:
STARTING DATE: 1/6/97 | DRAWN BY: D. BILLINGSLEY
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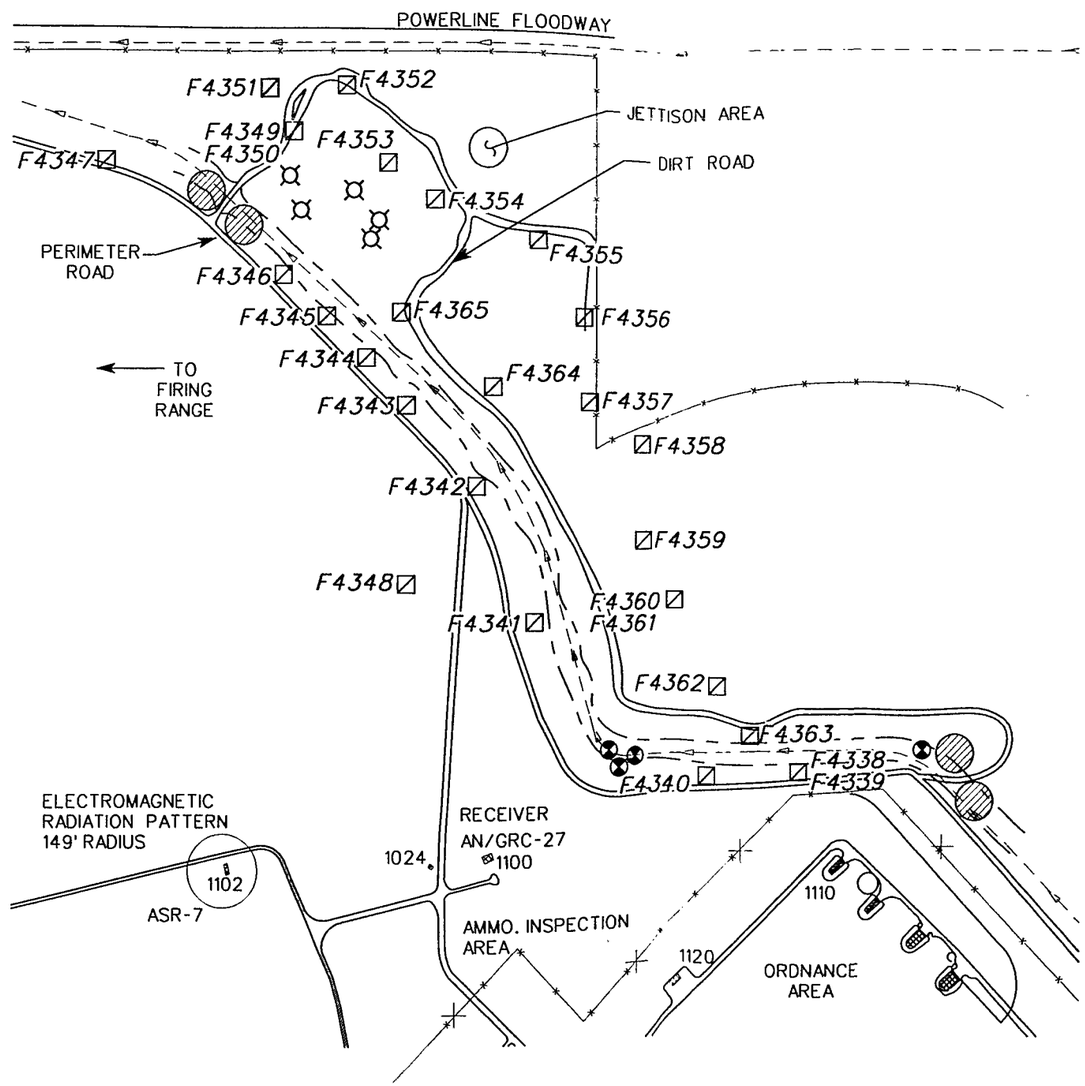

LEGEND:

- FENCE
- 1024 BUILDING NUMBER
- DRAINAGE
- PREVIOUS STUDY SAMPLE LOCATIONS
- PREVIOUS STUDY ASBESTOS SAMPLE LOCATIONS
- PREVIOUS STUDY GEOPHYSICAL SURVEY AREAS
- F4362 SHALLOW BORING LOCATIONS

SCALE

0 600 1200 FEET

NOTE: NO COMPOUNDS WERE DETECTED AT THESE SAMPLE LOCATIONS.

FIGURE 2-24A
OU-4 SAMPLE LOCATIONS, CONCRETE HARDFILL AREA, LF-26

WILLIAMS AIR FORCE BASE
PHOENIX ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: T. WOODARD | DWG 988les.508
ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. 3881
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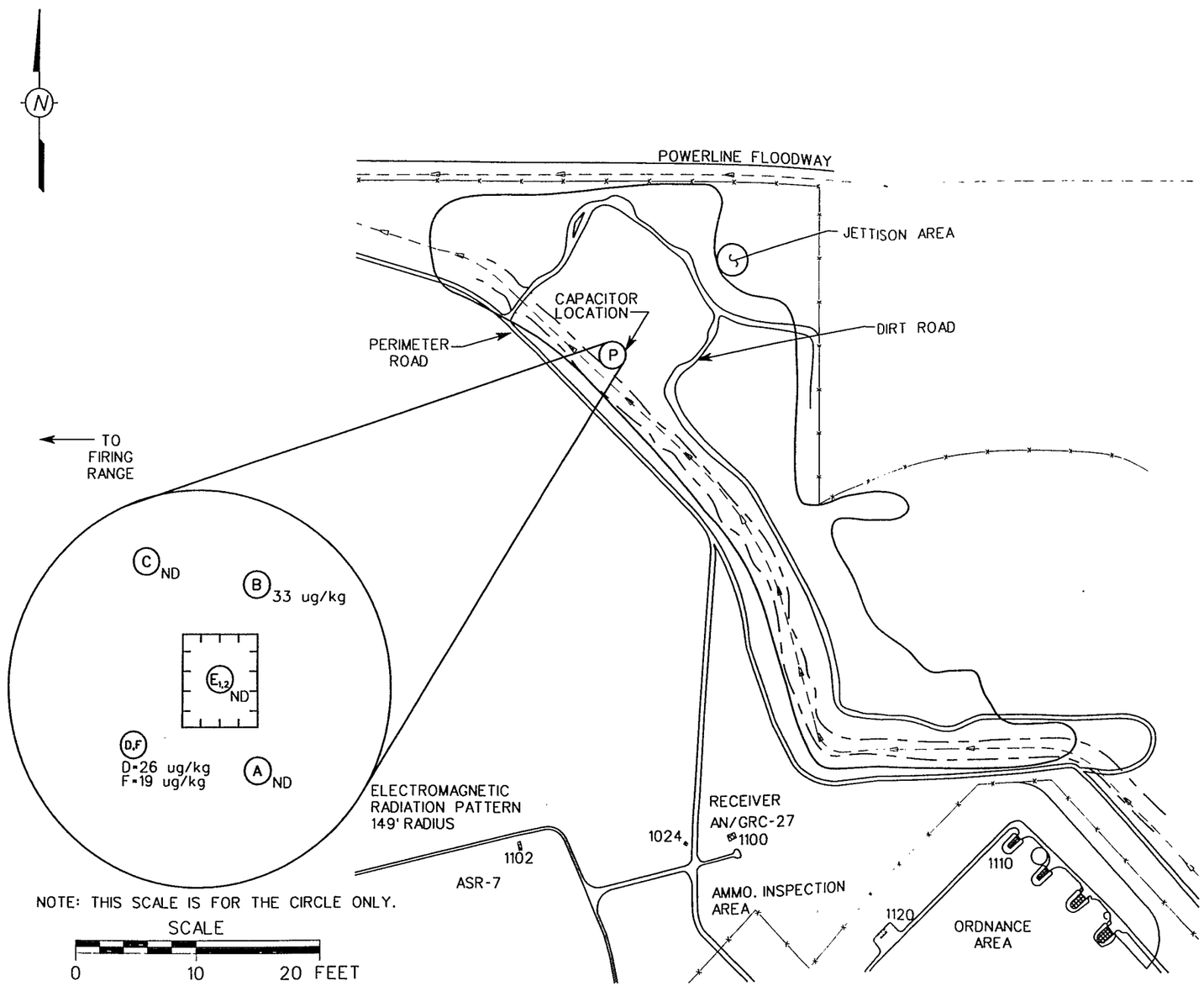

LEGEND:

- FENCE
- 1024 BUILDING NUMBER
- DRAINAGE
- (P) PCB SAMPLE LOCATIONS
- ND NON DETECT
- EXCAVATED AREA

NOTES:

1. SAMPLES AT CAPACITOR LOCATION E_1 AT 24" DEPTH, AROCLOR 1254 - 4,800,000ug/kg ON 2/10/97 E_2 AT 6' DEPTH, AROCLOR 1254 - NON DETECTED ON 3/7/97
2. SAMPLES AT A, B, C, AND D WERE TAKEN AT 6" DEPTH
3. ALL CONCENTRATIONS SHOWN ARE FOR AROCLOR 1254 AS ug/kg. DETECTION LIMIT IS AT 33 ug/kg.
4. AROCLOR 1242 WAS ALSO DETECTED AT SAMPLE LOCATION D AND F AT 6" DEPTH AT 40 ug/kg.
5. DATA ARE PROVIDED IN APPENDIX A-2 (FOLLOWING APPENDIX A, OU-4 RIR [IT 1997a]).

SCALE
0 600 1200 FEET

FIGURE 2-24B
PCB SAMPLE LOCATIONS, CONCRETE HARDFILL AREA, LF-26

WILLIAMS AIR FORCE BASE PHOENIX ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 1/6/98 | DATE LAST REV.: | DRAFT. CHCK. BY: C. TUMLIN | INITIATOR: T. WOODARD | DWG. NO.: 7581es 509
DRAWN BY: D. BILLINGSLEY | DRAWN BY: | ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881
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2.2.12.10 Facility 1004 (Site SS-33)

Site Description and History. The Old Munitions Storage Area is located northeast of the southeast corner of the Base (Figure 2-1A). The area consists of two bunkers (Facilities 1007 and 1008), and one storage igloo (Facility 1004). Facilities 1007 and 1008 were constructed in 1942, and were used initially to store munitions, then pesticides for an unknown length of time. A USAF contractor cleaned the interior of both facilities of spilled and outdated pesticides in 1985.

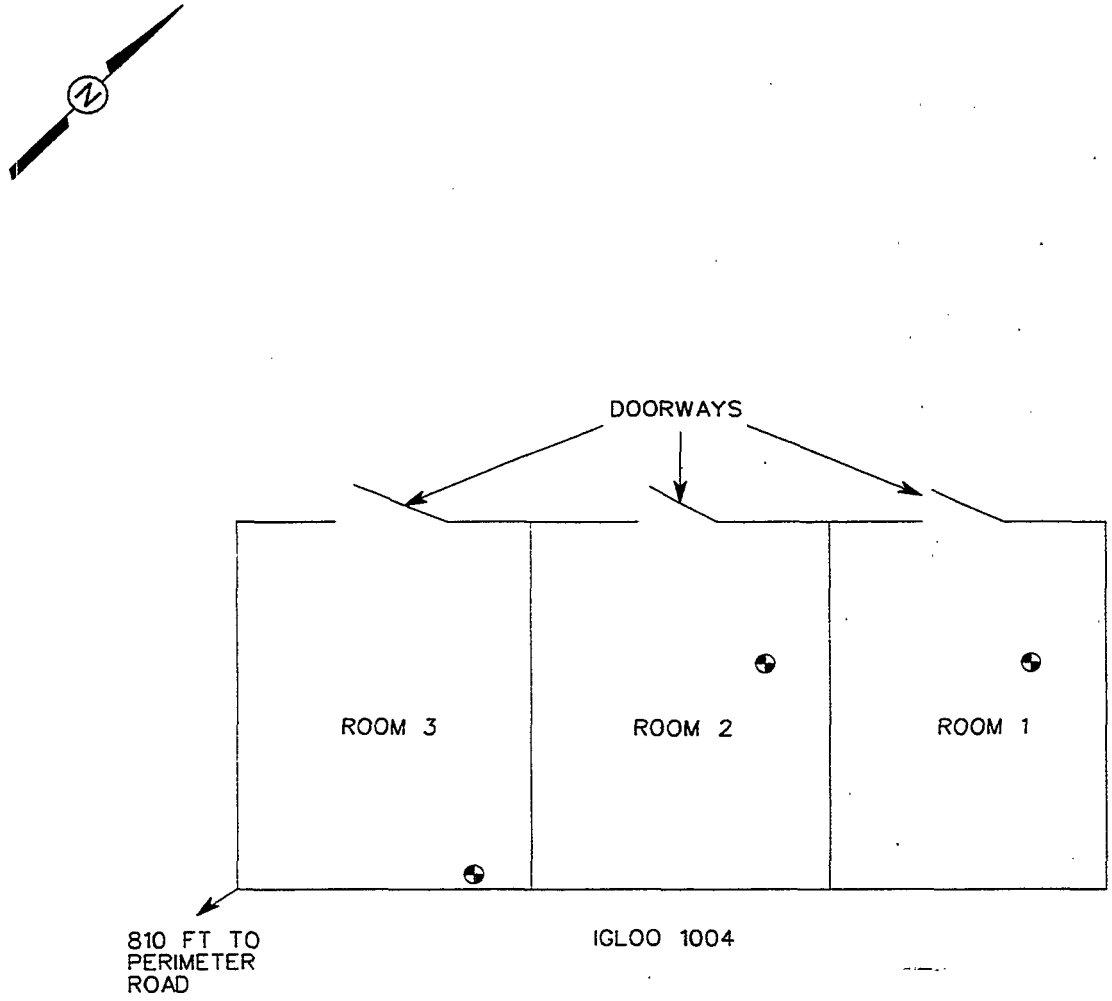
Base personnel indicated that Facility 1004 had been used for storage of outdated pesticides, which were reportedly removed in 1986.

E/A Investigation and Results. Visual inspection of Facility 1007 confirmed that the facility was empty, and there was no evidence of contamination (i.e., no odor or staining). Two surface-wipe samples were collected from Facility 1007. Visual inspection of Facility 1008 confirmed that the facility was empty and contained no residual odor. Two stains were noted on the floor and wall, and surface-wipe samples were collected from each. Visual inspection of Facility 1004 revealed three empty rooms (Figure 2-25). Room 1, on the northeast side of the facility, contained a strong pesticide odor and several dead insects and small animals (lizard and frog). Room 2 had a faint pesticide odor and stained outlines on the floor of cans or buckets. Room 3 showed no evidence of staining or odor. Surface-wipe samples were collected from each room.

All surface wipe samples collected from Facility 1004, Facility 1007, and Facility 1008 were analyzed for herbicides and pesticides/PCBs. None of the samples returned values above the laboratory detection limit. The source of the strong odor in Room 1 of Facility 1004 remained unknown, however, and the facility was recommended for further investigation under OU-4.

OU-4 Investigation and Results. Pulverized concrete chip samples from four locations on the floor of the three rooms of Facility 1004 were collected in accordance with the approved OU-4 work plan (IT, 1995c) and field sampling plan (IT, 1995d) (Figure 2-26). Samples were analyzed for SVOCs, herbicides, and pesticides/PCBs.

Analytical results, as reported in the OU-4 RIR (IT, 1997a), documented the presence of pesticides (e.g., 4,4'-DDE, 4,4'-DDT, chlordane, dieldrin), herbicides (e.g., 2,4-D, 2,4,5-T, silvex, dalapon, dicamba), fungicides (e.g., hexachlorobenzene), and SVOCs (e.g., pentachlorophenol,



LEGEND:

PREVIOUS STUDY SAMPLE LOCATIONS

SCALE

0 5 10 FEET

FIGURE 2-25
FACILITY 1004, SS-33

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 01/05/98 | DATE LAST REV.: | DRAFT. CHCK. BY: | INITIATOR: T. WOODARD | DWG. NO.: \409881ES.510
DRAWN BY: D. BILLINGSLEY | DRAWN BY: | ENGR. CHCK. BY: T. WOODARD | PROJ. MGR.: W. CARTER | PROJ. NO.: 409881

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DATE LAST ... | STARTING DATE: 6/23/97
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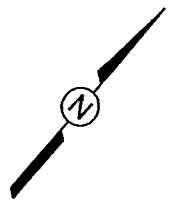
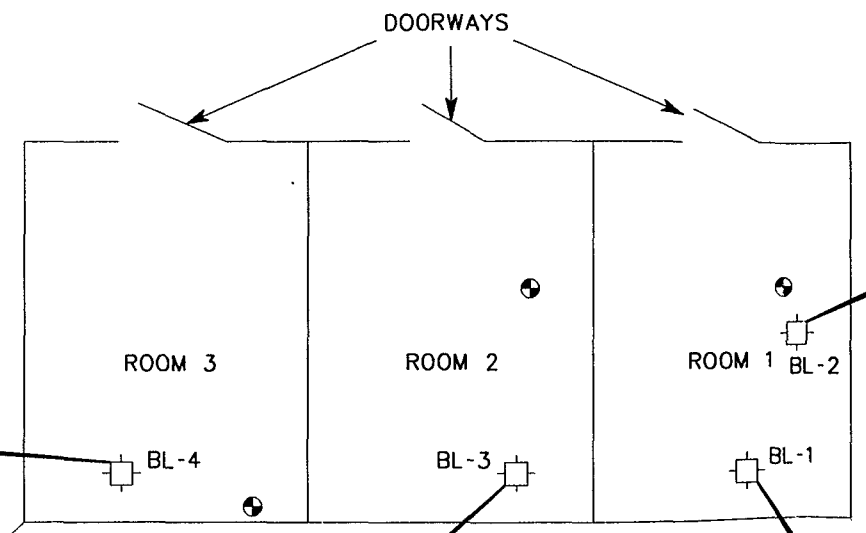




SS33-A-14BL-4	
SAMPLE NO.	F4370
Depth (feet)	0.02
4,4'-DDD	25 JPM
4,4'-DDE	320 JM
4,4'-DDT	340 JM
ALPHA-CHLORDANE	35 JPM
BETA-BHC	29 JM
DIELDRIN	52 JM
ENDRIN	19 JPM
GAMMA-CHLORDANE	50 JM
HEPTACHLOR EPOXIDE	3.5 JPM
DALAPON	92 JPSL
PENTACHLOROPHENOL	150,000 JC

SS33-A-14BL-2	
SAMPLE NO.	F4368
Depth (feet)	0.02
4,4'-DDD	150 JPM
GAMMA-CHLORDANE	44 JPM
2-METHYLNAPHTHALENE	59,000 D
DALAPON	1000 JSL
DIBENZOFURAN	12000 JD
PENTACHLOROPHENOL	100,000 JC
PHENANTHRENE	12000 JD

SS33-A-14BL-3	
SAMPLE NO.	F4369
Depth (feet)	0.02
4,4'-DDE	270 JM
4,4'-DDT	190 JM
DIELDRIN	71 JPM
2,4,5-T	20,000 JS
2,4-D	21,000 JS
DICAMBA	18,000 JS
HEXACHLOROBENZENE	41,000 D
PENTACHLOROPHENOL	98,000 JC
SILVEX	7,300 JPCS

SS33-A-14BL-1		
SAMPLE NO.	F4366	F4367 (DUP)
Depth (feet)	0.04	0.04
4,4'-DDE	260 JM	210 JM
4,4'-DDT	300 JM	270 JM
ALPHA-CHLORDANE	80 JPM	62 JPM
BETA-BHC	46 JPM	40 JPM
DELTA-BHC	-	13 JPM
DIELDRIN	68 JPM	57 JPM
ENDOSULFAN I	25 JPM	23 JPM
ENDOSULFAN II	21 JPM	-
GAMMA-CHLORDANE	100 JM	82 JPM
2,4-D	2000 JPS	2000 JPS
DALAPON	64000 NJPSL	62000 NJPSL
PENTACHLOROPHENOL	160,000 JC	180,000 JC

LEGEND:

- PREVIOUS STUDY SAMPLE LOCATIONS
- CHIP SAMPLE LOCATION

	SCREENING LEVELS			
PARAMETER	UNIT	HBGL SOIL	PRG SOIL	MINIMUM GPLs
4,4'-DDD	UG/KG	5700	1900	-
4,4'-DDE	UG/KG	4000	1300	-
4,4'-DDT	UG/KG	4000	1300	-
ALPHA-CHLORDANE	UG/KG	1000	340	-
BETA-BHC	UG/KG	760	250	-
DELTA-BHC	UG/KG	NIA	NIA	-
DIELDRIN	UG/KG	90	28	-
ENDOSULFAN I	UG/KG	5800	NIA	-
ENDOSULFAN II	UG/KG	NIA	NIA	-
ENDRIN	UG/KG	35000	20000	45000
GAMMA-CHLORDANE	UG/KG	1000	340	-
HEPTACHLOR EPOXIDE	UG/KG	150	49	-
2-METHYLNAPHTHALENE	UG/KG	NIA	NIA	-
DIBENZOFURAN	UG/KG	NIA	NIA	-
HEXACHLOROBENZENE	UG/KG	850	280	-
PENTACHLOROPHENOL	UG/KG	11000	2500	-
PHENANTHRENE	UG/KG	NIA	NIA	-
2,4,5-T	UG/KG	1200000	650000	-
2,4-D	UG/KG	1200000	650000	6700
DALAPON	UG/KG	NIA	NIA	-
DICAMBA	UG/KG	NIA	NIA	-
SILVEX	UG/KG	940000	520000	42000

SCALE

0 5 10 FEET

NOTES:

1. SUMMARY OF DETECTED COMPOUNDS FROM TABLE 4-2 (OU-4 RIR [IT 1997a]).
2. DATA QUALIFIERS ARE DEFINED ON PAGES 24-27 OF TABLE 4-2 (OU-4 RIR [IT 1997a]).
3. UNITS ARE IN ug/kg.

FIGURE 2-26
OU-4 SAMPLING LOCATIONS, FACILITY 1004, SS-33

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

dibenzofuran) in the surface of the concrete floor of Facility 1004. Apparently a combination of these chemicals that have been spilled onto and seeped into the floor are responsible for the persistent odors associated with the rooms. Because of the low permeability of concrete, and the low mobility of the detected compounds, it is not anticipated that the soil beneath the floor would have been impacted by the spilled chemicals.

Compliance Verification Action. A compliance verification action, which included the demolition and removal of Facility 1004 in order to remove an attraction for trespassers, was conducted in January and February 1997 (IT, 1997c). A composite chip sample from the concrete floor was collected and analyzed for TCLP SVOC, herbicide, and pesticide/PCBs. The analytical results confirmed the concrete floor was not hazardous waste. Nonfriable ACM ceiling and roofing material was identified and removed from the facility, and the facility was demolished. ACM was handled and disposed of by a licensed subcontractor, and the remainder of the debris was disposed of as construction debris at a solid waste landfill. Analytical results are included in the compliance verification report (IT, 1997c).

Because Facility 1004 has been removed, the selected remedy is no action. The selected remedy for the remaining facilities (1007 and 1008) is no action.

2.2.13 OU-6

OU-6 was created in 1997 to investigate the following sites:

- Old Pesticide/Paint Shop (Facility 742, Site SS-17)(initially investigated under OU-4)
- Base Production Well 6 (BPW6) (Site SS-17)
- Investigative Waste Facility (IWF)
- Decontamination Pad at Building 1069.

RI activities for OU-6 were completed in 1998.

2.3 Characterization of Background Conditions

2.3.1 Regional Background

Regional background concentrations for inorganic species in soils were obtained from surficial soils in Gila, Maricopa, Pima, Pinal, and Yuma Counties in Arizona. Each of the U.S. Geological Survey (USGS) samples was collected from alluvial materials with a geologic provenance similar to the Base. The regional ranges of inorganic species concentrations are shown in Table

2-2. For information regarding elements that were not analyzed by the USGS, normal soil ranges were obtained from *Heavy Metals in Soils* (Alloway, 1990). The data in the Alloway report are based on worldwide averages for uncontaminated soils and have been included to provide additional perspective for values measured at the Base.

All organics generally associated with anthropogenic activity were considered to be site-related, with the exception of polynuclear aromatic hydrocarbon (PAH). Background concentrations were considered for PAHs because these compounds can be naturally distributed throughout the environment, primarily from the combustion of fossil fuels with subsequent atmospheric dispersion and deposition (Gschwend and Hites, 1981; Kawamura and Kaplan, 1983; LaFlamme and Hites, 1978; Thomas, 1986).

2.3.2 Base-Specific Background

The Parties to the FFA agreed that it was necessary to establish Base-specific background levels for metals in surface soil as recommended in the OU-1 RIR (IT, 1992a). Locations for samples were chosen based on evaluation of historic aerial photographs for evidence of past soil disturbance, and on a site walkover and visual review of each area. Disturbance from recent activity was evaluated by examination of the size and type of vegetation present, and by observation of any indication of human intrusion. The number of locations selected was intended to obtain statistically significant results compiled from an adequate number of samples. The areas north, south, and northeast of the runways were designated because they satisfied all criteria (Figure 2-27). It was recognized that the designated areas could contain residual material from jet exhaust, but other considerations such as prevailing wind direction and the fact that all surface portions of the Base east of the runways had been disturbed indicated that the selected areas best represented surface background conditions. Areas off the Base have been more disturbed than on the Base due to agricultural use, and could have been affected by exhaust from jets and crop-dusting planes.

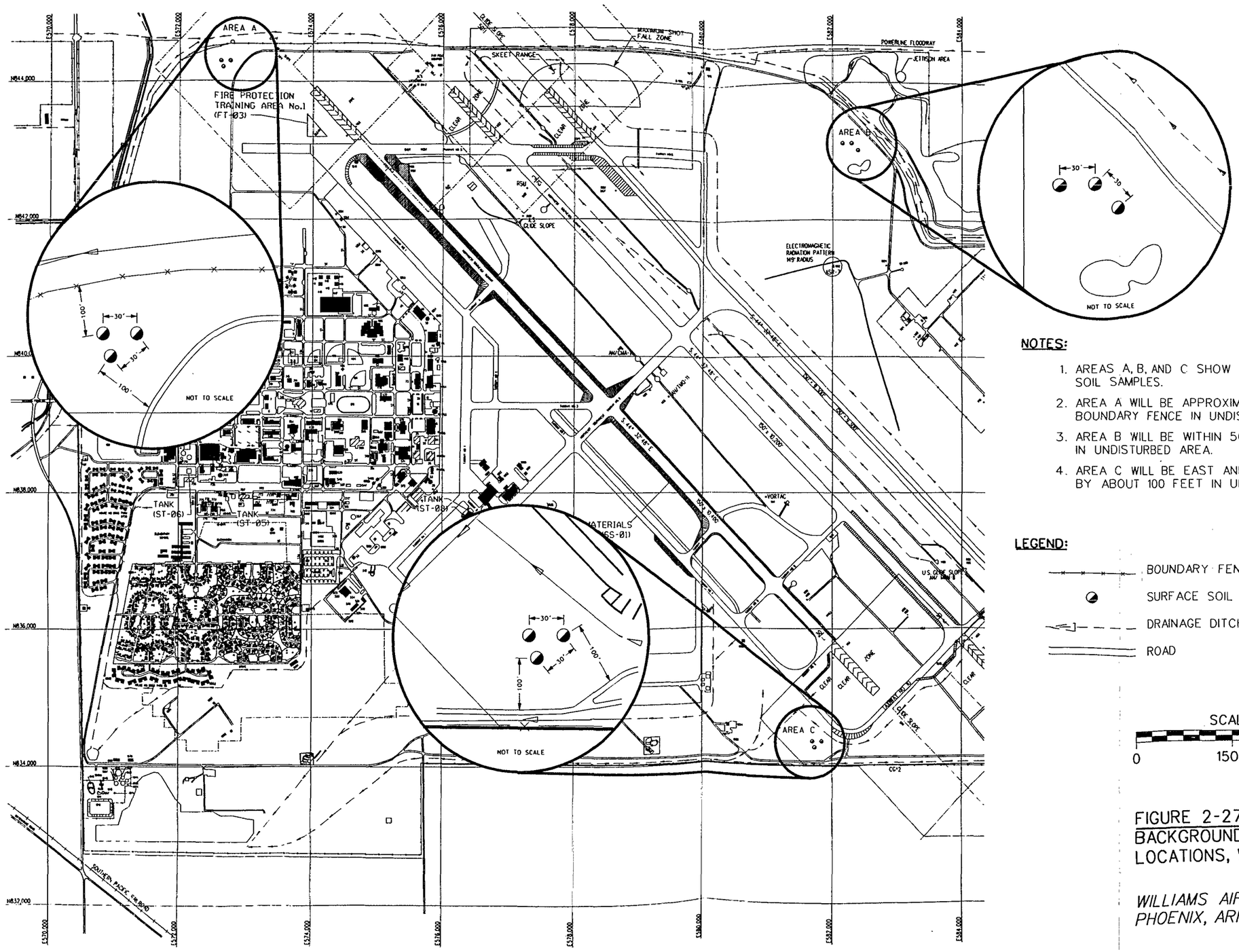
The OU-3 FSP addendum (IT, 1993b), and OU-1 RI work plan addendum (IT, 1993c) specified the exact locations and techniques that were approved by the FFA Parties. Nine surface soil samples and a duplicate were collected in September 1993, and analyzed for antimony, arsenic, beryllium, cadmium, chromium, copper, lead, mercury, nickel, selenium, silver, thallium, and zinc. The analytical results were averaged to determine a Base-specific background value for each metal; Base-specific concentrations and the regional range of concentrations detected for metals in soil are presented in Table 2-2.

Table 2-2

Background Inorganic Species Concentrations in Soil
Operable Unit 4
Williams Air Force Base, Arizona

Constituent	Soil (mg/kg)	
	Base-Specific Range[a]	Regional Range[b]
Antimony	ND[c] (<12)	< 1
Arsenic	2.3 to 4.3	2 to 97
Barium	NA[d]	–[e]
Beryllium	1.0 to 1.6	1.0 to 1.5
Cadmium	ND (<1)	0.01 to 2.0[f]
Chromium	16.9 to 24.8	15 to 100
Cobalt	NA	–
Copper	ND (<5)	15 to 200
Lead	10.4 to 19.4	10 to 100
Mercury	ND (<0.2)	0.01 to 0.5[f]
Nickel	15.6 to 24.7	7 to 50
Selenium	0.21 to 0.24	0.1 to 5[f]
Silver	ND (<2)	0.01 to .8[f]
Thallium	ND (<2)	0.1 to 0.8[f]
Zinc	ND (<4)	25 to 150

[a]The average soil concentration represents the mean of nine surface soil samples plus one duplicate collected at Williams AFB in September 1993. The range presents the low and high values for the ten samples.
[b]Data obtained from surficial soils in Gila, Caricopy, Pima, and Yuma counties.
[c]ND - Not detected.
[d]NA - Not analyzed because this chemical is not a priority pollutant metal. Base-specific background samples were analyzed for priority pollutant metals in accordance with the approved work plan.
[e]"–" Not available.
[f]Data obtained from *Heavy Metals in Soils* (Alloway, 1990).



NOTES:

1. AREAS A, B, AND C SHOW LOCATIONS FOR SURFACE SOIL SAMPLES.
2. AREA A WILL BE APPROXIMATELY 100 FEET SOUTH OF BOUNDARY FENCE IN UNDISTURBED AREA.
3. AREA B WILL BE WITHIN 50 FEET OF BOUNDARY FENCE IN UNDISTURBED AREA.
4. AREA C WILL BE EAST AND NORTH OF PERIMETER ROAD BY ABOUT 100 FEET IN UNDISTURBED AREA.

LEGEND:

- BOUNDARY FENCE
- SURFACE SOIL SAMPLE
- DRAINAGE DITCH
- ROAD

SCALE

0 1500 3000 FEET

FIGURE 2-27
BACKGROUND SURFACE SOIL SAMPLE LOCATIONS, WILLIAMS AFB

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 01/06/98	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD	DWG. NO.: 2581es.512
DRAWN BY: D. BILLINGSLEY	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W. CARTER	PROJ. NO.: 409881
DATE LAST REV.	DRAWN BY:		

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2.3.3 Contaminant Persistence in the Environment

Contaminant persistence in environmental media is determined by the chemical's ability to move through a medium, to transfer from one medium to another, and to transform or degrade. These processes are controlled both by the chemical or element properties and the medium. Migration to groundwater can occur via water infiltration, dispersion, and diffusion. Sorption of chemicals onto soil particles or soil organic matter can reduce migration; similarly, chemically or biologically mediated transformation or degradation of chemicals can reduce migration.

2.3.3.1 Metals

All soils contain naturally-occurring trace levels (background) of most metals; their presence in soils is not necessarily indicative of contamination. Metals can be transformed (oxidized or reduced) so that mobility and toxicity are affected; however, metals cannot be biologically degraded. In the soil, the fate of metals can be found in one or more of the following (Shuman, 1991):

- Dissolved in soil pore water
- Adsorbed on inorganic soil constituents
- Associated with insoluble soil organic matter
- Occupying exchange sites on inorganic constituents
- Precipitated as pure or mixture of solids.

Metals added to soil react with the soil components in a variety of interrelated ways. These reaction mechanisms can generally be classified as inorganic and organic complexation/ speciation, oxidation/reduction reactions, precipitation/dissolution reactions and adsorption/desorption reactions. The reaction mechanisms and rates both in soils and the water column depend on the type and amount of organic matter, clay, and hydrous oxides in the soil. Other factors include soil reaction potential (pH), exchangeable cations, oxidation/reduction potential (Eh), soil/water composition, infiltration rate, and chemical concentration.

A detailed analysis of metal fate and transport, particularly lead, is presented in Chapter 5.0 of the OU-4 RIR (IT, 1997a). The methodology for determination of Arizona minimum and site-specific GPLs is also presented.

2.3.3.2 Organic Compounds

The mobility of organic compounds within soil is affected by chemical processes that are in part due to a chemical's volatility, octanol-water partition coefficient (a measure of the affinity of a chemical to partition from water to organic materials), water solubility, and concentration. In

general, the more water insoluble a compound is, the more likely it is to adsorb on a sediment or organic surface. For several groups of compounds (including phenols, phthalates, and mono-cyclic aromatics such as benzene), volatilization, sorption, and biodegradation are all prominent processes. The behavior of a PAH was found to be a function of the number of rings present. Important processes for this class of compound are sorption and aerobic and anaerobic biodegradation. The fate of chlorinated pesticides is determined by sorption, volatilization, and/or biotransformation.

2.4 Highlights of Community Participation

2.4.1 Ongoing Public Involvement

A community relations plan for the Base was issued in February 1991 (IT, 1991c) and updated in March 1995. This plan listed contacts and interested parties throughout the USAF, government, and the local community. The plan also established communication channels to ensure timely dissemination of pertinent information to the surrounding community through mailings, public announcements in the local newspaper, public meetings, public comment periods, public service announcements, and the establishment of information repositories in local libraries.

Early in the IRP, the Base established a Technical Review Committee (TRC) to provide review and offer comment and recommendations on the progress of the cleanup effort. The TRC included representatives from the USAF and other governmental agencies as well as appointed representatives from the surrounding communities. Governmental agencies represented included EPA Region IX, ADEQ, ADWR, and the Maricopa County Department of Health.

With the advent of Base closure, the TRC was expanded to include additional community stakeholders and is now called the Restoration Advisory Board (RAB). Much the same as a TRC, the RAB acts as a forum for discussion and exchange of information regarding cleanup between the installation, governmental agencies and the community. However, because the RAB provides for an expanded and more diverse membership representing the community, a greater opportunity is afforded to those directly affected by the cleanup process to participate and provide input. This input will be especially valuable as decisions are made regarding transfer and end uses of Base property.

An administrative record that contains the documents relating to investigation and cleanup activities proposed for the Base has been established and is available for public inspection as part

of the information repositories at the Williams Gateway Airport Authority Administrative Offices,5835 South Soffaman Road, Mesa, Arizona, 85212.

2.4.2 Public Involvement Specific to OU-4

The public has been notified of ongoing investigations and results at OU-4 as part of public meetings for OU-3 and OU-2 amendment.

A public meeting was held on November 18, 1997 to review the actions selected for OU-4 sites. See Chapter 10.0 for the responsiveness summary of that meeting. The Proposed Plan for OU-4 was issued on October 28, 1997.

3.0 Scope and Role of Operable Unit

As with many Superfund sites, the environmental problems at Williams AFB are complex. As a result, the USAF has organized the work into the following OUs:

- OU-1 addresses soil and groundwater contamination at the following seven sites:

  - Landfill (LF-04)
  - Fire Protection Training Area No. 1 (FT-03)
  - Northwest Drainage System (SD-10)
  - Radioactive Instrumentation Burial Area (RW-11)
  - Pesticide Burial Area (DP-13)
  - Hazardous Materials Storage Area (SS-01)
  - USTs at four area (ST-05, ST-06, ST-07, ST-08).

- OU-2 addresses soil and groundwater at the Liquid Fuels Storage Area (ST-12). Deep soil at ST-12 was added to OU-2 by OU-2 ROD Amendment 1.

- OU-3 addresses soil and groundwater at the following two sites:

  - Fire Protection Training Area No. 2 (FT-02)
  - Southwest Drainage System (SD-09) (soil only).

- OU-4 addresses investigations of contamination at the following ten sites:

  - Electroplating/Chemical Cleaning Shop (SS-16)
  - OWS - POL Yard (SD-18)
  - Former Skeet Range at the South Desert Village (SS-19)
  - Firing Range/Skeet Range (SS-20)
  - Facilities 1020 and 1051 (SS-21)
  - ASTs 556 and 557 (ST-22)
  - Building 1069 (SS-23)
  - Building 1010 (SS-24)
  - Concrete Hardfill Area (Site LF-26)
  - Facility 1004 (SS-33).

- OU-5 addresses removal actions at the following nine sites:

  - Airfield USTs (ST-25)
  - Paint Shop Leach Field (WP-27)
  - Sewage Sludge Trenches (DP-28) (these were included in the OU-1 remedy)
  - Prime Beef Yard (SS-29)
  - Golf Course Maintenance Area (SS-31)
  - Building 1070 (SS-32)

- Munitions Incinerator (SS-34)
- Concrete Hard Drum Removal Area (LF-26)
- Sewage Sludge Stockpile Area (Area 28).

• OU-6 addresses investigation of contamination at the following sites:

- Old Pesticide/Paint Shop (SS-17)(this was originally investigated under OU-4)
- BPW6 (SS-17)
- IWF
- Decontamination Pad at Building 1069.

The remedy selected in this ROD is designed to be consistent with any subsequent remedies and planned future actions at the Base proposed in all subsequent RODs.

4.0 Risk Assessment

4.1 Introduction

This section summarizes the baseline human health risk assessment for the sites identified below, all of which collectively constitute OU-4. The risk assessment was performed as part of the RI/FS initiated by the USAF under the IRP, in order to determine the risks to human health and the environment, and to determine whether an RA is necessary at a given site. The details of the risk assessment are outlined in Chapter 6.0 of the OU-4 RIR (IT, 1997a). The purpose of this summary is to present the results of the risk assessment which determined the remedial action objectives for this OU. The risk assessment was conducted in accordance with EPA guidance documents, including, but not limited to the following: *Risk Assessment Guidance for Superfund, Volume I, Human Health Evaluation Manual (Part A), Interim Final* (EPA, 1989b) and *Risk Assessment Guidance for Superfund Human Health Risk Assessment, U.S. EPA Region IX Recommendations* (EPA, 1989c).

The following sites that are part of OU-4 are addressed in the risk assessment:

- Electroplating/Chemical Cleaning Shop (SS-16)
- OWS-POL Yard (SD-18)
- Facilities 1020, 1051, and Surrounding Areas (SS-21)
- ASTs 556 and 557 (ST-22)
- Building 1069 (SS-23)
- Building 1010 (SS-24)
- Concrete Hardfill Area (Site LF-26), exclusive of the Drum Removal Area (Area 3-05), which was included in OU-5.

The Former Skeet Range at the South Desert Village (SS-19) and the Firing Range/Skeet Range (SS-20) are included in OU-4. Both sites, however, are primarily contaminated with metallic lead (e.g., lead shot and bullets) in soil. Because of the lack of guidance on metallic lead risk assessments, risk assessments could not be performed for these sites, and they are not addressed herein. Facility 1004 (SS-33) is included in OU-4. As part of Base-wide compliance verification activities performed in January - March 1997, however, the facility was demolished and

removed. Because the contamination of concern to human health associated with Facility 1004 consisted of the concrete floor of the facility, the demolition and removal precluded a risk assessment.

4.2 Identification of Chemicals of Potential Concern

Data collected during the RI were evaluated for use in the risk assessment in accordance with EPA guidelines. This process includes evaluating sample collection and analytical methods used, evaluating the quality of the data, and comparing the data to the following screening criteria:

- ***Frequency of Detection.*** Chemicals are eliminated if they were detected infrequently (5 percent or lower frequency of detection), providing there was no evidence that infrequent detection reflected a "hot spot" location.

- ***Risk-Based Screening.*** Compare concentrations with the EPA (1995a) Region IX residential PRGs for residential soil; chemicals are excluded from further consideration if their concentrations are equal to or less than the PRGs. Also, if no toxicity values for a chemical are available, the chemical is excluded from the list of PRGs. Arizona HBGLs were not used as screening criteria because the PRGs are considered sufficiently protective for screening purposes.

- ***Background.*** If the mean of the site-influenced values is less than the mean of the background values, the chemicals are excluded from further considerations. If the mean of the site-influenced values is marginally greater than its background mean, a students t-test is performed to determine if the former is statistically greater than the latter.

- ***Chemical Specificity.*** Analytical results that are not specific for a particular compound are excluded from further consideration, unless toxicity values are located that reflect sufficiently the toxicity of the chemical (e.g.; JP-4, diesel range organics [DRO]).

The purpose of this selection process is to first identify those chemicals that are likely to be site-related, those that are potentially harmful to human health if they are site-related, and lastly, to evaluate the acceptability of the analytical data for use in the risk assessment (EPA, 1989a). Details of data evaluation, development of the screening criteria, COPC selection and source-term concentration estimation are provided in Section 6.2 of the OU-4 RIR (IT, 1997a).

Media of interest for OU-4 include surface soil (samples collected from 0 to 1 foot bgs), subsurface soil (samples collected at depths greater than 1 foot bgs), and total soil (includes surface and subsurface samples combined). At Building 1010 (Site SS-24), hexane-saturated

wipe samples were taken of removable indoor surface stains. Groundwater was not addressed and no groundwater data were acquired during the OU-4 investigation.

4.2.1 Chemicals of Potential Concern

4.2.1.1 Electroplating/Chemical Cleaning Shop (Facility 1085, Site SS-16)

Chemicals at this site are considered to be in subsurface soil for the purpose of this risk assessment, even though some samples were collected at depths less than 1 foot bgs, because all samples were collected below a concrete layer. The COPC in subsurface soil for Site SS-16 (Appendix B, Table B-1) are:

- Arsenic
- Chromium.

4.2.1.2 OWS-POL Yard (Facility 550, Site SD-18)

No surface soil samples were collected at this site. The chemicals detected in subsurface soil were not selected as COPC because the source-term concentrations of the detected chemicals are less than their respective PRGs (Appendix B, Table B-2).

4.2.1.3 Facilities 1020, 1051, and Surrounding Areas (Site SS-21)

No subsurface soil samples were collected at this site. No COPC were selected from the surface soil at this site because the source-term concentrations of the detected chemicals were less than their respective PRGs (Appendix B, Table B-3).

4.2.1.4 ASTs 556 and 557 (Site ST-22)

No surface soil samples were collected at this site. None of the detected chemicals were selected as COPC because the chemicals were detected in less than 5 percent of total samples or detected concentrations were below their PRGs (Appendix B, Table B-4).

4.2.1.5 Building 1069 (Site SS-23)

No COPC were selected from the surface soil data for this site because the source-term concentrations of the detected chemicals were less than their respective PRGs (Appendix B, Table B-5). No COPC were selected from the total soil data because the source-term concentrations of the detected chemicals were less than their respective PRGs (Appendix B, Table B-6).

4.2.1.6 Building 1010 (Site SS-24)

Most of the organics detected in surface soil were eliminated as COPC because their source-term concentrations were less than their respective PRGs (Appendix B, Table B-7). The COPC in surface soil are:

- Alpha-Chlordane
- Gamma-Chlordane
- Dieldrin.

Most of the organics detected in total soil were eliminated as COPC because their source-term concentrations were less than their respective PRGs (Appendix B, Table B-8). The COPC in total soil are:

- Alpha-Chlordane
- Gamma-Chlordane
- Dieldrin.

Wipe samples of removable surface stains were collected inside Building 1010. All chemicals were selected as COPC because no screening concentrations are available for chemicals in removable surface stains (Appendix B, Table B-9).

4.2.1.7 Concrete Hardfill Area (Site LF-26)

Concern at this site was limited to the possible presence of asbestos and PCBs (see Section 3.5.9 of the OU-4 RIR (IT, 1997a). Sampling and analysis of residual soils following cleanup revealed no asbestos, and all PCB detections were below applicable risk-based screening levels for residential soil. Thus, no COPC were selected.

A summary of COPC selected in soil and surface stains for each site at OU-4 is presented in Table 4-1.

4.2.2 Uncertainties

Uncertainties associated with the collection and laboratory analysis of the sampling data may impact the results of the selection process. These uncertainties result from the possible contamination of samples during collection, preparation, or analysis, and normal variation in the analytical techniques and could result in over- or underestimation of contaminant concentrations. These uncertainties are minimized by the laboratory validation process.

Table 4-1

Selected COPC for Sites at OU-4
Williams Air Force Base, Arizona

COPC in Surface Soil	COPC in Total (or Subsurface) Soil	COPC in Removable Indoor Surface Dust	
Electroplating/Chemical Cleaning (Site SS-16)			
NS*	Arsenic Chromium	NS	
OWS-POL (Site SD-18)			
NS	No COPC	NS	
Facilities 1020, 1051 and Surrounding Areas (Site SS-21)			
No COPC	No COPC	NS	
ASTs 556 and 557 (Site ST-22)			
NS*	No COPC	NS	
Building 1069 (Site SS-23)			
No COPC	No COPC	NS	
Building 1010 (Site SS-24)			
Dieldrin Alpha-chlordane Gamma-chlordane	Dieldrin Alpha-chlordane Gamma-chlordane	4,4'-DDE Aldrin Gamma-BHC Gamma-chlordane Endosulfan sulfate Endrin ketone	4,4'-DDT Beta-BHC Delta-BHC Alpha-chlordane Endosulfan I Endrin Heptachlor
Concrete Hardfill (Site LF-26)			
No COPC	No COPC	NS	

NS = Medium not sampled.
* COPC in subsurface soil for the purpose of the risk assessment.

4.3 Exposure Assessment

This section presents the estimation of potential exposures of human or environmental receptors to chemicals found at the site. Exposure is defined as the contact of a receptor with a chemical. Exposure assessment is the estimation of the magnitude, frequency, and duration of contact for each identified route of exposure. The magnitude of an exposure is determined by estimating the amount of chemical available at the receptor exchange boundaries (i.e., lungs, gastrointestinal tract, or skin) during a specified time period. The general procedure for conducting an exposure assessment is (EPA, 1989b):

- Characterization of exposure setting
- Identification of potential receptors and exposure pathways
- Estimation of exposure-point concentrations
- Quantification of exposure (where possible).

4.3.1 Receptor Assessment

The objective of the receptor assessment is to identify potential human and environmental populations that may be exposed to site-related chemicals at the Base under current and future land-use conditions. The assessment considers both on- and off-Base populations and their relationship to the potential migration pathways for site-related chemicals.

4.3.1.1 On-Base Land Use

The Base is relatively small when compared to most USAF bases. It was closed on September 30, 1993 and transferred from the Air Force's ATC to the Air Force Base Conversion Agency. This agency is working with the local community through the RAB and the Williams Redevelopment Partnership. The Partnership has maximized reuse for aviation, education, commercial, and industrial uses. The Base has been divided into reuse parcels identified as airfield, commercial, aviation support, air cargo, general industrial, education/research/training, institutional/medical, and schools. Leases have been negotiated for several industrial areas. ASU has established a branch campus at the Base. Current and projected future land use for the sites included in OU-4 are summarized in Table 4-2.

4.3.1.2 Off-Base Land Use

The Base is relatively isolated from any large metropolitan area. Located in Maricopa County, it is surrounded mostly by agricultural land, which has had a long history of intensive uses, predominantly production of citrus, cotton, and alfalfa. Smaller urban areas such as the City of Mesa, the Town of Gilbert, and the City of Apache Junction are located 5 to 15 miles northeast and northwest of the Base. Off-base land use is not expected to change.

Table 4-2

Land-Use Scenarios, OU-4
Williams Air Force Base, Arizona

Site	Current Land Use	Future Land Use
Electroplating/Chemical Cleaning (Site SS-16)	Industrial	Industrial under Williams Gateway Airport, limited access
OWS-POL (Site SD-18)	Industrial	Same as current under Williams Gateway Airport, limited access
Former Skeet Range at South Desert Village (Site SS-19)	Residential	Land use restricted to nonresidential, but occupation of housing allowed after completion of RA and in accordance with the deed restrictions and the requirements of the O&M manual
Firing Range/Skeet Range (Site SS-20)	Industrial	Industrial under Williams Gateway Airport, limited access, deed restricted to nonresidential
Facilities 1020, 1051 (Site SS-21)	Industrial	Industrial under Williams Gateway Airport, limited access
ASTs 556 and 557 (Site ST-22)	Industrial	Same as current under Williams Gateway Airport, limited access
Building 1069 (Site SS-23)	Industrial	Same as current under Arizona State University
Building 1010 (Site SS-24)	Industrial	Deed restricted to nonresidential
Concrete Hardfill (Site LF-26)	Industrial	Industrial under Williams Gateway Airport, limited access

The receptors selected for evaluation in the risk assessment include a trespasser, occupational worker, resident and construction worker (Figures 4-1 and 4-2). These receptors reflect the current and future land-use scenarios described above. Details regarding the rationale for selecting the receptors to be evaluated at each site are presented in Section 6.3.5 of the OU-4 RIR (IT, 1997a).

4.3.2 Identification of Potential Exposure Pathways

For exposures to occur, complete exposure pathways must exist. A complete exposure pathway requires (EPA, 1989b):

- A source and mechanism for release of the chemical
- An environmental transport pathway
- A point of potential human contact
- An exposure route at the exposure point.

If any one of these four components is absent, then an exposure pathway is incomplete. The Conceptual Site Model for OU-4 (Figures 4-1 and 4-2) provides a visual overview of all the potential exposure pathways considered here. Details regarding the rationale for selecting the potential exposure pathways for each receptor at each site are presented in Section 6.3.5 of the OU-4 RIR (IT, 1997a).

4.3.3 Quantification of Exposure-Point Concentrations

4.3.3.1 Exposure-Point Concentrations in Soil and Indoor Dust

Potential scenarios include direct (ingestion and dermal) and indirect (inhalation of VOCs/ fugitive dust) exposure pathways for surface and total soil. The source-term concentrations presented in Tables B-1 through B-9 for surface soil, subsurface soil, total soil, and indoor dust serve as the exposure-point concentrations for direct exposure (incidental ingestion and dermal contact) for all receptors.

4.3.3.2 Exposure-Point Concentrations in Ambient Air

COPC concentrations in ambient air potentially arise from volatilization of VOCs and emissions of COPC-bearing dust from soil resulting from activity on the site. COPC concentrations in ambient air inside a building can arise from resuspension of COPC-bearing removable surface dust. Presented in the following paragraphs are the models used to estimate exposure-point concentrations for indirect exposure via ambient air.

Figure 4-1
Conceptual Site Model For Sites SS-16, SD-18, SS-21, ST-22
OU-4 , Williams Air Force Base

SITES	SOURCE MEDIUM	TRANSPORT MECHANISM	EXPOSURE MEDIUM	EXPOSURE ROUTE	HYPOTHETICAL RECEPTORS: CURRENT LAND USE: School-age Trespasser	CURRENT LAND USE: Occupational	FUTURE LAND USE: School-age Trespasser	FUTURE LAND USE: Residential	FUTURE LAND USE: Occupational	FUTURE LAND USE: Construction worker
SS-16										
	SUBSURFACE SOIL		Soil	Incidental ingestion	1	2	1	1	2	●
				Dermal contact	1	2	1	1	2	●
		Resuspension/ volatilization	Air	Inhalation (dust, VOCs)	1	2	1	1	2	●
SD-18, ST-22										
	SUBSURFACE SOIL		Soil	Incidental ingestion	1	2	1	1	2	●
				Dermal contact	1	2	1	1	2	●
		Resuspension/ volatilization	Air	Inhalation (dust, VOCs)	1	2	1	1	2	●
SS-21										
	SURFACE SOIL		Soil	Incidental ingestion	1	●	1	1	●	●
				Dermal contact	1	●	1	1	●	●
		Resuspension/ volatilization	Air	Inhalation (dust, VOCs)	1	●	1	1	●	●

NOTE:
- ● = Exposure pathway quantified
- 1 = Not at potential receptor at the site under given land use scenario
- 2 = Receptors exposed to surface soil only

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Figure 4-2
Conceptual Site Model For Sites SS-23, SS-24, LF-26
OU-4 , Williams Air Force Base

SITES	SOURCE MEDIUM	TRANSPORT MECHANISM	EXPOSURE MEDIUM	EXPOSURE ROUTE	HYPOTHETICAL RECEPTORS: CURRENT LAND USE: School-age Trespasser	CURRENT LAND USE: Occupational	FUTURE LAND USE: School-age Trespasser	FUTURE LAND USE: Residential	FUTURE LAND USE: Occupational	FUTURE LAND USE: Construction worker
SS-23										
	SURFACE AND SUBSURFACE SOIL		Soil	Incidental ingestion	1	●	●	1	●	●
				Dermal contact	1	●	●	1	●	●
		Resuspension/ volatilization	Air	Inhalation (dust, VOCs)	1	●	●	1	●	●
SS-24										
	SURFACE AND SUBSURFACE SOIL		Soil	Incidental ingestion	1	●	●	1	●	●
				Dermal contact	1	●	●	1	●	●
		Resuspension/ volatilization	Air	Inhalation (dust, VOCs)	1	●	●	1	●	●
	INDOOR SURFACE DUST		Dust	Dermal contact	1	●	●	1	●	●
		Resuspension	Air	Inhalation of dust	1	●	●	1	●	●
LF-26										
	SURFACE AND SUBSURFACE SOIL		Soil	Incidental ingestion	1	●	1	1	●	●
				Dermal contact	1	●	1	1	●	●
		Resuspension/ volatilization	Air	Inhalation (dust, VOCs)	1	●	1	1	●	●

NOTE:

● = Exposure pathway quantified
* = Pulverized concrete treated as soil for the purpose of the risk assessment

1 = Not at potential receptor at the site under given land use scenario
2 = Residential child provides upper bound estimate for this receptor

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Dust Emissions. Inhalation exposure to particulate emissions from soils arises from construction or other site activities that raise dust. Therefore, the most appropriate approach to estimating chemical concentrations in ambient air is the use of an activity-based dust loading equation (U.S. Department of Energy [DOE], 1989). Details of the model are presented in Section 6.3.6.2 of the OU-4 RIR (IT, 1997a).

Volatilization from Soil. Exposure-point concentrations of VOCs in ambient air due to volatilization from soil are estimated with a chemical-specific soil volatilization factor derived from an EPA (1991) approved model. Details of the model are discussed in Section 6.3.6.2 of the OU-4 RIR (IT, 1997a).

4.3.4 Quantification of Chemical Intake

Estimation of chemical intake followed the guidance provided by EPA (1989a) as illustrated by the following general equation:

$$CDI = \frac{(C)(IR)(ET)(EF)(ED)}{(BW)(AT)} \qquad \text{Eq. 4-1}$$

where:

CDI	=	chronic daily intake
C	=	concentration of COPC in medium of interest
IR	=	contact or intake rate
ET	=	exposure time
EF	=	exposure frequency
ED	=	exposure duration
BW	=	body weight
AT	=	averaging time.

Details regarding pathway- and receptor-specific equation refinements and the units of measurement used to quantify exposure are presented in Section 6.3.7 of the OU-4 RIR (IT, 1997a).

IR is a compound term, for dermal exposure to soil or dust, consisting of the surface area of exposed skin (SA), the amount of soil that adheres to a given area of skin (AF), and the extent to which chemicals are dermally absorbed from soil (ABS). Among potential residential receptors, children are often more sensitive than adults because of their behavior (e.g., greater absolute soil incidental ingestion rate) and physiological characteristics (e.g., soil ingestion rate and inhalation rate expressed on a body weight basis). Therefore, for some estimates, contact rate, exposure

duration and body weight are combined to form an age-adjusted soil ingestion factor ($IngF_{adj}$) or an age-adjusted inhalation factor ($InhF_{adj}$) to account for the time that a resident may spend as a child. The exposure variable values used to quantify CDI are summarized in Table 4-3.

The intake model variables generally reflect 50th or 95th percentile values, which, when applied to the exposure-point concentrations, ensure that the estimated intakes represent the reasonable maximum exposure (RME). The RME scenario also accounts for exposures to sensitive subpopulations such as infants, children, elderly persons, and pregnant and nursing women.

4.3.5 Uncertainties

There are several sources of uncertainty in the exposure assessment process that may impact the risk assessment. These include: current and future land-use assumptions, accuracy and precision of the models to estimate exposure-point concentrations, evaluation of exposure pathways, and exposure parameter values. A detailed discussion of uncertainties is given in Section 6.6 of the OU-4 RIR (IT, 1997a).

4.4 Toxicity Assessment

4.4.1 Purpose of the Toxicity Assessment

The toxicity assessment provides information regarding the type and severity of adverse health effects that could result from exposure to COPCs and a measure of the dose-response relationship for each chemical. These dose-response relationships for oral, inhalation, and dermal toxicity are expressed quantitatively as slope factors (SF) and reference doses (RfD).

SFs, or cancer potency factors, are developed by the EPA for estimating excess incremental lifetime cancer risks (ILCR) associated with exposure to potentially carcinogenic chemicals. SFs, which are expressed in units of $(mg/kg\text{-}day)^{-1}$, are multiplied by the estimated CDI of a potential carcinogen, in mg/kg-day, to estimate an upper-bound of the ILCR associated with exposure at that intake level. "Upper bound" reflects the conservative estimate of the risks calculated from the SF. This approach makes underestimation of the actual cancer risk highly unlikely. SFs are derived from the results of human epidemiological studies or chronic animal bioassays to which animal-to-human extrapolation has been applied.

RfDs are developed by the EPA for indicating the potential for adverse noncancer health effects from exposure to chemicals. RfDs, which are expressed in units of mg/kg-day, are estimates of chronic daily exposure levels for humans, including sensitive individuals. Estimated intakes of

Table 4-3

Variables Used to Estimate Potential Chemical Intakes and Contact Rates for Receptors[a], OU-4 Williams Air Force Base, Arizona

(Page 1 of 2)

Pathway Variable	Occupational Worker	Construction Worker	School Age Trespasser	Residential
General Parameters Used in All Intake Models				
ED (years)	25	1	12	NA
ED_a (years)	NA	NA	NA	30
ED_c (years)	NA	NA	NA	6
EF (days/year)	250	250	168	350
f_r (unitless)	NA	NA	NA	0.5
BW (kg)	70	70	42	70
$BW_{a\,(kg)}$	NA	NA	NA	70
BW_c (kg)	NA	NA	NA	15
AT-Noncancer (days)	9125	365	4380	10950
AT-Cancer (days)	25550	25550	25550	25550
Inhalation of VOCs and Resuspended Dust from Soil				
IR_a (m^3/hour)	2.5	2.5	3.2	NA
IRA_a (m^3/day)	NA	NA	NA	20
IRA_c (m^3/day)	NA	NA	NA	10
$InhF_{adj}$ (m^3-yr/kg-day)	NA	NA	NA	10.9
ET (hours/day)	8	8	1.4	8
Incidental Ingestion of Soil				
IR_s (mg/day)	50	158	100	NA
IRS_a (mg/day)	NA	NA	NA	100
IRS_c (mg/day)	NA	NA	NA	200
$IngF_{adj}$ (mg-yr/kg-day)	NA	NA	NA	114.3
Dermal Contact with Soil				
SA_s (cm^2)	3200	6100	2300	NA
SA_d	840	2000	2700	NA
SA_{sa} (cm^2)	NA	NA	NA	3500

Table 4-3

Variables Used to Estimate Potential Chemical Intakes and Contact Rates for Receptors[a], OU-4 Williams Air Force Base, Arizona

(Page 2 of 2)

Pathway Variable	Occupational Worker	Construction Worker	School Age Trespasser	Residential
SA_{sc} (cm^2)	NA	NA	NA	1300
SFS_{adj} (mg-yr/kg-day)	NA	NA	NA	344
AF (mg/cm^2)	0.2	0.2	0.2	0.2
ABS (unitless)	csv	csv	csv	csv

[a]See Sections 6.3.7 and 6.3.8, and Table 6-14 of OU-4 RIR(IT, 1997) for justification and references for the variable values.

NA = Not applicable.
csv = Chemical-specific value.

chemicals from environmental media (e.g., the amount of a chemical ingested from contaminated soil) can be compared to the RfD. RfDs are derived from human epidemiological studies or animal studies to which uncertainty factors are applied (i.e., to account for the use of animal data to predict effects on humans). These uncertainty factors help ensure that the RfDs will not underestimate the potential for adverse noncancer effects to occur.

The sources of these values are generally the Integrated Risk Information System (IRIS) (EPA, 1997) and the Health Effects Assessment Summary Tables (HEAST) (EPA, 1995b). The toxicity information is summarized in Tables 4-4 and 4-5.

Dermal toxicity values are derived from the corresponding oral values, provided there is no evidence to suggest that dermal exposure induces exposure route-specific effects that are not appropriately modeled by oral exposure data. In the derivation of dermal toxicity values, the oral value is adjusted by the gastrointestinal absorption factor (GAF), expressed as a decimal fraction. The resulting dermal toxicity value is based on absorbed dose. This derivation is appropriate, because dermal doses are expressed as absorbed rather than exposure or contact doses. The dermal toxicity values are presented in Table 4-6.

4.4.2 Uncertainty

Considerable uncertainty is associated with the qualitative (hazard assessment) and quantitative (dose-response) evaluations of a toxicity assessment. Hazard assessment of carcinogenicity is evaluated as a weight-of-evidence determination. Positive animal cancer test data suggest that humans also contain tissue(s) that may manifest a carcinogenic response; however, the animal data cannot necessarily be used to predict the target tissue in humans. In the hazard assessment of noncancer effects, however, positive animal data suggest the nature of the effects (i.e., the target tissues and type of effects) anticipated in humans (EPA, 1989c). Uncertainty is decreased when similar effects are observed across species, strain, sex, and exposure route; when the magnitude of the response is clearly dose-related; when pharmacokinetic data indicate a similar fate in animals and humans; when postulated mechanisms of toxicity are similar for humans and animals; and when the COPC is structurally similar to other chemicals for which the toxicity is more completely characterized.

There are many sources of uncertainty in the dose-response evaluation for cancer (i.e., computation of a slope factor or unit risk) and noncancer effects (i.e., computation of an RfD). First is the uncertainty regarding interspecies (animal-to-human) extrapolation. Second is the uncertainty regarding intraspecies, or individual, variation. Most toxicity experiments are

Table 4-4

Summary of Slope Factors (SF) for COPC[a], OU-4
Williams Air Force Base, Arizona

(Page 1 of 2)

Constituent	Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight of Evidence	Inhalation Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight of Evidence
METALS				
Arsenic	1.5	A	15.1	A
Chromium VI	NL	NL	42.0	A
ORGANICS				
Aldrin	17	B2	17	B2
Beta-BHC	1.8	C	1.8	C
Delta-BHC[c]	1.8	B2	1.8	B2
Gamma-BHC (Lindane)	1.3	B2-C	NL	NA
Alpha-chlordane	1.30	B2	1.29	B2
Gamma-chlordane	1.30	B2	1.29	B2
DDE	0.34	B2	NL	NA
DDT	0.34	B2	0.34	B2
Dieldrin	16.0	B2	16.1	B2
Endosulfan I	NL	NA	NL	NA
Endosulfan Sulfate	NL	NA	NL	NA
Endrin	NL	NA	NL	NA
Endrin Ketone	NL	NA	NL	NA
Heptachlor	4.50	B2	4.55	B2

Table 4-4

Summary of Slope Factors (SF) for COPC[a], OU-4
Williams Air Force Base, Arizona

Constituent	Oral Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight of Evidence	Inhalation Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$	Weight of Evidence
Hexacholorobenzene	1.60	B2	1.61	B2
Pentachlorophenol	0.12	B2	NL	NL

NL = Not listed.
NA = Not applicable
[a] Details of the cancer assessment are presented in Section 6.4.1 and Table 6-16 of the OU-4 RIR (IT, 1997).

Table 4-5

Summary of Reference Doses (RfD) for COPC[a], OU-4
Williams Air Force Base, Arizona

(Page 1 of 2)

Constituent	Oral Reference Dose (RfD) (mg/kg-day)	Target Organ	Uncertainty Factor	Inhalation Reference Dose (RfD) (mg/kg-day)	Target Organ	Uncertainty Factor
METALS						
Arsenic	3.00×10^{-4}	Skin	3	NL	NL	NL
Chromium VI	5.00×10^{-3}	ND	500	NL	NL	NL
ORGANICS						
Aldrin	3×10^{-5}	Liver	1000	NL	NL	NL
Gamma-BHC	3×10^{-4}	Liver	1000	NL	NL	NL
Alpha-chlordane	6×10^{-5}	Liver	1000	NL	NL	NL
Gamma-chlordane	6×10^{-5}	Liver	1000	NL	NL	NL
Dieldrin	5×10^{-5}	Liver	100	NL	NL	NL
DDE	NL	NA	NA	NL	NA	NA
DDT	5×10^{-4}	Liver	100	NL	NL	NL
Endosulfan I	6.00×10^{-3}	Kidney	100	NL	NL	NL
Endosulfan Sulfate	6.00×10^{-3}	Kidney	100	NL	NL	NL
Endrin	3.00×10^{-4}	Nervous System	100	NL	NL	NL
Endrin Ketone	3.00×10^{-4}	Nervous System	100	NL	NL	NL
Heptachlor	5×10^{-4}	Liver	300	NL	NL	NL

Table 4-5

Summary of Reference Doses (RfD) for COPC[a], OU-4
Williams Air Force Base, Arizona

(Page 2 of 2)

Constituent	Oral Reference Dose (RfD) (mg/kg-day)	Target Organ	Uncertainty Factor	Inhalation Reference Dose (RfD) (mg/kg-day)	Target Organ	Uncertainty Factor
Hexacholorobenzene	8×10^{-4}	Liver	100	NL	NL	NL
Pentachlorophenol	3×10^{-2}	Fetus	100	NL	NL	NL

ND - Not determined.
NL - Not listed.
[a] Details of the noncancer assessment are presented in Section 6.4.2 and Table 6-17 of the OU-4 RIR (IT, 1997).

Table 4-6

Summary of Dermal Reference Doses and Dermal Cancer Slope Factors[a] Williams Air Force Base, Arizona

Constituent	GAF	Oral Reference Dose (RfD) (mg/kg-day)	Oral Factor (SF) (mg/kg-day)	Dermal Reference Dose (RfD) (mg/kg-day)	Dermal Slope Factor (SF) $(mg/kg\text{-}day)^{-1}$
METALS					
Arsenic	0.95	3.00e-04	1.5	2.85e-04	1.58e+00
Chromium VI	0.05	5.00e-03	NL	2.50e-04	NA
ORGANICS					
Aldrin	0.9	3.00e-05	17	2.70e-05	1.89e+01
Beta-BHC	0.9	NL	1.8	NL	2.00e+00
Delta-BHC	0.9	NL	1.8	NL	2.00e+00
Gamma-BHC (Lindane)	0.9	3.00e-04	1.3	2.70e-04	1.44e+00
Alpha-chlordane	0.9	6.00e-05	1.30	5.40e-05	1.44e+00
Gamma-chlordane	0.9	6.00e-05	1.30	5.40e-05	1.44e+00
DDE	0.9	NL	0.34	NL	3.78e-01
DDT	0.9	5.00e-04	0.34	4.50e-04	3.78e-01
Dieldrin	0.9	5.00e-05	16.0	4.50e-05	1.78e+01
Endosulfan I	0.9	6.00e-03	NL	5.40e-03	NA
Endosulfan Sulfate	0.9	6.00e-03	NL	5.40e-03	NA
Endrin	0.9	3.00e-04	NL	2.70e-04	NA
Endrin Ketone	0.9	3.00e-04	NL	2.70e-04	NA
Heptachlor	0.9	5.00e-04	4.50	4.50e-04	5.00e+00
Hexacholorobenzene	0.9	8.00e-04	1.60	7.20e-04	1.78e+00
Pentachlorophenol	0.9	3.00e-02	0.12	2.70e-02	1.33e-01

[a]Details regarding selection of GAF and derivation of dermal toxicity values are provided in Sections 6.4.3, 6.4.4, and Table 6-18 of the OU-4 RIR (IT, 1997).

NA = Not applicable because oral toxicity value not listed.
NL = Oral toxicity values not listed.

performed with animals that are very similar in age and genotype, so that intragroup biological variation is minimal, but the human population of concern may reflect wide heterogeneity including unusual sensitivity to the COPC. Third, uncertainty arises from the quality of the key study (from which the quantitative estimate is derived) and the database.

4.5 Risk Characterization

4.5.1 Methodology

The risk characterization is a quantitative estimate of the potential health risks associated with the intake of COPC at OU-4. ILCRs are determined by multiplying the CDI with the SF. The resultant risks are probabilities that are generally expressed in scientific notation (e.g., 1×10^{-6}). An ILCR of 1×10^{-6} indicates that, as a plausible upper bound, an individual has a one-in-one-million chance of developing cancer as a result of site-related exposure to a carcinogenic COPC over a 70-year lifetime under the specific exposure conditions evaluated for the site.

Potential concern for noncancer effects of a single COPC in a single medium is expressed as the hazard quotient (HQ), or the ratio of the estimated intake derived from the COPC concentration in a given medium to the COPC's RfD. By adding the HQs for all contaminants within a medium or across all media to which a given receptor may reasonably be exposed, the hazard index (HI) can be calculated. The HI provides a useful reference point for gauging the potential significance of multiple contaminant exposures within a single medium or across media.

In addition, a screening level risk evaluation estimates cancer risk and noncancer hazard for a hypothetical residential receptor exposed to surface and/or subsurface soil. The residential evaluation is presented as a screening level evaluation, rather than a typical baseline risk assessment evaluation because residential exposure is not plausible for most sites, and the evaluation is performed largely to determine if land-use restrictions are needed on any parcel. Also, the default assumptions used by EPA (1995a) to derive the Region IX PRGs are used without modification; i.e., there is no need to introduce site-specific variable values.

The screening level residential evaluation consists of two steps:

- Screening against frequency of detection and background (Section 4.2) to select chemicals included in the residential scenario evaluation.

- Dividing the source-term concentrations by the PRGs (separate evaluations are performed for cancer and noncancer endpoints), and multiplying the result by the target risk (10^{-6}) or target HI (1) of the PRG. The products are then summed to estimate total site cancer risk and total site HI.

The screening level ILCR must not exceed 10^{-6} and the HI must not exceed 1 for a parcel to be released without restriction for residential use (ADEQ, 1996). Further details and the quantitative screening risk/hazard estimates are provided in Sections 6.5.1.3 and 6.5.2.10 of the OU-4 RIR (IT, 1997a). The quantitative estimates are compiled in Table 4-7 and conclusions are presented below.

4.5.2 Risk Characterization Results and Discussion

4.5.2.1 Electroplating/Chemical Cleaning Shop (Facility 1085, Site SS-16)

As shown in Figure 4-1, there are no plausible receptors at this site for the current land-use scenario, and the construction worker exposed to subsurface soil is the only plausible receptor for the future land-use scenario. ILCRs and HIs for the construction worker at this site are presented in Tables B-10 and B-11, respectively. From Table B-10 it is seen that the total site ILCR of 1.2 x 10^{-6} is below the limit of 10^{-4} that is acceptable to ADEQ (1996) for nonresidential land use. From Table B-11 it is seen that the total site HI for the construction worker is 5.5 x 10^{-2}, less than the acceptable limit of 1.0 (ADEQ, 1996).

As noted in Table 4-7, the residential screening level ILCR is 6.9 x 10^{-6}, which exceeds the 10^{-6} limit for unrestricted release for residential development (ADEQ, 1996). It is concluded that COPC at this site do not pose an unacceptable hazard or risk to plausible human receptors for non-residential land use.

4.5.2.2 OWS - POL Yard (Site SD-18)

No COPC were selected in subsurface soil at this site; therefore, it is concluded that the chemicals in soil at this site do not pose an unacceptable hazard or risk to human health under the current and future land-use conditions. As noted in Table 4-7, the residential screening level ILCR and HI do not exceed the residential standards (ADEQ, 1996). It is concluded that this site does not pose unacceptable risk or hazard under residential and non-residential land use conditions.

Table 4-7

Summary of Residential Screening Level Risks/Hazards for Sites at OU-4 Williams Air Force Base, Arizona

Site / Medium	Total Site ILCR	Total Site HI
Electroplating/Chemical Cleaning (Site SS-16) / Subsurface Soil	6.9×10^{-6}	3.0×10^{-1}
OWS-POL (Site SD-18) / Subsurface Soil	3.9×10^{-9}	2.7×10^{-2}
Facilities 1020, 1051 and Surrounding Areas (Site SS-21) / Surface Soil	9.8×10^{-7}	4.2×10^{-5}
ASTs 556 and 557 (Site ST-22) / Subsurface Soil	$0.0 \times 10^{+0}$	7.1×10^{-3}
Building 1069 (Site SS-23) / Surface Soil	1.8×10^{-9}	5.4×10^{-1}
Building 1069 (Site SS-23) / Total Soil	1.8×10^{-9}	4.0×10^{-2}
Building 1010 (Site SS-24) / Surface Soil	1.3×10^{-5}	7.4×10^{-1}
Building 1010 (Site SS-24) / Total Soil	1.1×10^{-5}	6.7×10^{-1}
Concrete Hardfill (Site LF-26)	Not evaluated; PCB levels below ADEQ health-based guidance levels (see Section 4.2.1.7).	

ILCR = Incremental Lifetime Cancer Risk
HI = Hazard Index

4.5.2.3 Facilities 1020, 1051, and Surrounding Areas (Site SS-21)

No COPC were selected in surface soil at this site; therefore, it is concluded that the chemicals in soil at this site do not pose an unacceptable hazard or risk to human health under the current and future land-use conditions. As noted in Table 4-7, the residential screening level ILCR and HI do not exceed the residential standards. Because of a concern by ADEQ about residual contamination from spent bullets on the ground surface, the site may pose an unknown risk or hazard under residential land use conditions.

4.5.2.4 ASTs 556 and 557 (Site ST-22)

No COPC were selected in subsurface soil at this site; therefore, it is concluded that the chemicals in soil at this site do not pose an unacceptable hazard or risk to human health under the current and future land-use conditions. As noted in Table 4-7, the residential screening level ILCR and HI do not exceed the residential standards (ADEQ, 1996). It is concluded that this site does not pose unacceptable risk or hazard under residential and non-residential land use conditions.

4.5.2.5 Building 1069 (Site SS-23)

No COPC were selected in surface soil or total soil at this site; therefore, it is concluded that the chemicals in soil at this site do not pose an unacceptable hazard or risk to human health under the current and future land-use conditions. As noted in Table 4-7, the residential screening level ILCR and HI for either surface or total soil do not exceed the residential standards (ADEQ, 1996). It is concluded that this site does not pose unacceptable risk or hazard under residential and nonresidential land use conditions.

4.5.2.6 Building 1010 (Site SS-24)

As shown in Figure 4-2, the occupational worker is a receptor under the current and future land-use scenario. The construction worker and the school-age trespasser are receptors under the future land-use scenarios.

ILCRs and HIs for the construction worker exposed to total soil and concrete stains (wipe samples) under the future land-use scenario at this site are presented in Tables B-10 and B-11, respectively. From Table B-10 it is seen that the total site ILCR of 2.6×10^{-6} is below the limit of 10^{-4} that is acceptable to ADEQ (1996) for nonresidential land use. From Table B-11 it is seen that the total site HI for the construction worker is 3.3×10^{-1}, less than the acceptable limit of 1.0 (ADEQ, 1996).

ILCRs and HIs for the occupational worker exposed to surface soil and concrete stains under current and future land-use scenarios at this site are presented in Tables B-12 and B-13 respectively. From Table B-12 it is seen that the total site ILCR of 2.9×10^{-5} is below the limit of 10^{-4} that is acceptable to ADEQ (1996) for nonresidential land use. From Table B-13 it is seen that the total site HI for the occupational worker is 1.4×10^{-1}, less than the acceptable limit of 1.0 (ADEQ, 1996). Risks to this receptor under current and future land-use scenarios are identical because the exposure-point concentrations are the same for both the scenarios.

ILCRs and HIs for the school-age trespasser exposed to surface soil and concrete stains under the future land-use scenario at this site are presented in Tables B-14 and B-15, respectively. From Table B-14 it is seen that the total site ILCR of 4.4×10^{-5} is below the limit of 10^{-4} that is acceptable to ADEQ (1996) for nonresidential land use. From Table B-15 it is seen that the total site HI is 4.1×10^{-1}, less than the acceptable limit of 1.0 (ADEQ, 1996).

As noted in Table 4-7, the residential screening level ILCR is 1.3×10^{-5} for surface soil and 1.1×10^{-5} for total soil, which exceed the 10^{-6} limit for unrestricted release for residential development (ADEQ, 1996). It is concluded that COPC at this site do not pose an unacceptable hazard or risk to plausible human receptors for non-residential land use. Because this site has acceptable risks only under the nonresidential scenario, the Air Force will initiate institutional controls, such as a VEMUR and a deed restriction, as an RA on this site.

4.5.2.7 Concrete Hardfill Area (Site LF-26)

PCBs in residual soil are the only chemicals of interest at this site. No COPC were selected because all PCB detections were below applicable risk-based screening levels for residential soil. It is concluded that this site does not pose unacceptable risk or hazard for non-residential or residential land use.

4.6 Uncertainties

A risk assessment is an integrated evaluation of historical, chemical, analytical, environmental, demographic, and toxicological data that are as site-specific as possible. Uncertainty plays a major role in the final results of a risk assessment and exists at every stage of the risk assessment. Following is a list of some of the major sources of uncertainty in the OU-4 risk assessment:

- Projected future land-use assumptions
- Source-term concentrations, due to variations in the sample analytical results
- Input values for environmental fate and transport models
- Input values for exposure assessment models
- Accuracy with which the fate and transport and the exposure models themselves represent environmental processes and the behavior of the hypothetical receptors
- High-to-low dose and interspecies extrapolations for dose-response relationships.

It is not possible to eliminate all uncertainty; thus, to minimize the possibility of underestimating risk, each step is biased toward health-protective estimations. For example, the RME scenario uses upper-bound values for environmental medium contact rates (e.g., soil ingestion, air inhalation, and dermal contact rates), exposure frequency and exposure duration, ensuring risk estimates that are biased toward conservatism.

The toxicity values are also biased toward conservatism. Worst-case assumptions are used regarding human sensitivity and the adversity of observed effects in the derivation of RfDs for noncancer effects. The SFs for cancer reflect an upper limit on the dose-response relationship, resulting in an upper-bound estimate on risk.

Because each step builds on the previous one, this biased approach mathematically compounds, and should more than compensate for, risk assessment uncertainties. In addition, these calculations do not represent currently existing or expected future exposure or health risks. Rather, they are estimates of potential risk only if all of the conservative exposure assumptions are realized.

This qualitative discussion of uncertainty is not intended to discredit the calculated results, but to point out that risks are calculated for a specific hypothetical scenario under well defined constraints. Recognition of uncertainties is fundamental to the proper use of these results in guiding remedial action decision making.

5.0 Description of Alternatives

Sampling results have confirmed that COPC at certain sites within OU-4 are present at levels that do not pose any unacceptable risk or hazard to human health or the environment, as substantiated in Section 2.2.9 and Chapter 4.0. Remedial alternatives were not developed for the following five sites because no RA is necessary:

- OWS - POL Yard (Facility 550, Site SD-18)
- ASTs 556 and 557 (Site ST-22)
- Building 1069 (Site SS-23)
- Concrete Hardfill Area (Site LF-26)
- Facility 1004 (Site SS-33).

The OU-4 FS Report (IT, 1997b) documents the screening and evaluation of initial remedial alternatives for the four OU-4 sites where COPC remain at levels that do pose an unacceptable risk or hazard to human health or the environment.

Remedial alternatives that were retained for the following sites by the OU-4 FS screening process will be presented in this section:

- Former Skeet Range at the South Desert Village (Site SS-19)
- Firing Range (Facility 927, part of Site SS-20)
- Electroplating/Chemical Cleaning Shop (Facility 1085, Site SS-16)
- Building 1010 (Site SS-24).

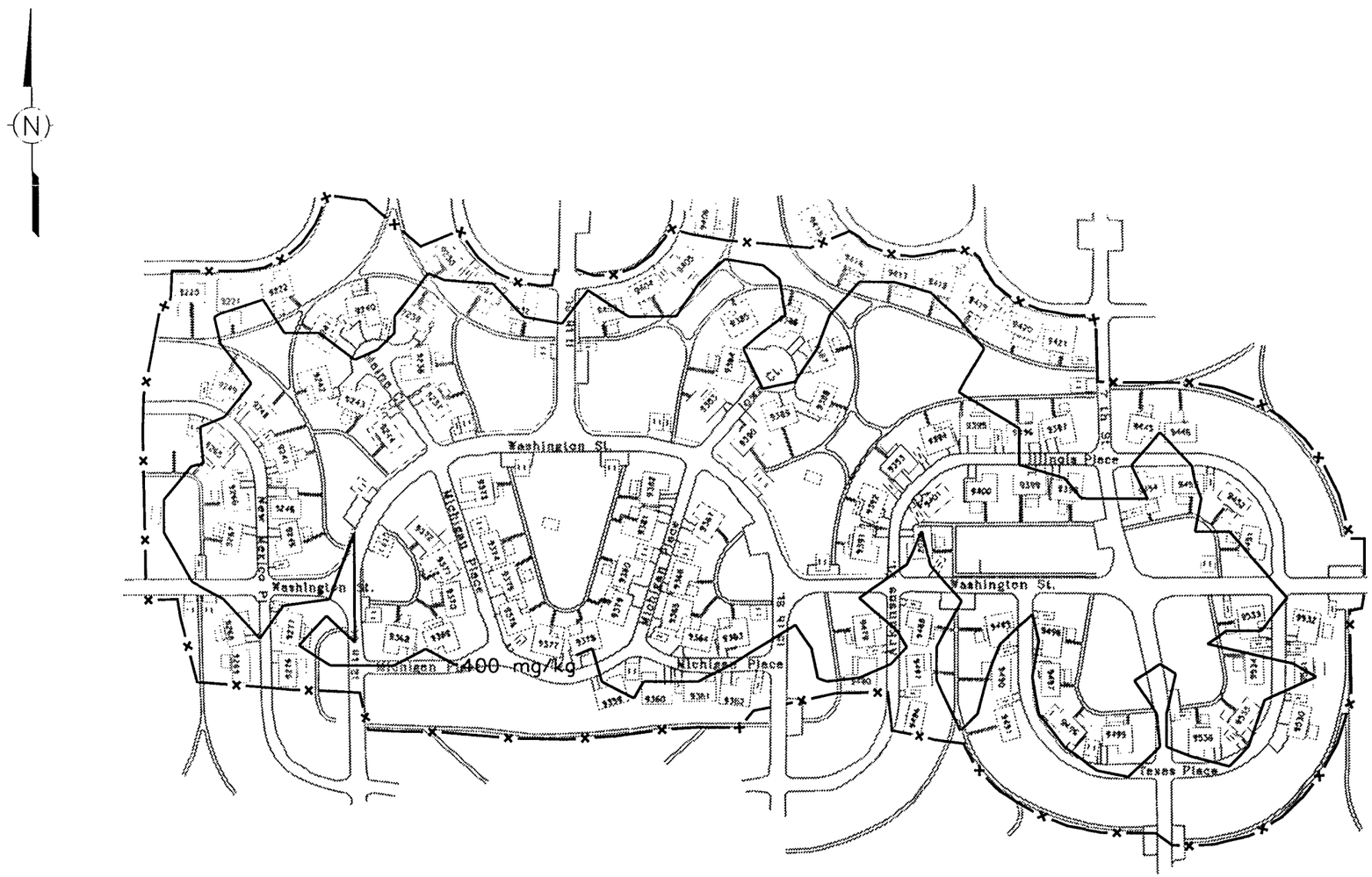
In addition, actions recommended for the following sites that were not retained by the OU-4 FS screening process will be presented:

- Former Skeet Range (part of Site SS-20)
- Facilities 1020 and 1051 (Site SS-21)

5.1 Former Skeet Range at the South Desert Village (Site SS-19)

5.1.1 Quantity and Composition of Media to be Treated

The aerial extent of lead shot-contaminated soil at the South Desert Village has been estimated in the OU-4 FS Report (IT, 1997b) based on cleanup levels of 400 mg/kg lead in bare surface soil (+400 mg/kg) (Figure 5-1), and of 5,000 mg/kg lead in bare surface soil (+5,000 mg/kg) (Figure 5-2). The total volume of contaminated soil based on excavating the +400 mg/kg area to a depth



LEGEND

- —X— FENCED BOUNDARY
- CONCRETE PARKING AREAS
- SINGLE FAMILY HOUSES
- PICNIC AREA
- 400 mg/kg LEAD IN SOIL

SCALE

0 200 400 FEET

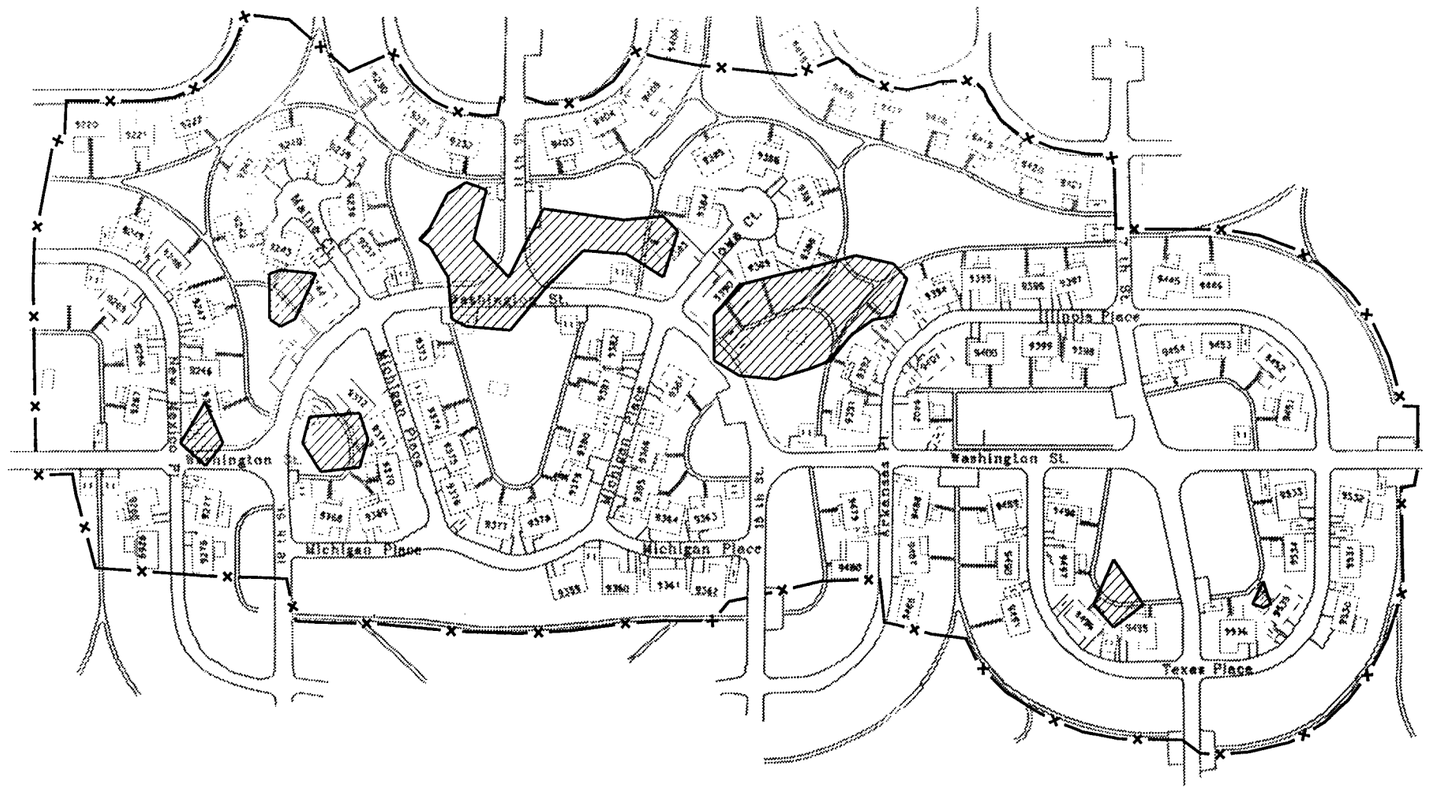
FIGURE 5-1
AREAS CONTAINING +400 mg/kg LEAD, FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 06/23/97	DATE LAST	INITIATOR: T. WOODARD	DWG. NO
DRAWN BY: D. BILLINGSLEY	DRAWN BY: D. BILLINGSLEY	PROJ. MGR.: W. CARTER	PROJ. NO: 409881
	ENGR. CHCK. BY: T. WOODARD		
	DRAFT. CHCK. BY:		

24 MAR 98 15:27:08



LEGEND

- FENCED BOUNDARY
- CONCRETE PARKING AREAS
- SINGLE FAMILY HOUSES
- PICNIC AREA
- 5000 mg/kg LEAD IN SOIL

SCALE

0 200 400 FEET

FIGURE 5-2
AREAS CONTAINING +5,000 mg/kg LEAD, FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

STARTING DATE: 10/30/95	DATE LAST REV: 12/23/97	DRAFT. CHCK. BY:	INITIATOR: T. WOODARD
DRAWN BY: CET	DRAWN BY: D. BILLINGSLEY	ENGR. CHCK. BY: T. WOODARD	PROJ. MGR.: W.CARTER
DWG. NO -6'es 465		PROJ. NO.: 409881	

24 MAR 98 16:36:46

drawing

of six inches below current surface was calculated to be 13,115 cubic yards (yd^3). The total volume of contaminated soil based on excavating the +5,000 mg/kg area to a depth of six inches below current surface was calculated to be 4,047 yd^3.

5.1.2 Remedial Alternatives

The following remedial alternatives for surface soil cleanup at the South Desert Village remained after secondary screening in the OU-4 FS Report (IT, 1997b):

- Alternative SS19-1: No Action
- Alternative SS19-3: Excavation, Off-Site Disposal, and Institutional Control
- Alternative SS19-4: Excavation, Desert Landscaping, and Institutional Control
- Alternative SS19-5: Excavation, Lead Mining, and Institutional Control.

5.1.2.1 Alternative SS19-1: No Action

The no-action alternative is presented as a remedial alternative in accordance with CERCLA guidance (EPA, 1989a) to serve as a baseline for comparison with other alternatives.

Source Treatment Component. Alternative SS19-1 does not incorporate a treatment component that would result in a permanent reduction of the toxicity or volume of soil contaminants, therefore it does not provide any direct reduction in risk to human health. This alternative would leave approximately 13,115 yd^3 of +400 mg/kg lead-contaminated soil in place with no additional means to prevent human exposure. This alternative prohibits future land use, and would not reduce the long-term environmental impact. Because contaminants would remain in the soil at concentrations greater than PRGs, a site review would be conducted every five years as required by Section 300.430 of the NCP.

Source Containment Component. Alternative SS19-1 does not incorporate a containment component that would restrict the migration of contaminants from soil to groundwater. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

Groundwater Component. Alternative SS19-1 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

General Components. No institutional controls will be utilized in the implementation of this alternative. There are no technical or administrative issues that would affect the implementation of this alternative.

The initial risk in implementing Alternative SS19-1 is very low because no RA that could create potential exposure would be taken at the site. The residual risk for Alternative SS19-1 is higher than for all other alternatives because no action would be taken to limit exposure of contaminants.

There are no capital costs associated with Alternative SS19-1. The estimated net present worth cost of Alternative SS19-1 is $92,000 (Appendix C, Table C-2A). Because the no-action alternative has an indeterminate time frame, the present worth cost was based on the thirty-year time period recommended by CERCLA guidance (EPA, 1989a). Costs of O&M, which represent the five-year increment cost of site reviews, are $18,000.

Compliance with Applicable or Relevant and Appropriate Requirements (ARAR). Because this alternative does not incorporate any active remedial measures, ARARs are not applicable.

5.1.2.2 Alternative SS19-3: Excavation, Off-Site Disposal, and Institutional Control

Source Treatment Component. Alternative SS19-3 would involve excavation of the +400 mg/kg lead area as outlined in Figure 5-1 to a depth of six inches. Soil that is covered by houses, asphalt, concrete, etc., and presents no pathway for exposure, would not be excavated. The estimated total volume of soil to be excavated is 13,115 yd^3. Once excavated, soil would be transported in covered trucks to a licensed, off-site landfill for permanent disposal. Clean soil would be imported and maintained at a thickness of no less than six inches to return the site to original grade, and to serve with the roadways, sidewalks, house foundations and slabs, paved parking areas and concrete patio areas as a protective cap for remaining contaminated soil (i.e., that soil deeper than six inches). This protective cap is the engineering control.

Institutional control measures would include an approved O&M Manual (Appendix A-3) that specifies procedures for maintenance of the protective cap, and a deed restriction and VEMUR that would be placed on the excavated/restored site. The deed restriction and VEMUR specify land-use restrictions, but indicate that the property can be inhabited by humans provided that

frequent and repeated contact with contaminated soil has been limited through the use of a protective cap consisting of the clean soil barrier, roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patio areas. Requirements specified in the O&M Manual will be enforced by the owner to minimize frequent and repeated contact with lead-contaminated soil.

Source Containment Component. Alternative SS19-3 does not include a containment component for contaminated soil. Although all surface soil with lead concentrations above PRGs will be removed, residual contamination in deeper soil will remain. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

Groundwater Component. Alternative SS19-3 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

General Components. The excavation of the contaminated surface soil could be implemented with proper planning.

The initial risk in implementing Alternative SS19-3 is low, and is associated with worker exposure to fugitive lead dust. This can be minimized by requirements to control releases. The residual risk for Alternative SS19-3 is very low, because all accessible contaminated soil with values higher than PRG will have been removed.

Costs associated with Alternative SS19-3 primarily consist of excavation, transportation, and disposal fees. The initial capital cost, assuming nonhazardous waste disposal is $1,386,000 (Appendix C, Table C-2C). The O&M costs for this alternative, including deed restriction and VEMUR placement, semiannual site surveys to assess the integrity of the replacement soil cap, and five-year site reviews, are $136,000. The net present worth of this alternative is $1,522,000.

Compliance with ARARs. All applicable location-specific ARARs for this alternative are listed in Appendix D, Table D-1. Applicable action-specific ARARs are listed in Appendix D, Table D-2. Applicable chemical-specific ARARs are listed in Appendix D, Table D-3.

The chemical-specific ARARs for lead shot-contaminated soil are represented by a HBGL of 400 mg/kg based on ADEQ interim soil remediation standards (ADEQ, 1996). The identification and development of criteria to be considered (TBC) for lead shot is presented in Chapter 2.0 of the OU-4 FS Report (IT, 1997b). EPA guidance on residential lead contamination levels in soil (EPA, 1994) list action levels of 400 mg/kg that are adopted as TBC in the OU-4 FS Report (IT, 1997b).

This alternative will comply with the chemical-specific ARAR and the TBC criteria for lead shot because all surface soil containing lead concentrations greater than 400 mg/kg will be removed and replaced with a protective barrier of clean soil.

Compliance with the location-specific ARARs pertaining to the National Historic Preservation Act (NHPA) and the Archeologic Resources Protection Act (ARPA) (Appendix D, Table D-1) will be met by following the dictates of the Programmatic Agreement (USAF, 1995), signed in 1995 by the Air Force, the State Historic Preservation Officer (SHPO), and the Advisory Council on Historic Preservation. Compliance with the ARAR pertaining to the Native American Graves Protection and Repatriation Act (NAGPRA) (Appendix D, Table D-1) will be met by following the plan of action prepared by the Air Force (USAF, 1997).

An action-specific ARAR (Appendix D, Table D-2) pertaining to Interim Soil Remediation Standards requires the placement of a VEMUR when remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL. In addition, utilization of an engineering control (i.e., a protective cap) to reduce or eliminate exposure to a contaminant is acceptable only under a nonresidential scenario, and requires the placement of a VEMUR. Compliance with this ARAR will be met by the placement of the protective cap over remaining lead contamination above 400 mg/kg, by recording a VEMUR on the site, and by requiring adherence to approved O&M practices to protect and monitor the protective cap. Compliance with other action-specific ARARs (Appendix D, Table D-2) will be met. A permit to generate fugitive dust will be required by Maricopa County.

5.1.2.3 Alternative SS19-4: Excavation, Off-Site Disposal, Desert Landscaping, and Institutional Control

Source Treatment Component. Alternative SS19-4 would involve the excavation of the +5,000 mg/kg lead area as outlined in Figure 5-2 to a depth of six inches. Soil that is covered by houses, asphalt, concrete, etc., and presents no pathway for exposure, would not be excavated.

The estimated total volume of soil to be excavated is 4,047 yd^3. Once excavated, soil would be transported in covered trucks to a licensed, off-site landfill for permanent disposal. Clean soil would be imported to return the site to original grade, and a cap consisting of three inches of crushed granite will be installed over the excavated area and the remaining +400 mg/kg area. Desert vegetation would be planted to complete and protect the excavated area. The unexcavated area would be covered by the roadways, sidewalks, house foundatuions and slabs, paved parking areas and concrete patio areas. All of the foregoing would constitute the protective cap and an engineering control.

Institutional control measures would include an approved O&M Manual that specifies procedures for maintenance of the protective cap, and a deed restriction and VEMUR that would be placed on the excavated/restored site. The deed restriction and VEMUR would specify land-use restrictions, but indicate that the property can be inhabited by humans provided that frequent and repeated contact with contaminated soil has been limited through the use of a protective cap consisting of the clean soil/crushed granite/desert vegetation barrier, roadways, sidewalks, house foundations and slabs, paved parking areas and concrete patio areas.

Source Containment Component. Alternative SS19-4 does not include a containment component for contaminated soil. Although all surface soil with lead concentrations above 5,000 mg/kg will be removed, lesser residual contamination will remain. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

Groundwater Component. Alternative SS19-4 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

General Components. The excavation of the contaminated surface soil could be implemented with proper planning.

The initial risk in implementing Alternative SS19-4 is low, and is associated with worker exposure to fugitive lead dust. This can be minimized by requirements to control releases. The residual risk for Alternative SS19-4 is low, because accessible highly-contaminated soil will have

been removed, and moderately-contaminated soil will have been covered with crushed granite and desert vegetation.

Costs associated with Alternative SS19-4 primarily consist of excavation, transportation, disposal, and landscaping fees. The initial capital cost, assuming nonhazardous waste disposal is $1,342,000 (Appendix C, Table C-2D). The O&M costs for this alternative, including placement of the deed restriction and VEMUR, crushed granite, landscaping and maintenance, semiannual site surveys to assess the integrity of the crushed granite cap, and a five-year site review, are $229,000. The net present worth of this alternative is $1,572,000.

Compliance with ARARs. All applicable location-specific ARARs for this alternative are listed in Appendix D, Table D-1. Applicable action-specific ARARs are listed in Appendix D, Table D-2. Chemical-specific ARARs are listed in Appendix D, Table D-3.

This alternative will comply with the chemical-specific ARAR and TBC criteria for lead shot (see Section 5.1.2.2) because all surface soil containing lead concentrations greater than 5,000 mg/kg will be removed and replaced with a cap of clean soil and crushed granite, and all surface soil containing lead concentrations greater than 400 mg/kg will be covered with a cap of clean soil and crushed granite.

Compliance with the location-specific ARAR pertaining to the NHPA and ARPA (Appendix D, Table D-1) will be met by following the dictates of the Programmatic Agreement (USAF, 1995), signed in 1995 by the Air Force, the SHPO, and the Advisory Council on Historic Preservation. Compliance with the ARAR pertaining to the NAGPRA (Appendix D, Table D-1) will be met by following the plan of action prepared by the Air Force (USAF, 1997).

An action-specific ARAR (Appendix D, Table D-2) pertaining to Interim Soil Remediation Standards requires the placement of a VEMUR when remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL. In addition, utilization of an engineering control (i.e., a protective cap) to reduce or eliminate exposure to a contaminant is acceptable only under a nonresidential scenario, and requires the placement of a VEMUR. Compliance with this ARAR will be met by the placement of the protective cap over remaining lead contamination above 400 mg/kg, by the recording a VEMUR on the site, and by requiring adherence to approved O&M practices to protect and monitor the protective cap. Compliance with other action-specific ARARs (Appendix D, Table D-2) will be met. A permit to generate fugitive dust will be required by Maricopa County.

5.1.2.4 Alternative SS19-5: Excavation, Lead Mining, and Institutional Control

Source Treatment Component. Alternative SS19-5 would involve the excavation of the +400 mg/kg lead area as outlined in Figure 5-1 to a depth of six inches. Soil that is covered by houses, asphalt, concrete, etc., and presents no pathway for exposure, would not be excavated. The estimated total volume of soil to be excavated is 13,115 yd^3. Once excavated, soil would be transported in covered trucks to the Skeet Range at Site SS-20, and stockpiled. The stockpiled soil would be graded to an even depth of one foot or less, and processed by commercially-available lead-shot reclamation (lead mining) equipment to separate the lead shot from the soil. The treated soil would be discharged to the surface of the Skeet Range. Clean soil would be imported to the South Desert Village to return the site to original grade, and to act as a protective cap for remaining contaminated soil (i.e., that soil deeper than six inches).

Additional institutional control measures would include an approved O&M Manual that specifies procedures for maintenance of the protective cap, and a deed restriction and VEMUR that would be placed on the excavated/restored site to comply with the consensus agreement statement (No. 97-02, April 22, 1997) signed by the parties of the FFA. The deed restriction and VEMUR would specify land-use restrictions, but indicate that the property can be inhabited provided that frequent and repeated contact with contaminated soil has been limited through the use of a protective cap consisting of the clean soil/crushed granite barrier, roadways, sidewalks, and foundations at SS-19. The actions specified in the O&M Manual as enforced by the owner of this site would ensure compliance and therefore prevent frequent and repeated contact with any contaminated soil.

Source Containment Component. Alternative SS19-5 does not include a containment component for contaminated soil. Although all surface soil with lead concentrations above PRGs will be removed, residual contamination in deeper soil will remain. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

Groundwater Component. Alternative SS19-5 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that lead in surface soil contamination at the South Desert Village has not leached and migrated below the zone of contamination.

General Components. The excavation of the contaminated surface soil could be implemented with proper planning. The technology for lead mining is available, but it requires specialized equipment and trained personnel. A limited number of contractors perform lead mining, so scheduling may be a constraint.

The initial risk in implementing Alternative SS19-5 is low, and is associated with worker exposure to fugitive lead dust. Dust problems at the excavation site are minimal, but the lead mining equipment typically uses high-pressure air to separate the lead shot from the soil. Methods to minimize emissions, such as controlled moisture application, will have to be considered during the remedial design process. The residual risk at the South Desert Village for Alternative SS19-5 is very low, because all accessible contaminated soil with values higher than PRG will have been removed. Treated soil graded over the Skeet Range at Site SS-20 may leave surface lead concentrations greater than residential PRGs, but less than nonresidential PRGs. The planned future use of Site SS-20 is industrial.

Costs associated with Alternative SS19-5 primarily consist of excavation, transportation, and special equipment and labor associated with lead mining. The value of the recycled lead shot would be insignificant. The initial capital cost is estimated to be $1,473,000 (Appendix C, Table C-2E). The O&M costs for this alternative, including semiannual site surveys to assess the integrity of the replacement soil cap, and a five-year site review, are $136,000. The net present worth of this alternative is $1,609,000.

Compliance with ARARs. All applicable location-specific ARARs for this alternative are listed in Appendix D, Table D-1. Applicable action-specific ARARs are listed in Appendix D, Table D-2. Applicable chemical-specific ARARs are listed in Appendix D, Table D-3.

This alternative will comply with the chemical-specific ARAR and TBC criteria for lead shot (see Section 5.1.2.2) because all surface soil containing lead concentrations greater than 400 mg/kg will be removed and replaced with a barrier of clean soil.

Compliance with the location-specific ARAR pertaining to the NHPA and ARPA (Appendix D, Table D-1) will be met by following the dictates of the Programmatic Agreement (USAF, 1995), signed in 1995 by the Air Force, the SHPO, and the Advisory Council on Historic Preservation. Compliance with the ARAR pertaining to the NAGPRA (Appendix D, Table D-1) will be met by following the plan of action prepared by the Air Force (USAF, 1997).

An action-specific ARAR (Appendix D, Table D-2) pertaining to Interim Soil Remediation Standards requires the placement of a VEMUR when remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL. Further placement of a deed restriction will ensure that not only the current owner but future owners comply with the VEMUR requirements. In addition, utilization of an engineering control (i.e., a protective cap) to reduce or eliminate exposure to a contaminant is acceptable only under a nonresidential scenario, and requires the placement of a VEMUR. Compliance with this ARAR will be met by the placement of the protective cap over remaining lead contamination above 400 mg/kg, by the recording a VEMUR on the site, and by requiring adherence to approved O&M practices to protect and monitor the protective cap. Compliance with other action-specific ARARs (Appendix D, Table D-2) will be met. A permit to generate fugitive dust will be required by Maricopa County.

5.2 Firing Range (Facility 927, Part of Site SS-20)

5.2.1 Quantity and Composition of Media to be Treated

The Firing Range at Site SS-20 is constructed such that large berms form three sides: the back-stop, and the two sides (Figure 2-13A). Contamination has been confirmed in the backstop. The OU-4 FS Report (IT, 1997b) calculated a volume of lead-contaminated soil in the backstop of 519 yd^3.

5.2.2 Remedial Alternatives

The following remedial alternatives for contaminated soil cleanup at the Former Firing Range at Site SS-20 were retained after secondary screening in the OU-4 FS Report (IT, 1997b):

- Alternative SS20-1FR: No Action
- Alternative SS20-3FR: Excavation, Off-Site Disposal, and Institutional Control

5.2.2.1 Alternative SS20-1FR: No Action

The no-action alternative is presented as a remedial alternative in accordance with CERCLA guidance (EPA, 1989a) to serve as a baseline for comparison with other alternatives.

Source Treatment Component. Alternative SS20-1FR does not incorporate a treatment component that would result in a permanent reduction of the toxicity or volume of soil contaminants; therefore, it does not provide any direct reduction in risk to human health. This alternative would leave approximately 519 yd^3 of lead-contaminated soil in place with no

additional means to prevent human exposure. This alternative prohibits future land use, and would not reduce the long-term environmental impact. Because contaminants would remain in the backstop soil at concentrations greater than PRGs, a site review would be conducted every five years as required by Section 300.430 of the NCP.

Source Containment Component. Alternative SS20-1FR does not incorporate a containment component that would restrict the migration of contaminants from soil to groundwater. Lead in soil from the backstop exceeds the calculated site-specific GPL of 1,340 mg/kg, and may represent a threat to groundwater.

Groundwater Component. Alternative SS20-1FR does not incorporate a groundwater treatment component. Lead in soil from the backstop exceeds the calculated site-specific GPL of 1,340 mg/kg, and may represent a threat to groundwater.

General Components. No institutional controls will be utilized in the implementation of this alternative. There are no technical or administrative issues that would affect the implementation of this alternative.

The initial risk in implementing Alternative SS20-1FR is very low because no remedial action that could create potential exposure would be taken at the site. The residual risk for Alternative SS20-1FR is higher than for all other alternatives because no action would be taken to limit exposure of contaminants or to mitigate the potential threat to groundwater.

There are no capital costs associated with Alternative SS20-1FR. O&M costs, which represent the five-year increment cost of site reviews, are $18,000 (Appendix C, Table C-3A). The estimated net present worth cost of Alternative SS20-1FR is $92,000. Because the no-action alternative has an indeterminate time frame, the present worth cost was based on the thirty-year time period recommended by CERCLA guidance (EPA, 1989a).

Compliance with ARARs. Because this alternative does not incorporate any active remedial measures, ARARs are not applicable.

5.2.2.2 Alternative SS20-3FR: Excavation, Off-Site Disposal, and Institutional Control

Source Treatment Component. Alternative SS20-3FR would involve excavation of the backstop to an estimated penetration depth of five feet. Once the estimated 519 yd^3 of soil is excavated, it would be transported in covered trucks to a licensed, off-site landfill for permanent disposal.

In addition, a deed restriction and VEMUR will be placed on the excavated/restored site. A VEMUR is an institutional control that places a deed notice of land-use restriction on a site. The placement of a VEMUR and a deed restriction will ensure continued future nonresidential land use.

Source Containment Component. Alternative SS20-3FR does not include a containment component for contaminated soil. All surface soil with lead concentrations above PRGs will be removed, however, so source containment will be unnecessary.

Groundwater Component. Alternative SS20-3FR does not incorporate a groundwater treatment component. Lead in soil from the backstop exceeds the calculated site-specific GPL of 1,340 mg/kg, and may represent a threat to groundwater. The removal of the contaminated soil with lead concentrations above PRGs would also remove the threat to groundwater.

General Components. The excavation of the contaminated surface soil could be implemented with proper planning.

The initial risk in implementing Alternative SS20-3FR is low, and is associated with worker exposure to fugitive lead dust. This can be minimized by requirements to control releases. The residual risk for Alternative SS20-3FR is very low, because all accessible contaminated soil with values higher than PRG will have been removed.

Costs associated with Alternative SS20-3FR primarily consist of excavation, transportation, and disposal fees. The initial capital cost, assuming nonhazardous waste disposal is $122,000 (Appendix C, Table C-3B). There are no annual O&M costs associated this alternative.

Compliance with ARARs. All applicable location-specific ARARs for this alternative are listed in Appendix D, Table D-4. Applicable action-specific ARARs are listed in Appendix D, Table D-5.

There are no chemical-specific ARARs for soil contaminated with metallic lead fragments, such as that in the backstop at SS-20. Alternative SS20-3FR will comply with chemical-specific industrial-use TBC levels for lead, because all soil containing lead concentrations exceeding 2,000 mg/kg will be removed. Alternative SS20-3FR will comply with action-specific ARARs, as listed in Appendix D, Table D-5. A VEMUR will be recorded to allow the remediation to Arizona nonresidential land-use levels. Deed restrictions will also be imposed to restrict current and future land use to nonresidential.

Location-specific ARARs, as listed in Appendix D (Table D-4), are not applicable because the excavated soil will be from the backstop, not the ground surface.

5.3 Electroplating/Chemical Cleaning Shop (Site SS-16)

5.3.1 Quantity and Composition of Media to be Treated

Under the alternatives being considered there is no quantity of soil to be treated.

5.3.2 Remedial Alternatives

The following soil remedial alternatives for site SS-16 are presented in the detailed analysis of alternatives:

- SS16-1: No Action
- SS16-2: Institutional Control (Deed Restriction and VEMUR).

5.3.2.1 Alternative SS16-1: No Action

The no-action alternative is presented as a remedial alternative in accordance with CERCLA guidance (EPA, 1989a) to serve as a baseline for comparison with other alternatives.

Source Treatment Component. Alternative SS16-1 does not incorporate a treatment component that would result in a permanent reduction of the toxicity or volume of soil contaminants, therefore it does not provide any direct reduction in risk to human health. This alternative would leave all contaminated soil in place with no additional means to prevent human exposure. This alternative prohibits future land use, and would not reduce the long-term environ-

mental impact. Because contaminants would remain in the soil at concentrations greater than residential PRGs, a site review would be conducted every five years as required by Section 300.430 of the NCP.

Source Containment Component. Alternative SS16-1 does not incorporate a containment component that would restrict the migration of contaminants from soil to groundwater. Sampling performed during the OU-4 RI, however, has documented that concentrations are at a level that they would not constitute a source.

Groundwater Component. Alternative SS16-1 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that all concentrations are below the Arizona GPL.

General Components. No institutional controls will be utilized in the implementation of this alternative. There are no technical or administrative issues that would affect the implementation of this alternative.

The initial risk in implementing Alternative SS16-1 is very low because no remedial action that could create potential exposure would be taken at the site. The residual risk for Alternative SS16-1 is higher than for all other alternatives because no action would be taken to limit exposure of contaminants.

There are no capital costs associated with Alternative SS16-1. O&M costs, which represent the five-year increment cost of site reviews, are $92,000 (Appendix C, Table C-1A). The estimated net present worth cost of Alternative SS16-1 is $92,000. Because the no-action alternative has an indeterminate time frame, the present worth cost was based on the thirty-year time period recommended by CERCLA guidance (EPA, 1989a).

Compliance with ARARs. Because this alternative does not incorporate any active remedial measures, ARARs are not applicable.

5.3.2.2 Alternative SS16-2: Institutional Control (Deed Restriction and VEMUR)

The institutional control (deed restriction and VEMUR) alternative is designed to restrict the current and future land-use options at the site to nonresidential only, thereby changing the PRG requirement for site closure. Implementation of a VEMUR, as defined in Section 7.1.1.4, and deed restrictions for land use at this site would reduce contact with soil by human receptors by

limiting those who would use this site. The 5-year site reviews will address any site under a VEMUR to determine whether the remedy remains protective and whether there is still no unacceptable risk to human health from the contaminants remaining on site.

Source Treatment Component. Alternative SS16-2 does not incorporate a treatment component that would result in a permanent reduction of the toxicity or volume of soil contaminants, therefore it does not provide any direct reduction in risk to human health. This alternative would leave all contaminated soil in place but would reduce human exposure by restricting land use to nonresidential. Because of the restriction no annual site reviews would be necessary.

Source Containment Component. Alternative SS16-2 does not incorporate a containment component but sampling performed during the OU-4 RI has documented that contaminant concentrations are at a level that would not constitute a source.

Groundwater Component. Alternative SS16-2 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that all concentrations are below the Arizona GPL.

General Components. Institutional control in the form of deed restrictions and a VEMUR will be utilized in the implementation of this alternative. There are no technical or administrative issues that would affect the implementation of this alternative.

The initial risk in implementing Alternative SS16-2 is very low because the site is currently used for nonresidential purposes. The residual risk for Alternative SS16-2 is lower than the no action alternative because this alternative would limit the use, therefore limiting exposure.

There is a $2,000 capital costs associated with Alternative SS16-2 (Appendix C, Table C-1B). There will be no O&M costs associated with this remedy.

Compliance with ARARs. No location-specific ARARs apply to this alternative. No chemical-specific ARARs apply to this alternative. Applicable action-specific ARARs are listed in Appendix D, Table D-6.

This alternative will comply with the action-specific ARAR (Appendix D, Table D-6) pertaining to Interim Soil Remediation Standards, which requires the placement of a VEMUR when reme-

diation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL.

5.4 Building 1010 (Site SS-24)

5.4.1 Quantity and Composition of Media to be Treated

Under the alternatives being considered there is no quantity of soil to be treated.

5.4.2 Remedial Alternatives

The following soil remedial alternatives for Site SS-24 are presented in the detailed analysis of alternatives:

- SS24-1: No Action
- SS24-2: Institutional Control (Deed Restriction and VEMUR).

5.4.2.1 Alternative SS24-1: No Action

The no-action alternative is presented as a remedial alternative in accordance with CERCLA guidance (EPA, 1989a) to serve as a baseline for comparison with other alternatives.

Source Treatment Component. Alternative SS24-1 does not incorporate a treatment component that would result in a permanent reduction of the toxicity or volume of soil contaminants, therefore it does not provide any direct reduction in risk to human health. This alternative would leave all contaminated soil in place with no additional means to prevent human exposure. This alternative prohibits future land use, and would not reduce the long-term environmental impact. Because contaminants would remain in the soil at concentrations greater than residential PRGs, a site review would be conducted every five years as required by Section 300.430 of the NCP.

Source Containment Component. Alternative SS24-1 does not incorporate a containment component that would restrict the migration of contaminants from soil to groundwater. Sampling performed during the OU-4 RI, however, has documented that concentrations are at a level that they would not constitute a source.

Groundwater Component. Alternative SS24-1 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that all concentrations are below the Arizona GPL.

General Components. No institutional controls will be utilized in the implementation of this alternative. There are no technical or administrative issues that would affect the implementation of this alternative.

The initial risk in implementing Alternative SS24-1 is very low because no remedial action that could create potential exposure would be taken at the site. The residual risk for Alternative SS24-1 is higher than for the institutional alternatives because no action would be taken to limit exposure of contaminants.

There are no capital costs associated with Alternative SS24-1. O&M costs, which represent the five-year increment cost of site reviews, are $92,000 (Appendix C, Table C-4A). The estimated net present worth cost of Alternative SS24-1 is $92,000. Because the no-action alternative has an indeterminate time frame, the present worth cost was based on the thirty-year time period recommended by CERCLA guidance (EPA, 1989a).

Compliance with ARARs. Because this alternative does not incorporate any active remedial measures, ARARs are not applicable.

5.4.2.2 Alternative SS24-2: Institutional Control (Deed Restriction and VEMUR)

The institutional control (deed restriction and VEMUR) alternative is designed to restrict the current and future land-use options at the site to nonresidential only, thereby changing the PRG requirement for site closure. Implementation of a VEMUR, as defined in Section 7.1.1.4, and deed restrictions at this site would reduce contact with soil by human receptors by limiting those who would use this site. The 5-year site reviews will address any site under a VEMUR to determine whether the remedy remains protective and whether there is still no unacceptable risk to human health from the contaminants remaining on site.

Source Treatment Component. Alternative SS24-2 does not incorporate a treatment component that would result in a permanent reduction of the toxicity or volume of soil contaminants, therefore it does not provide any direct reduction in risk to human health. This alternative would leave all contaminated soil in place but would reduce human exposure by restricting land use to nonresidential. Because of the restriction no annual site reviews would be necessary.

Source Containment Component. Alternative SS24-2 does not incorporate a containment component but sampling performed during the OU-4 RI has documented that contaminant concentrations are at a level that they would not constitute a source.

Groundwater Component. Alternative SS24-2 does not incorporate a groundwater treatment component. Sampling performed during the OU-4 RI, however, has documented that all concentrations are below the Arizona GPL.

General Components. Institutional controls in the form of deed restrictions and a VEMUR will be utilized in the implementation of this alternative. There are no technical or administrative issues that would affect the implementation of this alternative.

The initial risk in implementing Alternative SS24-2 is very low because the site is currently used for nonresidential purposes. The residual risk for Alternative SS24-2 is lower than the no action alternative because this alternative would limit the use therefore exposure.

There is a $2,000 capital costs associated with Alternative SS24-2 (Appendix C, Table C-4B). There will be no O&M costs associated with this remedy.

Compliance with ARARs. No location-specific ARARs apply to this alternative. No chemical-specific ARARs apply to this alternative. Applicable action-specific ARARs are listed in Appendix D, Table D-7.

This alternative will comply with the action-specific ARAR (Appendix D, Table D-7) pertaining to Interim Soil Remediation Standards, which requires the placement of a VEMUR when remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL.

5.5 Skeet Range (Part of Site SS-20) and Site SS-21

Alternatives not presented in the OU-4 FS Report, such as institutional control of the Skeet Range at Site SS-20 and of Site SS-21, are not presented in detail in this section. The institutional control alternative for these sites was not selected from presentation of components and agreement with ARARs; rather, it was imposed by ADEQ because of unknowns concerning surface soil lead concentrations in the presence of reported lead pellets and bullets on the ground.

Costs of recordation of VEMURs and 5-year reviews are directly comparable to the institutional control costs for previously detailed alternatives, such as Alternative SS24-2.

6.0 Comparative Analysis of Alternatives

The final phase in the evaluation of remedial alternatives involves a comparison of the various alternatives. The advantages and disadvantages of each alternative are reviewed relative to the EPA evaluation criteria: threshold criteria (overall protection of human health and the environment, and compliance with ARARs); primary criteria (long-term effectiveness and permanence, reduction of toxicity, mobility, or volume through treatment, short-term effectiveness, implementability, and cost); and modifying criteria (regulatory agency acceptance, and community acceptance).

This section summarizes the detailed analysis of alternatives presented in the OU-4 FS Report (IT, 1997b). Each alternative will be evaluated relative to the threshold criteria and the primary criteria; the modifying criteria are evaluated relative to the public comment received on the proposed plan.

Alternatives not presented in the OU-4 FS Report, such as institutional control of the Skeet Range at Site SS-20 and of Site SS-21, are not presented in detail in this section. The institutional control alternative for these sites was not selected through the evaluation of criteria; rather, it was imposed by ADEQ because of unknowns concerning surface soil lead concentrations in the presence of reported lead pellets and bullets on the ground.

6.1 Former Skeet Range at the South Desert Village (Site SS-19)

6.1.1 Alternative SS19-1: No Action

6.1.1.1 Overall Protection of Human Health and the Environment

The no-action alternative would not reduce the potential risk to human health associated with exposure to lead in soil at this site. Significant areas of the site would retain lead levels in the surface soil that pose a risk to children through ingestion.

6.1.1.2 Compliance with ARARs

This alternative will not comply with the lead action levels identified in chemical-specific ARARs (Appendix D, Table D-3). Because this alternative does not incorporate any active remedial measures or monitoring activities, action-specific ARARs are not applicable, and are

not evaluated. Location-specific ARARs (Appendix D, Table D-1) will be met by this alternative.

6.1.1.3 Long-Term Effectiveness and Permanence

This alternative provides no treatment or controls for reducing potential exposure to lead, and no long-term management measures. All current and future health risks would remain unchanged under this alternative. Because contaminants would remain at concentrations exceeding the lead action level, a site review would be conducted every five years as required by Section 300.430 of the NCP.

6.1.1.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

The no-action alternative would not reduce the toxicity, mobility, or volume of contaminant in the soil through an active remediation process; the alternative does not satisfy the statutory preference for treatment.

6.1.1.5 Short-Term Effectiveness

There would be no additional short-term risks posed to the general public, workers, or the environment, because no action would be undertaken at the site.

6.1.1.6 Implementability

Because no remedial action would be performed, there are no technical or administrative concerns or issues relating to the availability of services or materials that would hinder the implementation of this alternative.

6.1.1.7 Cost

There are no capital costs associated with this alternative. O&M costs are $18,000, which represents the five-year increment cost of site reviews (Appendix C, Table C-2A). The estimate net present worth of this alternative is $92,000.

6.1.2 Alternative SS19-3: Excavation, Off-Site Disposal, and Institutional Control

6.1.2.1 Overall Protection of Human Health and the Environment

This alternative would minimize human health risk by breaking the ingestion pathway for the lead-contaminated surface soil. In the area defined by the VEMUR and specified in the deed restriction, contact with lead by children under seven years of age would be eliminated by a protective cap consisting of a six-inch layer of clean soil, existing roadways, sidewalks, house

foundations and slabs, paved parking areas and concrete patio areas, which would cover any remaining contamination above action levels. The VEMUR, attached as Appendix A-2, requires that in order to augment the engineering remedy, the property will be subject to a deed restriction that prohibits the inhabitation of children under seven years of age. Periodic inspection and repair of the protective cap in accordance with the approved O&M Manual and the Agreement between ASU and ADEQ (Appendix A) will ensure the future protection to human health and the environment. Procedures for protection of workers or inhabitants who might dig through the cap during construction or landscaping are outlined in the O&M Manual.

Environmental protection would be provided by reducing the amount of lead uptake into the local food chain, which consists of burrowing mammals and their predators. The burrowing mammal population will be reduced by the removal of the dead grass and top soil food source, and by the presence of human inhabitants .

Institutional controls will ensure requirements are maintained in the event of future land transfer.

6.1.2.2 Compliance with ARARs

This alternative will comply with the chemical-specific ARAR for lead in soil. Compliance with the location-specific ARARs pertaining to NHPA, ARPA, and NAGPRA will be met. Compliance with the action-specific ARAR pertaining to soil remediation without the use of engineering controls will be met by recording deed restrictions and a VEMUR on the site, and by approval of acceptable O&M manual practices. Compliance with other action-specific ARARs will be met.

6.1.2.3 Long-Term Effectiveness and Permanence

This alternative will be reasonably effective as a permanent reduction of lead exposure at this site. The O&M Manual will minimize the effects of erosion, excavation activities, and burrowing animals in bringing subsurface lead shot to the surface.

6.1.2.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Excavation will remove much of the lead shot at the site, thereby reducing the mass and volume of contaminated media. This alternative will achieve an overall on-site reduction in toxicity through treatment because the excavated lead in soil will be relocated to a permanent managed disposal site.

6.1.2.5 Short-Term Effectiveness

Removal of soil may result in limited exposure to workers; however, there will be little fugitive lead dust. Requirements to control releases and to protect workers will be determined during the remedial design process. Typical construction- and transportation-related risk to workers would be involved. A potential risk from dust exists for nearby inhabitants within the South Desert Village, if the RA is performed after the non-contaminated housing is populated.

6.1.2.6 Implementability

This alternative could be performed without any significant technical difficulty, and without the need for special equipment, materials, or personnel. Shallow excavation in the large, open areas would be simple; excavation around houses would require much smaller equipment and would represent the bulk of the labor. The dry soil conditions would facilitate excavation, but would aggravate fugitive dust generation. Truck traffic would place a significant demand on existing roads, but there are no known limitations. Archeological monitoring would be required during the excavation activities. Access to the area is currently restricted by a perimeter security fence.

No administration issues are considered as problematic. Potential requirements are specified in the action-specific ARARs (Appendix D, Table D-2) .

6.1.2.7 Cost

The cost of this alternative primarily includes excavation, transportation, and disposal fees. The initial capital cost is estimated to be $1,386,000, assuming that all excavated soil can be disposed of as nonhazardous waste (Appendix C, Table C-2C). O&M costs for this alternative, including semiannual site surveys to access the integrity of the replacement soil cap, and five-year reviews, are $136,000. The net present worth of Alternative SS19-3 is $1,522,000.

6.1.3 Alternative SS19-4: Excavation, Off-Site Disposal, Desert Landscaping, and Institutional Control

6.1.3.1 Overall Protection of Human Health and the Environment

The human health risk at the site, particularly to children, will be substantially reduced by the removal of the highest concentrations of lead (>5,000 mg/kg) in surface soil, the backfill with a clean soil cap of the excavated area, and the cover of all lead-contaminated areas containing lead in soil in excess of 400 mg/kg with a crushed granite and desert vegetation barrier. Some degree of environmental protection would be provided in soil removal areas by reducing the amount of

lead uptake into the local food chain by burrowing animals. Lead shot will remain in the soil at the site beneath the soil and the crushed granite.

6.1.3.2 Compliance with ARARs

This alternative would meet the chemical-specific ARARs for lead contamination. All surface soil with lead exceeding 5,000 mg/kg will be removed, and surface soil with lead values exceeding 400 mg/kg will be capped with soil, crushed granite, and desert landscaping. Compliance with the location-specific ARARs pertaining to NHPA, ARPA, and NAGPRA will be met. Compliance with the action-specific ARAR pertaining to soil remediation without the use of engineering controls will be met by recording deed restrictions and a VEMUR on the site, and by approval of acceptable O&M practices. Compliance with other action-specific ARARs will be met.

6.1.3.3 Long-Term Effectiveness and Permanence

Alternative SS19-4 provides moderate long-term effectiveness and permanence, because lead in soil is removed and/or capped with desert landscaping. No treatment of the excavated soil will be performed.

6.1.3.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Excavation will reduce the mass and volume of contaminants at the site, and achieve an overall on-site reduction in toxicity through treatment because the excavated lead in soil will be relocated to a permanent managed disposal site.

6.1.3.5 Short-Term Effectiveness

Removal of soil may result in limited exposure to workers; however, there will be little fugitive lead dust. Requirements to control releases and to protect workers will be determined during the remedial design process. Typical construction- and transportation-related risk to workers would be involved. A potential risk from dust exists for nearby inhabitants within the South Desert Village, if the remedial action is performed after the non-contaminated housing is populated.

6.1.3.6 Implementability

This alternative could be performed without any significant technical difficulty, and without the need for special equipment, materials, or personnel. Shallow excavation in the large, open areas would be simple; excavation around houses would require much smaller equipment and would represent the bulk of the labor. The dry soil conditions would facilitate excavation, but would aggravate fugitive dust generation. Truck traffic would place a significant demand on existing

roads, but there are no known limitations. Archeological monitoring would be required during excavation activities. Access to the area is currently restricted by a perimeter security fence.

No administration issues are considered as problematic. Potential requirements are specified in the action-specific ARARs (Appendix D, Table D-2) .

6.1.3.7 Cost

The cost of this alternative primarily includes excavation, transportation, disposal, and landscaping fees. The initial capital cost is estimated to be $1,342,000, assuming that all excavated soil can be disposed of as nonhazardous waste (Appendix C, Table C-2D). If toxicity characteristic waste testing determines that some portion of the soil must be disposed of as hazardous waste, disposal costs would/could be much higher. O&M costs for this alternative, including institutional controls, landscape and maintenance, semiannual site surveys to access the integrity of the replacement soil cap, and five-year reviews, are $229,000. The net present worth of Alternative SS19-4, assuming nonhazardous waste, is $1,572,000.

6.1.4 Alternative SS19-5: Excavation, Lead Mining, and Institutional Control

6.1.4.1 Overall Protection of Human Health and the Environment

This alternative would minimize human health risk by eliminating the lead-contaminated surface soil. Contact with lead by children would be virtually eliminated since a protective cap composed of six-inch layer of clean soil, existing roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patio areas would cover any remaining contamination above action levels. This action would not protect workers or inhabitants who might dig through the clean layer during construction or landscaping, but lead shot in soil does not pose a significant risk to this subpopulation. Environmental protection would be provided by reducing the amount of lead uptake into the local food chain.

6.1.4.2 Compliance with ARARs

This alternative will comply with the chemical-specific ARAR for lead since all surface soil with lead values exceeding 400 mg/kg will be removed. The treated soil that will remain at Site SS-20 should have residual lead values below the industrial land-use action level of 5,000 mg/kg. Compliance with the location-specific ARAR pertaining to NHPA, ARPA, and NAGPRA will be met. Compliance with the action-specific ARAR pertaining to soil remediation without the use of engineering controls will be met by recording a VEMUR on the site, and by approval of acceptable O&M manual practices. Compliance with action-specific ARARs will be achieved

(Appendix D, Table D-2). Approval from Maricopa County to generate fugitive dust from excavation and mining operations may be required.

6.1.4.3 Long-Term Effectiveness and Permanence

This alternative will be effective at permanently reducing lead exposure at this site. It provides a permanent solution for lead disposal because the lead will be isolated and recycled. It does, however, add treated soil that may contain lead concentrations up to 2,000 mg/kg to another site (SS-20). This would prevent a residential land-use scenario without another clean up. The USAF is no longer the owner of Site SS-20, and permission to treat soil at the site will be required.

6.1.4.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Excavation will remove much of the total lead-contaminated soil at SS-19, thereby reducing the volume and toxicity. This alternative will also achieve an overall reduction in the lead mobility through treatment, because the lead will be reclaimed for reuse. Treated soil with residual lead, though, would be left in place at Site SS-20.

6.1.4.5 Short-Term Effectiveness

Removal of soil may result in limited exposure to workers; however, there will be little fugitive lead dust. Requirements to control releases and to protect workers will be determined during the remedial design process. Typical construction-, transportation-, and mining process equipment-related risk to workers would be involved. A potential risk from dust exists for nearby inhabitants within the South Desert Village, if the remedial action is performed after the noncontaminated housing is populated.

6.1.4.6 Implementability

This alternative could be performed without technical difficulties, but would require special equipment and trained personnel for the lead shot separation. Because lead mining equipment is specialized, it is available from a limited number of suppliers; scheduling could be a constraint. Shallow excavation in the large, open areas would be simple; excavation around houses would require much smaller equipment and would represent the bulk of the labor. The dry soil conditions would facilitate excavation and lead-shot separation, but would aggravate fugitive dust generation. Truck traffic would place a significant demand on existing roads, but there are no known limitations. Archeological monitoring would be required during excavation activities. Access to the area is currently restricted by a perimeter security fence.

No administration issues are considered as problematic. Potential requirements are specified in the action-specific ARARs (Appendix D, Table D-2).

6.1.4.7 Cost

The primary cost for this alternative is the labor and equipment associated with the excavation, transportation, and the lead-shot mining. The initial capital cost is estimated to be $1,473,000 (Appendix C, Table C-2E). The value of the lead shot sent for recycling would be insignificant. The O&M costs for this alternative, including semiannual surveys to access the integrity of the replacement soil cap, and five-year site reviews, are $136,000. The net present value is $1,609,000.

6.2 Firing Range (Facility 927, Part of Site SS-20)

6.2.1 Alternative SS20-1FR: No Action

6.2.1.1 Overall Protection of Human Health and the Environment

The no-action alternative would not control human exposure to contaminated soil, nor reduce the potential risks to human health and the environment associated with lead in soil.

6.2.1.2 Compliance with ARARs

This alternative will not comply with the lead action levels identified in the chemical-specific ARARs (Appendix D, Table D-3). Because this alternative does not incorporate any active remedial measures or monitoring activities, action-specific ARARs are not applicable, and are not evaluated. Location-specific ARARs (Appendix D, Table D-1) will be met by this alternative.

6.2.1.3 Long-Term Effectiveness and Permanence

This alternative provides no treatment or controls for reducing potential exposure to lead, and no long-term management measures. All current and future health risks would remain unchanged under this alternative. Because contaminants would remain at concentrations exceeding the lead action level, a site review would be conducted every five years as required by Section 300.430 of the NCP.

6.2.1.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

The no-action alternative would not reduce the toxicity, mobility, or volume of contaminant in the soil through an active remediation process; the alternative does not satisfy the statutory preference for treatment. Incremental corrosion/deterioration of the lead fragments in the soil will result in changes to the characteristics of the lead contamination. Such changes could increase the toxicity, mobility, and volume of contaminated soil over the long term.

6.2.1.5 Short-Term Effectiveness

There would be no additional short-term risks posed to the general public, workers, or the environment as a result of pursuing the no-action alternative.

6.2.1.6 Implementability

Because no remedial action would be performed, there are no technical or administrative concerns or issues relating to the availability of services or materials that would hinder the application of this alternative.

6.2.1.7 Cost

There are no capital costs associated with this alternative. O&M costs are $18,000, which represents the five-year increment cost of site reviews (Appendix C, Table C-3A). The estimate net present worth of this alternative is $92,000.

6.2.2 Alternative SS20-3FR: Excavation, Off-Site Disposal, and Institutional Control

6.2.2.1 Overall Protection of Human Health and the Environment

This alternative would minimize human health risk by eliminating lead-contaminated soil from the site. Environmental protection would be provided by reduction of the lead uptake into the local food chain by burrowing animals.

6.2.2.2 Compliance with ARARs

This alternative will comply with Arizona industrial land-use chemical-specific TBCs for lead, since all soil with values exceeding 2,000 mg/kg will be removed. The location-specific ARAR pertaining to NHPA, ARPA, and NAGPRA is not applicable because only backstop soil will be removed; no excavations into the subsurface will be performed. The action-specific ARAR pertaining to treatment without the use of engineering controls will be met by recording a

VEMUR at the site and imposing deed restrictions. Compliance with other action-specific ARARs will be met.

6.2.2.3 Long-Term Effectiveness and Permanence

This alternative will be effective at permanently reducing the lead exposure at this site since essentially all lead-contaminated soil will be removed.

6.2.2.4 Reduction in Toxicity, Mobility, or Volume Through Treatment

Excavation will permanently remove the great majority of the lead at the site, thereby reducing the mass and volume of contaminated media.

6.2.2.5 Short-Term Effectiveness

Removal of soil may result in limited exposure to workers; however, there will be little fugitive lead dust. Requirements to control releases and to protect workers will be determined during the remedial design process. Typical construction- and transportation-related risk to workers would be involved.

6.2.2.6 Implementability

This alternative could be performed without technical difficulties. The dry soil conditions facilitate excavation, but pose fugitive dust emission concerns. Truck traffic would be minor, and no known road restrictions exist beyond the administrative controls enforced by the airport authority.

No administrative issues will impact implementability.

6.2.2.7 Cost

The cost of this alternative includes primarily excavation, transportation, and disposal fees. The initial capital cost is estimated to be $122,000, assuming all excavated soil is nonhazardous waste (Appendix C, Table C-3C). There are no O&M costs associated with this alternative.

6.3 Electroplating/Chemical Cleaning Shop (Site SS-16)

The only alternatives to be compared at this site are the no-action alternative versus institutional Control. Under each of the six criteria for comparison previously covered, institutional control through the implementation of deed restrictions and a VEMUR has advantages.

6.4 Building 1010 (Site SS-24)

The only alternatives to be compared at this site are the no-action alternative versus institutional control. Under each of the six criteria for comparison previously covered, institutional control through the implementation of deed restrictions and a VEMUR has advantages.

Institutional controls ensure that site use will be nonresidential and that any future property transfer will retain that status. They also permit the owner to educate workers about the types of contaminants present.

7.0 Selected Remedy

7.1 Selected Remedy for the Former Skeet Range at the South Desert Village (Site SS-19)

In accordance with Consensus Statement 97-02 (Appendix A-1), dated April 23, 1997, the Parties agree to allow human habitation of the South Desert Village provided that frequent and repeated contact with the soil is limited through the use of controls which either prevent or limit exposure pathways, such as contaminated surface soil removal, placement of a clean-soil protective cap, and recordation of a VEMUR (Appendix A-2) to provide notice of residual contamination to present and future landowners. In addition to any environmental covenants in the deed from the Air Force, the transferee, ASU, and the State of Arizona, have agreed to enter into a separate agreement (Appendix A-4) to ensure that current and future land owners do not disturb or cause exposure to residual contamination, and to ensure that children under 7 years of age will not be allowed to reside on the property as long as such contamination is present. As a means of ensuring the adequacy of protective measures on the property, O&M requirements have been established as part of the agreement between ASU and the State of Arizona. Semiannual site reviews by the property recipient will be performed in accordance with the O&M plan (Appendix A-3), and 5-year reviews will also be conducted to monitor the effectiveness of these controls. The Parties agree that the controls will not change the land-use status of Site SS-19 from nonresidential to residential, but they will allow reuse of the housing.

The selected remedy for SS-19 is Alternative SS19-3: Excavation, Off-Site Disposal, and implementation of Institutional Controls. The specific components of this alternative are presented in Section 5.1.2.3, and are described in this section. The selected remedy will successfully implement the contaminated surface soil removal and capping requirement of the Consensus Statement.

Alternative SS19-3 satisfies the two threshold criteria, overall protection of human health and the environment and compliance with ARARs, and provides the best balance of compliance with the nine EPA evaluation criteria.

7.1.1 Major Components of the Selected Remedy

7.1.1.1 Excavation

This remedy will excavate and remove the top 6 inches of soil from the part of the South Desert

Village that has been determined to have lead concentrations in the surface soil above 400 mg/kg (Figure 5-1), an estimated volume of 13,115 yd^3. Soil beneath buildings, sidewalks, and roads will not be removed. The excavated soil will be transported in covered trucks to a licensed solid waste landfill for permanent disposal. It is anticipated that the excavated soil will expand 25 percent during loading, and the actual volume of soil transported will be 16,394 yd^3.

7.1.1.2 Capping

A protective cap is required because lead-shot soil contamination has been documented within the area outlined by Figure 5-1 to depths of 4 feet bgs (IT, 1997a). Removal of the top 6 inches of contaminated surface soil, then, will not remove all of the potential for exposure. The cap, which is intended to prevent exposure to any remaining lead pellets in the soil, will be composed of two parts: six inches of clean soil backfill of excavated areas, and the footprints of existing houses, sidewalks, roadways, paved parking areas, and concrete patio areas. Clean soil will be imported and maintained at a thickness of at least six inches to return the site to original grade.

7.1.1.3 Oversight

During excavation activities, and before backfill with clean soil, various actions may be performed in the South Desert Village. The Arizona SHPO will require archeological monitoring of the exposed soil by a qualified archeologist, in accordance with an approved plan. Utilities such as power, gas, telephone, and cable television may be installed, and roads and/or sidewalks may be repaired. Coordination of these actions will be worked out in the remedial design.

7.1.1.4 Institutional Controls and VEMUR

Institutional Controls will be tailored to prevent access to residual soil contamination. Institutional controls refer to nonengineering measures (usually but not always, legal controls) intended to affect human activities in such a way as to prevent or reduce exposure to hazardous substances. Examples of Institutional Controls cited in the preamble to the NCP (EPA, 1990) include land and resource use and deed restrictions, well-drilling prohibitions, building permits and well use advisories and deed notices.

For sites being remediated to nonresidential risk levels (an HI of 1, and an ILCR of 10^{-4}) ADEQ (1996) requires that a VEMUR be placed on a site to provide notice of residual contamination. A VEMUR (Appendix A-2) shall be recorded in the land records where the property is situated in accordance with Section R-18-7-207(A) of the Arizona Soil Remediation Standards Rules

(ADEQ, 1996) and A.R.S 49-152. Section R-18-7-207 describes the VEMUR as follows:

- A person who is required to record a VEMUR in accordance with A.R.S. § 49-152 shall record, with the County Recorder's office where the property is located, a copy of the document set forth in Appendix B. The VEMUR shall be recorded within 30 days after completing remediation and shall be formatted in accordance with A.R.S. § 11-480 and any other specific requirements of the recorder of the jurisdiction. Remediation is considered complete when the analytical results of the samples taken to confirm the remediation level have been received by the person conducting the remediation. An authorized departmental representative shall sign the VEMUR before it is recorded.

- A person who wishes to cancel a recorded VEMUR as described in A.R.S. § 49-152(F) shall record, with the County Recorder's office where the property is located, a copy of the document set forth in Appendix C. An authorized departmental representative shall sign the VEMUR cancellation before it is recorded.

- Within 30 days of the date of recording, a person who records a document described in subsection (A) or (B) of this Section shall provide a copy of the recording to the Department.

To protect human health and the environment, and in order to comply with Consensus Statement 97-02, certain actions beyond the RA are required. These include the recording of a VEMUR (as noted above) which shall contain the following: 1) a legal description of the affected real estate; 2) a brief description of the nature and extent of lead contamination; 3) a list of specified actions that will constitute remediation; and 4) define the future land use of the area within the VEMUR as nonresidential. In addition, the transferee of the property (ASU) and the State of Arizona have agreed through a separate binding agreement to ensure the prevention of exposure to residual contamination, as well as to prohibit children under 7 years of age from residing on the property.

7.1.1.5 O&M

O&M procedures and responsibilities are specified in the approved Operation and Maintenance Plan attached to this ROD as Appendix A-3, in order to maintain the integrity of the soil cap. Specific procedures for such actions as installation and/or repair of utilities in the area, and specific responsibilities for maintenance and inspections will be covered by O&M documents.

The integrity of the cap will be inspected semiannually, and 5-year site reviews will be performed. These O&M requirements will also be made the responsibility of the transferee, through two documents: (1) the separate agreement between ASU and the State of Arizona; and (2) the Quitclaim Deed between the United States and Arizona State University. Given the fact the conveyance is the subject of a Public Benefit Conveyance for educational purposes, transfer of this property to another party is unlikely.

7.1.2 Implementation Concerns

There are no major implementation concerns associated with the excavation, removal, and backfilling of the affected area. A Maricopa County air permit will be required for fugitive dust emissions, or dust suppression methods may be specified during the remedial design. Archeological monitoring will be required during excavation activities. The alternative is estimated to require three months to complete. There are no implementation concerns associated with the recordation of a VEMUR with respect to the site and the implementation of the agreement between ASU and the State of Arizona.

7.1.3 Cost

The initial capital cost, assuming all soil to be nonhazardous waste, is estimated to be $1,386,000. The O&M costs, which include semiannual site visits to inspect the soil cap integrity, and the 5-year review, are $136,000. The net present worth is $1,522,000.

7.2 Selected Remedy for the Firing Range and Skeet Range (Facility 927, Part of Site SS-20)

The selected remedy for Site SS-20 is Alternative SS20-3FR: Excavation and Off-Site Disposal. the specific components of this alternative are presented in Section 5.2.2.2, and are described in this section.

The recordation of a VEMUR (Appendix A-2) will be used to provide notice of residual contamination on the Skeet Range which is adjacent to the runway. In addition, the Air Force will use Institutional Controls to prevent exposure to residual contamination by limiting the property's use to nonresidential activities, through the implementation of environmental use restrictions in the deed conveying the property. These environmental use restrictions shall run with the land and be binding on successors in interest in accordance with Arizona real property law, and shall be enforceable by the United States. The environmental use restrictions shall be made enforceable through deed covenants which shall allow the United States, as Grantor, to institute

legal action to enforce performance and observance of these covenants, enjoin acts which are violative of these covenants, and exercise any other legal or equitable right or remedy with respect to these covenants.

In addition, since this property is to be transferred for use as a public airport, the conveyance mechanism itself shall pose a limitation on the use of the property for residential purposes. Typically, the property recipient enters into contractual obligations with the Federal Aviation Administration which limits the use of the property to support the public airport. In the event the property is no longer for the public airport, the deed conveying the affected property will include provisions allowing for site access by the United States and appropriate environmental regulatory agencies for the purposes of ensuring compliance with the restrictions identified in the deed conveying the property.

7.2.1 Major Components of the Selected Remedy

An area of lead-contaminated soil approximately 140 feet in width and 20 feet in height along the north berm of the Firing Range will be excavated to a depth into the berm of 5 feet. This soil represents a volume of 519 yd^3, which could expand 25 percent to 649 yd^3 upon excavation. The excavated soil will be transported by covered trucks off Base to a licensed solid waste landfill.

The Former Skeet Range was adjacent to the active runway so no action other than the recordation of a VEMUR and placement of appropriate access and environmental use restrictions in the deed conveying the property will be accomplished to ensure that use of this site by the transferee and its successors will not result in exposure to or disturbance of any residual contamination.

7.2.2 Implementation Concerns

There are no major implementation concerns associated with the excavation, removal, and backfilling of the affected area. A Maricopa County air permit will be required for fugitive dust emissions, or dust suppression methods may be specified during the remedial design. The alternative is estimated to require one week to complete.

7.2.3 Cost

The initial capital cost, assuming all soil to be nonhazardous waste, is estimated to be $122,000. Any O&M costs associated with this remedy would be negligible as long as the property is used in accordance with the terms of the conveyance as a public airport. To ensure compliance with the institutional controls, a monitoring component will be established as part of the 5-year review

process as long as the property is part of the public airport. If the use of the property changes (i.e., the property is no longer used for airport purposes), the monitoring component will need to be reviewed to ensure that an appropriate monitoring profile is implemented which could include greater frequency of inspections of the property.

7.3 Selected Remedy for the Electroplating/Chemical Cleaning Shop (Site SS-16)

The selected remedy for SS-16 is Alternative SS16-2: Institutional Control. The specific components of this alternative are presented in Chapter 5.0. The only component from among source treatment, source containment, groundwater, and general will be the general component via the recordation of a VEMUR (Appendix A-2) and placement of covenants in the deed designed to prevent activities which could cause exposure to residual contamination. These environmental use restrictions shall run with the land and be binding on successors in interest in accordance with Arizona real property law, and shall be enforceable by the United States. The Air Force will also assure through the property transfer process and deed restrictions that any engineering controls required to meet nonresidential use will become the operations and maintenance responsibility of the acquiring land owner.

This remedy will involve placing a VEMUR on SS-16 and appropriate environmental use restrictions in the deed conveying the property to restrict use to nonresidential. As is the case in 7.2 above, in the event the property is no longer used for the public airport, the deed conveying the affected property will include provisions allowing for site access by the United States and appropriate environmental regulatory agencies for the purposes of ensuring compliance with the environmental use restrictions identified in the deed conveying the property. The environmental use restrictions shall be made enforceable through deed covenants which shall allow the United States, as Grantor, to institute legal action to enforce performance and observance of these covenants, enjoin acts which are violative of these covenants, and exercise any other legal or equitable right or remedy with respect to these covenants. To ensure compliance with the institutional controls, a monitoring component will be established as part of the 5-year review process as long as the property is part of the public airport. If the use of the property changes, the monitoring component will need to be reviewed to ensure that an appropriate monitoring profile is implemented which could include greater frequency of inspections of the property. The cost of this alternative is estimated at $2,000.

7.4 Selected Remedy for Building 1010 (Site SS-24)

The selected remedy for SS-24 is Alternative SS24-2: Institutional Control. The specific com-

ponents of this alternative are presented in Chapter 5.0. The only component from among source treatment, source containment, groundwater, and general will be the general component via the recordation of a VEMUR and placement of covenants in the deed designed to prevent activities which could cause exposure to residual contamination. These environmental use restrictions shall run with the land and be binding on successors in interest in accordance with Arizona real property law, and shall be enforceable by the United States. The Air Force will assure through the property transfer process and deed restrictions that any engineering controls required to meet nonresidential use will become the operations and maintenance responsibility of the acquiring land owner.

As is the case in 7.2 and 7.3 above, in the event the property is no longer used for its intended transfer as a conveyance of the wastewater treatment plant under the auspices of a public benefit conveyance for health purposes under the authority of the Department of Health and Human Services, the deed conveying the affected property will include provisions allowing for site access by the United States and appropriate environmental regulatory agencies for the purposes of ensuring compliance with the restrictions identified in the deed conveying the property. The environmental use restrictions shall be made enforceable through deed covenants which shall allow the United States, as Grantor, to institute legal action to enforce performance and observance of these covenants, enjoin acts which are violative of these covenants, and exercise any other legal or equitable right or remedy with respect to these covenants. As in the case of the other affected properties containing SS-16, SS-19 and SS-20, the conveyance of the property is for the sole purposes of carrying out a specific program, and, therefore, use of the property inconsistent with the purposes of such conveyance could result in the forfeiture of the subject property. To ensure compliance with the institutional controls, a monitoring component will be established as part of the 5-year review process as long as the property is subject to the requirements of the conveyance for public health. If the use of the property changes, the monitoring component will need to be reviewed to ensure that an appropriate monitoring profile is implemented which could include greater frequency of inspections of the property. The cost of this alternative is estimated at $2,000.

7.5 Selected Remedy for Facilities 1020 and 1051 (Site SS-21)

The recordation of a VEMUR (Appendix A-2) will be used to provide notice of residual contamination at Site SS-21. In addition, the Air Force will use Institutional Controls to prevent exposure to residual contamination by limiting the property's use to nonresidential activities, through the implementation of environmental use restrictions in the deed conveying the property.

These environmental use restrictions shall run with the land and be binding on successors in interest in accordance with Arizona real property law, and shall be enforceable by the United States. The environmental use restrictions shall be made enforceable through deed covenants which shall allow the United States, as Grantor, to institute legal action to enforce performance and observance of these covenants, enjoin acts which are violative of these covenants, and exercise any other legal or equitable right or remedy with respect to these covenants.

In addition, since this property is to be transferred for use as a public airport, the conveyance mechanism itself shall pose a limitation on the use of the property for residential purposes, as described in Section 7.2. To ensure compliance with the institutional controls, a monitoring component will be established as part of the 5-year review process as long as the property is part of the public airport. If the use of the property changes, the monitoring component will need to be reviewed to ensure that an appropriate monitoring profile is implemented which could include greater frequency of inspections of the property. The cost of the implementation of the institutional controls is estimated at $2,000.

8.0 Statutory Determination

Under Section 121 of CERCLA, the selected remedy must be protective of human health and the environment, and must comply with all ARARs. The selected remedy must also be cost effective and utilize permanent solutions and alternative treatment technologies to the maximum practical extent. Remedies that employ treatment that permanently and significantly reduce the volume, toxicity, or mobility of hazardous wastes as a major part of the remedy are preferable. How the selected remedies for OU-4 sites meet these requirements is discussed in this chapter.

The State of Arizona and the communities surrounding Williams AFB were involved in the decision-making process through the TRC, the RAB, and through public meetings and comment periods on proposed remedies and removal actions. Chapter 10.0 of this document addresses the communities' involvement in more depth.

The selected remedy for both the Former Skeet Range (Site SS-19) and the Firing Range (part of Site SS-20) is excavation, off-site disposal, and institutional controls. The placement and maintenance of a protective cap is an integral part of the Site SS-19 remedy, as well. This selected remedy represents the best balance among alternatives with respect to the evaluation criteria.

The selected remedy for the Electroplating/Chemical Cleaning Shop (Site SS-16), the Former Skeet Range at Site SS-20, Facilities 1020 and 1051 (Site SS-21), and Building 1010 (Site SS-24) is institutional controls in the form of placement of deed restrictions and a VEMUR on the site.

8.1 Protection of Human Health and the Environment

The selected remedy protects human health by breaking the ingestion pathway for lead in soil to a human child receptor. In the case of the Former Skeet Range at the South Desert Village (SS-19), the exposed surface soil containing above 400 mg/kg lead will be removed, and the lead-contaminated subsurface soil below it will be covered with a six-inch clean soil cap. A VEMUR, O&M manual requirements, deed restrictions, semiannual soil cap inspections, and five-year reviews will assure that the pathway remains broken. The selected remedy is the least expensive. The selected remedy is more protective of human health than Alternative SS19-1, is more protective of human health than Alternative SS19-4, and is preferred to Alternative SS19-5 because it does not add lead-contaminated soil to another location on the Base.

In the case of the Firing Range (part of SS-20), the lead-contaminated soil in the impact side of the north berm will be removed. This will reduce any lead contamination at the site to industrial-use levels or below.

The selected remedy at Sites SS-16, the Former Skeet Range at SS-20, SS-21, and SS-24 will limit those individuals who have access to the site and their interaction with the site. This will minimize human health risk.

8.2 Attainment of ARARs

The selected remedy will comply with ARARs, which are presented in Appendix D.

8.3 Cost Effectiveness

The selected remedy for the Skeet Range at the South Desert Village, Alternative SS19-3, was evaluated for cost effectiveness against Alternative SS19-1 (no action), Alternative SS19-4 (excavation, off-site disposal, desert landscaping, and Institutional Control), Alternative SS19-5 (excavation, lead mining, and Institutional Control). The selected remedy is the least expensive.

The Institutional Action at Site SS-16 and Site SS-24 is the most cost effective alternative.

8.4 Utilization of Permanent Solutions and Alternative Treatment Technologies to the Maximum Extent Possible

The selected remedy utilizes permanent solutions and treatment technologies to the maximum extent possible. The lead mining alternative would allow recycling of the lead shot from the South Desert Village, but the difficulty of locating a site on which to stage the soil for treatment, and on which to leave the treated soil at the completion of the action make the off-site disposal alternative more economical.

The selected alternative at Sites SS-19 and the SS-20 Firing Range would accomplish site cleanup to acceptable levels within 3 to 6 months.

The selected alternative at Sites SS-16, the Former Skeet Range at SS-20, SS-21, and SS-24 does not permanently reduce the contaminant levels, but it will meet all acceptable levels while the facilities are in industrial use.

8.5 Preference for Treatment as a Principal Element

No practical method of in-situ treatment of lead shot in soil has been proposed. Any alternative except removal will leave the contaminant source in place. Source reduction treatment by removal, then, is the most practical alternative.

There are no practical alternatives to lower the contaminant levels at Sites SS-16 and SS-24 because of their already low concentrations. The levels of lead in surface soil are unknown at the Site SS-20 Skeet Range and at Site SS-21, but sampling has documented there will be no impact to groundwater.

9.0 Documentation of Significant Changes

This section documents the reasons for any significant changes to the selected remedy after receiving public comments on this document.

The public comment period for cleanup of soils at OU-4 began on November 10, 1997, coincident with public review of the proposed plan for OU-4 (IT, 1997d). The public meeting was held November 18, 1997. There have been no changes to the selected remedy as the result of public comments.

10.0 Responsiveness Summary

10.1 Overview

The USAF published the proposed plan for OU-4, Williams AFB on October 28, 1997; the public comment period began November 10, 1997 and extended through December 9, 1997. A public meeting was held at the Williams Gateway Airport, Building 1, 6001 South Power Road in Mesa, Arizona to present the plan to the public on November 18, 1997. The ROD recommends a no-action alternative for six OU-4 sites where there is no contaminant that poses a unacceptable risk to human health and the environment, institutional control through deed restrictions and a VEMUR at two sites, and a combination of remedial cleanup actions and institutional controls through deed restrictions and a VEMUR at two sites that contain lead in soil at levels that pose an unacceptable risk to human health and the environment if no action were taken.

The public meeting held on November 18, 1997 was attended by RAB members and two members of the general public. There were no significant comments received that impact the planned actions.

10.2 Background on Community Involvement

To date, the level of community interest and concern regarding the soil contamination at OU-4 in particular and environmental cleanup in general at Williams AFB can be characterized as extremely low. In contrast, Base reuse issues have sparked great interest, which in turn have created an indirect interest on what effect, if any, the environmental contamination at the Base will have on future use or transfer of Base property.

The RAB has been briefed on the progress of environmental investigation all OUs and the selected remedy identified in the ROD for OU-4. An ad was placed in the *Tribune* announcing to the public that the proposed plan had been placed in the information repository at the Gilbert Public Library and that there was an opportunity to offer input during the 30-day comment period. A fact sheet describing the selected remedy for cleanup of OU-4 was also placed in the information repository and distributed at the public meeting. The ad announcing the public comment period and the availability of the proposed plan for review contained the time, location, and subject matter of the public meeting.

10.3 Summary of Comments Received During the Public Comment Period and Air Force Responses

The public comment period on the proposed plan for cleanup of soils at OU-4 was held from November 10, 1997 through December 9, 1997.

10.4 Community Relations Activities at Williams Air Force Base

Community relations activities at Williams AFB have been guided by a written community relations plan. Design of the site-specific community relations plan was guided by the level and types of concern expressed by local community members in one-on-one interviews conducted in November 1989.

An information repository containing correspondence, fact sheets, and other pertinent documents, such as the community relations plan, has been established and is currently maintained at the Williams Gateway Airport Authority Administrative Offices,5835 South Soffaman Road, Mesa, Arizona 85212.

A TRC provided review and comment on actions and proposed actions with respect to releases and threatened releases of hazardous substances at Williams AFB until it was replaced by the RAB in February, 1994. The purpose of the RAB (and the TRC before it) is to serve as an advisory committee to the USAF on the IRP at Williams AFB. The RAB, whose expanded membership includes representatives of the USAF, state and federal regulatory agencies, and community stakeholders, meets quarterly to discuss the results of the field investigations and to discuss proposals for interim or final cleanup actions. In addition to IRP issues, the RAB covers Base reuse topics.

Eleven fact sheets have been written and distributed that describe planned, ongoing, and completed activities under the IRP at Williams AFB. Six were information updates on progress of environmental investigation. Five others described the proposed plans for cleanup of OU-1, OU-2, OU-3, OU-4, and OU-5.

A 35-millimeter slide presentation describing the IRP was developed for the Base Commander's use with community and civic groups. Before the training wing was deactivated, the Commander or his designee briefed numerous groups about environmental activities at Williams AFB.

News releases and public notices have been submitted to the local papers announcing milestones in the IRP. Topics include:

- Signing of the FFA
- Availability for comment on engineering evaluation/cost analyses for the Radioactive Instrumentation Burial Area, the Fire Protection Training Area No. 1, and the Pesticide Burial Area
- Availability of the OU-1, OU-2, OU-3, OU-4, and OU-5 RI reports for review
- Availability of the OU-1, OU-2, OU-3, OU-4, and OU-5 proposed plans for public comment
- Announcement of public meeting to present the proposed plans for OU-1, OU-2, OU-3, OU-4, and OU-5.

Fact sheets describing the proposed plans to clean up OU-1 and OU-2 were mailed to the mailing list contained in the community relations plan, along with the announcement of the public comment period and the public meeting. The broadcast media also received a public service announcement giving the time and location of the public meeting. Notices in the *Arizona Republic/Phoenix Gazette* announced the public comment periods for OU-1 and OU-2. The *Tribune* carried notices for the public comment period for the OU-3, OU-4, and OU-5 proposed plans.

Four public meetings have been held at the Mesa Conference Center Complex as part of the community relations program at Williams AFB. Fifty to 75 citizens attended the first meeting held on June 16, 1992 to present the proposed plan for cleanup of OU-2, and less than 20 citizens attended the second and third public meetings held October 14, 1993 and February 10, 1994 to present the proposed plan for cleanup of OU-1. Less than a half dozen bona fide community members attended the public meeting held on July 18, 1995 to present the proposed plan for OU-3. RAB members and two persons, one representing the State of Arizona and one representing the Gila River Indian Community, attended the OU-5 public meeting. The OU-4 public meeting on November 18, 1997 was attended by RAB Committee and two community members.

At each public meeting, attendees were given an agenda, a fact sheet, and graphic representations of cleanup alternatives as handouts. Copies of the FSs and proposed plans were available at each public meeting for review. Press packets, including the handouts, hard copies of slides, and the news releases, were available for media representatives who attended the first four meetings. The presentation materials were provided all attendees of the OU-4 meeting.

Questions and answers from the public meeting are summarized as follows:

Questions and Answers

Mr. Terry McArthur (citizen) asked if there was a significant risk reduction between the options of placing a 6-inch clean soil cover on the area or removing 6 inches of contaminated soil and replacing it with clean soil.

Mr. Carter (IT) said that in terms of risk reduction, he did not recall that there would be a significant difference between the two options. Removing the soil will reduce the amount of lead in the soil significantly, thus reducing the lead levels. Capping with clean soil, new vegetation, and placing a VEMUR to restrict digging and disturbance of the cap together were selected as the most cost-effective procedure while producing a reasonable reduction in human health risk. Mr. Freitas (EPA) said that an operation and maintenance plan also will address what type of activity may occur at the site, in addition to the VEMUR.

Mr. McArthur (citizen) then asked about new utility placement in the area. Mr. Carter (IT) said that coordination meetings are currently being conducted between the Air Force and local utilities and ASU officials. The attempt will be made to phase in new utility work so the utilities can be installed before remediation or removal action takes place. Any subsequent utility work would be guided by the operations and maintenance plan, which will outline how any disturbed and contaminated soil will be handled. This manual will have to be agreed to by the Air Force, the regulatory agencies, the utilities, and ASU.

Mr.. Jim Burke (Gila Indian River Community) asked if the cost of the OU-4 action is known. Mr. Carter (IT) referred him to the last page of the proposed plan handed out earlier. He said the cost will be about $1.5 million.

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APPENDIX A

REQUIRED DOCUMENTS

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A-1 Consensus Statement 97-02

A-2 VEMURs

A-3 South Desert Village Protective Cap Operation and Maintenance Manual

A-4 Agreement

A-5 Draft Quitclaim Deed

APPENDIX A

REQUIRED DOCUMENTS

APPENDIX A-1

CONSENSUS STATEMENT 97-02

Consensus Statement No. 97-02
Agreement on Skeet Range/ South Desert Village (SS-19)

April 22, 1997

ISSUES:
Lead shot contamination at the former skeet range located in South Desert Village could pose a hazard to human health (i.e. children). The Arizona Amended Soil Remediation Rule allows an owner to record a Voluntary Environmental Mitigation Use Restriction (VEMUR) for non residential use if a cap is maintained over any area where the lead concentration in the upper 6 inches of soil exceeds 400 mg/kg. The Arizona Amended Soil Remediation Rule requires that this property be classified as non residential however it can be inhabited provided that frequent and repeated contact with the soil has been limited through the use of a protective cap thereby eliminating unacceptable risk to the inhabitants.

DECLARATION:
The Remedial Project Managers (RPM), representing the Parties to the Williams AFB Federal Facilities Agreement (FFA) have agreed to this consensus statement after considering all of the Parties' concerns.

CONSIDERATIONS:
This consensus statement considers actions that will be acceptable to the Parties leading to a permanent remedy as shown below.

AGREEMENT/CONSENSUS:
It is agreed that the Air Force will remove the top 6" of soil where characterization has shown the lead level to exceed 400 mg/kg and replace with material specified in the approved final OU-4 Feasibility Study Report. Soil below roadways, sidewalks, or foundations within the 400 mg/kg lead area will be retained in place and a VEMUR specifying restrictions for non residential use will be signed. The cap must be periodically monitored and repaired as necessary per the requirements specified in the operations and maintenance manual to be written and issued for review and use. The above agreemnet is contingent on acceptance by the public of the Proposed Plan.

Accepted by the Parties on the date signed and noted below:

Rich Freitas 4-22-97
Rich Freitas
EPA Region IX RPM

Amanda E. Stone 4-22-97
Amanda Stone
ADEQ RPM

C. Helms 22 Apr 97
Charles Helms
AFBCA RPM

Mason R. Bolitho 4/23/97
Mason Bolitho
ADWR RPM

CS0422-1 4/22/97

APPENDIX A-2

VEMUR

1. SS-19, Former Skeet Range (South Desert Village) - Final
2. SS-16, Electroplating Shop - Draft (Note 1)
3. SS-20, Firing Range - Draft (Note 1)
4. SS-24, Facility 1010 - Draft (Note 1)
5. SS-20, Skeet Range - Draft (Note 1)
6. SS-21, Facility 1020 and Facility 1051 - Draft (Note 1)

Note 1 - The noted VEMURs are in draft form. The Air Force expects to record these in either identical or substantially the same format (subject to coordination with ADEQ) as shown.

Hold for FC

OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
99-0358789 04/15/99 01:15
PAULA 1 OF 1

Return to:
U.S. Air Force
AFBCA/DC ROL
Regional Operating Location
3711 Outlaw Country Drive (Bldg 4531)
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

FORMER SKEET RANGE
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

990358789

Former Skeet Range
Williams Air Force Base
Mesa, Arizona

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

LEGAL DESCRIPTION: SOUTH DESERT VILLAGE

A portion of "PARCEL J1" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the South half of Section 31, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Northwest corner of the Southwest quarter of said Section 31;
thence South 00° 49' 18" East, along the West line of said Southwest quarter, a distance of 421.09 feet;
thence North 89° 10' 42" East, perpendicular to said West line, a distance of 1111.28 feet to the Point of Beginning;
thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 76° 32' 00" East, a distance of 20.62 feet;
thence North 04° 37' 30" West, a distance of 55.23 feet;
thence North 70° 00' 48" East, a distance of 42.72 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 39° 14' 10" West, a distance of 78.10 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence North 64° 00' 16" East, a distance of 11.18 feet;
thence North 74° 37' 27" East, a distance of 72.80 feet;
thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 53° 24' 11" East, a distance of 68.01 feet;
thence North 67° 22' 15" East, a distance of 38.08 feet;
thence North 45° 34' 10" East, a distance of 35.36 feet;
thence North 00° 34' 10" East, a distance of 25.00 feet;
thence North 38° 08' 17" East, a distance of 82.01 feet;
thence South 67° 37' 45" East, a distance of 26.93 feet;
thence South 86° 11' 09" East, a distance of 75.17 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence North 39° 13' 45" East, a distance of 64.03 feet;
thence South 57° 49' 23" East, a distance of 76.32 feet;

thence South 89° 25' 50" East, a distance of 75.00 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;
thence North 49° 23' 01" East, a distance of 53.15 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence South 50° 46' 15" East, a distance of 32.02 feet;
thence South 09° 44' 07" East, a distance of 55.90 feet;
thence South 55° 01' 54" West, a distance of 43.01 feet;
thence South 50° 45' 50" West, a distance of 39.05 feet;
thence South 25° 59' 44" East, a distance of 67.08 feet;
thence North 79° 15' 34" East, a distance of 50.99 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;
thence North 22° 22' 15" East, a distance of 53.85 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 75° 23' 40" East, a distance of 61.85 feet;
thence South 48° 14' 41" East, a distance of 53.15 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 32° 10' 37" West, a distance of 76.32 feet;
thence South 59° 21' 43" East, a distance of 109.77 feet;
thence South 00° 34' 10" West, a distance of 55.00 feet;
thence South 73° 29' 07" East, a distance of 72.80 feet;
thence South 39° 14' 10" East, a distance of 39.05 feet;
thence South 89° 25' 50" East, a distance of 105.00 feet;
thence North 25° 59' 44" West, a distance of 55.90 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 10° 44' 26" East, a distance of 25.50 feet;
thence South 21° 13' 55" East, a distance of 26.93 feet;
thence South 11° 52' 46" West, a distance of 50.99 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 39° 13' 45" West, a distance of 64.03 feet;
thence North 89° 25' 50" West, a distance of 55.00 feet;
thence South 56° 52' 46" West, a distance of 36.06 feet;
thence South 76° 54' 06" East, a distance of 138.29 feet;
thence South 59° 41' 08" East, a distance of 40.31 feet;
thence South 66° 56' 24" West, a distance of 87.32 feet;
thence South 20° 13' 24" West, a distance of 74.33 feet;
thence South 45° 34' 10" West, a distance of 42.43 feet;
thence North 75° 23' 40" West, a distance of 61.85 feet;
thence North 68° 52' 28" West, a distance of 42.72 feet;
thence North 00° 34' 10" East, a distance of 50.00 feet;

thence North 14° 36' 20" East, a distance of 61.85 feet;
thence North 58° 28' 00" West, a distance of 29.15 feet;
thence South 58° 33' 51" West, a distance of 47.17 feet;
thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 05° 08' 28" East, a distance of 50.25 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
thence North 78° 07' 14" West, a distance of 50.99 feet;
thence North 54° 26' 19" West, a distance of 61.03 feet;
thence North 38° 05' 25" West, a distance of 64.03 feet;
thence North 09° 44' 07" West, a distance of 55.90 feet;
thence North 10° 52' 27" East, a distance of 55.90 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
thence South 22° 22' 15" West, a distance of 53.85 feet;
thence South 15° 49' 28" West, a distance of 57.01 feet;
thence South 45° 34' 10" West, a distance of 35.36 feet;
thence North 30° 23' 40" West, a distance of 29.15 feet;
thence North 25° 59' 44" West, a distance of 55.90 feet;
thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 30° 18' 52" East, a distance of 80.62 feet;
thence North 41° 42' 15" West, a distance of 74.33 feet;
thence North 16° 07' 47" West, a distance of 52.20 feet;
thence South 27° 08' 04" West, a distance of 55.90 feet;
thence South 56° 52' 46" West, a distance of 90.14 feet;
thence South 49° 37' 30" East, a distance of 78.10 feet;
thence South 30° 23' 40" East, a distance of 29.15 feet;
thence South 45° 34' 10" West, a distance of 35.36 feet;
thence South 68° 46' 05" West, a distance of 53.85 feet;
thence South 84° 51' 32" West, a distance of 50.25 feet;
thence North 70° 59' 44" West, a distance of 15.81 feet;
thence North 11° 57' 34" West, a distance of 46.10 feet;
thence North 34° 58' 06" West, a distance of 43.01 feet;
thence South 59° 36' 20" West, a distance of 116.62 feet;
thence South 64° 00' 16" West, a distance of 55.90 feet;
thence North 89° 25' 50" West, a distance of 85.00 feet;
thence South 31° 32' 00' West, a distance of 29.15 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence North 16° 07' 47" West, a distance of 52.20 feet;
thence South 68° 46' 05" West, a distance of 53.85 feet;
thence South 85° 48' 21" West, a distance of 60.21 feet;
thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence South 64° 00' 16" West, a distance of 55.90 feet;

thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 58° 28' 00" West, a distance of 58.31 feet;
thence North 45° 34' 10" East, a distance of 63.64 feet;
thence South 47° 47' 49" East, a distance of 60.21 feet;
thence North 00° 34' 10" East, a distance of 165.00 feet;
thence South 22° 22' 15" West, a distance of 107.70 feet;
thence South 82° 58' 29" West, a distance of 75.66 feet;
thence South 39° 13' 45" West, a distance of 64.03 feet;
thence North 44° 25' 50" West, a distance of 84.85 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence North 30° 23' 40" West, a distance of 87.46 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising and area of 792,650 square feet or 18.1970 acres more or less.

The subject of this VEMUR, Installation Restoration Program (IRP) Site SS-19, is a former six station skeet range. The range was demolished and graded in 1950, prior to construction of the Base housing units now known as South Desert Village. The range occupied what is now an area south of Coolidge Street, between 5th Street and Perimeter Road.

This site was identified in the 1993 Facilities Assessment Report as an area requiring further investigation. In 1994, five (5) soil samples were collected from locations representative of the area affected by lead shot. Analysis indicated one (1) lead value in excess of the Base-specific background range, the regional background range, and the Environmental Protection Agency (EPA) - Region IX residential Preliminary Remediation Goal (PRG) and the Arizona residential Health Based Guidance Level (HBGL) of 400 mg/kg. Based on this finding, the site was recommended for further investigation during Operable Unit 4 (OU-4).

While conducting soil borings, as part of the OU-4 investigation, visible lead shot and broken skeet targets were observed; brought to the surface by widespread rodent burrowing. Because of the widespread lead-shot contamination visible on the surface, a supplemental investigation was proposed to determine the aerial and vertical extent of lead contamination.

The supplemental investigation was performed in January and February of 1996. Over 1,000 locations were bored to a depth of 2 feet below ground surface (bgs), and approximately 100 locations were bored to a total depth of 4 feet bgs. Samples were sieved and the remaining lead pellets counted and documented.

It has been established that lead from lead shot is not a threat to groundwater at this site; however, the lead shot in the surface soil represents a potential health risk to residents of the South Desert Village. Since risk based PRGs for lead (as lead shot) in soil could not be quantified for the site (because of lack of empirical data) the EPA Region IX and Arizona HBGL for lead in soil was adopted as a surrogate PRG for the upperbound estimate of lead available for

ingestion. A conversion of lead pellet abundance to potential lead in soil was performed and the data was used to generate a map of South Desert Village indicating the area where lead values in soil could be expected to exceed the PRG.

The selected remedy (completed in June 1998) for this site is excavation, removal, and replacement of the top six (6) inches of soil within the 400 mg/kg area. The replacement soil is a protective cap over the remaining contamination, and is subject to repair and maintenance in accordance with an EPA, Arizona Department of Environmental Quality (ADEQ), and Air Force approved Operation & Maintenance Manual.

This VEMUR is to be recorded with the county recorder on the chain of title to indicate the selected remedy has been completed, and to give notice that the remediated portion of the property has not been cleaned up to residential standards. However, in accordance with Consensus Statement No. 97-02, dated 22 April 1997, and the Arizona Amended Soil Remediation Rule, the US EPA, Region IX, and the ADEQ have agreed that the remedy properly maintained in accordance with the South Desert Village Protective Cap Operation and Maintenance Manual, dated May 1998, is sufficiently protective of human health and the environment to allow human habitation. In order to augment the physical remedy, the property will be subjected to a deed restriction that prohibits the habitation of children under seven (7) years of age.

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990358789

Former Skeet Range
Williams Air Force Base
Mesa, Arizona

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to habitation by persons over the age of seven (7) years and above, and agrees that the repair and maintenance of the protective cap be in accordance with an EPA, Arizona Department of Environmental Quality (ADEQ), and Air Force approved Operation & Maintenance Manual.

for: **UNITED STATES OF AMERICA**

Date: September 18, 1998

Albert F. Lowas, Jr.
ALBERT F. LOWAS, JR.
Director
Air Force Base Conversion Agency

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the 18 day of September, 1998, before me, Helen J. Woodland, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

Helen J. Woodland
Notary Public, Commonwealth of Virginia
My commission expires: Jul 31, 20001

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: 4/1/99

Approved: Jan A. Callahan

Title: Director, Waste Programs Division

990358789

for: ARIZONA DEPARTMENT OF
ENVIRONMENTAL QUALITY

Date: 4/1/99

Jean A. Calhoun
Director, Waste Program Division

Notary Public
My commission expires:
1/18/00

PAMELA J. STAWNEY
Notary Public - Arizona
Maricopa County
My Comm. Expires Jan 18, 2000

APPENDIX

LEGAL DESCRIPTION OF PROPERTY BY REGISTERED LAND SURVEYOR

BRADY • AULERICH & ASSOCIATES, INC.
Civil Engineering • Land Surveying
Construction Staking

Dennis H. Brady P.L.S.
C.E. Aulerich P.L.S.
Robert N. Hermon P.E./P.L.S.

LEGAL DESCRIPTION: SOUTH DESERT VILLAGE VEMUR

A portion of "PARCEL J1" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the South half of Section 31, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Northwest corner of the Southwest quarter of said Section 31;

thence South 00° 49' 18" East, along the West line of said Southwest quarter, a distance of 421.09 feet;

thence North 89° 10' 42" East, perpendicular to said West line, a distance of 1111.28 feet to the Point of Beginning;

thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 76° 32' 00" East, a distance of 20.62 feet;
thence North 04° 37' 30" West, a distance of 55.23 feet;
thence North 70° 00' 48" East, a distance of 42.72 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 39° 14' 10" West, a distance of 78.10 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence North 64° 00' 16" East, a distance of 11.18 feet;
thence North 74° 37' 27" East, a distance of 72.80 feet;
thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 53° 24' 11" East, a distance of 68.01 feet;
thence North 67° 22' 15" East, a distance of 38.08 feet;
thence North 45° 34' 10" East, a distance of 35.36 feet;
thence North 00° 34' 10" East, a distance of 25.00 feet;
thence North 38° 08' 17" East, a distance of 82.01 feet;
thence South 67° 37' 45" East, a distance of 26.93 feet;
thence South 86° 11' 09" East, a distance of 75.17 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence North 39° 13' 45" East, a distance of 64.03 feet;
thence South 57° 49' 23" East, a distance of 76.32 fee;
thence South 89° 25' 50" East, a distance of 75.00 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;

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thence North 49° 23' 01" East, a distance of 53.15 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence South 50° 46' 15" East, a distance of 32.02 feet;
thence South 09° 44' 07" East, a distance of 55.90 feet;
thence South 55° 01' 54" West, a distance of 43.01 feet;
thence South 50° 45' 50" West, a distance of 39.05 feet;
thence South 25° 59' 44" East, a distance of 67.08 feet;
thence North 79° 15' 34" East, a distance of 50.99 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;
thence North 22° 22' 15" East, a distance of 53.85 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 75° 23' 40" East, a distance of 61.85 feet;
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thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 32° 10' 37" West, a distance of 76.32 feet;
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thence South 00° 34' 10" West, a distance of 55.00 feet;
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thence North 14° 36' 20" East, a distance of 61.85 feet;
thence North 58° 28' 00" West, a distance of 29.15 feet;
thence South 58° 33' 51" West, a distance of 47.17 feet;

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thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 05° 08' 28" East, a distance of 50.25 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
thence North 78° 07' 14" West, a distance of 50.99 feet;
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thence North 30° 18' 52" East, a distance of 80.62 feet;
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thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 58° 28' 00" West, a distance of 58.31 feet;
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thence South 47° 47' 49" East, a distance of 60.21 feet;
thence North 00° 34' 10" East, a distance of 165.00 feet;

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thence South 22° 22' 15" West, a distance of 107.70 feet;
thence South 82° 58' 29" West, a distance of 75.66 feet;
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thence North 30° 23' 40" West, a distance of 87.46 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising and area of 792,650 square feet or 18.1970 acres more or less.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
10209
CHRISTOPHER E.
AULERICH
Expires 3/31/99
ARIZONA U.S.A.

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Tempe, Arizona 85283
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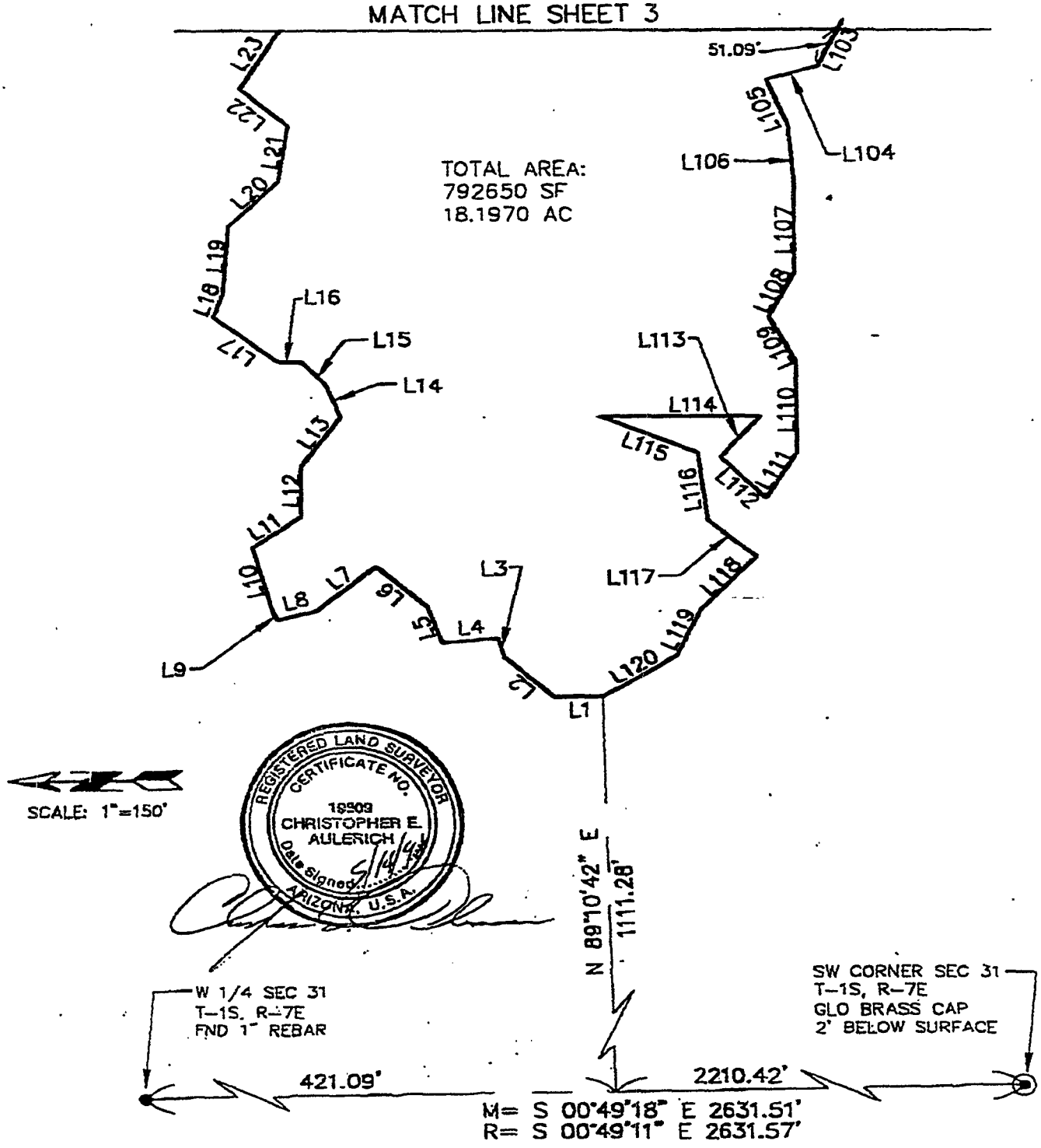
PAGE 5 OF 7 PAGES

PROJECT: SOUTH DESERT VILLAGE VEMUR DATE: 5-12-98

MATCH LINE SHEET 3



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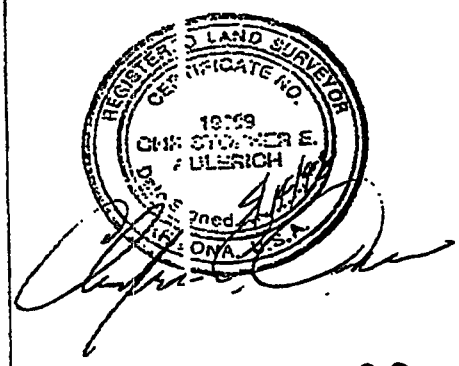
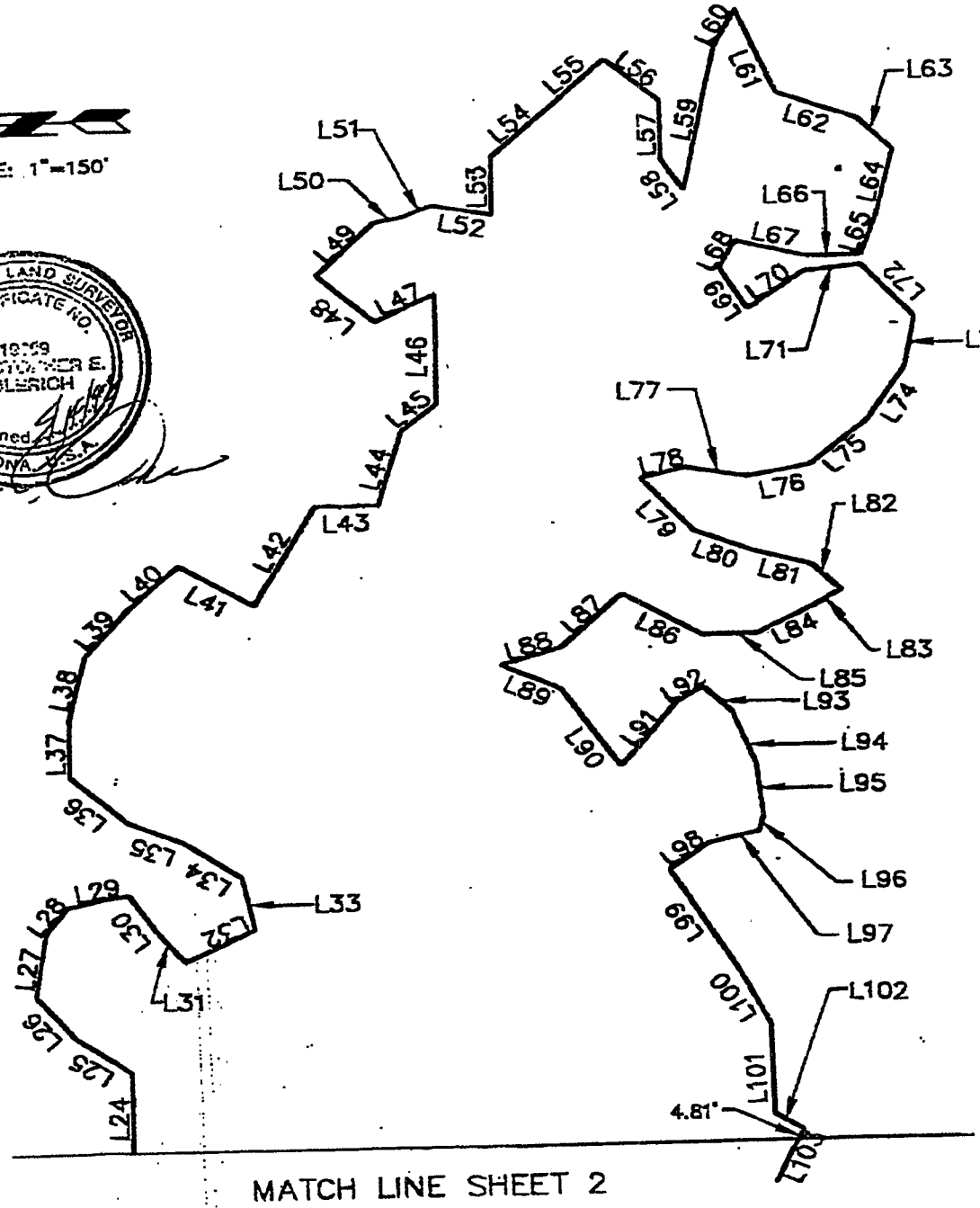
PAGE 6 OF 7 PAGES

PROJECT: SOUTH DESERT VILLAGE VEMUR DATE: 5-12-98

SCALE: 1"=150'





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Tempe, Arizona 85283
Phone (602) 839-4000 Fax (602) 345-9259

PROJECT: SOUTH DESERT VILLAGE VEMUR DATE: 5-12-98

LINE#	DIRECTION	DIST
L1	N 00°34'10" E	50.00'
L2	N 42°33'24" E	67.27'
L3	N 76°32'00" E	20.62'
L4	N 04°37'30" W	55.23'
L5	N 70°00'48" E	42.72'
L6	N 42°33'24" E	67.27'
L7	N 39°14'10" W	78.10'
L8	N 13°28'00" W	41.23'
L9	N 64°00'16" E	11.18'
L10	N 74°37'27" E	72.80'
L11	S 34°25'21" E	61.03'
L12	S 89°25'50" E	55.00'
L13	S 53°24'11" E	68.01'
L14	N 67°22'15" E	38.08'
L15	N 45°34'10" E	35.36'
L16	N 00°34'10" E	25.00'
L17	N 38°08'17" E	82.01'
L18	S 67°37'45" E	26.93'
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L20	S 44°25'50" E	70.71'
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L24	S 89°25'50" E	75.00'
L25	N 35°33'41" E	61.03'
L26	N 49°23'01" E	53.15'
L27	S 79°58'06" E	60.83'
L28	S 50°46'15" E	32.02'
L29	S 09°44'07" E	55.90'
L30	S 55°18'54" W	43.01'
L31	S 50°45'50" W	39.05'
L32	S 25°59'44" E	67.08'
L33	N 79°15'34" E	50.99'
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L42	S 59°31'43" E	109.77'
L43	S 00°34'10" W	55.00'
L44	S 73°39'07" E	72.80'
L45	S 39°14'10" E	39.05'
L46	S 89°25'50" E	105.00'
L47	N 25°59'44" W	55.90'
L48	N 42°33'24" E	67.27'
L49	S 44°25'50" E	70.71'
L50	S 10°44'26" E	25.50'
L51	S 21°13'55" E	26.93'
L52	S 11°52'46" W	50.99'

LINE#	DIRECTION	DIST
L53	S 89°25'50" E	55.00'
L54	S 41°25'04" E	67.27'
L55	S 41°25'04" E	67.27'
L56	S 39°13'45" W	64.03'
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L58	S 56°52'46" W	36.06'
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L69	S 58°33'51" W	47.17'
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L72	S 48°34'56" W	67.27'
L73	N 78°07'14" W	50.99'
L74	N 54°26'19" W	61.03'
L75	N 38°05'25" W	64.03'
L76	N 09°44'07" W	55.90'
L77	N 10°52'27" E	55.90'
L78	N 13°28'00" W	41.23'
L79	S 48°34'56" W	67.27'
L80	S 22°22'15" W	53.85'
L81	S 15°49'28" W	57.01'
L82	S 45°34'10" W	35.36'
L83	N 30°23'40" W	29.15'
L84	N 25°59'44" W	55.90'
L85	N 00°34'10" E	50.00'
L86	N 30°18'52" E	80.62'
L87	N 41°42'15" W	74.33'
L88	N 16°07'47" W	52.20'
L89	S 27°08'04" W	55.90'
L90	S 56°52'46" W	90.14'
L91	S 49°37'30" E	78.10'
L92	S 30°23'40" E	29.15'
L93	S 45°34'10" W	35.36'
L94	S 68°46'05" W	53.85'
L95	S 84°51'32" W	50.25'
L96	N 70°59'44" W	15.81'
L97	N 11°57'34" W	46.10'
L98	N 34°58'06" W	43.01'
L99	S 59°36'20" W	116.62'
L100	S 64°00'16" W	55.90'
L101	N 89°25'50" W	85.00'
L102	S 31°32'00" W	29.15'
L103	N 62°51'56" W	55.90'
L104	N 16°07'47" W	52.20'

LINE#	DIRECTION	DIST
L105	S 68°46'05" W	53.85'
L106	S 85°48'21" W	60.21'
L107	N 89°25'50" W	100.00'
L108	N 82°51'56" W	55.90'
L109	S 64°00'16" W	55.90'
L110	N 89°25'50" W	100.00'
L111	N 58°28'00" W	58.31'
L112	N 45°34'10" E	63.64'
L113	S 47°47'49" E	60.21'
L114	N 00°34'10" E	165.00'
L115	S 22°22'15" W	107.70'
L116	S 82°58'29" W	75.66'
L117	S 39°13'45" W	64.03'
L118	N 44°25'50" W	84.85'
L119	N 62°51'56" W	55.90'
L120	N 30°23'40" W	187.46'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
19909
CHRISTOPHER E.
AULERICH
Date Signed 5/6/98
ARIZONA, U.S.A.

Return to:
U.S. Air Force
AFBCA/ROL Bergstrom AFB
3711 Fighter Drive
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

SITE SS-16 ELECTROPLATING SHOP
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

A portion of PARCEL "C" – RECORD OF SURVEY – LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the Northwest quarter of Section 32, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at a Brass Cap stamped RLS 4251, 1979 WAFB, said point assumed to be the Southwest corner of said Section 32;

thence South 89° 23' 00" East, along a Reference line (the terminus of which bears South 89° 23' 00" East 7,913.33 feet to a ¾ inch iron pipe accepted as the South quarter corner of Section 33, said line also being the basis of bearing for this description), a distance of 483.84 feet;

thence North 00° 37' 00" East, a distance of 2,912.30 feet;
thence South 89° 31' 44" East, a distance of 292.68 feet;
thence North 00° 13' 49" East, a distance of 432.81 feet to the Point of Beginning;
thence continuing North 45° 25' 55" West, a distance of 421.65 feet;
thence North 45° 26' 23" East, a distance of 231.44 feet;
thence South 44° 24' 38" East, a distance of 420.76 feet;
thence South 45° 34' 07" West, a distance of 223.92 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising an area of 2.201 acres more or less.

The U.S. Air Force Installation Restoration Program Site SS-16 consists of two former chemical application facilities located in Building 1085 at the former Williams Air Force Base. The Electroplating Facility was located at the northwest end of Building 1085, in a small room constructed of cement block on a cement slab. A sub-slab soil sample collected in 1993 during the Williams AFB Evaluation/Assessment to investigate floor staining returned values for arsenic and beryllium within background ranges but above Arizona residential health-based guidance levels (HBGL) and EPA residential preliminary remediation goals (PRG) (*Final Evaluation/Assessment Report, Williams Air Force Base, Arizona, September 1994*). Follow-up boreholes and sub-slab soil sampling in 1995 during the Operable Unit (OU) 4 Remedial Investigation confirmed the results of previous sampling. Laboratory analyses of subsurface soil samples collected from five boreholes at various depths between the surface and 51 feet detected arsenic levels between 2.2 milligrams per kilogram (mg/kg) and 5.2 mg/kg, and beryllium levels between 0.34 mg/kg and 0.92 mg/kg. (*Final Remedial Investigation Report, Operable Unit 4, Williams Air Force Base, Arizona, May 1997*).

Because these levels fell within the Base-specific background range for beryllium and the regional background range for arsenic, and because the values were not indicative of a contamination "hot spot", the *Final Remedial Investigation Report, Operable Unit 4* concluded the concentrations were occurring naturally. Risk assessment screening performed for the *Final Record of Decision, Operable Unit 4, Williams Air Force Base, Arizona, in progress 1999*, however, concluded that arsenic and beryllium at the site posed a cancer risk to plausible human receptors under an unrestricted residential development scenario, but not under a nonresidential land use scenario. The current land use scenario for the Electroplating Facility is industrial. Because of the proximity of the facility to an active taxiway of the operational Williams Gateway Airport, the future land use scenario is expected to remain industrial. The selected remedy in the OU-4 Record of Decision for the Electroplating Facility is the implementation of institutional controls through deed restrictions to prevent uses which could cause exposure to residual contaminants and notification of the existence of such contaminants through the recordation of a VEMUR.

Pursuant to Section 49-152, subsection (A), Arizona Revised Statutes, Owner has chosen to record a VEMUR for the property described above to partially meet the requirements of the selected remedy.

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to nonresidential uses, as defined in Arizona Revised Statutes § 49-152(A).

for: **UNITED STATES OF AMERICA**

Date: _____

_____
ALBERT F. LOWAS, JR.
Acting Director
Air Force Base Conversion Agency

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: _____ Approved: _____

Title: _____

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the _____ day of _____, 1999, before me, _____, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Acting Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

_____
Notary Public, Commonwealth of Virginia
My commission expires:

Return to:
U.S. Air Force
AFBCA/ROL Bergstrom AFB
3711 Fighter Drive
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

SITE SS-20 FIRING RANGE
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

A portion of "AIRPORT PARCEL" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the Northeast quarter of Section 29, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Northwest corner of said Northeast quarter;
thence South 89° 22' 53" East, along the North line of said Northeast quarter, a distance of 1,348.33 feet;
thence South 00° 37' 07" West, perpendicular to the said North line of said Northeast quarter, a distance of 377.65 feet to the Point of Beginning;
thence North 08° 47' 26" East, a distance of 74.73 feet;
thence North 47° 27' 42" East, a distance of 73.32 feet;
thence North 79° 20' 29" East, a distance of 122.40 feet;
thence South 82° 41' 16" East, a distance of 127.47 feet;
thence South 53° 37' 29' East, a distance of 89.65 feet;
thence South 06° 52' 22" East, a distance of 71.36 feet;
thence South 37° 33' 50" West, a distance of 213.34 feet;
thence South 88° 13' 15" West, a distance of 158.42 feet;
thence North 31° 50' 48" West, a distance of 198.02 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising an area of 2.1230 acres more or less.

A firing range near the north end of the former Williams Air Force Base was used for target practice from 1961 to 1992. The firing range was investigated and sampled during Base-wide Evaluation/Assessment activities in 1993. Soil from the backstop was sifted for removal of bullet fragments, and analyzed for evidence of fine particulate lead. Soil at the base of the backstop was also sampled and analyzed for evidence of fine particulate lead. All samples returned lead values much greater than base-specific and regional background levels, and greater than EPA preliminary remediation goals. The area was designated as part of U.S. Air Force Installation Restoration Program Site SS-20 and recommended for inclusion in Operable Unit (OU) 4 (*Final Evaluation/Assessment Report, Williams Air Force Base, Arizona, September 1994*).

During the OU-4 remedial investigation, 13 shallow boreholes were sampled at depths of 1, 2, and 3 feet below the surface to determine the vertical extent of lead contamination. Analytical results of sampling documented high lead values in the backstop soil at an expected height for bullet impact. Lead values for soil from the floor of the range were all below screening levels, as reported in the *Final Remedial Investigation Report, Operable Unit 4, Williams Air Force Base, Arizona, May 1997*. The site was recommended in the *Final Record of Decision, Operable Unit 4, Williams Air Force Base, Arizona, in progress 1999* for remedial action consisting of excavation and off-site disposal of an estimated 519 square yards of contaminated soil, and establishment of institutional controls in the form of a deed restriction and notification of potential residual contaminants through a VEMUR.

The recommended remedial action at SS-20 Firing Range was performed in spring 1998 (*Final Remedial Action Oversight Report, South Desert Village (SS-19) and Firing Range (SS-20), Operable Unit 4, Williams Air Force Base, Arizona, June 1998*). Pursuant to Section 49-152, subsection (A), Arizona Revised Statutes, Owner has chosen to record a VEMUR for the property to partially satisfy the requirements of the selected remedy in the OU-4 Record of Decision.

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to nonresidential uses, as defined in Arizona Revised Statutes § 49-152(A).

for: **UNITED STATES OF AMERICA**

Date: _____

_____
ALBERT F. LOWAS, JR.
Acting Director
Air Force Base Conversion Agency

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: _____ Approved: _____

Title: _____

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the _____ day of _____, 1999, before me, _____, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Acting Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

_____
Notary Public, Commonwealth of Virginia
My commission expires:

Return to:
U.S. Air Force
AFBCA/ROL Bergstrom AFB
3711 Fighter Drive
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

SITE SS-24 FACILITY 1010
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

A portion of Parcel "K" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the Northwest quarter of Section 6, Township 2 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Northwest corner of said Northwest quarter, said point also being the Northwest corner of said Parcel "K";

thence South 00° 43' 57" East, along the West line of said Northwest quarter and said Parcel "K", a distance of 175.32 feet;

thence North 89° 16' 03" East, perpendicular to the said West line, a distance of 224.13 feet to the Point of Beginning;

thence North 89° 17' 21" East, a distance of 80.20 feet;

thence South 00° 13' 49" West, a distance of 97.85 feet;

thence South 88° 27' 24" West, a distance of 78.05 feet;

thence North 01° 02' 01" West, a distance of 98.97 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising an area of 7,785 square feet more or less.

The U.S. Installation Restoration Program Site SS-24 on the former Williams Air Force Base consists of Facility 1010, the former Pesticide (Entomology) Shop, located south of the Base perimeter road near the Base wastewater treatment plant. The facility is a 1,240-square foot metal building constructed on a concrete slab, surrounded by an 8,000-square foot fenced yard. Because the facility had been used since its construction in 1983 for the storage and mixing of pesticides, and because the building and grounds had never been surveyed for contamination, it was designated Site SS-24 and included in Operable Unit (OU) 4 for remedial investigation. As reported in the *Final Remedial Investigation Report, Operable Unit 4, Williams Air Force Base, Arizona, May 1997*, laboratory analysis of surface soil samples collected from the fenced yard surrounding Building 1010 detected the following chemicals of potential concern (COPC) above EPA preliminary remediation goal (PRG) screening levels: alpha-chlordane (up to 1,000 micrograms per kilogram [µg/kg]; PRG = 340 µg/kg), dieldrin (up to 540 µg/kg; PRG = 28 µg/kg), gamma-chlordane (up to 1,000 µg/kg; PRG = 340 µg/kg), and heptachlor (110 µg/kg; PRG = 99 µg/kg). Laboratory analysis of wipe samples collected from surface stains located on floors and shelves in the north bay of Facility 1010 detected the following COPC: gamma-chlordane (2.0 µg/kg) and gamma-BHC (Lindane) (up to 0.21 µg/kg). No promulgated screening levels or levels of acceptable contamination for surface stains exist for the detected COPC. The remedy for Site SS-24 selected in the *Final Record of Decision, Operable Unit 4, Williams Air Force Base, Arizona, in progress 1999* is institutional control in the form of a deed restriction to prevent uses which could cause exposure to residual contaminants and notification of the existence of such contaminants through the recordation of a VEMUR.

Pursuant to Section 49-152, subsection (A), Arizona Revised Statutes, Owner has chosen to record a VEMUR for the property described above to partially complete the requirements of the OU-4 Record of Decision.

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to nonresidential uses, as defined in Arizona Revised Statutes § 49-152(A).

for: **UNITED STATES OF AMERICA**

Date: _____

_____
ALBERT F. LOWAS, JR.
Acting Director
Air Force Base Conversion Agency

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: _____ Approved: _____

Title: _____

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the _____ day of _____, 1999, before me, _____, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Acting Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

_____
Notary Public, Commonwealth of Virginia
My commission expires:

Return to:
U.S. Air Force
AFBCA/ROL Bergstrom AFB
3711 Fighter Drive
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

SS-20 SKEET RANGE
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

A portion of "AIRPORT PARCEL" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the North half of Section 29, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the North quarter corner of said Section 29;

thence South 89° 22' 53" East, along the North line of said Section 29, a distance of 653.63 feet;

thence South 00° 37' 07" West, perpendicular to the said North line, a distance of 136.90 feet to the Point of Beginning;

thence continuing South 00° 37' 07" West, a distance of 600.00 feet;

thence North 89° 22' 53" West, parallel to the said North line, a distance of 756.00 feet;

thence North 00° 37' 07" East, a distance of 600.00 feet;

thence South 89° 22' 53" East, parallel to the said North line, a distance of 756.00 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising an area of 453,600 square feet or 10.4132 acres more or less.

A Skeet Range at the former Williams Air Force Base was active near the north end of the Base runways during the 1960s, until construction of an additional east runway in the early 1970s obliterated the range and facilities. The area of the Former Skeet Range was investigated during Basewide Evaluation/Assessment activities in 1993, and surface soil was sampled at two locations adjacent to the north end of the east runway. Although evidence of the Former Range was noted in the form of broken skeet targets and shotgun shell casings, no lead pellets were observed on the surface. Results of surface soil analysis reported lead values above residential limits, and the area was designated as part of U.S. Air Force Installation Restoration Program Site SS-20 and recommended for inclusion in Operable Unit (OU) 4 (*Final Evaluation/ Assessment Report, Williams Air Force Base, Arizona, September 1994*).

During the OU-4 remedial investigation, a compilation of Base aerial photographs was used to estimate the area of potential lead pellet fallout that remained after the construction of the east runway. Soil samples within this area were collected at a depth of approximately two feet below the surface and analyzed for lead to see if surface pellets had leached into the subsurface. Analytical results reported in the *Final Remedial Investigation Report, Operable Unit 4, Williams Air Force Base, Arizona, May 1997* were all within or very near the Base-specific range for lead of 10.4 to 19.4 milligrams per kilogram (mg/kg). This part of Site SS-20 was recommended for no action in the *Final Record of Decision, Operable Unit 4, Williams Air Force Base, Arizona, in progress 1999.*

Because of the lead detected in surface soil during the Evaluation/Assessment, and the likelihood that scattered lead pellets remain on the surface at the site, an unrestricted residential development scenario for the site was unacceptable to the Arizona Department of Environmental Quality. The current land-use scenario for the SS-20 Skeet Range is industrial, and because of the proximity of the facility to an active runway of the operational Williams Gateway Airport, the future land-use scenario is expected to remain industrial. Pursuant to Section 49-152, subsection (A), Arizona Revised Statutes, Owner has chosen to record a VEMUR for the property.

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to nonresidential uses, as defined in Arizona Revised Statutes § 49-152(A).

for: **UNITED STATES OF AMERICA**

Date: _____

_____
ALBERT F. LOWAS, JR.
Acting Director
Air Force Base Conversion Agency

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: _____

Approved: _____

Title: _____

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the _____ day of _____, 1999, before me, _____, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Acting Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

_____
Notary Public, Commonwealth of Virginia
My commission expires:

APPENDIX

LEGAL DESCRIPTION OF PROPERTY BY REGISTERED LAND SURVEYOR

Return to:
U.S. Air Force
AFBCA/ROL Bergstrom AFB
3711 Fighter Drive
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

SITE SS-21, FACILITY 1020 AND FACILITY 1051
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

A portion of "AIRPORT PARCEL" – RECORD OF SURVEY – LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the South half of Section 32, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Southwest corner of said Section 32;

thence South 89° 22' 03" East, along the South line of said Section, a distance of 1,248.30 feet;

thence North 00° 32' 10" East, a distance of 153.46 feet to the Point of Beginning;

thence continuing North 00° 32' 10" East, a distance of 370.99 feet;

thence South 89° 10' 29" East, a distance of 2,258.93 feet;

thence South 00° 32' 10" West, a distance of 370.94 feet;

thence North 89° 10' 33" West, a distance of 2,258.93 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising an area of 837,980 square feet or 19.2374 acres more or less.

The U.S. Air Force Installation Restoration Program Site SS-21 at the former Williams Air Force Base consists of Facility 1020 – the Firing-In Buttress, and Facility 1051 – the Bore Sighting Bunker, both located along the south Perimeter Road of the Base. Each facility is a large three-sided concrete structure that had been filled with sand and gravel during use as a backstop for bullets from training aircraft. At some time before the early 1990s, use of the facilities was discontinued, and the backstop material from each structure was removed and piled nearby (Facility 1051) or spread out on the nearby ground surface (Facility 1020). Visual evidence of spent bullets on the ground surface near each facility was reported in the *Basewide Environmental Baseline Survey, Williams Air Force Base, Arizona, December 1993*, although no visual evidence was noted during a different site visit reported in the *Final Facilities Assessment Report, Williams Air Force Base, Arizona, March 1993*. Because of the data gap posed by the lack of soil sampling and the differing observations, the facilities were included in Operable Unit (OU) 4 for further investigation.

During OU-4 remedial investigation activities, each facility was mapped and the shallow subsurface soil was sampled and analyzed for lead. Analytical results reported in the *Final Remedial Investigation Report, Operable Unit 4* yielded lead values within the regional background range, and below any State of Arizona or EPA regulatory limit. The site was recommended for no further action in the *Final Record of Decision, Operable Unit 4, Williams Air Force Base, Arizona, in progress 1999*. Because of the lead from bullets reported on the surface near the facilities, an unrestricted residential development scenario for the site was unacceptable to the Arizona Department of Environmental Quality. The current land-use scenario for SS-21 is industrial, and because of the proximity of the facility to the operational Williams Gateway Airport, the future land-use scenario is expected to remain industrial. Pursuant to Section 49-152, subsection (A), Arizona Revised Statutes, Owner has chosen to record a VEMUR for the property.

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to nonresidential uses, as defined in Arizona Revised Statutes § 49-152(A).

for: **UNITED STATES OF AMERICA**

Date: _____

_____
ALBERT F. LOWAS, JR.
Acting Director
Air Force Base Conversion Agency

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: _____ Approved: _____

Title: _____

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the _____ day of _____, 1999, before me, _____, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Acting Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

_____
Notary Public, Commonwealth of Virginia
My commission expires:

APPENDIX

LEGAL DESCRIPTION OF PROPERTY BY REGISTERED LAND SURVEYOR

APPENDIX A-3

SOUTH DESERT VILLAGE PROTECTIVE CAP
OPERATION AND MAINTENANCE MANUAL

(This final manual dated May 1999 is incorporated herein and made a part hereof by reference.)

APPENDIX A-4

AGREEMENT

(The enclosed Agreement represents the agreement that will be excuted by the Arizona Department of Environmental Quality and Board of Regents on behalf of Arizona State University with regard to South Desert Village. This agreement has undergone the required fifteen business day comment period and has had any resulted modifications included. It will be executed after the date of the signing of this ROD and is included for information.)

AGREEMENT

Agreement ("Agreement") made as of _____, 2000, between the ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY ("ADEQ" or "Department") on behalf of the State of Arizona and the ARIZONA BOARD OF REGENTS for and on behalf of Arizona State University ("ASU").

RECITALS

1. ADEQ enters into this Agreement pursuant to the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U.S.C. § 9604(d), which authorizes the State to enter into a cooperative agreement with the United States Environmental Protection Agency to carry out actions authorized under CERCLA; that cooperative agreement entered into between the United States Environmental Protection Agency Region IX and the Arizona Department of Environmental Quality, ADEQ Contract No. 000300-99; A.R.S. § 49-202(H), which authorizes the Director to take all action necessary or appropriate to secure to the State of Arizona the benefits of CERCLA; A.R.S. 49-292 and A.R.S. 49-285.01, which authorize the Department to enter into settlement agreements and to provide a written release and covenant not to sue to prospective purchasers.

2. ASU enters into this Agreement pursuant to A.R.S. 15-1625.B which authorizes the Arizona Board of Regents to enter into contracts and to acquire and hold real property. This Agreement is being entered into by ASU in connection with the transfer to ASU by the United States Department of Education of the real property described in the Quit Claim Deed attached hereto as Exhibit 1 ("Quit Claim Deed"). The obligations of the parties under this Agreement are contingent upon title to the Site being vested in ASU.

3. The Parties agree that ASU's entry into this Agreement and the actions undertaken by ASU in accordance with the Agreement do not constitute an admission by ASU of liability for any purpose.

4. Williams Air Force Base, located in Mesa, Arizona, was commissioned in 1941 and used as a flight training school until the base was closed in 1993. The Air Force is the owner and former operator of the Base, including that portion of the Base containing 390 base housing units constructed in 1950 and now known as South Desert Village.

5. Following Base closure, the Air Force conducted a Remedial Investigation and Feasibility Study (RI/FS) of the Base, and locations within the Base where contamination was suspected were evaluated under the provisions of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, 42 U. S. C. § 9601 et. seq., as amended (CERCLA) implemented by the Air Force Installation Restoration Program (IRP). A portion of approximately 18.2 acres of South Desert Village was designated for further investigation as an IRP site under Operable Unit 4 (OU-4) and assigned the IRP Site designation number SS-19. Soil samples taken by the Air Force from a portion of South Desert Village which had been constructed over the location of a former Base trap and skeet range established the presence of

lead in soils at levels exceeding 400 mg/kg at the surface and lead detections to a depth of four feet below ground surface. That portion of South Desert Village with surface soil lead concentrations in excess of 400 mg/kg is described in Exhibit A and is referred to as the "Affected Area" or the "Site".

6. ASU is the prospective transferee of South Desert Village from the United States Department of Education for use as campus housing. ASU did not cause or contribute to the existing lead contamination at South Desert Village or otherwise cause or contribute to a release or threatened release of hazardous substances as defined by A.R.S. § 49-201(17) present or existing on or under the Site as of the effective date of this Agreement (collectively, the "Existing Contamination").

7. The discovery of excess lead in the soil in South Desert Village precluded the transfer to ASU of approximately 86 houses built over the Affected Area, pending a more detailed investigation of the extent of lead contamination.

8. The Air Force investigation established that the lead in the soils in the Site is not a threat to groundwater at the site, but that the lead shot in the soils represented a potential health risk to future residents of South Desert Village without further remediation.

9. ADEQ has established by rule risk-based standards for soil remediation activities. The Arizona Soil Remediation Standards Rule permit soil to be remediated to residential or non-residential site-specific remediation levels. Arizona Administrative Code R18-7-206(A). With prior approval of ADEQ, a person may achieve the remediation levels sufficient to permit human habitation at the Site by the use of institutional and engineering controls. The Department's approval shall be based, in part, on a demonstration that such institutional and engineering controls will be maintained. A.A.C. R18-7-206(D).

10. The remedy selected by USEPA, ADEQ and the Air Force for the Site in the Williams Air Force Base Operable Unit 4 (OU-4) Record of Decision ("ROD") utilizes engineering controls in the form of the removal of the first six inches of contaminated surface soils and placement of a six inch clean soil protective cap. The selected remedy also requires adherence to the operational and maintenance requirements of the *South Desert Village Protective Cap Operation and Maintenance Manual* (Appendix A-3 to the ROD, henceforth referred to as the "O&M Manual"). The remedy also selects institutional controls in the form of the recordation of a Voluntary Environmental Mitigation Use Restriction ("VEMUR") in accordance with A.R.S. § 49-152; deed restrictions contained in the Quit-Claim Deed by and between the United States Department of Education, as grantor, and ASU, as grantee; this Agreement, wherein ASU agrees to perform the protective cap inspections and maintenance as set forth in the O&M Manual under the oversight of ADEQ; semi-annual soil cap inspections to be conducted by ASU; and the CERCLA five-year reviews to be conducted by USEPA.

11. Notwithstanding remediation to a non-residential level, the remedy will allow human habitation of the Site provided that frequent and repeated contact with the soil is limited by means of the engineering and institutional controls selected in the ROD. Under A.R.S. Sections 49-151 and 49-152, property may be used for a "residential use" only if it is remediated to a residential standard. Property may be used for a "nonresidential use" if it is remediated to a nonresidential standard. A.R.S. Section 49-151.3 defines "residential use" as:

> those uses of remediated property upon which there are dwellings where the residents are reasonably expected to be in frequent, repeated contact with soil or other uses where natural persons are reasonably expected to be in similar contact, such as child care centers and elementary schools. (Emphasis added)

A.R.S. Section 49-151.1 defines "nonresidential use" as "those uses of property other than residential uses." From these provisions and from Arizona Administrative Code R18-7-206(A) and R18-7-206(D), ADEQ has concluded that (i) a use of remediated property in which natural persons do not have frequent and repeated contact with the soil is a nonresidential use, and (ii) a nonresidential use is permitted if the remediated property has been remediated to a nonresidential standard. The engineering and institutional controls for the Site are in place to protect natural persons from frequent and repeated contact with the soil. Therefore, human habitation of the Site is permissible so long as the natural persons are protected from frequent and repeated contact with the soil. The engineering and institutional controls selected for the Site will not change the land-use status of the Site from non-residential to residential; but the engineering and institutional controls described in this Agreement and in the ROD, properly maintained, will allow reuse of the base housing for residential purposes.

12. The Air Force has excavated and removed six inches of soil from the Site. The protective cap consists of clean soil backfill of excavated areas maintained at a thickness of no less than six inches and the foundations of existing houses, patios, sidewalks, roadways and paved parking areas. The owner of the Site is to conduct inspections of the protective cap to monitor any deterioration due to erosion, to repair any deterioration due to erosion and to implement erosion control measures to mitigate any deterioration due to erosion.

13. The Air Force has recorded a VEMUR covering the Site and has prepared the O&M Manual which, *inter alia,* lists the specific responsibilities for the maintenance, repair and monitoring of the protective cap. Finally, the United States Department of Education (DOE) as grantor, and ASU, as Grantee, have executed the Quit-Claim Deed which contains certain covenants, conditions and restrictions which must be complied with by ASU.

PURPOSE

14 The purpose of this Agreement is to institute a framework through which the institutional and engineering controls in place for the South Desert Village soil cap will be maintained by ASU. Accordingly, the purpose of this Agreement is to (i) set forth the respective

rights and responsibilities of ADEQ and ASU; (ii) assure compliance by ASU with the covenants, conditions and restrictions in the Quit Claim Deed; (iii) provide for the additional obligation of ASU in Paragraph 34 of this Agreement concerning reimbursement by ASU of ADEQ costs incurred in monitoring ASU compliance with this Agreement and the Quit Claim Deed ; and (iv) settle and resolve, subject to reservations and limitations contained in Paragraphs 39-41 of this Agreement (Reservation of Rights by State of Arizona), the potential liability of ASU for the Existing Contamination at the Site. This Agreement is not to be construed as serving any other purpose other than the purposes stated herein.

15. The resolution of the potential liability of ASU is in the public interest. ASU will provide a substantial public benefit in assuming the responsibility for the maintenance, repair and monitoring of the engineering and institutional controls designed to protect the integrity of the protective cap. The acquisition of the Site by ASU also addresses an important public purpose with the conversion of former base housing into affordable student housing.

DEFINITIONS

16. Unless otherwise expressly provided herein, terms used in this Agreement which are defined in Water Quality Assurance Revolving Fund ("WQARF"), Arizona Revised Statutes Title 49, Chapter 2, Article 5, or CERCLA, 42 U.S.C. § 9601 et. seq. shall have the meanings assigned to them when used herein.

17. **"Existing Contamination"** shall mean any hazardous substances as defined by A.R.S. § 49-201(17) present or existing on or under the Site as of the effective date of this Agreement, including lead contamination in the soils at the site.

18. **"Parties"** shall mean ADEQ and ASU.

19. **"Purchaser"** shall mean Arizona State University.

AGREEMENT

20. ASU shall perform its obligations under this Agreement and will comply with each and all of the covenants, conditions and restrictions contained in the Quit Claim Deed that relate to the Affected Area, including, without limitation, the obligation of ASU to perform the tasks assigned to ASU in the O&M Manual, the tasks assigned to the owner of the Affected Area in the O&M Manual and any other tasks applicable to ASU under the O&M Manual. Specifically, ASU will assume those responsibilities applicable to ASU as the owner of the Site outlined in Paragraph 5 (Maintenance of the Protective Cap) and Paragraph 6 (Document Approval and Distribution) of the O&M Manual.

21. ASU shall conduct a semi-annual formal protective soil cap inspection of the Site and document each such inspection in a report entitled "South Desert Village Semi-Annual Monitoring Report" as more fully described in Sections 5.3 and 5.3.2 of the Manual. The first

such semi-annual inspection shall be conducted on or before June 30, 2000. Following the completion of the June 30, 2000 inspection and for each semi-annual inspection thereafter, ASU shall prepare and forward the South Desert Village Semi-Annual Monitoring Report to EPA and ADEQ not later than 30 days following each inspection as set forth in Section 6.3 of the O&M Manual.

22. Copies of the South Desert Village Semi-Annual Monitoring Report shall be forwarded as follows:

To USEPA at:	Chief, Air Force and DOE Section U.S. E.P.A. Region IX Mail Code SFD - 8-1 75 Hawthorne Street San Francisco, CA 94105
To ADEQ at:	Arizona Department of Environmental Quality Federal Projects Unit Manager Waste Programs Division 3033 North Central Avenue Phoenix, Arizona 85012

23. ASU shall conduct pre-disturbance inspections as described in Section 5.3. 1.1 of the Manual and prepare an inspection form for each pre-and post-disturbance of the protective soil cap on a form similar to that set forth in Appendix D of the Manual. ASU need not forward such inspection forms as they are prepared to the USEPA or to ADEQ, but shall maintain the completed forms and make them available for inspection at reasonable times upon request of either USEPA or ADEQ.

24. ASU shall provide a copy of the *South Desert Village Tenant Protective Cap Awareness* booklet to each tenant of a housing unit located in the affected area of the South Desert Village and shall obtain signature proof of the tenant's understanding and agreement in accordance with Section 6.2.1. of the Manual. ASU shall also give a copy of the *South Desert Village Excavation Awareness* booklet to each excavation crew conducting soil disturbance activities within the affected area of South Desert Village prior to the start of any excavation, and shall obtain signature proof of understanding and agreement from all crew members, in accordance with Section 6.2.2 of the Manual. ASU need not forward such signed forms to the USEPA or to ADEQ, but shall maintain the completed forms and make them available for inspection at reasonable times upon request of either USEPA or ADEQ.

ACCESS/NOTICE TO ADEQ AND SUCCESSORS IN INTEREST

25. ASU hereby grants to ADEQ, its representatives, authorized agents, and contractors, the right to enter upon, use, and occupy the Site for the purpose of monitoring compliance with this Agreement and conducting remedial and/or corrective actions.

26. ASU and its tenants, agents, employees and guests shall cooperate with ADEQ in the performance of activities conducted by ADEQ on the site.

27. ADEQ will use reasonable efforts to give ASU at least 3 days prior notice of any inspections or remedial or corrective actions to be conducted on the Site. All notices from ADEQ to ASU under this Agreement shall be in accordance with Section 45 of this Agreement. Notices in writing may be sent by facsimile transmission or by regular first class mail, postage prepaid. Unless otherwise stated in this Agreement, each reference to "days" means calendar days, excluding Saturdays, Sundays, and legal holidays.

28. ADEQ will, before leaving the Site, give ASU a duplicate sample and a receipt describing all samples taken. ADEQ will furnish ASU with a copy of the results of any analysis made of the samples collected.

29. ADEQ will use reasonable efforts to perform all activities promptly and in a manner that minimizes any inconvenience to or disruption of the use and enjoyment of the Site by ASU and its tenants.

30. Within 30 days from the effective date of this Agreement, ASU shall record a certified copy of this Agreement with the Maricopa County Recorder's Office. Thereafter, each deed, title, or other instrument conveying an interest in the Site shall contain a notice stating that the Site is subject to this Agreement. ASU shall provide to ADEQ a copy of the Deed between the United States Department of Education and ASU.

31. ASU and any subsequent purchaser of the Site shall provide written notice to ADEQ of any sale, assignment or other transfer of the Site at least fifteen (15) business days before the date of the transfer.

32. ASU shall require that assignees, successors in interest, lessees, and sublessees of the Site shall provide the same access and cooperation. ASU shall require that any subsequent assignments or transfers of the Site or an interest in the Site are consistent with this Paragraph and Paragraphs 50-51 (Parties Bound/Assignment of Covenant) .

33. On assignment, the Assignee assumes the obligations and the benefits of the Agreement. Moreover, prior to or simultaneous with any transfer of the Site, the transferee as part of the notice required by this Paragraph must consent in writing to be bound by the terms of this Agreement. All Assignees must meet the requirements of A.R. S. § 49-285.01 (A) and (B). Unless the Assignor has breached the Agreement, the Assignor retains the benefits of this Agreement.

COST RECOVERY

34. Not more frequently than annually, ADEQ shall bill ASU for its costs of oversight of the obligations of ASU under this Agreement, together with documentation supporting

ADEQ's costs. ASU shall make payment to ADEQ of such documented costs within sixty (60) days of receipt of such billing. Such payment shall be made payable to the Water Quality Assurance Revolving Fund and reference the Site and Site Code No. 440000-99. The annual billing shall not exceed the sum of one-thousand ($ 1,000) dollars, unless a different sum is agreed to by the parties in writing. Payment shall be made to: Michael D. Clark, Chief Financial Officer, Fiscal Services Department, Arizona Department of Environmental Quality, 3033 N. Central Avenue, Phoenix, Arizona 85012.

RECORDS RETENTION

35. ASU agrees to retain and make available to ADEQ for inspection and copying all records of inspections or reports required by this Agreement for at least five (5) years after the termination of this Agreement.

REMEDIES OF ADEQ

36. ADEQ agrees that ASU is not responsible for the Existing Contamination and that the only enforcement action ADEQ may take against ASU with respect to the Existing Contamination is set forth in Paragraph 37.

37. In the event of a failure by ASU to meet a requirement of this Agreement or to perform any of the covenants, conditions or restrictions applicable to ASU in the Quit Claim Deed, ADEQ may notify ASU in writing of the failure and demand performance by ASU. If ASU fails to commence performance of the action required under this Agreement or under the Quit-Claim Deed within fifteen (15) days after receipt of notice from ADEQ or if ASU fails to diligently pursue the action to completion, ADEQ may elect to either (A) perform the action, for which ASU shall reimburse ADEQ for three times the amount of its reasonable and documented costs, or (B) seek specific performance by ASU in an action filed in the Superior Court. ADEQ agrees that it will take no other action to enforce this Agreement or remedy a failure by ASU to perform the obligations of ASU under this Agreement or the covenants, conditions or restrictions applicable to ASU in the Quit Claim Deed.

COVENANT NOT TO SUE BY STATE OF ARIZONA

38. Subject to the remedies of ADEQ in Paragraph 37 and Reservation of Rights in Paragraph 39, the State of Arizona covenants not to sue or take any other civil or administrative action against ASU for any and all civil liability for injunctive relief or reimbursement of remedial action costs pursuant to WQARF or pursuant to 42 U.S.C. § 9607(a) and § 9613 with respect to the Existing Contamination.

RESERVATION OF RIGHTS BY STATE OF ARIZONA

39. The covenant not to sue set forth in Paragraph 38 does not pertain to any matters other than those expressly specified in Paragraph 38. The State of Arizona reserves and the

Agreement is without prejudice to all rights against ASU with respect to all other matters, including but not limited to, the following:

a) claims based on a failure by ASU to meet a requirement of this Agreement.

b) any liability resulting from releases of hazardous substances, pollutants or contaminants at or from the Site caused or contributed to by ASU, its successors, assignees, lessees or sublessees after transfer of title to the Site to ASU;

c) civil or criminal liability for past or future violations by ASU of local, State or federal statutes or regulations.

40. Nothing in this Agreement is intended as a release or covenant not to sue for any claim or cause of action, administrative or judicial, civil or criminal, past or future, in law or in equity, which the State of Arizona may have against any person, firm, corporation or other entity not a party to this Agreement.

41. Nothing in this Agreement is intended to limit the right of the State of Arizona to undertake future remedial actions at the Site or to seek to compel parties other than ASU to perform or pay for remedial actions at the Site. Nothing in this Agreement shall in any way restrict or limit the nature or scope of remedial actions which may be taken or be required by the State in exercising its authority under State or federal law. ASU acknowledges that it is purchasing property where remedial actions may be required.

CONTRIBUTION PROTECTION

42. With regard to claims for contribution against ASU, the Parties hereto agree that, upon transfer of the Site to ASU, ADEQ will seek protection from contribution actions or claims as provided by 42 U.S.C. § 9613(f)(2) and A.R.S. § 49-292(C) for matters addressed in this Agreement and described in a consent decree to be filed in the federal district court.

43. ASU agrees that with respect to any suit or claim for contribution brought by or against it for matters related to this Agreement it will notify the ADEQ in writing no later than 60 days following service of such suit or claim.

ADDITIONAL REMEDIAL ACTION

44. ADEQ and ASU acknowledge and agree that in the event the engineering or institutional controls selected as the remedy for the Site in the OU-4 ROD (1) prove no longer protective of human health and the environment; (2) fail to achieve remediation objectives; (3) prove ineffective to accomplish all or part of their stated purposes; or in the event that (4) contamination is later discovered at South Desert Village and is attributable to Department of Defense activities; or (5) applicable regulatory requirements are revised to reflect new scientific

or health data and the selected remedy is determined to be no longer protective of human health and the environment, then ADEQ, in conjunction with USEPA, shall seek additional remedial actions from the Department of Defense consistent with the requirements imposed upon the Department of Defense pursuant to 42 U.S.C. Section 9620, as amended and the Department of Defense Policy on Responsibility for Additional Environmental Cleanup after Transfer of Real Property, 62 Federal Register at 48259 (September 15, 1997). ADEQ shall not require ASU to conduct any remedial action with respect to the Existing Contamination except as specifically provided in this Agreement.

NOTICES AND SUBMISSIONS

45. Reports, documents, notices or other correspondence required under this Agreement shall be directed to:

To ASU at:	Director of Administrative Services Arizona State University East Campus P. 0. Box 6045 S. Sagewood Mesa, Arizona 85212 Telephone: 602 727-1788
With a copy to:	Paul J. Ward General Counsel Arizona State University P.O. Box 872003 Tempe, Arizona 85287-2003
To ADEQ at:	Arizona Department of Environmental Quality Federal Projects Unit Manager Waste Programs Division 3033 North Central Avenue Phoenix, Arizona 85012 Telephone 602 207-2300

46. This Agreement shall be governed by the laws of the State of Arizona.

47. This Agreement, the Quit Claim Deed, the VEMUR and the O&M Manual constitute the entire agreement and understanding of ASU and ADEQ with respect to the subject matter hereof and supersede all prior agreements. This Agreement may not be amended, modified, extended, or renewed except in a writing executed by ASU and ADEQ.

48. If any provision of this Agreement is unenforceable, the remainder of this Agreement shall remain in effect.

49. If ASU's performance under this Agreement depends upon the appropriation of funds by the Arizona Legislature, and if the Legislature fails to appropriate the funds necessary for performance of its obligations under this Agreement, the Agreement may be terminated by ADEQ or ASU at the end of the period for which funds are available. The parties understand and agree that the use by ASU of the Site for student housing is conditioned upon ASU's legal obligation to maintain the institutional and engineering controls selected as the remedy for SS- 19 in the ROD as more fully described in this Agreement. In the event that the Legislature fails to appropriate the necessary funds, the parties shall promptly meet and confer with USEPA to determine the appropriate course of action.

PARTIES BOUND/ASSIGNMENT OF COVENANT

50. This Agreement shall apply to and be binding upon the State of Arizona, and shall apply to and be binding on ASU, its officers, directors, employees, and agents, successors, assignees, lessees or sublessees. Each signatory of a Party to this Agreement represents that he or she is fully authorized to enter into the terms and conditions of this Agreement and legally bind such Party.

51. Notwithstanding any other provisions of this Agreement, all of the rights, benefits and obligations conferred upon ASU under this Agreement may be assigned or transferred to any person with prior written notice to ADEQ as prescribed by A.R.S. § 49-285.01(E) and (F) and Paragraph 38 of this Agreement (Covenant Not to Sue by State of Arizona).

PAYMENT OF COSTS

52. ASU shall pay to ADEQ an initial fee of $900.00 and payment of ADEQ's remaining costs for the preparation and execution of this Agreement pursuant to A.R.S.§49-285.01(H),which shall include, but not be limited to, the cost of publishing the mandatory public notice for this Agreement. All fees shall be paid to ADEQ following execution of this Agreement.

PUBLIC COMMENT

53. Prior to execution of this Agreement by ADEQ and ASU, this Agreement shall be subject to a fifteen business day public comment period, after which ADEQ or ASU may modify or decline to execute a final Agreement if comments received disclose facts or considerations which indicate that this Agreement is inappropriate, improper or inadequate.

EFFECTIVE DATE

54. The effective date of this Agreement shall be the date upon which ADEQ executes this Agreement.

DATED this _____ day of _____, 2000.

ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

By_____
David M. Esposito
Director, Waste Programs Division

Date:_____

ARIZONA BOARD OF REGENTS for and on behalf of ARIZONA STATE UNIVERSITY

By_____

Date:_____

QUITCLAIM DEED

PREAMBLE

THIS DEED is made this ___ day of _____, 19__, between the UNITED STATES OF AMERICA, acting through the Secretary of Education, by David B. Hakola, Director, Real Property Group, Office of Management, ("GRANTOR"), pursuant to Section 203(k) of the Federal Property and Administrative Services Act of 1949, as amended, ("Act"), P.L. No. 81-152, 63 stat. 377, 40 U.S.C. Section 471 et seq., Reorganization Plan No. 1 of 1953, the Department of Education Organization Act of 1979, P.L. No. 96-88, 93 Stat. 668, 20 U.S.C. Section 3401 et seq., and the Arizona Board of Regents, for and on behalf of Arizona State University, a tax supported political subdivision of the state of Arizona ("GRANTEE").

I. RECITALS

1. By letter dated _____, 19__, from the Department of the Air Force, certain Federal surplus real property identified as being a portion of the former Williams Air Force Base, known as Parcel ____, consisting of _____ acres, with improvements, located in Maricopa County, Arizona, ("Property"), was assigned to GRANTOR for disposal upon the recommendation of GRANTOR that the Property is needed for educational purposes in accordance with the provisions of the Act.

2. GRANTEE has made a firm offer to purchase the Property under the provisions of the Act, has applied for a public benefit allowance, and proposes to use the Property for educational purpose as detailed in its application to GRANTOR dated _____, 19__ ("Application").

3. The Department of the Air Force has notified GRANTOR that no objection will be interposed to the transfer of the Property to GRANTEE, and GRANTOR has accepted the offer of GRANTEE.

II. AGREEMENT

4. GRANTOR, in consideration of the foregoing, one dollar, the performance by the GRANTEE of the covenants, conditions, and restrictions hereinafter contained and other good and valuable consideration, does hereby remise, release and quitclaim to the GRANTEE, its successors and assigns, all right, title, interest, claim and demand, reserving such rights as may arise from the operation of the conditions subsequent, restrictions and covenants of this Deed, which the UNITED STATES OF AMERICA has in and to the Property, Which is more particularly described in EXHIBIT "A" which is attached hereto, and which is incorporated herein by reference.

GRANTOR retains all existing utility systems except the laterals, service drops or appropriate term for such utility system line to or from the building or facilities. The retention point for the GRANTOR for existing electric, gas and telephone systems will be the point on the building or facility from the meter location or utility entrance box location to the distribution systems. The GRANTOR will retain existing transferable easements and access for all GRANTOR owned utility systems and for utility company owned utility systems, and assignable non-exclusive utility easements and rights-of-way in, on, over and across that portion of the subject Property containing utility systems excluded herein for the purpose of locating, operating, maintaining, altering, repairing, and patrolling the existing utility systems together with the right to trim, cut, fell, and remove therefrom, all trees, underbrush, obstructions and other vegetation, structures, or obstacles within the limits of the easements and rights-of-way; reserving, however, to GRANTEE and its successor and assigns, the right to relocate such easements and the rights-of-way at the expense of GRANTEE and its successors and assigns; and reserving the right to the GRANTEE to use and cross such easements and rights-of-way.

5. GRANTEE by acceptance of this Deed, covenants and agrees for itself, its successors and assigns, that, subject to the provisions of paragraph 27 of this Deed, the Property is transferred on an "as is, where is" basis, without warranty of any kind, either expressed or implied, including as to the condition of the Property. The GRANTEE also covenants and agrees for itself, its successors and assigns, that the GRANTOR has no obligation to provide any additions, improvements, or alterations to the Property, and that this conveyance is subject to any and all existing easements, rights of way, reservations and servitudes, whether or not of record.

III. CONDITIONS SUBSEQUENT

6. GRANTEE shall HAVE AND HOLD the Property subject, however, to each of the following conditions subsequent, which are for the sole benefit of the UNITED STATES OF AMERICA and which shall be binding and enforceable against GRANTEE, its successors and assigns as follows:

(1) For a period of thirty (30) years from the date of this Deed, the Property will be used solely and continuously for educational purposes in accordance with the proposed program and plan of GRANTEE set forth in its Application and for no other purposes. GRANTOR reserves the right to enter and inspect the Property during said period.

(2) During the above period of thirty (30) years GRANTEE will not sell, resell, lease, rent, mortgage, encumber, or otherwise transfer any interest in any part of the Property except as GRANTOR may authorize in advance in writing.

(3) One year from the date of this Deed and biennially thereafter for the period of thirty (30) years, unless GRANTOR directs otherwise, GRANTEE will file with GRANTOR a report on the operation and maintenance of the Property and will furnish, as requested by

GRANTOR, such other pertinent information evidencing its continuous use of the Property as required by condition subsequent number 1.

(4) During the above period of thirty (30) years GRANTEE will at all times be and remain a tax supported institution or a nonprofit institution, organization, or association exempt from taxation under §501(c) (3) of the Internal Revenue Code of 1954, as amended.

(5) For the period during which the Property is used for the purpose for which Federal assistance is hereby extended by GRANTOR or for another purpose involving the provision of similar services or benefits, GRANTEE hereby agrees that it will comply with the requirements of (a) Title VI of the Civil Rights Act of 1964 (P.L. No. 88-352), 42 U.S.C. §2000d et seq.; (b) Title IX of the Education Amendments of 1972 (P.L. No. 92-318), 20 U.S.C. § 1681 et seq.; (c) §504 of the Rehabilitation Act of 1973 (P.L. No. 93-112), 29 U.S.C. §794 et seq.; Title II of the Americans With Disabilities Act of 1990; and all requirements imposed by or pursuant to the Regulations (34 C.F.R. Parts 12, 100, 104 and 106) issued pursuant to the Act and now in effect, to the end that, in accordance with said Acts and Regulations, no person in the United State shall, on the ground of race, color, national origin, sex or handicap, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under the program and plan referred to in condition subsequent number 1 above or under any other program or activity of the GRANTEE, its successors and assigns to which such Acts and Regulation apply by reason of this conveyance.

7. The failure of GRANTOR to insist in any one of more instances upon complete performance of the conditions subsequent, terms, or covenants of this Deed shall not be construed as a waiver of, or a relinquishment of GRANTOR's right to the future performance of any of those conditions subsequent, terms and covenants and the GRANTEE's obligations with respect to such future performance shall continue in full force and effect.

8. In the event of a breach of any of the conditions subsequent or in the event of a breach of any other terms and covenants of this Deed, whether caused by the legal or other inability of GRANTEE, its successors and assigns, to perform any of the terms and conditions of this Deed, at the option of the UNITED STATES OF AMERICA, all right, title and interest in and to the Property shall, upon the recording by the UNITED STATES OF AMERICA of a Notice of Entry, pass to and become the property of the UNITED STATES OF AMERICA, which shall have an immediate right to entry thereon, and the GRANTEE, its successors and assigns, shall forfeit all right, title, and interest in and to the Property and in and to any and all of the tenements, hereditaments, and appurtenances thereto.

9. In the event GRANTOR fails to exercise its options to reenter the Property or to revert title thereto for any breach of conditions subsequent numbered 1, 2, 3, and 4 of Paragraph 6 of

this Deed within thirty-one (31) years from the date of this conveyance, conditions subsequent numbered 1, 2, 3, and 4 of said Paragraph 6, together with all rights to reenter and revert title for breach of those conditions, will as of that date, terminate and be extinguished.

10. The expiration of conditions subsequent numbered 1, 2, 3, and 4, of paragraph 6 of this Deed and the right to reenter and revert title for breach thereof, will not affect the obligation of GRANTEE, its successors and assigns, with respect to condition subsequent number 5 of Paragraph 6 or the right reserved to GRANTOR to reenter and revert title for breach of condition subsequent number 5.

IV. COVENANTS

11. GRANTEE, by the acceptance of this Deed, covenants and agrees for itself, its successors and assigns, that in the event GRANTOR exercises its option to revert all right, title and interest in and to the Property to GRANTOR, or GRANTEE voluntarily returns title to the Property in lieu of a reverter, the GRANTEE shall provide protection to and maintenance of the Property at all times until such time as the title to the Property or possession of the Property, whichever occurs later in time, is actually reverted or returned to and accepted by GRANTOR. Such protection and maintenance shall, at a minimum, conform to the standards prescribed by the General Services Administration in FPMR 101-47.4913 (41 C.F.R. Part 101-47.4913) now in effect, a copy of which is referenced in the GRANTEE's Application.

12. GRANTEE, by the acceptance of this Deed, further covenants and agrees for itself, its successors and assigns, to the extent permitted by law, to indemnify and hold harmless the United States, its agents, and employees against any and all loss, damage, claim, or liability whatsoever, due to the Grantee's use or occupancy of the property, or any other act or omission of the Grantee, including failure to comply with the obligations of this transfer.

13 GRANTEE, by the acceptance of this Deed, further covenants and agrees for itself, its successors and assigns, that in its use and occupancy of the property it will comply with all Federal, State and applicable local laws relating to asbestos; and that GRANTOR assumes no liability for damages for personal injury, illness, disability or death, to the GRANTEE, or to GRANTEE's successors or assigns, employees, invitees, or any other person subject to the control or direction of GRANTEE, its successors or assigns, or to any other person, including members of the general public, arising from or incident to the purchase, transportation, removal, handling, use, disposition, or other activity causing or leading to contact of any kind whatsoever with asbestos on the Property, whether GRANTEE, its successors or assigns have properly warned or failed properly to warn the individual(s) injured.

14 GRANTEE, by the acceptance of this Deed, further covenants, agrees and acknowledges for itself, its successors and assigns, that the Property transferred herein includes improvements presumed to contain lead-based paint and that lead is especially hazardous to

children of less than six (06) years of age, and further agrees to comply with the Residential Lead-Based Paint Hazard Reduction Act of 1992 (Title X of Public Law 102-550), to include abatement of all Lead-Based Paint hazards, prior to its transfer of the Property for residential habitation. The Lead Warning Statement (Exhibit B) is attached and must be provided to any Grantee.

15. GRANTEE, by the acceptance of this Deed, further covenants and agrees for itself, its successors and assigns, to the extent permitted by law, to indemnify the United States from any liability arising by reason of GRANTEE's failure to perform GRANTEE's obligations under this agreement with respect to elimination of immediate lead-based paint health hazards, the prohibition against the use of lead-based paint, and GRANTEE's responsibility for complying with applicable Federal, State and local lead-based paint laws and regulations.

16. GRANTEE, by the acceptance of this Deed, further covenants and agrees for itself, its successors and assigns and every successor in interest to the Property herein conveyed, or any part thereof, that any construction or alteration is prohibited unless a determination of no hazard to air navigation is issued by the Federal Aviation Administration in accordance with Title 14, Code of Federal Regulations, Part 77 entitled "Objects Affecting Navigable Airspace", or under the authority of the Federal Aviation Act of 1958, as amended.

17. GRANTEE, by the acceptance of this Deed, covenants that, at all times during the period that title to the Property is vested in GRANTEE, its transferees and assigns, subject to conditions subsequent numbered 1, 2, 3, and 4 of Paragraph 6 of this Deed, it will comply with all provisions of the following: the National Environmental Policy Act of 1969, as amended, 42 U.S.C. Section 4321 et seq., including the preparation of environmental impact statements, as required (See 42 U.S.C. Section 4332); the National Historic Preservation Act of 1966, as amended (P.L. No. 89-665); the Native American Graves Protection and Repatriation Act of 1990 (P.L. 101-601); and the Archaeological Resources Protection Act of 1969, as amended; Executive Order No. 11988, 44 Federal Register 43239(1979) reprinted in 42 U.S.C.A. Section 4321 app. at 188-189 (1987), governing floodplain management; Executive Order No. 11990, 42 Federal Register 26961 (1977), reprinted in 42 U.S.C.A. Section 4321 app. at 197-198 (1987), governing protection of wetlands; Federal Property Management Regulations, 42 C.F.R. 101-47.304-13; 41 C.F.R. 101-47.200 et seq., 53 Federal Register 29892 (1988), provisions relating to asbestos; and other appropriate and applicable guidelines, laws, regulations or executive orders, Federal, State or local; pertaining to floodplains, wetlands or the future use of the Property conveyed by this Deed.

18. GRANTEE, by acceptance of this Deed, covenants and agrees for itself, its successors and assigns, and every successor in interest to the Property conveyed herein or any part thereof that it will comply with the requirements of: (a) Title VI of the Civil Rights Act of 1964 (P.L. 88-352), 42 U.S.C. Section 2000d et seq., (b) Title IX of the Education Amendments of 1972 (P.L. 92-318), 20 U.S.C. Section 1681 et seq., and Section 844 of the Education

Amendments of 1974 (P.L. 93-380) (in relation to education); (c) Section 504 of the Rehabilitation Act of 1973 (P.L. 93-112), 29 U.S.C. Section 794 et seq., and Title II of the Americans with Disabilities Act of 1990; (d) all requirements imposed by or pursuant to the Regulations (34 C.F.R. Parts 12, 100, 104 and 106) issued pursuant to the Act and now in effect, all to the end that, in accordance with said Acts and Regulations, no person in the United States shall, on the ground of race, color, national origin, sex, or handicap, be excluded from participation in, be denied the benefits of, or otherwise be subjected to discrimination under the program and plan referred to in condition subsequent 1 above or under any other program or activity of the GRANTEE, its successors and assigns, to which such Acts and Regulations apply by reason of this conveyance. This covenant shall attach to and run with the land for so long as the Property is used for a purpose for which Federal assistance is hereby extended by GRANTOR or for another purpose involving the provision of similar services or benefits, and shall in any event, and without regard to technical classifications or designation, legal or otherwise, be binding to the fullest extent permitted by law and equity, for the benefit of, in favor of and enforceable by GRANTOR against GRANTEE, its successors and assigns, for the Property, or any part thereof. In the event of a breach of this covenant by GRANTEE or by its successors or assigns, GRANTOR, may, in addition to any right or remedy set forth in this agreement, avail itself of any remedy authorized by the violated statues or regulations.

19. In the event title to the Property or any part thereof is reverted to the UNITED STATES OF AMERICA for noncompliance or is voluntarily reconveyed in lieu of reverter, GRANTEE, its successors or assigns, shall at the option of GRANTOR, be responsible for and be required to reimburse the UNITED STATES OF AMERICA for the decreased value thereof that is not the result of reasonable wear and tear, an act of God, or alterations and conversion made by the GRANTEE and approved by the GRANTOR, to adapt the Property to the educational use for which the Property was transferred. GRANTEE shall, in addition thereto, to the extent permitted by law, reimburse GRANTOR for damage it may sustain as a result of such noncompliance, including but not limited to costs incurred to recover title to or possession of the Property.

20. GRANTEE may seek abrogation of the conditions subsequent numbered 1, 2, 3, and 4 of Paragraph 6 of this Deed by:

a. Obtaining the advance written consent of the GRANTOR; and

b. Payment to the UNITED STATES OF AMERICA of a sum of money equal to the fair market value of the property to be released from the conditions subsequent as of the effective date of the abrogation:

(1) multiplied by the percentage public benefit allowance granted at the time of conveyance,

(2) divided by 360, and

(3) multiplied by the number of months, or any portion thereof, of the remaining period of restrictions to be abrogated.

21. GRANTEE, by acceptance of this Deed, further covenants and agrees for itself, its successors and assigns, that in the event the Property or any part or interest thereof is at any time within the period of thirty (30) years from the date of this conveyance sold, leased, mortgaged, encumbered or otherwise disposed of or used for purposes other than those designated in condition subsequent number 1 above without the written consent of GRANTOR, all revenues therefrom and the reasonable value, as determined by GRANTOR, of any other benefits to GRANTEE deriving directly or indirectly from such sale, lease, mortgage, encumbrance, disposal or use, shall be considered to have been received and held in trust by GRANTEE for the UNITED STATES OF AMERICA and shall be subject to the direction and control of GRANTOR; but the provisions of this paragraph shall not impair or affect the rights reserved to GRANTOR under any other provision of this Deed.

22. GRANTEE, by the acceptance of this Deed, further covenants for itself, its successors and assigns, that at all times during the period that title to the Property is vested in GRANTEE subject to conditions subsequent 1, 2, 3, and 4 of Paragraph 6 of this Deed, GRANTEE shall at its sole cost and expense keep and maintain the Property and the improvements thereon, including all buildings, structures and equipment at any time situate upon the Property, in good order, condition and repair, and free from any waste whatsoever.

23. GRANTOR expressly reserves from this conveyance the geothermal and mineral rights to the Property. Further, GRANTOR reserves the right to enter upon the Property to prospect for and produce such minerals. GRANTEE, its successors and assigns, shall not engage in, authorize, permit, or suffer the extraction or production of any minerals or exploitation of the geothermal rights without written consent of GRANTOR. GRANTEE, by the acceptance of this Deed, further covenants and agrees for itself, its successors and assigns, that should an extraction or production of minerals or exploitation of the geothermal rights including the geothermal rights on or under the described Property occur: (i) it will hold all payments, bonuses, delayed rentals, or royalties in trust for GRANTOR, and (ii) that all net revenues and proceeds resulting from the extraction or production of any minerals including the exploitation of the geothermal rights by GRANTEE, its successors and assigns, will be held in trust for and promptly paid to GRANTOR. Nothing herein shall be construed as authorizing the GRANTEE to engage in the extraction or production of minerals or the exploitation of the geothermal rights, in, on, or under the Property.

24. GRANTEE, by acceptance of this Deed, covenants that, upon the recording by the UNITED STATES OF AMERICA of a Notice of Entry, all right, title, interest in and to the Property shall pass to and become the property of the UNITED STATES OF AMERICA, which

shall have an immediate right to enter thereon , and the GRANTEE, its successors and assigns, shall immediately and quietly quit possession thereof and forfeit all right, title and interest in and to the Property in any and all of the tenements, herediments, and appurtenances thereunto belonging, conveying all right, title and interest conveyed to it in this Deed except for encumbrances authorized and approved by the GRANTOR in writing as provided in condition subsequent number 2 of Paragraph 6 of this Deed.

25. GRANTEE further covenants, to the extent permitted by law, to pay damages for any time period held over beyond the time period stated in a demand to quit possession of the Property at the fair market rental value plus reasonable attorneys fees and costs of the GRANTOR in securing the return of the Property.

26. If the GRANTEE, its successors or assigns, shall cause the Property and/or any improvements thereon to be insured against loss, damage or destruction, or if the GRANTOR requires such insurance while the Property is subject to conditions subsequent numbered 1,2,3,and 4 of Paragraph 6 of this Deed, and any such loss, damage or destruction shall occur during the period GRANTEE holds title to the Property subject to conditions subsequent numbered 1, 2, 3, and 4 of Paragraph 6 of this Deed said insurance and all monies payable to GRANTEE, its successors or assigns, shall be held in trust by the GRANTEE, its successors or assigns, and shall be promptly used by GRANTEE for the purpose of repairing and restoring the Property to its former condition or replacing it with equivalent or more suitable facilities; or, if not so used, shall be paid to the Treasurer of the United States in an amount equal to the unamortized public benefit allowance of the Property multiplied by the current fair market value of the improvements lost, damaged or destroyed. If the Property is located in a floodplain, GRANTEE will, during the period it holds title subject to conditions subsequent numbered 1, 2, 3, and 4 of Paragraph 6 of this Deed, insure the Property and any machinery, equipment, fixtures, and furnishings contained therein against loss, damage, or destruction from flood, to the maximum limit of coverage made available with respect to the Property under Section 102 of the Flood Disaster Protection Act of 1973 (P.L. 93-234). Proceeds of such insurance will be used as set forth above.

27. Pursuant to Section 120(h)(3) of the Comprehensive Environmental Response, Compensation and Liability Act of 1980, as amended (42 U.S.C. § 9620(h)(3)), the following is notice of hazardous substances on the Property and the description of remedial action taken concerning the Property:

a. Notice of Hazardous Substance. The Grantor has made a complete search of its files and records. Exhibit C contains a table with the name of hazardous substances stored for one year or more, or known to have been released or disposed of, on the Property; the quantity in kilograms and pounds of the hazardous substance stored for one year or more, or known to have been released, or disposed of on the Property; and the date(s) that such storage, release, or disposal took place.

b. Description of Remedial Action Taken, if any. A description of the remedial actions taken on the Property regarding hazardous substances is as follows:

A former six-station skeet range was located on the Property. Soil samples taken from various locations on the Property identified lead shot, which exceeded 400 mg/kg. In addition, visible lead shot and broken skeet targets were identified which had been brought to the surface by burrowing rodents. While it has been determined that lead shot is not a threat to groundwater, the presence of the lead shot in the surface soil presents a potential health risk. Therefore, the selected remedy for the affected area on the Property consists of the following components:

(i) excavation and removal of the top six inches of soil within the 400 mg/kg area, except the soil beneath the houses, sidewalks, roads, paved parking areas and concrete patio areas,

(ii) engineering controls to form a protective cap to prevent access to remaining soil contamination consisting of (A) installing six inches of clean soil backfill in the excavated areas and (B) the footprints of the existing houses, sidewalks, roadways, paved parking areas and concrete patio areas,

(iii) institutional controls to prevent access to remaining soil contamination consisting of (A) the recording of a Voluntary Environmental Mitigation Use Restriction with the Maricopa County, Arizona, Recorder, a copy of which is attached hereto as Exhibit D and is incorporated herein by reference ("VEMUR") (B) an Operations and Maintenance Manual specifying the procedures and requirements to maintain the protective cap applicable to the owner of the property, persons living on the property and persons conducting activities on the property, attached hereto as Exhibit E and incorporated herein by reference ("O&M Manual"), and (C) the deed restrictions applicable to owners of the property as set forth in Section 30 of this Deed.

c. Covenant. The United States covenants and warrants that all remedial action necessary to protect human health and the environment with respect to hazardous substances remaining on the Property has been taken before the date of this Deed, and any additional remedial action found to be necessary after the date of this Deed for contamination on the Property existing prior to the date of this Deed shall be conducted by the United States. The foregoing covenant shall not apply in any case in which the grantee of the Property, or any part thereof, is a potentially responsible party with respect to the Property before the date on which any grantee acquired an interest in the Property, or is a potentially responsible party as a result of

an act or omission affecting the Property. For the purposes of this covenant, necessary remedial action shall not include clean up required as a result of any changes in the Grantee's use of the Property hereby conveyed.

28. Grantor reserves a right of access to any and all portions of the herein described land for purposes of environmental investigation, remediation or other corrective action and any future covenants necessitated by remedial action found to be necessary after the date of this Deed for contamination on the Property existing prior to the date of this Deed as provided in Paragraph 27.c. herein. This reservation includes the right of access to and use of, to the extent permitted by law, available utilities at reasonable cost to the Grantor, and where applicable, at the same rates available to the Grantee. These rights shall be exercisable in any case in which a remedial action, response action or corrective action is found to be necessary after the date of conveyance of the herein described land, or such access is necessary to carry out a remedial action, response action or corrective action on adjoining property. Pursuant to this reservation, the United States, (including but not limited to, Region IX, United States Environmental Protection Agency (EPA)), and the State of Arizona, and their respective officers, agents, employees, contractors and subcontractors shall have the right (upon reasonable notice to Grantee or the then owner and any authorized occupant of the aforedescribed Property, except in the event of imminent and substantial endangerment to human health or the environment) to enter upon the herein described land and conduct investigations and surveys, to include without limitation, drillings, testpitting, borings, data and/or record compilation and other activities related to environmental investigation, and to carry out remedial or removal actions as required or necessary under applicable authorities, including but not limited to monitoring wells, pumping wells, and treatment facilities. This reservation shall run with the land and shall be binding on the Grantee, its successors, and assigns. The United States agrees to assume responsibility for damages arising from activity of the United States its officers, employees, and authorized representatives (including contractors) on said land, in the exercise of this reservation of access, either by repairing such damage or at the option of the United States by making an appropriate settlement with the Grantee in lieu of restoration, subject to the appropriation of moneys for such purposes.

29. GRANTEE hereby covenants on behalf of itself, its successors and assigns, to preserve and maintain those portions of the Property containing archaeological sites identified as the Southwest Germann Site [AZ U:10:20 (ASU) and the Midvale Site [AZ U:10:24 (ASU)]; located in the County of Maricopa, State of Arizona, more particularly described in Exhibit "A" of this instrument, in accordance with the recommended approaches in The Secretary of Interior's Standards and Guidelines for Archaeological Documentation (48 FR 44734-37), the National Advisory Council's publication, Treatment of Archaeological Properties (Advisory Council on Historic Preservation 1980), in order to preserve and enhance those qualities that make them eligible for inclusion in the National Register of Historic Places. This covenant shall be a binding servitude upon the Property and shall be deemed to run with the land.

(a) No construction, alteration, remodeling, demolition, disturbance of ground (within 15 meters of either of the aforementioned archaeological site boundaries), or other action shall be undertaken or permitted to be undertaken on said Property that would materially affect the integrity or the appearance of the aforesaid attributes without the prior consultation with the Gila River Indian Community, Ak-Chin Indian Community, Salt River Pima-Maricopa Indian Community, Tohono O'Odham Nation, and The Hopi Tribe (a.k.a. Tribes), and written permission of the Arizona State Historic Preservation Officer (SHPO), and signed by a fully authorized representative thereof. The GRANTEE shall also consult with and obtain the concurrence of the Secretary of Education to ensure such activities are consistent with the terms and requirements of this conveyance with respect to Federal public benefit allowances. Should the SHPO object to the proposed treatment of the sites within the said thirty (30) days of receipt of the request from the GRANTEE and if the GRANTEE cannot resolve the dispute with the SHPO, then the GRANTEE will request comments from the SHPO. The SHPO will provide comments within the said (30) days of receipt of the request from the GRANTEE. The GRANTEE shall consider the comments of the SHPO in reaching its decision on the treatment. The GRANTEE will report its decision to the SHPO, prior to initiating the treatment.

(b) In the event that avoidance and protection of archaeological sites cannot be accomplished, the GRANTEE shall ensure that the following measures are carried out:

The Grantee shall ensure that an Archaeological Data Recovery Plan is consistent with the Umbrella Treatment Plan developed by the Air Force for Williams Air Force Base; and developed in consultation with the SHPO for the recovery of archaeological data from the archaeological site within those portions of the project area that will be impacted by construction and shall be implemented before construction can start. The GRANTEE shall be responsible for all costs arising out of archaeological testing or data recovery. The Data Recovery Plan shall be consistent with the Secretary of Interior's Standards and Guidelines for Archaeological Documentation (48 FR 44734-37), and take into account the Council's publication, Treatment of Archaeological Properties (Advisory Council on Historic Preservation 1980). It shall specify, at a minimum:

(1) the property, properties, or portions of properties where data recovery will be carried out;

(2) any property, properties, or portions of properties that will be destroyed without data recovery;

(3) the research questions to be addressed through the data recovery, with an explanation of their relevance and importance;

(4) the field and analysis methods to be used, with an explanation of their relevance to the research question;

(5) the methods to be used in data management, and dissemination of data, including a schedule;

(6) the proposed disposition of recovered materials and records;

(7) the proposed treatment and disposition of human remains and associated grave goods; and

(8) the proposed schedule for the submission of progress reports to the SHPO.

The draft Data Recovery Plan shall be submitted to the SHPO and concurring parties to the Programmatic Agreement among the United States Air Force, the Arizona State Historic Preservation Officer, and the Advisory Council on Historic Preservation concerning Disposal of Williams Air Force Base, Mesa, Arizona dated May 8, 1995, for thirty (30) days review. Unless the SHPO or another party objects within thirty (30) days after receipt of the Draft Data Recovery Plan, the GRANTEE shall ensure that it is implemented. If the SHPO or another party requests changes in draft Plan, all parties shall be provided with a twenty (20)-day period, from receipt, to review and comment upon the revised Data Recovery Plan. If the SHPO or another party fails to comment within the specified periods, the lack of comment shall be taken as concurrence with the Plan. The GRANTEE shall also consult with and obtain the concurrence of the Secretary of Education to ensure such activities are consistent with the terms and requirements of this conveyance with respect to Federal public benefit allowances.

The GRANTEE shall make arrangements for the disposition of any human remains encountered during data recovery and shall be consistent with the requirements of the Native American Graves Protection and Repatriation Act (P.L. 101-601) of 1990 and State Law A.R.S. 41-844 and A.R.S. 41-865. The GRANTEE shall be responsible for all costs related to the excavation and disposition of human remains and associated funerary objects.

The GRANTEE shall ensure that all materials and records resulting from the data recovery are curated in accordance with 36 CFR Part 79, except those human remains and associated funerary objects for which alternative disposition is provided in accordance with the Burial Agreement. The GRANTEE shall consider the concerns of any Tribe(s) about curation standards and facilities.

Should any Historic Properties (structures, artifacts, etc.) be discovered during implementation of an undertaking, the GRANTEE will immediately stop work in the immediate area of discovery and obtain the comments of the SHPO regarding appropriate treatment of the findings and the site. Work in the area of the discovery shall not resume until appropriate

treatment for the affected Historic Properties has been developed and implemented in consultation with the SHPO. The final mitigation plan shall be approved by the SHPO. GRANTEE will allow the SHPO or his or her designee, at all reasonable times and upon reasonable advance notice to GRANTEE, to inspect those portions of the Property transferred containing the Southwest Germann Site [AZ U:10:20 (ASU) and the Midvale Site [AZ U:10:24 (ASU) in order to ascertain whether GRANTEE is complying with the conditions of this Preservation Covenant.
Failure of the SHPO to exercise any right or remedy granted under this covenant shall not have the effect of waiving or limiting the exercise by the SHPO of any other right or remedy or the invocation of such right or remedy at any other time.

In the event of a violation of this covenant, in addition to any remedy now or hereafter provided by law, any signatory or concurring party to the Programmatic Agreement described above in this covenant may, following reasonable notice to the GRANTEE, institute suit to enjoin said violation and to require, at the expense of the GRANTEE, mitigation of data recovery and restoration of those qualities which made the Historic Property eligible for listing on the National Register of Historic Places. Any party that institutes such suit (other than the SHPO) shall not include the SHPO as an additional party to such suit. Subject to applicable law the successful party to such lawsuit shall be entitled to recover all costs or expenses incurred in connection with such a suit, including all court costs and attorney's fees.

The GRANTEE agrees that the SHPO is the covenantee and may without prior notice to the GRANTEE convey and assign all or part of the rights and responsibilities of the SHPO contained herein to a third party. As covenantee, the SHPO has the right, but no responsibility or obligation, to enforce the covenant.

All requirements set forth in this preservation covenant requiring the expenditure of SHPO funds are expressly subject to the availability of appropriations. If the SHPO cannot perform any obligation set forth in this preservation covenant due to the unavailability of funds, the Air Force, the SHPO, the Advisory Council on Historic Preservation, and the GRANTEE may negotiate an amendment to this preservation covenant in accordance with Stipulation 10 of the Programmatic Agreement, or invoke the dispute resolution clause in accordance with Stipulation 4 of the Programmatic Agreement.

This covenant is binding on GRANTEE, its successors and assigns, in perpetuity. The restrictions, stipulations and covenants contained herein shall be inserted by GRANTEE, its successors and assigns, verbatim or by express reference in any deed or other legal instrument by which it divests itself of either the fee simple title or any lesser estate in the affected Property identified as the Southwest Germann Site [AZ U:10:20 (ASU) and the Midvale Site [AZ U:10:24 (ASU)] or any part thereof.

30.

a. The Grantee acknowledges the notice provided pursuant to Arizona Revised Statute § 49-152(A) recorded in the Office of the Maricopa County Recorder, and contained in the VEMUR. This Notice identifies the specific areas where lead-shot contamination may be present as a result of the Property's previous use as a skeet range. As a result of the presence of lead in the soil, the Grantee covenants that it shall not use the premises or allow the premises to be used for the habitation of children under seven years of age, as long as such lead contamination is present on the Property. In addition, the Grantee covenants that in order to maintain the protective cap consisting of the six inches of clean soil backfill and the footprints of the existing houses, sidewalks, roadways, paved parking areas and concrete patio areas Grantee shall comply with the procedures and requirements in the O&M Manual. These covenants shall run with the land and shall be binding on the Grantee and its successors and assigns.

b. To the fullest extent permitted by law and equity, the foregoing covenants shall be binding for the benefit and in favor of and be enforceable by the Grantor and by its successors in office. The Grantor and its successors in office shall be entitled to institute legal action to enforce performance and observance of these covenants, enjoin acts which are violative of these covenants, and exercise any other legal or equitable right or remedy with respect to these covenants. These rights and remedies may be exercised separately or in combination. The enforcement by Grantor and its successors and assigns of the covenants of Grantee and its successors and assigns in this section 30 are subject to the following:

(i) Grantor acknowledges that primary responsibility for enforcement of compliance with the covenants in this Section 30 is held by the Arizona Department of Environmental Quality ("ADEQ") under the Agreement, dated _____, between ADEQ and Grantee, a copy of which is attached hereto as Exhibit F and incorporated herein by reference ("ADEQ/Grantee Agreement").

(ii) Accordingly, Grantor agrees for itself and its successors and assigns:

(A) Grantor will take no action to enforce the covenants in this Section 30 until after ADEQ has had a reasonable time to act under the ADEQ/Grantee Agreement and has failed to do so; and

(B) In taking any action to enforce the covenants in this Section 30, Grantor and its successors and assigns will be subject to the same procedures, requirements and restrictions applicable to enforcement action by ADEQ in Sections 25, 26, 27, 29, 36, 37, 45, and the second sentence of Section 28 of the ADEQ/Grantee Agreement, and shall have the same rights given to ADEQ in Sections 25, 26, 27, 29, 36, 37, 45, and the second sentence of Section 28 of the ADEQ/Grantee Agreement.

31. Except as herein expressly conveyed, this conveyance is made and accepted on the basis that GRANTEE shall have no right of use, license, easement, servitude, or usufruct for any

purpose, by necessity or otherwise, express or implied, on, over or under any of the property of the United States. By acceptance of this conveyance, GRANTEE covenants for himself and assigns that no such right or interest will ever be asserted by reason of this conveyance to GRANTEE.

32. All covenants, conditions subsequent and restrictions contained in this Deed shall run with the land and be binding upon GRANTEE, its successors and assigns, to all or any part of the Property. All rights and powers reserved to GRANTOR by this Deed may be exercised by an successor in function to GRANTOR, and all references in this Deed to GRANTOR shall include its successor in function. All covenants and conditions subsequent contained herein are for the sole benefit of GRANTOR and may be modified or abrogated by it as provided in the Act.

V. SIGNATURES

TO INDICATE THEIR AGREEMENT to the provisions contained in this agreement, GRANTOR and GRANTEE have executed this document as of the date and year first above written.

UNITED STATES OF AMERICA
Acting by and through the
Secretary of Education
GRANTOR:

By:_____
David B. Hakola
Director, Real Property Group
Office of Management
U.S. Department of Education
Washington, D.C.

ACCEPTANCE

The Arizona Board of Regents, for and on behalf of the Arizona State University, GRANTEE, acting by Dr. Lattie F. Coor, President, Arizona State University, hereby accepts this Quitclaim Deed and Accepts and agrees to all the terms, covenants, conditions subsequent, and restrictions contained therein.

ARIZONA BOARD OF REGENTS
GRANTEE:

By: _____
Dr. Lattie F. Coor, President
Arizona State University

ACKNOWLEDGEMENTS

WASHINGTON)

DISTRICT OF COLUMBIA)

On this ____ day of _____, 19__, personally appeared before me, a Notary Public in and for the District of Columbia, David B, Hakola, Director, Real Property Group, office of Management, U. S. Department of Education, acting for the United States of America and the Secretary of Education, known to me to be the same person whose name is subscribed to the foregoing instrument and acknowledged to me that he executed the same as on the date hereof as his free and voluntary act and deed for the purposes and consideration therein expressed and with the full authority and as the act and deed of the United States of America and the Secretary of Education.

In WITNESS WHEREOF, I have set my hand and seal at Washington, D.C., on this ___ day of _____, 19__.

_____
Notary Public
My Commission Expires: _____

COUNTY)
STATE OF ARIZONA)

On this ___ day of _____, 19__, personally appeared before me, a Notary Public in and for the State of Arizona, DR. Lattie F. Coor, President, Arizona State University, to me known to be the same person whose name is subscribed to the foregoing instrument and who acknowledged to me that he executed the same on the date hereof as his free and voluntary act and deed for the purposes and consideration therein expressed and with the full authority of the Arizona Board of Regents and as the act and deed of said Board of Regents.

IN WITNESS WHEREOF, I have set my hand and seal on this the ___ day of _____, 19__.

_____
Notary Public
My Commission Expires: _____.

APPENDIX B

RISK ASSESSMENT TABLES

Table B-1

Summary Statistics of Detected Chemicals in Subsurface Soil Samples
Electroplating/Chemical Cleaning (SS-16), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentration	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]		COPC?
Inorganics (mg/kg)										
ARSENIC	18 / 18	2.2 - 5.8	0.83 - 1	4.15	4.74E+00	4.74E+00	2.91E+00	3.20E-01		Yes
BERYLLIUM	16 / 18	0.21 - 0.92	0.21 - 0.25	0.51	7.60E-01	7.60E-01	1.14E+00	1.40E-01		No(c)
CADMIUM	2 / 18	10.5 - 13.4	0.83 - 1.3	1.78	2.39E+00	2.39E+00	NA	3.80E+01		No(b)
CHROMIUM	18 / 18	11.2 - 106	1 - 1.3	29.45	3.88E+01	3.88E+01	1.91E+01	3.00E+01	c	Yes
COPPER	18 / 18	9.8 - 50.5	0.65 - 0.97	27.27	3.42E+01	3.42E+01	NA	2.80E+03		No(b)
LEAD	18 / 18	7.5 - 403	0.42 - 0.5	35.19	3.83E+01	3.83E+01	1.44E+01	4.00E+02		No(b)
NICKEL	18 / 18	7 - 79.8	2.7 - 4.3	20.62	2.64E+01	2.64E+01	2.01E+01	1.50E+03	d	No(b)
SELENIUM	2 / 18	1.1 - 1.1	1 - 1.3	0.63	6.93E-01	6.93E-01	1.08E-01	3.80E+02		No(b)
THALLIUM	5 / 18	1.2 - 1.5	1 - 1.3	0.77	9.13E-01	9.13E-01	NA	4.91E+00	e	No(b)
ZINC	18 / 18	34.4 - 94.1	0.83 - 1.3	65.37	7.65E+01	7.65E+01	NA	2.30E+04		No(b)
Organics (µg/kg)										
ACETONE	5 / 44	3 - 5	10 - 60	5.99	6.31E+00	5.00E+00	NA	2.00E+06		No(b)
ETHYL BENZENE	1 / 44	2 - 2	10 - 60	6.09	6.47E+00	2.00E+00	NA	2.90E+06		No(a)
M,P-XYLENE	3 / 44	2 - 6	10 - 60	6.02	6.49E+00	6.00E+00	NA	9.80E+05		No(b)
METHYLENE CHLORIDE	5 / 44	2 - 3	10 - 60	5.85	6.32E+00	3.00E+00	NA	1.10E+04		No(b)
TETRACHLOROETHENE	25 / 44	2 - 490	10 - 60	28.16	2.77E+01	2.77E+01	NA	7.00E+03		No(b)
TOLUENE	32 / 44	2 - 120	10 - 60	21.31	3.15E+01	3.15E+01	NA	1.90E+06		No(b)
TRICHLOROETHENE	11 / 44	2 - 13	10 - 60	6.02	6.59E+00	6.59E+00	NA	7.10E+03		No(b)
XYLENE (TOTAL)	3 / 44	0.6 - 2	10 - 60	5.87	7.06E+00	2.00E+00	NA	9.80E+05		No(b)

[a] For a lognormal distribution.
[b] *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
[c] Based on PRG for chromium VI (Section 6.2.5.1).
[d] Soluble salts of nickel.
[e] Based on PRG for thallium sulfate by adjusting for molecular weight.
COPC = Chemical of potential concern.
NA = Not available or not applicable.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration
No(c) = Site mean <= mean of background.

Table B-2

Summary Statistics of Detected Chemicals in Subsurface Soil Samples
OWS-POL (SD-18), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentrations	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]		COPC?
Organics (µg/kg)										
1,2,4 TRIMETHYLBENZENE	1 / 15	51000 - 51000	110 - 120	3453	2.86E+03	2.86E+03	NA	7.40E+05	c	No(b)
1,3,5 TRIMETHYLBENZENE	1 / 15	17000 - 17000	110 - 120	1186	1.01E+03	1.01E+03	NA	3.30E+05	c	No(b)
2-METHYLNAPHTHALENE	2 / 15	160 - 12000	370 - 390	975	1.07E+03	1.07E+03	NA	8.00E+05	d	No(b)
BIS(2-ETHYLHEXYL)PHTHALATE	7 / 15	40 - 410	370 - 390	154.3	2.48E+02	2.48E+02	NA	3.20E+04		No(b)
DI-N-BUTYLPHTHALATE	1 / 15	140 - 140	370 - 390	186.7	1.93E+02	1.40E+02	NA	6.50E+06		No(b)
ETHYL BENZENE	1 / 15	38000 - 38000	110 - 120	2586	2.12E+03	2.12E+03	NA	2.90E+06		No(b)
M,P-XYLENES	1 / 15	38000 - 38000	220 - 240	2640	2.21E+03	2.21E+03	NA	9.80E+05		No(b)
NAPHTHALENE	1 / 15	3000 - 3000	370 - 390	377	4.57E+02	4.57E+02	NA	8.00E+05		No(b)
O-XYLENES	1 / 15	18000 - 18000	110 - 11000	1616	4.82E+03	4.82E+03	NA	9.80E+05		No(b)
PHENANTHRENE	1 / 15	600 - 600	370 - 390	217	2.49E+02	2.49E+02	NA	1.90E+04	e	No(b)
TOLUENE	1 / 15	10000 - 10000	110 - 11000	1083	3.02E+03	3.02E+03	NA	1.90E+06		No(b)
Total Petroleum Hydrocarbons										
DIESEL RANGE ORGANICS (mg/kg)	4 / 15	8.8 - 1700	5.5 - 6	118.9	1.70E+02	1.70E+02	NA	3.90E+03	c	No(b)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
c PRG calculated in text.
d Based on PRG for naphthalene.
e Based on PRG for anthracene.
COPC = Chemical of potential concern.
NA = Not applicable or not available.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration

Table B-3

Summary Statistics of Detected Chemicals in Surface Soil Samples
Facilities 1020, 1051, and Surrounding Areas (SS-21), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentrations	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]	COPC?
Inorganics (mg/kg)									
LEAD	14 / 14	7.6 - 136	0.41 - 0.42	39.55	6.72E+01	6.72E+01	1.44E+01	4.00E+02	No(b)
Organics (µg/kg)									
BENZO(A)ANTHRACENE	1 / 14	45 - 45	330 - 340	160.36	1.98E+02	4.50E+01	NA	6.10E+02	No(b)
BENZO(A)PYRENE	1 / 14	47 - 47	330 - 340	160.50	1.97E+02	4.70E+01	NA	6.10E+01	No(b)
BENZO(B)FLUORANTHENE	1 / 14	79 - 79	330 - 340	162.79	1.81E+02	7.90E+01	NA	6.10E+02	No(b)
CHRYSENE	1 / 14	74 - 74	330 - 340	162.43	1.83E+02	7.40E+01	NA	2.40E+04	No(b)
DI-N-OCTYL PHTHALATE	3 / 14	37 - 55	330 - 340	142.29	2.14E+02	5.50E+01	NA	1.30E+06	No(b)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995,* (EPA, 1996).
COPC = Chemical of potential concern.
NA = Not applicable or not available
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration.
No(c) = Site mean <= background mean concentration.

Table B-4

Summary Statistics of Detected Chemicals in Subsurface Soil Samples
ASTs 556 and 557 (ST-22), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentrations	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]		COPC?
Organics (µg/kg)										
1,2,4 TRIMETHYLBENZENE	1 / 29	4700 - 4700	100 - 120	215.5	1.29E+02	1.29E+02	NA	7.40E+05	c	No(a)
1,3,5 TRIMETHYLBENZENE	1 / 29	3500 - 3500	100 - 120	174.1	1.18E+02	1.18E+02	NA	3.30E+05	c	No(a)
ETHYL BENZENE	1 / 29	1200 - 1200	100 - 120	94.8	9.00E+01	9.00E+01	NA	2.90E+06		No(a)
JP4 (BY MODIFIED 8015)	16 / 29	6100 - 350000	2100 - 2700	28529	7.38E+04	7.38E+04	NA	5.20E+06	c	No(b)
M,P-XYLENES	1 / 29	2100 - 2100	210 - 250	180.3	1.76E+02	1.76E+02	NA	9.80E+05		No(a)
O-XYLENES	1 / 29	1300 - 1300	100 - 120	98.3	9.17E+01	9.17E+01	NA	9.80E+05		No(a)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
c PRG calculated in text.
COPC = Chemical of potential concern.
NA = Not applicable or not available.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration.

Table B-5

Summary Statistics of Detected Chemicals in Surface Soil Samples
Building 1069 (SS-23), OU-4
Williams Air Force Base

Chemical	Frequency of Detection	Range of Detected Concentration	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]	COPC?
Organics (µg/kg)									
BIS(2-ETHYLHEXYL)PHTHALATE	1 / 7	57 - 57	340 - 380	158.86	2.46E+02	5.70E+01	NA	3.20E+04	No(b)
DI-N-OCTYL PHTHALATE	1 / 7	35 - 35	340 - 380	155.71	3.29E+02	3.50E+01	NA	1.30E+06	No(b)
TOLUENE	4 / 7	15 - 330	10 - 11	59.36	1.17E+03	3.30E+02	NA	1.90E+06	No(b)
Total Petroleum Hydrocarbons (mg/kg)									
DIESEL RANGE ORGANICS	4 / 7	17 - 2100	5.2 - 10	309.74	5.27E+05	2.10E+03	NA	3.90E+03 c	No(b)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
c PRG calculated in text.
COPC = Chemical of potential concern.
NA = Not applicable or not available.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration.

Table B-6

Summary Statistics of Detected Chemicals in Total Soil
Building 1069 (SS-23), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentration	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]		COPC?
Organics (µg/kg)										
BIS(2-ETHYLHEXYL)PHTHALATE	1 / 20	57 - 57	340 - 390	175	1.97E+02	5.70E+01	NA	3.20E+04		No(b)
DI-N-OCTYL PHTHALATE	3 / 20	35 - 46	340 - 390	161	2.20E+02	4.60E+01	NA	1.30E+06		No(b)
PHENANTHRENE	1 / 20	47 - 47	340 - 390	174	2.01E+02	4.70E+01	NA	1.90E+04	c	No(b)
TOLUENE	16 / 20	8 - 330	10 - 12	41	7.02E+01	7.02E+01	NA	1.90E+06		No(b)
Total Petroleum Hydrocarbons (mg/kg)										
DIESEL RANGE ORGANICS	15 / 20	6.6 - 2100	5.2 - 10	121	1.54E+02	1.54E+02	NA	3.90E+03	d	No(b)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
c Based on PRG for anthracene.
d PRG calculated in text.
COPC = Chemical of potential concern.
NA = Not applicable or not available.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration.

Table B-7

Summary Statistics of Detected Chemicals in Surface Soil Samples
Building 1010 (SS-24), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentrations	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]		COPC?
Organics (µg/kg)										
4,4'-DDE	10 / 13	1.8 - 230	3.7 - 37	36.87	3.81E+02	2.30E+02	NA	1.30E+03		No(b)
4,4'-DDT	7 / 13	2.3 - 47	3.7 - 37	9.76	2.72E+01	2.72E+01	NA	1.30E+03		No(b)
ALDRIN	2 / 13	2.4 - 3.4	1.9 - 19	2.29	3.79E+00	3.40E+00	NA	2.60E+01		No(b)
ALPHA-CHLORDANE	8 / 13	0.78 - 1000	1.9 - 19	95.86	1.84E+03	1.00E+03	NA	3.40E+02	c	Yes
BENZO(K)FLUORANTHENE	1 / 13	110 - 110	350 - 400	184.23	2.00E+02	1.10E+02	NA	6.10E+03		No(b)
BETA-BHC	4 / 13	0.71 - 7.2	1.9 - 19	2.35	4.26E+00	4.26E+00	NA	2.50E+02		No(b)
BIS(2-ETHYLHEXYL)PHTHALATE	4 / 13	57 - 1300	350 - 400	247.15	4.12E+02	4.12E+02	NA	3.20E+04		No(b)
CHRYSENE	1 / 13	54 - 54	350 - 400	179.92	2.24E+02	5.40E+01	NA	2.40E+04		No(b)
DIELDRIN	6 / 13	2.3 - 540	3.7 - 37	47.28	1.51E+02	1.51E+02	NA	2.80E+01		Yes
ENDRIN	1 / 13	14 - 14	3.7 - 37	4.71	8.47E+00	8.47E+00	NA	2.00E+04		No(b)
ENDRIN ALDEHYDE	2 / 13	5.1 - 16	3.7 - 37	5.12	9.55E+00	9.55E+00	NA	2.00E+04	d	No(b)
GAMMA-CHLORDANE	6 / 13	1.1 - 1000	1.9 - 19	122.22	3.95E+03	1.00E+03	NA	3.40E+02	c	Yes
HEPTACHLOR	1 / 13	110 - 110	1.9 - 19	10.32	2.35E+01	2.35E+01	NA	9.90E+01		No(b)
HEPTACHLOR EPOXIDE	3 / 13	1.6 - 19	1.9 - 19	4.10	9.54E+00	9.54E+00	NA	4.90E+01		No(b)
PENTACHLOROPHENOL	1 / 13	3700 - 3700	890 - 1000	725.00	9.42E+02	9.42E+02	NA	2.50E+03		No(b)
TOLUENE	10 / 13	2 - 55	11 - 12	16.69	3.47E+01	3.47E+01	NA	1.90E+06		No(b)
Total Petroleum Hydrocarbons (mg/kg)										
DIESEL RANGE ORGANICS	6 / 12	5.6 - 920	5.4 - 6	91.17	6.41E+02	6.41E+02	NA	3.90E+03	e	No(b)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
c Based on PRG for chlordane.
d Based on PRG for endrin.
e PRG calculated in text.
NA = Not applicable or not available.
COPC = Chemical of potential concern.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration

Table B-8

Summary Statistics of Detected Chemicals in Total Soil Samples
Building 1010 (SS-24), OU-4
Williams Air Force Base, Arizona

Chemicals	Frequency of Detection	Range of Detected Concentrations	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	Arithmetic Mean of Background	Screening Concentration [b]		COPC?
Organics (µg/kg)										
4,4'-DDE	11 / 14	1.8 - 230	3.7 - 37	34.81	2.56E+02	2.30E+02	NA	1.30E+03		No(b)
4,4'-DDT	7 / 14	2.3 - 47	3.7 - 37	9.21	2.29E+01	2.29E+01	NA	1.30E+03		No(b)
ALDRIN	2 / 14	2.4 - 3.4	1.9 - 19	2.20	3.44E+00	3.40E+00	NA	2.60E+01		No(b)
ALPHA-CHLORDANE	9 / 14	0.78 - 1000	1.9 - 19	89.63	1.03E+03	1.00E+03	NA	3.40E+02	c	Yes
BENZO(K)FLUORANTHENE	1 / 14	110 - 110	350 - 410	185.71	2.01E+02	1.10E+02	NA	6.10E+03		No(b)
BETA-BHC	4 / 14	0.71 - 7.2	1.9 - 19	2.25	3.83E+00	3.83E+00	NA	2.50E+02		No(b)
BIS(2-ETHYLHEXYL)PHTHALATE	4 / 14	57 - 1300	350 - 410	244.14	3.84E+02	3.84E+02	NA	3.20E+04		No(b)
CHRYSENE	1 / 14	54 - 54	350 - 410	181.71	2.22E+02	5.40E+01	NA	2.40E+04		No(b)
DIELDRIN	7 / 14	1.5 - 540	3.7 - 37	44.01	1.09E+02	1.09E+02	NA	2.80E+01		Yes
ENDRIN	1 / 14	14 - 14	3.7 - 37	4.52	7.52E+00	7.52E+00	NA	2.00E+04		No(b)
ENDRIN ALDEHYDE	2 / 14	5.1 - 16	3.7 - 37	4.90	8.48E+00	8.48E+00	NA	2.00E+04	d	No(b)
GAMMA-CHLORDANE	7 / 14	1.1 - 1000	1.9 - 19	114.70	2.35E+03	1.00E+03	NA	3.40E+02	c	Yes
HEPTACHLOR	2 / 14	22 - 110	1.9 - 19	11.15	3.44E+01	3.44E+01	NA	9.90E+01		No(b)
HEPTACHLOR EPOXIDE	4 / 14	1.6 - 19	1.9 - 19	3.96	8.15E+00	8.15E+00	NA	4.90E+01		No(b)
PENTACHLOROPHENOL	1 / 14	3700 - 3700	890 - 1000	708.93	8.92E+02	8.92E+02	NA	2.50E+03		No(b)
TOLUENE	10 / 14	2 - 55	11 - 12	15.93	3.08E+01	3.08E+01	NA	1.90E+06		No(b)
Total Petroleum Hydrocarbons (mg/kg)										
DIESEL RANGE ORGANICS	7 / 13	5.6 - 920	5.4 - 6.2	85.85	4.39E+02	4.39E+02	NA	3.90E+03	e	No(b)

a For a lognormal distribution.
b *Region IX Preliminary Remedial Goals (PRGs) First Half 1995*, (EPA, 1996).
c Based on PRG for chlordane.
d Based on PRG for endrin.
e PRG calculated in text.
NA = Not applicable or not available.
COPC = Chemical of potential concern.
No(a) = Frequency of detection is < 5%.
No(b) = Source-term concentration is <= screening concentration

Table B-9

Summary Statistics of Detected Chemicals in Wipe Samples
Building 1010 (SS-24), OU-4
Williams Air Force Base, Arizona

Chemical	Frequency of Detection	Range of Detected Concentration	Range of Detection Limits	Arithmetic Mean	95% Upper Confidence Limit [a]	Source-Term Concentration	COPC?
PCBs and Pesticides (µg/cm^2)							
4,4'-DDE	13 / 13	0.000025 - 0.0001	0.0001 - 0.0022	5.99E-05	8.02E-05	8.02E-05	Yes b
4,4'-DDT	10 / 13	0.000013 - 0.00005	0.00011 - 0.0022	1.18E-04	2.55E-04	5.17E-05	Yes
ALDRIN	5 / 13	0.000003 - 0.007	0.00005 - 0.001	5.39E-04	2.29E-03	2.29E-03	Yes
ALPHA-CHLORDANE	13 / 13	0.000008 - 0.001	0.00005 - 0.001	1.31E-04	3.60E-04	3.60E-04	Yes
BETA-BHC	1 / 13	0.000003 - 0.000003	0.00005 - 0.001	7.47E-05	1.89E-04	2.80E-06	Yes
DELTA-BHC	1 / 13	0.000018 - 0.000018	0.00005 - 0.001	7.39E-05	1.12E-04	1.83E-05	No(a)
ENDOSULFAN I	7 / 13	0.000005 - 0.000016	0.00005 - 0.001	6.13E-05	1.50E-04	1.61E-05	Yes
ENDOSULFAN SULFATE	7 / 13	0.000005 - 0.000023	0.0001 - 0.0022	1.21E-04	7.48E-04	2.26E-05	Yes
ENDRIN	12 / 13	0.000011 - 0.00031	0.0001 - 0.0022	1.20E-04	3.07E-04	3.07E-04	Yes
ENDRIN KETONE	2 / 13	0.00003 - 0.00022	0.0001 - 0.0022	8.09E-05	1.12E-04	1.12E-04	Yes
GAMMA-BHC (LINDANE)	13 / 13	0.000034 - 0.00023	0.00005 - 0.001	1.34E-04	2.12E-04	2.12E-04	Yes
GAMMA-CHLORDANE	13 / 13	0.000003 - 0.002	0.00005 - 0.001	2.20E-04	1.33E-03	1.33E-03	Yes
HEPTACHLOR	4 / 13	0.000003 - 0.00005	0.00005 - 0.001	6.94E-05	2.41E-04	5.06E-05	Yes

a For a lognormal distribution.
b No screening concentrations are available for chemicals in removable surface stains.
COPC = Chemical of potential concern.
No(a) = No toxicity values available.

Table B-10

Summary of Cancer Risk to the Construction Worker
Future Land Use, OU-4
Williams Air Force Base, Arizona

(Page 1 of 2)

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	ILCR Soil Ingestion	Dermal Dose (mg/kg-day)	ILCR Dermal Contact	Inhaled Dose (mg/kg-day)	ILCR Inhalation	Sum of ILCR
Site SS-16									
Subsurface Soil									
ARSENIC	4.74E+00	1.07E-06	1.05E-07	1.57E-07	8.08E-10	1.28E-09	2.98E-09	4.50E-08	2.03E-07
CHROMIUM	3.88E+01	8.72E-06	8.56E-07	NA	6.61E-08	NA	2.44E-08	1.02E-06	1.02E-06
Sum				**1.57E-07**		**1.28E-09**		**1.07E-06**	**1.23E-06**
Site SD-18	No COPC in this site								
Site SS-21	No COPC in this site								
Site ST-22	No COPC in this site								
Site SS-23	No COPC in this site								
Site SS-24									
Total Soil									
ALPHA-CHLORDANE	1.00E+00	2.25E-07	2.21E-08	2.87E-08	1.71E-08	2.46E-08	6.29E-10	8.11E-10	5.42E-08
DIELDRIN	1.09E-01	2.45E-08	2.41E-09	3.85E-08	1.86E-09	3.30E-08	6.86E-11	1.10E-09	7.27E-08
GAMMA-CHLORDANE	1.00E+00	2.25E-07	2.21E-08	2.87E-08	1.71E-08	2.46E-08	6.29E-10	8.11E-10	5.42E-08
Sum				**9.59E-08**		**8.23E-08**		**2.73E-09**	**1.81E-07**
Wipe Samples **(mg/cm^2)**									
4,4'-DDE	8.02E-08	4.01E-08	NA	NA	2.24E-09	8.47E-10	1.12E-10	NA	8.47E-10
4,4'-DDT	5.17E-08	2.58E-08	NA	NA	1.44E-09	5.46E-10	7.22E-11	2.46E-11	5.70E-10

Table B-10

Summary of Cancer Risk to the Construction Worker
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg)[a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	ILCR Soil Ingestion	Dermal Dose (mg/kg-day)	ILCR Dermal Contact	Inhaled Dose (mg/kg-day)	ILCR Inhalation	Sum of ILCR
ALDRIN	2.29E-06	1.14E-06	NA	NA	6.40E-08	1.21E-06	3.20E-09	5.44E-08	1.26E-06
ALPHA-CHLORDANE	3.60E-07	1.80E-07	NA	NA	1.01E-08	1.45E-08	5.04E-10	6.50E-10	1.52E-08
BETA-BHC	2.80E-09	1.40E-09	NA	NA	7.82E-11	1.56E-10	3.91E-12	7.04E-12	1.64E-10
DELTA-BHC	1.83E-05	9.15E-06	NA	NA	5.12E-07	1.02E-06	2.56E-08	4.60E-08	1.07E-06
ENDOSULFAN I	1.61E-08	8.07E-09	NA	NA	4.51E-10	NA	2.26E-11	NA	NA
ENDOSULFAN SULFATE	2.26E-08	1.13E-08	NA	NA	6.32E-10	NA	3.16E-11	NA	NA
ENDRIN	3.07E-07	1.53E-07	NA	NA	8.58E-09	NA	4.29E-10	NA	NA
ENDRIN KETONE	1.12E-07	5.58E-08	NA	NA	3.12E-09	NA	1.56E-10	NA	NA
GAMMA-BHC (LINDANE)	2.12E-07	1.06E-07	NA	NA	5.92E-09	8.56E-09	2.96E-10	NA	8.56E-09
GAMMA-CHLORDANE	1.33E-06	6.66E-07	NA	NA	3.72E-08	5.38E-08	1.86E-09	2.40E-09	5.62E-08
HEPTACHLOR	5.06E-08	2.53E-08	NA	NA	1.41E-09	7.07E-09	7.07E-11	3.22E-10	7.39E-09
Sum						**2.32E-06**		**1.04E-07**	**2.42E-06**
Sum of Site				**9.59E-08**		**2.40E-06**		**1.07E-07**	**2.60E-06**
Site LF-26				No COPC in this site					
Site SS-33									
Surface Soil									
DIELDRIN	7.10E-02	1.60E-08	1.57E-09	2.51E-08	1.21E-09	2.15E-08	4.47E-11	7.19E-10	4.73E-08
HEXACHLOROBENZENE	3.69E+01	8.30E-06	8.15E-07	1.30E-06	6.29E-07	1.12E-06	2.32E-08	3.74E-08	2.46E-06
PENTACHLOROPHENOL	1.80E+02	4.05E-05	3.98E-06	4.77E-07	3.07E-06	4.09E-07	1.13E-07	NA	8.86E-07
Sum				**1.78E-06**		**1.53E-06**		**3.74E-08**	**3.35E-06**

NA = Not applicable.
a Unless otherwise specified.
Note: Box indicates total site ILCR.

Table B-11

Summary of Noncancer Hazard Effects to the Construction Worker
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	HQ Incidental Ingestion	Dermal Dose (mg/kg-day)	HQ Dermal Contact	Inhaled Dose (mg/kg-day)	HQ Inhalation	Hazard Index
Site SS-16									
TOTAL SOILS									
ARSENIC	4.74E+00	1.07E-06	7.33E-06	2.44E-02	5.66E-08	1.98E-04	2.09E-07	NA	2.46E-02
CHROMIUM	3.88E+01	8.72E-06	5.99E-05	1.20E-02	4.63E-06	1.85E-02	1.71E-06	NA	3.05E-02
Sum				**3.64E-02**		**1.87E-02**			**5.51E-02**
Site SD-18				No COPC in this site					
Site SS-21				No COPC in this site					
Site ST-22				No COPC in this site					
Site SS-23				No COPC in this site					
Site SS-24									
TOTAL SOILS									
ALPHA-CHLORDANE	1.00E+00	2.25E-07	1.55E-06	2.58E-02	1.19E-06	2.21E-02	4.40E-08	NA	4.79E-02
DIELDRIN	1.09E-01	2.45E-08	1.69E-07	3.37E-03	1.30E-07	2.89E-03	4.80E-09	NA	6.26E-03
GAMMA-CHLORDANE	1.00E+00	2.25E-07	1.55E-06	2.58E-02	1.19E-06	2.21E-02	4.40E-08	NA	4.79E-02
Sum				**5.49E-02**		**4.71E-02**			**1.02E-01**
WIPE SAMPLES **(mg/cm^2)**									
4,4'-DDE	8.02E-08	4.01E-08	NA	NA	1.57E-07	NA	7.85E-09	NA	NA
4,4'-DDT	5.17E-08	2.58E-08	NA	NA	1.01E-07	2.25E-04	5.06E-09	NA	2.25E-04
ALDRIN	2.29E-06	1.14E-06	NA	NA	4.48E-06	1.66E-01	2.24E-07	NA	1.66E-01
ALPHA-CHLORDANE	3.60E-07	1.80E-07	NA	NA	7.05E-07	1.31E-02	3.52E-08	NA	1.31E-02
BETA-BHC	2.80E-09	1.40E-09	NA	NA	5.48E-09	NA	2.74E-10	NA	NA

Table B-11

Summary of Noncancer Hazard Effects to the Construction Worker
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	HQ Incidental Ingestion	Dermal Dose (mg/kg-day)	HQ Dermal Contact	Inhaled Dose (mg/kg-day)	HQ Inhalation	Hazard Index
DELTA-BHC	1.83E-05	9.15E-06	NA	NA	3.58E-05	NA	1.79E-06	NA	NA
ENDOSULFAN I	1.61E-08	8.07E-09	NA	NA	3.16E-08	5.85E-06	1.58E-09	NA	5.85E-06
ENDOSULFAN SULFATE	2.26E-08	1.13E-08	NA	NA	4.42E-08	8.19E-06	2.21E-09	NA	8.19E-06
ENDRIN	3.07E-07	1.53E-07	NA	NA	6.01E-07	2.22E-03	3.00E-08	NA	2.22E-03
ENDRIN KETONE	1.12E-07	5.58E-08	NA	NA	2.18E-07	8.09E-04	1.09E-08	NA	8.09E-04
GAMMA-BHC (LINDANE)	2.12E-07	1.06E-07	NA	NA	4.15E-07	1.54E-03	2.07E-08	NA	1.54E-03
GAMMA-CHLORDANE	1.33E-06	6.66E-07	NA	NA	2.61E-06	4.83E-02	1.30E-07	NA	4.83E-02
HEPTACHLOR	5.06E-08	2.53E-08	NA	NA	9.90E-08	2.20E-04	4.95E-09	NA	2.20E-04
Sum						**2.32E-01**		**0.00E+00**	**2.32E-01**
Sum of Site				**5.49E-02**		**2.79E-01**		**0.00E+00**	**3.34E-01**
Site LF-26				No COPC in this site					
Site SS-33									
SURFACE SOIL									
DIELDRIN	7.10E-02	1.60E-08	1.10E-07	2.20E-03	8.48E-08	1.88E-03	3.13E-09	NA	4.08E-03
HEXACHLOROBENZENE	3.69E+01	8.30E-06	5.71E-05	7.13E-02	4.41E-05	6.12E-02	1.62E-06	NA	1.33E-01
PENTACHLOROPHENOL	1.80E+02	4.05E-05	2.78E-04	9.28E-03	2.15E-04	7.96E-03	7.93E-06	NA	1.72E-02
Sum				**8.28E-02**		**7.10E-02**			**1.54E-01**

NA = Not applicable
a Unless otherwise specified
Note: Box indicates total site HI.

Table B-12

Summary of Cancer Risk to the Occupational Worker
Current and Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	ILCR Soil Ingestion	Dermal Dose (mg/kg-day)	ILCR Dermal Contact	Inhaled Dose (mg/kg-day)	ILCR Inhalation	Sum of ILCR
Site SS-16				Receptor not applicable to this site					
Site SD-18				No COPC in this site					
Site SS-21				No COPC in this site					
Site ST-22				No COPC in this site					
Site SS-23				No COPC in this site					
Site SS-24									
Surface Soil									
ALPHA-CHLORDANE	1.00E+00	1.00E-07	1.75E-07	2.27E-07	2.24E-07	3.23E-07	6.99E-09	9.02E-09	5.59E-07
DIELDRIN	1.51E-01	1.51E-08	2.64E-08	4.22E-07	3.38E-08	6.00E-07	1.06E-09	1.70E-08	1.04E-06
GAMMA-CHLORDANE	1.00E+00	1.00E-07	1.75E-07	2.27E-07	2.24E-07	3.23E-07	6.99E-09	9.02E-09	5.59E-07
Sum				**8.76E-07**		**1.25E-06**		**3.50E-08**	**2.16E-06**
Wipe Samples (mg/cm^2)									
4,4'-DDE	8.02E-08	4.01E-08	NA	NA	2.35E-08	8.89E-09	2.80E-09	NA	8.89E-09
4,4'-DDT	5.17E-08	2.58E-08	NA	NA	1.52E-08	5.73E-09	1.81E-09	6.14E-10	6.34E-09
ALDRIN	2.29E-06	1.14E-06	NA	NA	6.72E-07	1.27E-05	7.99E-08	1.36E-06	1.40E-05
ALPHA-CHLORDANE	3.60E-07	1.80E-07	NA	NA	1.06E-07	1.53E-07	1.26E-08	1.62E-08	1.69E-07
BETA-BHC	2.80E-09	1.40E-09	NA	NA	8.22E-10	1.64E-09	9.78E-11	1.76E-10	1.82E-09
DELTA-BHC	1.83E-05	9.15E-06	NA	NA	5.37E-06	1.07E-05	6.39E-07	1.15E-06	1.19E-05

Table B-12

Summary of Cancer Risk to the Occupational Worker
Current and Future Land Use, OU-4
Williams Air Force Base, Arizona

(Page 2 of 2)

Chemical	Exposure Point Concentration for Soil (mg/kg)[a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	ILCR Soil Ingestion	Dermal Dose (mg/kg-day)	ILCR Dermal Contact	Inhaled Dose (mg/kg-day)	ILCR Inhalation	Sum of ILCR
ENDOSULFAN I	1.61E-08	8.07E-09	NA	NA	4.74E-09	NA	5.64E-10	NA	NA
ENDOSULFAN SULFATE	2.26E-08	1.13E-08	NA	NA	6.64E-09	NA	7.90E-10	NA	NA
ENDRIN	3.07E-07	1.53E-07	NA	NA	9.01E-08	NA	1.07E-08	NA	NA
ENDRIN KETONE	1.12E-07	5.58E-08	NA	NA	3.28E-08	NA	3.90E-09	NA	NA
GAMMA-BHC (LINDANE)	2.12E-07	1.06E-07	NA	NA	6.22E-08	8.98E-08	7.40E-09	NA	8.98E-08
GAMMA-CHLORDANE	1.33E-06	6.66E-07	NA	NA	3.91E-07	5.65E-07	4.66E-08	6.01E-08	6.25E-07
HEPTACHLOR	5.06E-08	2.53E-08	NA	NA	1.49E-08	7.43E-08	1.77E-09	8.04E-09	8.23E-08
Sum						**2.43E-05**		**2.60E-06**	**2.69E-05**
Sum of Site				**8.76E-07**		**2.56E-05**		**2.63E-06**	**2.91E-05**
Site LF-26				No COPC in this site					
Site SS-33									
Surface Soil									
DIELDRIN	7.10E-02	7.10E-09	1.24E-08	1.98E-07	1.59E-08	2.82E-07	4.96E-10	7.99E-09	4.89E-07
HEXACHLOROBENZENE	3.69E+01	3.69E-06	6.45E-06	1.03E-05	8.25E-06	1.47E-05	2.58E-07	4.15E-07	2.54E-05
PENTACHLOROPHENOL	1.80E+02	1.80E-05	3.15E-05	3.77E-06	4.03E-05	5.37E-06	1.26E-06	NA	9.14E-06
Sum				**1.43E-05**		**2.03E-05**		**4.23E-07**	**3.50E-05**

NA = Not applicable.
a Unless otherwise specified.
Note: Box indicates total site ILCR.

Table B-13

Summary of Noncancer Hazard Effects to the Occupational Worker
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	HQ Incidental Ingestion	Dermal Dose (mg/kg-day)	HQ Dermal Contact	Inhaled Dose (mg/kg-day)	HQ Inhalation	Hazard Index
Site SS-16				Receptor not applicable to this site					
Site SD-18				No COPC in this site					
Site SS-21				No COPC in this site					
Site ST-22				No COPC in this site					
Site SS-23				No COPC in this site					
Site SS-24									
SURFACE SOIL									
ALPHA-CHLORDANE	1.00E+00	1.00E-07	4.89E-07	8.15E-03	6.26E-07	1.16E-02	1.96E-08	NA	1.98E-02
DIELDRIN	1.50E-01	1.50E-08	7.34E-08	1.47E-03	9.39E-08	2.09E-03	2.94E-09	NA	3.56E-03
GAMMA-CHLORDANE	1.00E+00	1.00E-07	4.89E-07	8.15E-03	6.26E-07	1.16E-02	1.96E-08	NA	1.98E-02
Sum				**1.78E-02**		**2.53E-02**			**4.31E-02**
WIPE SAMPLES (mg/cm^2)									
4,4'-DDE	8.02E-08	4.01E-08	NA	NA	6.59E-08	NA	7.85E-09	NA	NA
4,4'-DDT	5.17E-08	2.58E-08	NA	NA	4.25E-08	9.44E-05	5.06E-09	NA	9.44E-05
ALDRIN	2.29E-06	1.14E-06	NA	NA	1.88E-06	6.96E-02	2.24E-07	NA	6.96E-02
ALPHA-CHLORDANE	3.60E-07	1.80E-07	NA	NA	2.96E-07	5.48E-03	3.52E-08	NA	5.48E-03
BETA-BHC	2.80E-09	1.40E-09	NA	NA	2.30E-09	NA	2.74E-10	NA	NA
DELTA-BHC	1.83E-05	9.15E-06	NA	NA	1.50E-05	NA	1.79E-06	NA	NA
ENDOSULFAN I	1.61E-08	8.07E-09	NA	NA	1.33E-08	2.46E-06	1.58E-09	NA	2.46E-06
ENDOSULFAN SULFATE	2.26E-08	1.13E-08	NA	NA	1.86E-08	3.44E-06	2.21E-09	NA	3.44E-06
ENDRIN	3.07E-07	1.53E-07	NA	NA	2.52E-07	9.34E-04	3.00E-08	NA	9.34E-04
ENDRIN KETONE	1.12E-07	5.58E-08	NA	NA	9.18E-08	3.40E-04	1.09E-08	NA	3.40E-04

Table B-13

Summary of Noncancer Hazard Effects to the Occupational Worker
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	HQ Incidental Ingestion	Dermal Dose (mg/kg-day)	HQ Dermal Contact	Inhaled Dose (mg/kg-day)	HQ Inhalation	Hazard Index
GAMMA-BHC (LINDANE)	2.12E-07	1.06E-07	NA	NA	1.74E-07	6.45E-04	2.07E-08	NA	6.45E-04
GAMMA-CHLORDANE	1.33E-06	6.66E-07	NA	NA	1.10E-06	2.03E-02	1.30E-07	NA	2.03E-02
HEPTACHLOR	5.06E-08	2.53E-08	NA	NA	4.16E-08	9.24E-05	4.95E-09	NA	9.24E-05
Sum						**9.75E-02**			**9.75E-02**
Site Sum				**1.78E-02**		**1.23E-01**			**1.41E-01**
Site LF-26				No COPC in this site					
Site SS-33									
SURFACE SOIL									
DIELDRIN	7.10E-02	7.10E-09	3.47E-08	6.95E-04	4.45E-08	9.88E-04	1.39E-09	NA	1.68E-03
HEXACHLOROBENZENE	3.69E+01	3.69E-06	1.81E-05	2.26E-02	2.31E-05	3.21E-02	7.22E-07	NA	5.47E-02
PENTACHLOROPHENOL	1.80E+02	1.80E-05	8.81E-05	2.94E-03	1.13E-04	4.17E-03	3.52E-06	NA	7.11E-03
Sum				**2.62E-02**		**3.73E-02**			**6.35E-02**

NA = Not applicable
a Unless otherwise specified
Note: Box indicates total site HI.

Table B-14

Summary of Cancer Risk to the School-age Trespasser
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg)[a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	ILCR Soil Ingestion	Dermal Dose (mg/kg-day)	ILCR Dermal Contact	Inhaled Dose (mg/kg-day)	ILCR Inhalation	Sum of ILCR
Site SS-16				Receptor not applicable to this site					
Site SD-18				No COPC in this site					
Site SS-21				No COPC in this site					
Site ST-22				No COPC in this site					
Site SS-23				No COPC in this site					
Site SS-24									
Surface Soil									
ALPHA-CHLORDANE	1.00E+00	1.00E-07	1.88E-07	2.44E-07	8.64E-08	1.25E-07	8.42E-10	1.09E-09	3.70E-07
DIELDRIN	1.51E-01	1.51E-08	2.84E-08	4.54E-07	1.30E-08	2.32E-07	1.27E-10	2.05E-09	6.88E-07
GAMMA-CHLORDANE	1.00E+00	1.00E-07	1.88E-07	2.44E-07	8.64E-08	1.25E-07	8.42E-10	1.09E-09	3.70E-07
Sum				**9.42E-07**		**4.82E-07**		**4.22E-09**	**1.43E-06**
Wipe Samples (mg/cm^2)									
4,4'-DDE	8.02E-08	4.01E-08	NA	NA	4.07E-08	1.54E-08	3.37E-10	NA	1.54E-08
4,4'-DDT	5.17E-08	2.58E-08	NA	NA	2.62E-08	9.90E-09	2.17E-10	7.39E-11	9.97E-09
ALDRIN	2.29E-06	1.14E-06	NA	NA	1.16E-06	2.19E-05	9.63E-09	1.64E-07	2.21E-05
ALPHA-CHLORDANE	3.60E-07	1.80E-07	NA	NA	1.83E-07	2.64E-07	1.52E-09	1.96E-09	2.66E-07
BETA-BHC	2.80E-09	1.40E-09	NA	NA	1.42E-09	2.84E-09	1.18E-11	2.12E-11	2.86E-09

Table B-14

Summary of Cancer Risk to the School-age Trespasser
Future Land Use, OU-4
Williams Air Force Base, Arizona

(Page 2 of 2)

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	ILCR Soil Ingestion	Dermal Dose (mg/kg-day)	ILCR Dermal Contact	Inhaled Dose (mg/kg-day)	ILCR Inhalation	Sum of ILCR
DELTA-BHC	1.83E-05	9.15E-06	NA	NA	9.28E-06	1.86E-05	7.70E-08	1.39E-07	1.87E-05
ENDOSULFAN I	1.61E-08	8.07E-09	NA	NA	8.19E-09	NA	6.79E-11	NA	NA
ENDOSULFAN SULFATE	2.26E-08	1.13E-08	NA	NA	1.15E-08	NA	9.51E-11	NA	NA
ENDRIN	3.07E-07	1.53E-07	NA	NA	1.56E-07	NA	1.29E-09	NA	NA
ENDRIN KETONE	1.12E-07	5.58E-08	NA	NA	5.66E-08	NA	4.70E-10	NA	NA
GAMMA-BHC (LINDANE)	2.12E-07	1.06E-07	NA	NA	1.07E-07	1.55E-07	8.92E-10	NA	1.55E-07
GAMMA-CHLORDANE	1.33E-06	6.66E-07	NA	NA	6.76E-07	9.76E-07	5.61E-09	7.23E-09	9.83E-07
HEPTACHLOR	5.06E-08	2.53E-08	NA	NA	2.57E-08	1.28E-07	2.13E-10	9.69E-10	1.29E-07
Sum						**4.20E-05**		**3.13E-07**	**4.23E-05**
Sum of Site				**9.42E-07**		**4.25E-05**		**3.17E-07**	**4.38E-05**
Site LF-26				No COPC in this site					
Site SS-33				Receptor not applicable to this site					

NA = Not applicable.
a Unless otherwise specified.
Note: Box indicates total site ILCR.

Table B-15

Summary of Noncancer Hazard Effects to the School-Age Trespasser
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	HQ Incidental Ingestion	Dermal Dose (mg/kg-day)	HQ Dermal Contact	Inhaled Dose (mg/kg-day)	HQ Inhalation	Hazard Index
Site SS-16				Receptor not applicable to this site					
Site SD-18				No COPC in this site					
Site SS-21				No COPC in this site					
Site ST-22				No COPC in this site					
Site SS-23				No COPC in this site					
Site SS-24									
Surface Soil									
ALPHA-CHLORDANE	1.00E+00	1.00E-07	1.10E-06	1.83E-02	5.04E-07	9.34E-03	4.91E-09	NA	2.76E-02
DIELDRIN	1.50E-01	1.50E-08	1.64E-07	3.29E-03	7.56E-08	1.68E-03	7.36E-10	NA	4.97E-03
GAMMA-CHLORDANE	1.00E+00	1.00E-07	1.10E-06	1.83E-02	5.04E-07	9.34E-03	4.91E-09	NA	2.76E-02
Sum				**3.98E-02**		**2.04E-02**			**6.02E-02**
Wipe Samples (mg/cm^2)									
4,4'-DDE	8.02E-08	4.01E-08	NA	NA	2.37E-07	NA	1.97E-09	NA	0.00E+00
4,4'-DDT	5.17E-08	2.58E-08	NA	NA	1.53E-07	3.40E-04	1.27E-09	NA	3.40E-04
ALDRIN	2.29E-06	1.14E-06	NA	NA	6.77E-06	2.51E-01	5.62E-08	NA	2.51E-01
ALPHA-CHLORDANE	3.60E-07	1.80E-07	NA	NA	1.07E-06	1.97E-02	8.84E-09	NA	1.97E-02
BETA-BHC	2.80E-09	1.40E-09	NA	NA	8.28E-09	NA	6.87E-11	NA	0.00E+00
DELTA-BHC	1.83E-05	9.15E-06	NA	NA	5.41E-05	NA	4.49E-07	NA	0.00E+00
ENDOSULFAN I	1.61E-08	8.07E-09	NA	NA	4.78E-08	8.85E-06	3.96E-10	NA	8.85E-06

Table B-15

Summary of Noncancer Hazard Effects to the School-Age Trespasser
Future Land Use, OU-4
Williams Air Force Base, Arizona

Chemical	Exposure Point Concentration for Soil (mg/kg) [a]	Exposure Point Concentration for Air (mg/m^3)	Ingestion Dose (mg/kg-day)	HQ Incidental Ingestion	Dermal Dose (mg/kg-day)	HQ Dermal Contact	Inhaled Dose (mg/kg-day)	HQ Inhalation	Hazard Index
ENDOSULFAN SULFATE	2.26E-08	1.13E-08	NA	NA	6.69E-08	1.24E-05	5.55E-10	NA	1.24E-05
ENDRIN	3.07E-07	1.53E-07	NA	NA	9.08E-07	3.36E-03	7.53E-09	NA	3.36E-03
ENDRIN KETONE	1.12E-07	5.58E-08	NA	NA	3.30E-07	1.22E-03	2.74E-09	NA	1.22E-03
GAMMA-BHC (LINDANE)	2.12E-07	1.06E-07	NA	NA	6.27E-07	2.32E-03	5.20E-09	NA	2.32E-03
GAMMA-CHLORDANE	1.33E-06	6.66E-07	NA	NA	3.94E-06	7.30E-02	3.27E-08	NA	7.30E-02
HEPTACHLOR	5.06E-08	2.53E-08	NA	NA	1.50E-07	3.33E-04	1.24E-09	NA	3.33E-04
Sum						**3.51E-01**			**3.51E-01**
Sum of Site				**3.98E-02**		**3.71E-01**			**4.11E-01**
Site LF-26				No COPC in this site					
Site SS-33				Receptor not applicable to this site					

NA = Not applicable
a Unless otherwise specified
Note: Box indicates total site HI.

APPENDIX C

COST TABLES

Table C-1

Cost Summary for SS-16, Remediation Alternatives
Operable Unit 4, Feasibility Study
Williams Air Force Base

Williams AFB
Project-409881
DDP - SS16$.XLS

OPTION	SS16-1	SS16-2
RESPONSE ACTION	NO ACTION	INSTITUTIONAL CONTROL
COST COMPONENT	NO ACTION	DEED RESTRICTION/VEMUR
AREA AFFECTED (FT^2)	N/A	N/A
VOLUME AFFECTED ($YARD^3$)	N/A	N/A
INSTALLED CAPITAL COST (A)	$0	$2,200
REMEDIATION TIME (YEARS)	30	30
O&M NET PRESENT VALUE COST (B) (a)	$91,800	$0
TOTAL NET PRESENT VALUE (A+B)	$91,800	$2,200

INFLATION	4%
INTEREST	5%

a. Net Present Values of alternatives are based on 4% inflation and 5% interest rate.

Table C-1A

SS-16-1, No Action
Operation and Maintenance Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS16$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					91,800
TOTAL NET PRESENT WORTH (+50%, -30%)					**91,800**

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-1B

SS-16-2, Institutional Control (Deed Restriction and VEMUR)
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS16$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Institutional Control	VEMUR Deed Restriction	1,500
TOTAL DIRECT COSTS (TDC)		1,500
INDIRECT CAPITAL COSTS		
1. Engineering and related tech support	20 % TDC	300
2. License, Permit, and Legal Fees	2 % TDC	0
3. Start-up (sampling costs are included)		NA
4. Contingency	25 % TDC	400
TOTAL INSTALLED COST (+50%, -30%)		**2,200**

NA - not applicable

Table C-2

SS-19 Cost Summary

South Desert Village Remediation Alternatives
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

OPTION	SS19-1	SS19-2	SS19-3	SS19-4	SS19-5
RESPONSE ACTION	NO ACTION	INSTITUTIONAL CONTROL	SOIL REMOVAL / DISPOSAL / INSTITUTIONAL CONTROL	ABATEMENT / RESTRICTIVE EXPOSURE / NO ACTION / INSTITUTIONAL CONTROL	SOIL REMOVAL / INSTITUTIONAL CONTROL
COST COMPONENT	NO ACTION	INSTITUTIONAL CONTROL	EXCAVATION / DISPOSAL / DEED RESTRICTION / VEMUR	EXCAVATION / LANDSCAPING / DEED RESTRICTION / VEMUR	EXCAVATION / LEAD MINING / DEED RESTRICTION / VEMUR
AREA AFFECTED ($YARD^2$)	78,691	78,691	78,691	LANDSCAPE 78,691 EXCAVATE 24,282	78,691
VOLUME AFFECTED ($YARD^3$)*	N/A	N/A	13,115	LANDSCAPE 6,557 EXCAVATE 4,047	13,115
INSTALLED CAPITAL COST (A)	$0	$3,200	$1,386,373	$1,342,415	$1,473,396
REMEDIATION TIME (YEARS)	30	30	30	30	30
O&M NET PRESENT VALUE COST (B) (a)	$91,800	$91,800	$135,500	$229,100	$135,500
TOTAL NET PRESENT VALUE (A+B)	$91,800	$95,000	$1,521,900	$1,571,500	$1,608,900

INFLATION	4%
INTEREST	5%

a. Net Present Values for alternatives are based on 4% inflation and 5% interest rate.

* Cost estimated on 15% expansion of this volume.

Table C-2A

SS-19-1, No Action
Operation and Maintenance Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					91,800
TOTAL NET PRESENT WORTH (+50%, -30%)					91,800

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-2B

SS-19-2, Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Institutional Control	Deed Restriction VEMUR	3,000
TOTAL DIRECT COSTS (TDC)		3,000
INDIRECT CAPITAL COSTS		
1. Management, Plans, & Sampling		NA
2. Start-up (sampling costs are included)		NA
3. Contingency	5 % TDC	200
TOTAL INSTALLED COST (+50%, -30%)		3,200

NA - not applicable

Table C-2C

SS-19-3, Excavate/Disposal/Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Excavate, Haul, Landfill	13,115 yd^3	1,103,873
2. Additional Hand Labor for Close Work. Excavate around house.	94 houses, 24 mhr/house, $50/mhr	112,800
	Equipment Rental	15,000
3. Institutional Control	VEMUR	3,000
	Deed Restrictions	
TOTAL DIRECT COSTS (TDC)		1,234,673
INDIRECT CAPITAL COSTS		
1. Management, Plans, & Sampling		90,000
2. Start-up (sampling costs are included)		NA
3. Contingency	5 % TDC	61,700
TOTAL INSTALLED COST (+50%, -30%)		1,386,373

NA - not applicable

Table C-2C

SS-19-3, Excavate/Disposal/Institutional Control
Operation and Maintenance
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Biannual O&M Activities:					
Cap Inspection					3,000
Expenses					500
Total					3,500
Annual Cost					1,750
Net Present Worth (30 years)(a)					**43,700**
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					**91,800**
TOTAL NET PRESENT WORTH (+50%, -30%)					**135,500**

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-2D

SS-19-4, Excavate/Landscape/Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Excavate, Haul, Landfill	4,047 yd^3	958,215
Landscape	6,557 yd^3	
Additonal Hand Labor for Close		
2. Work @ Houses	94 houses, 24 mhr/house, $50/mhr	112,800
	Equipment Rental	15,000
3. Institutional Control	Deed Restriction	3,000
	VEMUR	
TOTAL DIRECT COSTS (TDC)		1,089,015
INDIRECT CAPITAL COSTS		
1. Management, Plans, & Sampling		90,000
2. Start-up (sampling costs are included		NA
3. Contingency	15 % TDC	163,400
TOTAL INSTALLED COST (+50%, -30%)		1,342,415

NA - not applicable

Table C-2D

SS-19-4, Excavate/Landscape/Institutional Control
Operation and Maintenance
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Biannual O&M Activities:					
Cap Inspection					3,000
Expenses					500
Total					3,500
Annual Cost					1,750
Annual O&M Activities:					
Landscape Maintenance					3,000
Contingency	25% operating				750
Total					3,750
Total Annual Cost					5,500
Net Present Worth (30 years)(a)					137,300
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					91,800
TOTAL NET PRESENT WORTH (+50%, -30%)					**229,100**

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-2E

SS-19-5, Excavate/Backfill/Lead Mining @ SS-20/Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Excavate, Haul, Reclaim Lead shot, Grade, Compact	1. Excavate 6" soil @ SS-19 2. Transport soil to SS-20 Skeet Range 3. Reclaim lead shot from soil 4.Grade & compact soil @ SS-20 5. Grade & compact clean backfill @ SS-19	1,186,696
2. Additonal Hand Labor for Close Work @ Houses	94 houses, 24 mhr/house, $50/mhr Equipment Rental	112,800 15,000
3. Institutional Control	Deed Restriction VEMUR	3,000
TOTAL DIRECT COSTS (TDC)		1,317,496
INDIRECT CAPITAL COSTS		
1. Management, Plans, & Sampling		90,000
2. Start-up (sampling costs are included)		NA
3. Contingency	5 % TDC	65,900
TOTAL INSTALLED COST (+50%, -30%)		1,473,396

NA - not applicable

Table C-2E

SS-19-5, Excavate/Backfill/Lead Mining @ SS-20/Institutional Control
Operation and Maintenance
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS19$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY UNITS/ PERIOD	COST ($)
Biannual O&M Activities:				
Cap Inspection				3,000
Expenses				500
Total				3,500
Annual Cost				1,750
Net Present Worth (30 years)(a)				**43,700**
Five Year Activities:				
Site Review				15,000
Contingency	25% operating			3,750
Total				18,750
Net Present Worth (30 years)(a)				**91,800**
TOTAL NET PRESENT WORTH (+50%, -30%)				**135,500**

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-3

Cost summary for SS-20, Firing Range Remediation Alternatives
Operable Unit 4, Feasibility Study
Williams Air Force Base

Williams AFB
Project-409881
DDP - SS20FIR$.XLS

OPTION	SS20-1FR	SS20-2FR	SS20-3FR
RESPONSE ACTION	NO ACTION	INSTITUTIONAL CONTROL	SOIL REMOVAL / DISPOSAL / INSTITUTIONAL CONTROL
COST COMPONENT	NO ACTION	FENCING, DEED RESTRICTION	EXCAVATION / DISPOSAL / DEED RESTRICTION / VEMUR
AREA AFFECTED (FT^2)	58,000	58,000	2,800
VOLUME AFFECTED ($YARD^3$)*	N/A	N/A	519
INSTALLED CAPITAL COST (A)	$0	$30,740	$121,552
REMEDIATION TIME (YEARS)	30	30	1
O&M NET PRESENT VALUE COST (B) (a)	$91,800	$99,900	$0
TOTAL NET PRESENT VALUE (A+B)	$91,800	$130,600	$121,600

INFLATION	4%
INTEREST	5%

a. Net Present Values of alternatives are based on 4% inflation and 5% interest rate.

* Cost estimated on 15% expanse of this volume.

Table C-3A

SS-20-1, Firing Range, No Action
Operation and Maintenance Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS20FIR$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					91,800
TOTAL NET PRESENT WORTH (+50%, -30%)					91,800

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-3B

SS-20-2, Firing Range, Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS20FIR$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Fence	960 Linear Feet	19,440
2. Institutional Control	Deed Restriction VEMUR	1,500
TOTAL DIRECT COSTS (TDC)		20,940
INDIRECT CAPITAL COSTS		
1. Engineering and related tech support	20 % TDC	4,200
2. License, Permit, and Legal Fees	2 % TDC	400
3. Start-up (sampling costs are included)		NA
4. Contingency	25 % TDC	5,200
TOTAL INSTALLED COST (+50%, -30%)		**30,740**

NA - not applicable

Table C-3B

SS-20-2, Firing Range, Institutional Control
Operation and Maintenance Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS20FIR$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Annual Activities:					
Fence Maintenance					260
Contingency	25% operating				65
Total					325
Net Present Worth (30 years)(a)					**8,100**
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					**91,800**
TOTAL NET PRESENT WORTH (+50%, -30%)					**99,900**

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-3C

SS-20-3, Firing Range, Excavate/Disposal/Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS20FIR$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Excavate, Haul, Landfill	519 yd^3, 674 tons (assumed volume: 140' x 20' x 5')	88,552
2. Institutional Control	VEMUR Deed Restriction	1,500
TOTAL DIRECT COSTS (TDC)		90,052
INDIRECT CAPITAL COSTS		
1. Management, Plans, & Sampling	20 % TDC	18,000
2. Start-up (sampling costs are included)		NA
3. Contingency	15 % TDC	13,500
TOTAL INSTALLED COST (+50%, -30%)		121,552

NA - not applicable

Table C-4

Cost Summary for SS-24, Remediation Alternatives
Operable Unit 4, Feasibility Study
Williams Air Force Base

Williams AFB
Project-409881
DDP - SS24$.XLS

OPTION	SS24-1	SS24-2
RESPONSE ACTION	NO ACTION	INSTITUTIONAL CONTROL
COST COMPONENT	NO ACTION	DEED RESTRICTION/VEMUR
AREA AFFECTED (FT^2)	N/A	N/A
VOLUME AFFECTED ($YARD^3$)	N/A	N/A
INSTALLED CAPITAL COST (A)	$0	$2,200
REMEDIATION TIME (YEARS)	30	30
O&M NET PRESENT VALUE COST (B) (a)	$91,800	$0
TOTAL NET PRESENT VALUE (A+B)	$91,800	$2,200

INFLATION	4%
INTEREST	5%

a. Net Present Values of alternatives are based on 4% inflation and 5% interest rate.

Table C-4A

SS-24-1, No Action
Operation and Maintenance Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS24$.XLS

COST COMPONENT	UNIT COST ($)	UNIT	QTY	UNITS/ PERIOD	COST ($)
Five Year Activities:					
Site Review					15,000
Contingency	25% operating				3,750
Total					18,750
Net Present Worth (30 years)(a)					91,800
TOTAL NET PRESENT WORTH (+50%, -30%)					91,800

a. Net Present Values for alternatives are based on 4% inflation, and 5% interest rate.

Table C-4B

SS-24-2, Institutional Control
Initial Capital Costs
Operable Unit 4, Feasibility Study
Williams Air Force Base, Arizona

Williams AFB
Project-409881
DDP - SS24$.XLS

COST COMPONENT	DESCRIPTION	COST ($)
DIRECT CAPITAL COSTS		
1. Institutional Control	VEMUR Deed Restriction	1,500
TOTAL DIRECT COSTS (TDC)		1,500
INDIRECT CAPITAL COSTS		
1. Engineering and related tech support	20 % TDC	300
2. License, Permit, and Legal Fees	2 % TDC	0
3. Start-up (sampling costs are included)		NA
4. Contingency	25 % TDC	400
TOTAL INSTALLED COST (+50%, -30%)		**2,200**

NA - not applicable

APPENDIX D

ARARS

Table D-1

Location-Specific Applicable or Relevant and Appropriate Requirements
Former Skeet Range (SS-19)
Operable Unit 4
Williams Air Force Base, Arizona

Location	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data	National Historical Preservation Act (16 USC Section 490); 36 CFR Part 800	Actions are addressed in Programmatic Agreement	SS19-3 SS19-4 SS19-5	SS19-1 SS19-3 SS19-4 SS19-5
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data	Archeological Resources Protection Act (16 USC Section 470)	Actions are addressed in Programmatic Agreement	SS19-3 SS19-4 SS19-5	SS19-1 SS19-3 SS19-4 SS19-5
Within area where action may uncover Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony	Action to preserve in place or provide respectful and dignified disposition of human remains, funerary objects, sacred objects, and objects of cultural patrimony	Alteration of terrain that uncovers Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony	Native American Graves Protection and Repatriation Act (25 USC Part 3001); 43 CFR Part 10	Actions are addressed in Plan of Action	SS19-3 SS19-4 SS19-5	SS19-1 SS19-3 SS19-4 SS19-5

[a]Criteria is applicable for alternatives listed.
[b]Criteria is relevant and appropriate for alternatives listed

Table D-2

Action-Specific Applicable or Relevant and Appropriate Requirements
Former Skeet Range (SS-19), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Air Emissions Control During Remediation	Control of air emissions of volatile organics, particulates, and gaseous contaminants.	Emission of VOCs, particulates, and gaseous air contaminants	Maricopa County Air Quality Standards (Rules 200, 210, 220, 320) as dictated by the Clean Air Act Arizona Administrative Code (AAC) R18-2-201, R18-2-206, R18-2-210, & R18-2-218		SS19-5	SS19-3 SS19-4
Disposal of Lead Characteristic Waste	Lead must be treated or stabilized to below the standard of 5.0 mg/L TCLP for non-wastewater.	Disposal of lead characteristic waste.	AAC R18-8-268 (40 CFR 268.40) (40 CFR 268.44)	TCLP is used to determined whether waste is hazardous. The extraction procedure toxicity test is used to evaluate whether LDR applies. If TCLP results are close, then the extraction procedure toxicity test should be used to check.	SS19-3 SS19-4	
Disposal of RCRA Contaminated Debris	RCRA contaminated debris must be treated using applicable technologies in the referenced section (i.e extraction, destruction, or immobilization). If extraction or destruction is used, and the debris is not subsequently characteristic, then it is not a hazardous waste. Otherwise, after treatment, it must be disposed in a Subtitle C landfill.	Disposal of lead characteristic RCRA waste	AAC R18-8-268 (40 CFR 268.45)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste.		SS19-5 SS19-3 SS19-4

Table D-2

Action-Specific Applicable or Relevant and Appropriate Requirements
Former Skeet Range (SS-19), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Container Storage (On Site)	Containers of hazardous waste must be: • Maintained in good condition • Compatible with hazardous waste to be stored • Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration. Place containers which contain free liquid on sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids or the volume of the largest container, whichever is greater. Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system. Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line. Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier.	RCRA hazardous waste (listed or characteristic) held for a temporary period before treatment, disposal, or storage elsewhere (40 CFR 264.10) in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled).	AAC R18-8-264 (40 CFR 264.171) (40 CFR 264.172) (40 CFR 264.173) (40 CFR 264.174) (40 CFR 264.175)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste. These requirements are applicable for any contaminated soil, groundwater, or treatment system waste that might be containerized and stored on site prior to treatment or final disposal. Soil containing a listed waste must be managed as if it were a hazardous waste so long as it contains a constituent of the listed waste.		SS19-3 SS19-4 SS19-5

Table D-2

Action-Specific Applicable or Relevant and Appropriate Requirements
Former Skeet Range (SS-19), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Container Storage (On Site) (continued)	At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners. Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond 1 year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.					
Requirements for Recycling	Hazardous wastes that are recycled are subject to the requirements for generators, transportors, and storage facilities.	Generation of recyclable material	AAC R18-8-261 (40 CFR Part 261.6)	Applicable generator, transportation, and storage requirements are defined in this table.	SS19-5	
Characterization of Waste	Generator must characterize waste for lead and other parameters that the off-site TSDF requires for proper treatment, storage, disposal, and compliance with LDR. If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste.	Generation of RCRA hazardous waste.	AAC R18-8-261 (40 CFR Part 261)	Waste must be characterized for off-site disposal, and to meet the requirement of the off-site disposal facility for LDR.	SS19-3 SS19-4	
Generation of RCRA hazardous waste	Full requirements must be met for off-site disposal.	Generation of RCRA hazardous waste	AAC R18-8-262 (40 CFR 262)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste. This includes packaging, labeling, manifesting, etc. On-site storage requirements are addressed separately.		SS19-3 SS19-4

Table D-2

Action-Specific Applicable or Relevant and Appropriate Requirements
Former Skeet Range (SS-19), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Transportation of RCRA hazardous waste	RCRA hazardous waste shipped off site for recycle or to a TSDF must meet full RCRA requirements.	Shipment of hazardous waste	AAC R18-8-263 (40 CFR 263)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste.		SS19-3 SS19-4
Disposal of RCRA Waste	The waste will have to be characterized to provide information suitable for certification that land disposal criteria are met in full.	Off-site disposal of RCRA waste	AAC R18-8-268 (40 CFR 268)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste. Full requirements relative to off-site disposal must be met.		SS19-3 SS19-4
Utilization of an engineering control	The utilization of an engineering control to reduce or eliminate exposure to a contaminant is acceptable only under a nonresidential scenario, and requires the recordation of a VEMUR	Engineering control to reduce or eliminate exposure to a contaminant	Arizona Revised Statutes (ARS) 49-152 and AAC R18-7-207		SS19-3 SS19-4 SS19-5	SS19-3 SS19-4 SS19-5
Recordation of a VEMUR	Under a nonresidential scenario, if a remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL, the recordation of a VEMUR is required.	Contamination remaining on site above residential HBGLs, but equal to or below nonresidential HBGLs.	ARS 49-152 and AAC R18-7-207		SS19-3 SS19-4 SS19-5	SS19-3 SS19-4 SS19-5
Human Habitation	By using engineering and institutional controls that residents are not reasonably expected to be in frequent, repeated contact with soil, human habitation is permitted in a non-residential use area.	Engineering and institutional controls to reduce or eliminate frequent, repeated contact with soil by residents.	ARS 49-151 and 49-152, AAC R18-7201-209	By maintaining engineering and institutional controls in accordance with the operations and maintenance manual referenced herein, it is reasonably expected that residents will be prevented from frequent, repeated contact with soil.	SS19-3 SS19-4 SS19-5	SS19-3 SS19-4 SS19-5

[a] Criteria is applicable for alternatives listed.
[b] Criteria is relevant and appropriate for alternatives listed.

LDR = Land disposal regulations.
HBGL = Health-based guidance level.

Table D-3

Chemical-Specific Applicable or Relevant and Appropriate Requirements
Former Skeet Range (SS-19), Operable Unit 4
Williams Air Force Base, Arizona

Contaminant	Action Level			Citation
	Applicable (mg/kg)	Relevant and Appropriate (mg/kg)	Criteria To Be Considered (mg/kg)	
Lead in soil	400	400		AZ HBGL
Lead in soil			400	EPA Region IX PRG

[a]Criteria is applicable for alternatives listed.
[b]Criteria is relevant and appropriate for alternatives listed.
PRG = Preliminary remediation goal.
HBGL = Health-based guidance level.

Table D-4

Location-Specific Applicable or Relevant and Appropriate Requirements
Firing Range (SS-20)
Operable Unit 4
Williams Air Force Base, Arizona

Location	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data	National Historical Preservation Act (16 USC Section 490); 36 CFR Part 800	Actions are addressed in Programmatic Agreement	SS20-3FR	SS20-1FR
Within area where action may cause irreparable harm, loss, or destruction of significant artifacts	Action to recover and preserve artifacts	Alteration of terrain that threatens significant scientific, prehistoric, historic, or archaeological data	Archeological Resources Protection Act (16 USC Section 470)	Actions are addressed in Programmatic Agreement	SS20-3FR	SS20-1FR
Within area where action may uncover Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony	Action to preserve in place or provide respectful and dignified disposition of human remains, funerary objects, sacred objects, and objects of cultural patrimony	Alteration of terrain that uncovers Native American human remains, funerary objects, sacred objects, and objects of cultural patrimony	Native American Graves Protection and Repatriation Act (25 USC Part 3001); 43 CFR Part 10	Actions are addressed in Plan of Action	SS20-3FR	SS20-1FR

[a]Criteria is applicable for alternatives listed.
[b]Criteria is relevant and appropriate for alternatives listed

Table D-5

Action-Specific Applicable or Relevant and Appropriate Requirements
Firing Range (SS-20), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Air Emissions Control During Remediation	Control of air emissions of volatile organics, particulates, and gaseous contaminants.	Emission of VOCs, particulates, and gaseous air contaminants	Maricopa County Air Quality Standards (Rules 200, 210, 220, 320) as dictated by the Clean Air Act Arizona Administrative Code (AAC) R18-2-201, R18-2-206, R18-2-210, & R18-2-218		SS20-3FR	
Disposal of Lead Characteristic Waste	Lead must be treated or stablized to below the standard of 5.0 mg/L TCLP for non-wastewater.	Disposal of lead characteristic waste	AAC R18-8-268 (40 CFR 268.40) (40 CFR 268.44)	TCLP is used to determined whether waste is hazardous. Extraction procedure toxicity test is used to evaluate whether LDR applies. If TCLP results are close, then extraction procedure toxicity should be used to check.	SS20-3FR	
Disposal of RCRA Contaminated Debris	RCRA contaminated debris must be treated using applicable technologies in the referenced section (i.e extraction, destruction, or immobilization). If extraction or destruction is used, and the debris is not subsequently characteristic, then it is not a hazardous waste. Otherwise, after treatment, it must be disposed in a Subtitle C landfill.	Disposal of lead characteristic RCRA waste	AAC R18-8-268 (40 CFR 268.45)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste.	SS20-3FR	

Table D-5

Action-Specific Applicable or Relevant and Appropriate Requirements
Firing Range (SS-20)
Operable Unit 4, Williams Air Force Base

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Container Storage (On Site)	Containers of hazardous waste must be: • Maintained in good condition • Compatible with hazardous waste to be stored • Closed during storage (except to add or remove waste). Inspect container storage areas weekly for deterioration. Place containers which contain free liquid on sloped, crack-free base, and protect from contact with accumulated liquid. Provide containment system with a capacity of 10 percent of the volume of containers of free liquids or the volume of the largest container, whichever is greater.	RCRA hazardous waste (listed or characteristic) held for a temporary period before treatment, disposal, or storage elsewhere (40 CFR 264.10) in a container (i.e., any portable device in which a material is stored, transported, disposed of, or handled)	AAC R18-8-264 (40 CFR 264.171) (40 CFR 264.172) (40 CFR 264.173) (40 CFR 264.174) (40 CFR 264.175)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste. These requirements are applicable for any contaminated soil, groundwater, or treatment system waste that might be containerized and stored on site prior to treatment or final disposal. Soil containing a listed waste must be managed as if it were a hazardous waste so long as it contains a constituent of the listed waste.	SS20-3FR	
	Remove spilled or leaked waste in a timely manner to prevent overflow of the containment system.					
	Keep containers of ignitable or reactive waste at least 50 feet from the facility's property line.					

Table D-5

Action-Specific Applicable or Relevant and Appropriate Requirements
Firing Range (SS-20)
Operable Unit 4, Williams Air Force Base

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Container Storage (On Site) (Continued)	Keep incompatible materials separate. Separate incompatible materials stored near each other by a dike or other barrier. At closure, remove all hazardous waste and residues from the containment system, and decontaminate or remove all containers and liners. Storage of banned wastes must be in accordance with 40 CFR 268. When such storage occurs beyond 1 year, the owner/operator bears the burden of proving that such storage is solely for the purpose of accumulating sufficient quantities to allow for proper recovery, treatment, and disposal.					
Characterization of Waste	Generator must characterize waste for lead and other parameters that the off-site TSDF requires for proper treatment, storage, disposal, and compliance with LDR.If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste.	Generation of RCRA hazardous waste	AAC R18-8-261 (40 CFR Part 261)	Waste must be characterized for off-site disposal, and to meet the requirement of the off-site disposal facility for LDR.	SS20-3FR	
Generation of RCRA hazardous waste	Full requirements must be met for off-site disposal.	Generation of RCRA hazardous waste	AAC R18-8-262 (40 CFR 262)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste. This includes packaging, labeling, manifesting, etc. On-site storage requirements are addressed separately.	SS20-3FR	

Table D-5

Action-Specific Applicable or Relevant and Appropriate Requirements
Firing Range (SS-20)
Operable Unit 4, Williams Air Force Base

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Transportation of RCRA hazardous waste	RCRA hazardous waste shipped off site for recycle or to a TSDF must meet full RCRA requirements.	Shipment of hazardous waste	AAC R18-8-263 (40 CFR 263)	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste.	SS20-3FR	
Transportation of RCRA hazardous waste	RCRA hazardous waste shipped off site must meet full DOT requirements.	Transporters of hazardous waste	49 CFR Parts 171 through 179	If waste fails to meet TCLP criteria of 5.0 mg/L, waste is characterized as RCRA hazardous waste. Transporters must also meet requirements of 40 CFR Parts 263.11 and 263.31.	SS20-3FR	
Disposal of RCRA Waste	The waste will have to be characterized to provide information suitable for certification that land disposal criteria are met in full.	Off-site disposal of RCRA waste	AAC R18-8-268 (40 CFR 268)	Full requirements relative to off-site disposal must be met.	SS20-3FR	
Recordation of a VEMUR	Under a nonresidential scenario, if a remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL, the recordation of a VEMUR is required.	Contamination remaining on site above residential HBGLs, but equal to or below nonresidential HBGLs	A R S 49-152 and AAC R18-7-207		SS20-3FR	SS20-1FR

[a] Criteria is applicable for alternatives listed.
[b] Criteria is relevant and appropriate for alternatives listed.
LDR = Land disposal regulations.
HBGL = Health-based guidance levels.

Table D-6

Action-Specific Applicable or Relevant and Appropriate Requirements
Electroplating/Chemical Cleaning Shop (SS-16), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Recordation of a VEMUR	Under a nonresidential scenario, if a remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL, the recordation of a VEMUR is required.	Contamination remaining on site above residential HBGLs, but equal to or below nonresidential HBGLs.	A R S 49-152 and AAC R18-7-207		SS16-2	SS16-1

[a]Criteria is applicable for alternatives listed.
[b]Criteria is relevant and appropriate for alternatives listed.
HBGL = Health-based guidance levels.

Table D-7

Action-Specific Applicable or Relevant and Appropriate Requirements
Building 1010 (SS-24), Operable Unit 4
Williams Air Force Base, Arizona

Action	Requirement(s)	Prerequisite(s)	Citation	Comments	A[a]	RAR[b]
Recordation of a VEMUR	Under a nonresidential scenario, if a remediation results in contamination being left on site above a residential HBGL, but equal to or below a nonresidential HBGL, the recordation of a VEMUR is required.	Contamination remaining on site above residential HBGLs, but equal to or below nonresidential HBGLs.	A R S 49-152 and AAC R18-7-207		SS24-2	SS24-1

[a]Criteria is applicable for alternatives listed.
[b]Criteria is relevant and appropriate for alternatives listed.
HBGL = Health-based guidance level.

FINAL

INSTALLATION RESTORATION PROGRAM

WILLIAMS AIR FORCE BASE, ARIZONA

SOUTH DESERT VILLAGE PROTECTIVE CAP OPERATION AND MAINTENANCE MANUAL

CONTRACT NUMBER F41624-94-D-8047, DELIVERY ORDER 007

Project No. 409877

May 1999

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Final

Williams Air Force Base, Arizona

South Desert Village Protective Cap Operation and Maintenance Manual

Prepared for:

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HSC/PKVCB
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May 1999

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List of Acronyms/Abbreviations

AAC	Arizona Administrative Code
ADEQ	Arizona Department of Environmental Quality
ADWR	Arizona Department of Water Resources
ARAR	applicable or relevant and appropriate requirement
ARS	Arizona Revised Statutes
ASU	Arizona State University
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
EPA	U.S. Environmental Protection Agency
FS	feasibility study
IRP	Installation Restoration Program
IT	IT Corporation
mg/kg	milligrams per kilogram
mg/mL	milligrams per milliliter
O&M	operation and maintenance
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PPE	personal protective equipment
RA	remedial action
RI	remedial investigation
ROD	record of decision
TCLP	toxicity characteristics leaching procedure
USAF	United States Air Force
VEMUR	Voluntary Environmental Mitigation Use Restriction
WAFB	Williams Air Force Base

1.0 Introduction

1.1 Purpose

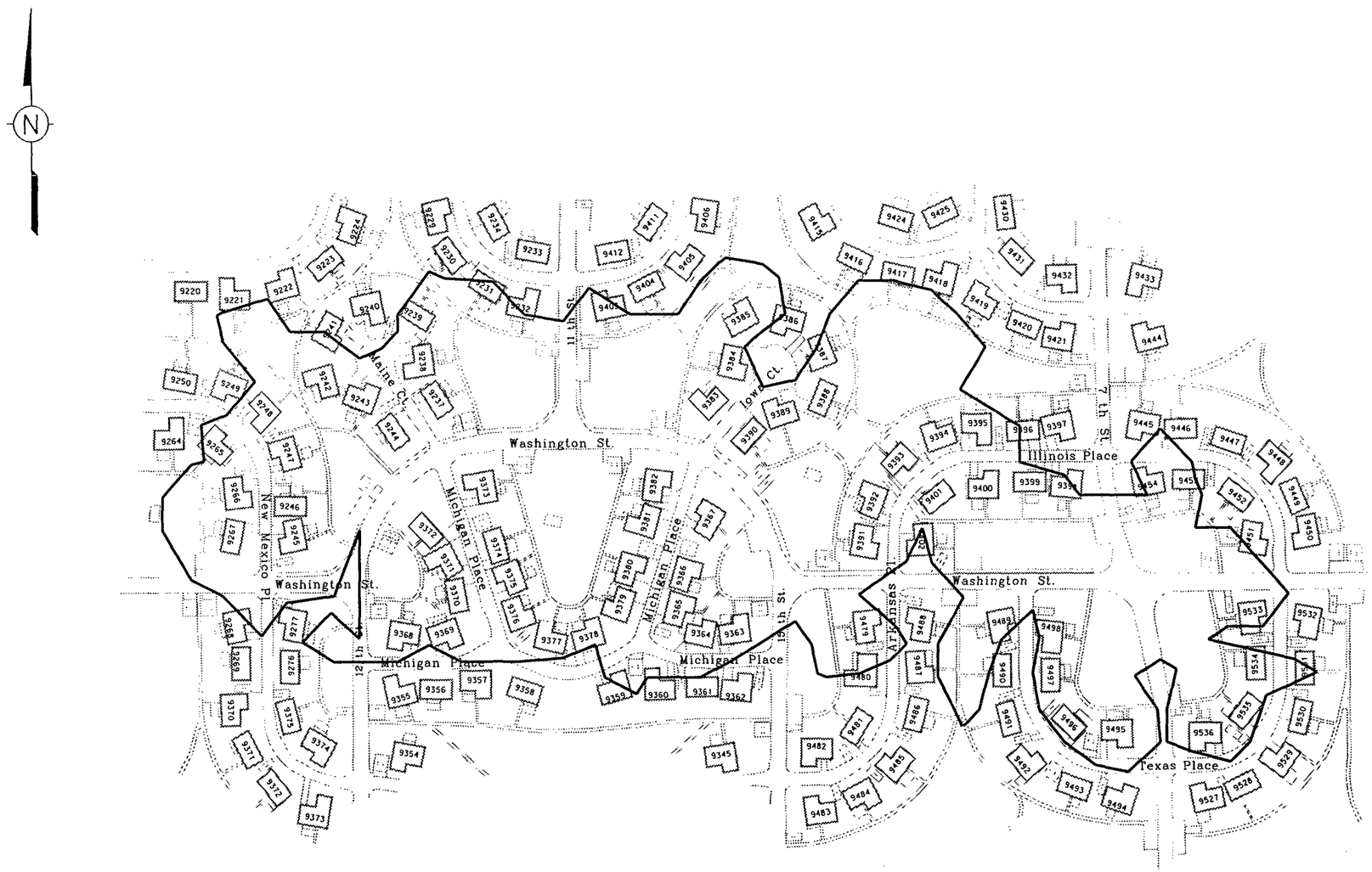
The purpose of the South Desert Village protective cap operation and maintenance (O&M) manual is to accomplish the following at a soil remediation site on the former Williams Air Force Base, Arizona:

- Provide a historical summary of the events that led to the remedial action (RA) at the South Desert Village.
- Inform South Desert Village residents and workers about the health risks of the lead contamination that remains beneath the protective cap.
- Define the extent and nature of the protective cap.
- List the specific responsibilities for the maintenance of the cap and for inspections to verify the continuing integrity of the cap.
- List the responsibilities of the landowner, the residents and the workers, and the actions to be taken by them to ensure the integrity of the cap.

1.2 Overview

The O&M manual applies to an area affecting 86 houses within the South Desert Village where lead in soil remains beneath a protective cap in amounts that could pose an unacceptable long-term human health risk ("affected area" shown in Figure 1-1). The cap is an engineered control measure imposed on the area as part of a remedy intended to prevent frequent and repeated contact by residents with the underlying lead-contaminated soil. The manual documents the nature and extent of the affected area and describes how houses within the affected area can be identified.

Houses and open areas located within the affected area will be permanently marked by metal signs, which will serve to inform residents and workers of the presence and location of the protective cap and of the actions needed to preserve it. Each tenant of a house located within or near the affected area will be informed by the property owner during the leasing process of: (1) the existence of lead contamination in the underlying soil; (2) the potential health risk of frequent and repeated contact with the contaminated soil; (3) the existence of the protective cap and a summary of its parameters; and (4) the actions that must be taken to ensure the integrity of the cap. Upon becoming owner, Arizona State University (ASU), will be obligated to obtain an



LEGEND

- CONCRETE PARKING AREAS
- SINGLE FAMILY HOUSES
- PICNIC AREA
- AFFECTED AREA BOUNDARY

SCALE

0 200 400 FEET

FIGURE 1-1
AFFECTED AREA OF SOUTH DESERT VILLAGE, ARIZONA STATE UNIVERSITY EAST CAMPUS

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

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ENGR. CHCK. BY: T.WOODARD		PROJ. MGR.: W.CARTER	PROJ. NO. 877
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DRAWN BY: D. BILLINGSLEY	DRAWN BY:		

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acknowledgment signed by the tenants of the acceptance of obligation to not disturb the protective cap.

Any scheduled or emergency work that would affect the integrity of the protective cap must follow the notification and work procedures specified in this manual. Examples of such work include landscaping modifications or additions, utility line improvements or repairs, and additions or changes to roadways or paved parking surfaces.

1.3 Lead in Soil

Lead is a naturally occurring soft bluish-gray metal that occurs in small amounts in rocks and soil. It has no special taste or smell. Most of the lead that occurs in the environment comes from human activities like mining, manufacturing, and the burning of fossil fuels.

The occurrence of lead as small pellets in the soil of the South Desert Village is a result of the use of the area as a trap and skeet range by the U.S. Air Force (USAF) before the houses were constructed. Metallic lead in soil can slowly become oxidized into lead compounds such as lead carbonate, which can be crumbled easily, and can become mixed with the surrounding soil. Eventually, all lead in the pellets will become part of the soil at the South Desert Village.

1.3.1 Human Health and Lead

Lead can affect almost every organ and system in the human body. The most sensitive is the central nervous system, particularly in children, but lead also damages the kidneys and the immune system. Exposure to lead is more dangerous for young and unborn children than for adults; unborn children can become exposed through their mothers. Harmful effects include premature births, smaller babies, decreased mental ability in the infant, learning difficulties, and reduced growth in young children. In adults, lead above certain thresholds may decrease reaction time, cause weakness in fingers, wrists, and ankles, cause anemia, cause abortion, and damage the male reproductive system. All these effects are related to high-level exposures to lead. There is no certain connection between these effects and exposure to low levels of lead.

The most common ways that exposure to high levels of lead can occur are ingestion (eating) or inhalation (breathing). These are called exposure pathways. The health effects are the same whether the lead is eaten or inhaled as dust. Lead in soil clings to fingers, toys, and other objects that children normally put in their mouths. Adults can also ingest soil through failure to wash hands before eating, etc.

1.3.2 Lead Ingestion Potential at South Desert Village

The purpose of the protective cap in the affected area at the South Desert Village is to break the exposure pathways for ingestion or inhalation of lead-contaminated soil. This is accomplished by: (1) the removal of the top 6 inches of contaminated soil, and (2) shielding the inhabitants from the underlying lead-contaminated soil by a protective cap composed of existing roads, sidewalks, etc., and 6 inches of clean soil in open areas. As long as the protective cap remains in place, no exposure pathway exists, and thus no risk to human health from lead exposure exists.

Contact with lead-contaminated soil must be frequent and repeated to become a health risk. A temporary breach of the cap from an unplanned situation, such as a tree falling and exposing its root ball, will not present a health-threatening situation, but should be reported promptly for repair.

2.0 History

WAFB was commissioned in 1941 and used as a flight training school until the base was closed in 1993. Following Base closure, property transfer to interested parties such as Williams Gateway Airport Authority and ASU was initiated. ASU intended to use the property for a proposed east campus. Before transfer, however, property parcels where contamination was suspected were evaluated under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), implemented by the USAF Installation Restoration Program (IRP). The housing unit known as the South Desert Village was investigated under the IRP, as described in the following text.

2.1 Former Trap and Skeet Range

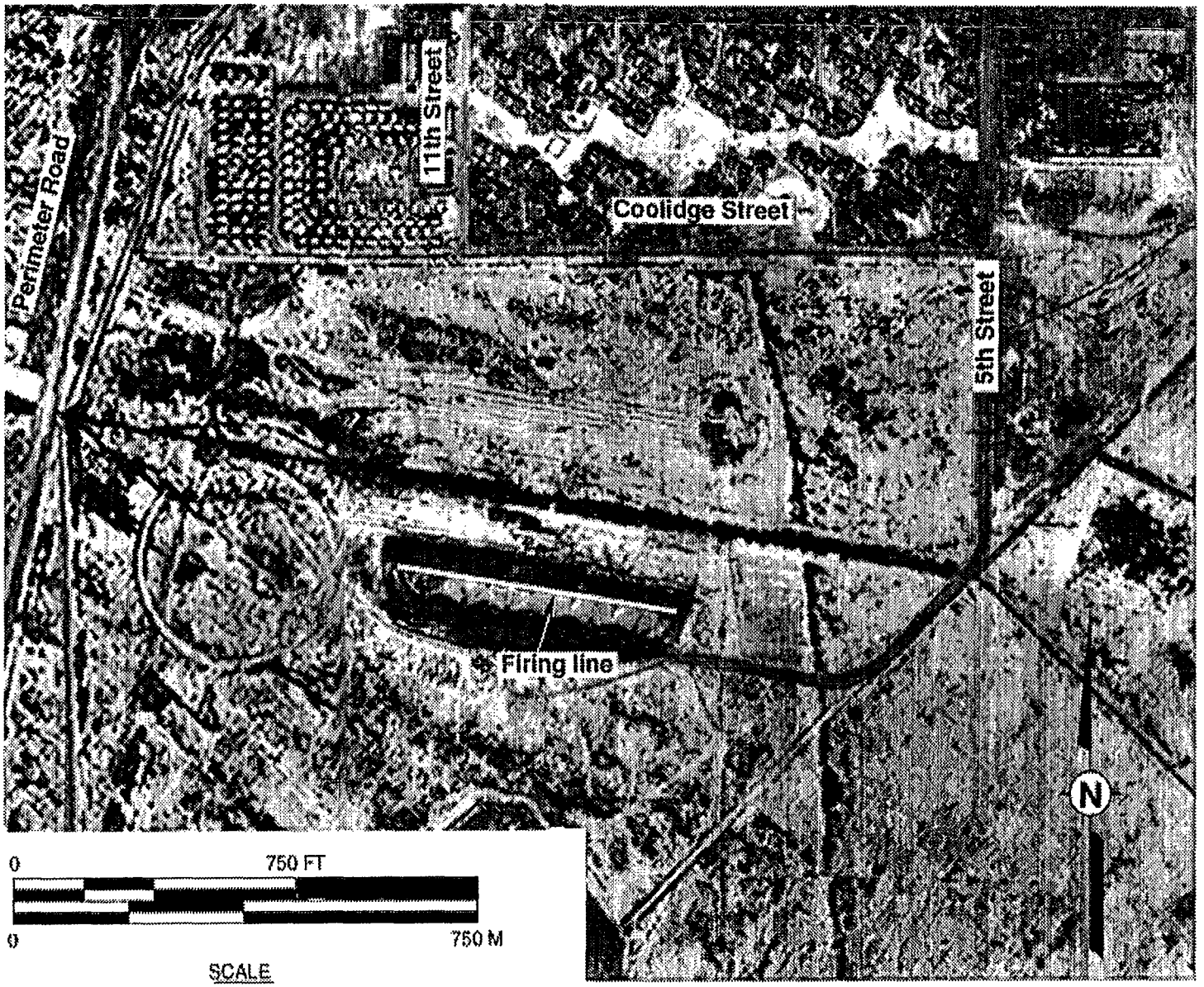
A six-field combination trap and skeet range, located south of the intersection of 11th Street and Coolidge Street, is a prominent feature in an aerial photograph dated February 18, 1949 (Figure 2-1). The Base housing development now known as the South Desert Village was constructed in 1950 at the location of the former trap and skeet range, as seen in the aerial photograph dated January 11, 1954 (Figure 2-2). Because of the concern that elevated levels of lead may have been present in the soil beneath the South Desert Village, it was investigated as part of WAFB closure activities.

2.2 Installation Restoration Program Site SS-19

Initial investigation of the former trap and skeet range was performed in 1993 during a Basewide evaluation/assessment implemented by the USAF IRP. Analytical results from one of five soil samples indicated elevated lead values (737 milligrams per kilogram [mg/kg]) in the top soil (IT Corporation [IT], 1997a). The area was designated for further investigation as an IRP site under Operable Unit (OU)-4 and assigned the IRP site designation SS-19.

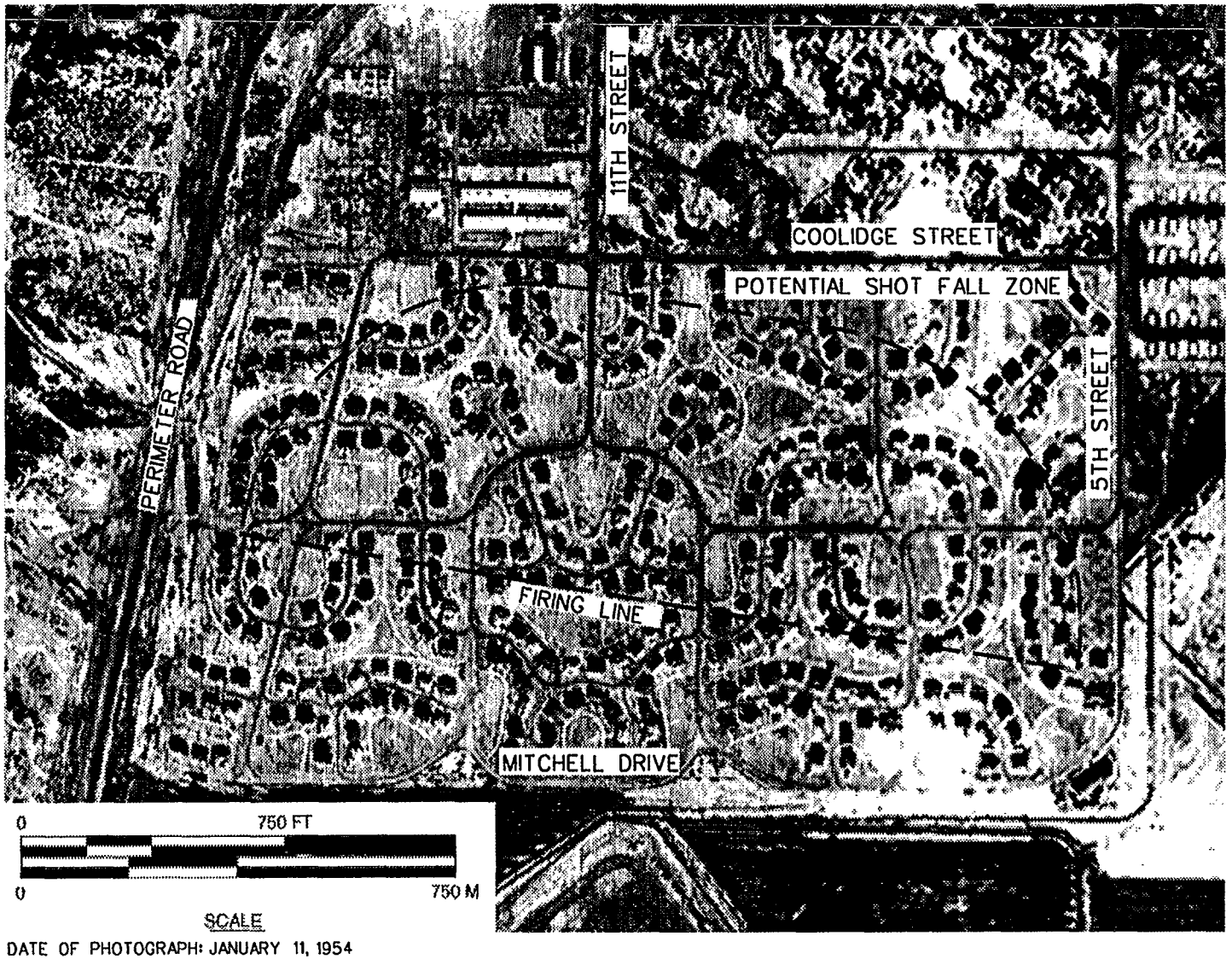
2.3 OU-4 Remedial Investigation

Site SS-19 was further investigated in 1995, as part of the OU-4 remedial investigation (RI). A planned series of 21 shallow soil samples and chemical analyses for lead in soil was changed after the discovery of widespread visible evidence of the former trap and skeet range in the form of lead pellets and broken skeet targets (clay pigeons), brought to the surface by burrowing rodents. The extent of sitewide lead contamination was estimated by a walkover and search for visible lead pellets; that area was then sampled at four different depths on a 50-foot grid and characterized by pellet counts per hand-auger sample. Each sample represented 6 inches of soil



DATE OF PHOTOGRAPH: FEBRUARY 18, 1949

FIGURE 2-1
AERIAL PHOTOGRAPH OF FORMER SKEET RANGE



DATE OF PHOTOGRAPH: JANUARY 11, 1954

FIGURE 2-2
AERIAL PHOTOGRAPH OF SOUTH DESERT VILLAGE

thickness beginning at the surface (6 inches, 12 inches, and 18 inches), and contained approximately 700 cubic centimeters of soil. The pellet counts were used to develop a lead pellet contour map of each 6-inch interval. Lead contamination was found to be most abundant in the top 12 inches of soil, but was locally abundant to depths of 4 feet (IT, 1997a). Figure 2-3 represents the pellet counts in the top 6 inches of the sampled area.

2.4 Evaluation

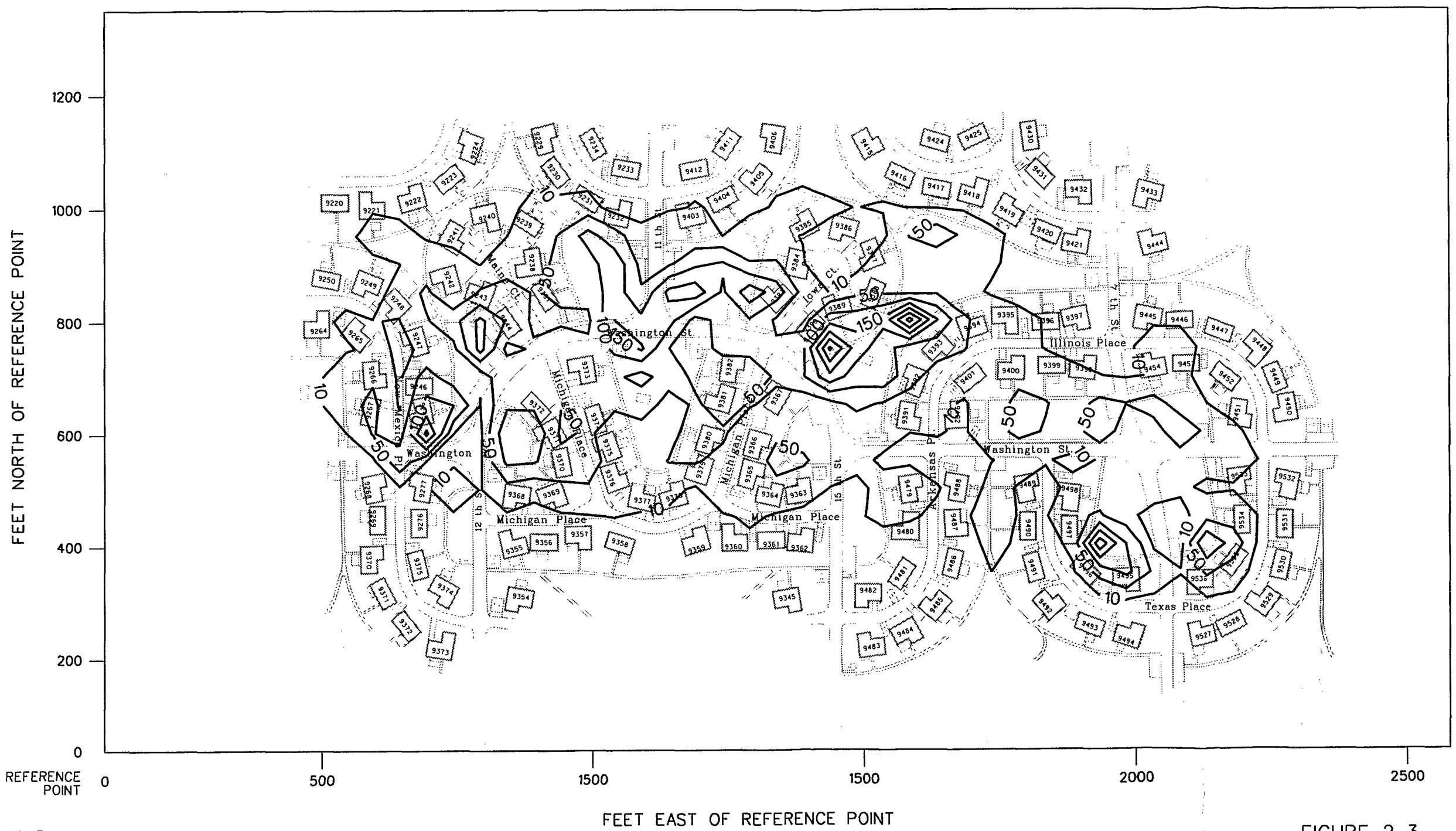
2.4.1 Proposed Land Use Issues

The South Desert Village consists of 390 housing units, which ASU intends to use as campus housing. The discovery of excess lead in the soil of the South Desert Village precluded the transfer of approximately 125 houses pending the investigation of the extent of contamination. A series of discussions between the USAF, the U.S. Environmental Protection Agency (EPA), the Arizona Department of Environmental Quality (ADEQ), Arizona Department of Water Resources (ADWR), and ASU followed the characterization of the extent of lead-shot contamination within the South Desert Village. It was clear that metallic lead, in the form of pellets, existed and was available for gradual dissolution into the soil.

The primary concern to all parties was the protection of future South Desert Village inhabitants (particularly children) from exposure to hazardous levels of lead in soil. For the USAF to assign the property to the U.S. Department of Education for conveyance to ASU and for EPA and ADEQ to allow habitation of the affected units of the South Desert Village, there first had to be a remedy in place to protect the inhabitants from frequent and repeated contact with lead in the soil.

2.4.2 Consensus Statement 97-02

The applicable law for remediation of the contaminated soil in the affected area of the South Desert Village is in Arizona Revised Statutes (ARS) Sections 49-151 and 49-152 and Arizona Administrative Code (AAC) Sections R18-7-201 through R18-7-209 (collectively, the "Arizona Soil Remediation Standards Rule"). Under the Arizona Soil Remediation Standards Rule, the remediation requirement for lead in soil of land that will have a "residential use" is cleanup to less than 400 mg of lead per kg of soil. To remediate the affected area of the South Desert Village to this level would have required removal of all soil having a lead level of 400 mg/kg and greater. This presented a serious practical problem because the soil beneath the roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patio areas in the affected area of the South Desert Village contained lead levels greater than 400 mg/kg. To



LEGEND:

—10— LEAD UNIT COUNT PER SAMPLE

FIGURE 2-3
LEAD SHOT ABUNDANCE IN TOP 6" OF SOIL, FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

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remove this underlying soil would have required demolition of the houses, roads, sidewalks, parking areas and patio areas in the affected area. Because it was the plan of ASU to use the houses in the affected area for student housing and to use the other improvements in the affected area, the USAF, ADEQ, ADWR, and EPA decided to look for an alternative remedy.

After an extended discussion among the USAF, ADEQ, ADWR, and EPA, an alternative remedy was found, as described in the next paragraph. The legal basis for the alternative remedy is the following legal analysis of the Arizona Soil Remediation Standards Rule by ADEQ. Under ARS Sections 49-151 and 49-152, property may be used for a "residential use" only if it is remediated to a residential standard. Property that will be used for a "nonresidential use" does not have to be remediated to a residential standard. ARS Section 49-151.3 defines "residential use" as any use in which natural persons are reasonably expected to be in frequent and repeated contact with the soil. ARS Section 49-151.1 defines "nonresidential use" as "those uses of property other than residential uses." From these provisions and from AAC R18-7-206(A) and R18-7-206(D), ADEQ concluded that: (1) any use of remediated property in which natural persons are protected from frequent and repeated contact with contaminated soil is a permitted nonresidential use; (2) permitted nonresidential uses include human habitation when natural persons are protected from frequent and repeated contact with contaminated soil; (3) the Arizona Soil Remediation Standards Rule permits soil to be remediated to a site-specific remediation level (R18-7-206A); (4) the Arizona Soil Remediation Standards Rule allows site-specific remediation levels to be achieved through the use of institutional and engineering controls (R18-7-206D); (5) the institutional and engineering controls included in the selected alternative remedy will prevent frequent and repeated contact by natural persons with the lead-contaminated soil remaining in the affected area of the South Desert Village, provided that such controls are maintained; and (6) therefore, human habitation of the affected area of the South Desert Village is permissible so long as natural persons are protected from frequent and repeated contact with the lead-contaminated soil by the institutional and engineering controls included in the alternative remedy described in the following text.

The alternative remedy was described initially in Consensus Statement 97-02 (see Attachment A). To prevent frequent and repeated contact of natural persons with the contaminated soil, the following conditions were specified in the Consensus Statement and are specified in the OU-4 Record of Decision (ROD):

- Removal of the top 6 inches of soil in areas where characterization has shown the lead levels in soil to exceed 400 mg/kg, except under roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patio areas.

- Replacement of the removed soil with a 6-inch cap of clean soil to prevent frequent and repeated contact with soil below the depth of 6 inches.

- Establishing that the protective cap includes existing roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patio areas, in addition to the clean soil cap.

- Monitoring and maintaining the protective cap in accordance with the approved O&M manual.

- The recording of a Voluntary Environmental Mitigation Use Restriction (VEMUR) on the property within the South Desert Village that contains lead in soil at levels greater than 400 mg/kg. The VEMUR would specify the land use as "nonresidential" within the defined area, but human habitation would be permitted as long as frequent and repeated contact with contaminated soil was limited through the use of a protective cap. The VEMUR provides that in order to augment the physical remedy, the property will be subject to a deed restriction that prohibits the inhabitation of children under seven years of age within the area of the South Desert Village that contains lead in soil at levels greater than 400 mg/kg.

Six conditions must be satisfied to allow the transfer of the property from the USAF to the Department of Education and the subsequent habitation of the houses in the affected area of the South Desert Village. The sixth condition requires the establishment of a legally binding and enforceable agreement between the future owner and/or operator of the property - here, ASU, its successors, assigns, and grantees - and ADEQ, its successors and assigns, that defines the responsibility of the future property owner for the protection, ongoing maintenance, and enforcement of any and all conditions and restrictions regarding the protective cap was agreed to by USAF, EPA, ADEQ, and ASU. These conditions and restrictions shall run with the land and shall be recorded in the office of the Maricopa County Recorder. Notice of these conditions and restrictions shall also be provided to the public in the Administrative Record for the Williams Air Force Base National Priority Listing site.

2.5 OU-4 Feasibility Study

The OU-4 feasibility study (FS) (IT, 1997b) was completed as part of the CERCLA process to evaluate cleanup remedies to be used at SS-19 to comply with the conditions of the Consensus Statement. The FS documented possible alternatives to meet those cleanup conditions.

A health risk assessment of lead shot and oxidation products in soil was attempted, but could not be completed because of a lack of data on the effects of lead shot ingestion by humans. In lieu of risk assessment, the ADEQ Amended Soil Remediation Rule, which allows the nonresidential designation if a VEMUR is recorded, was relied upon (ADEQ, 1996). This rule cites an allowable lead concentration in soil of 400 mg/kg for areas with residential use. The value of 400 mg/kg lead in soil is consistent with preliminary remediation goals established by the EPA.

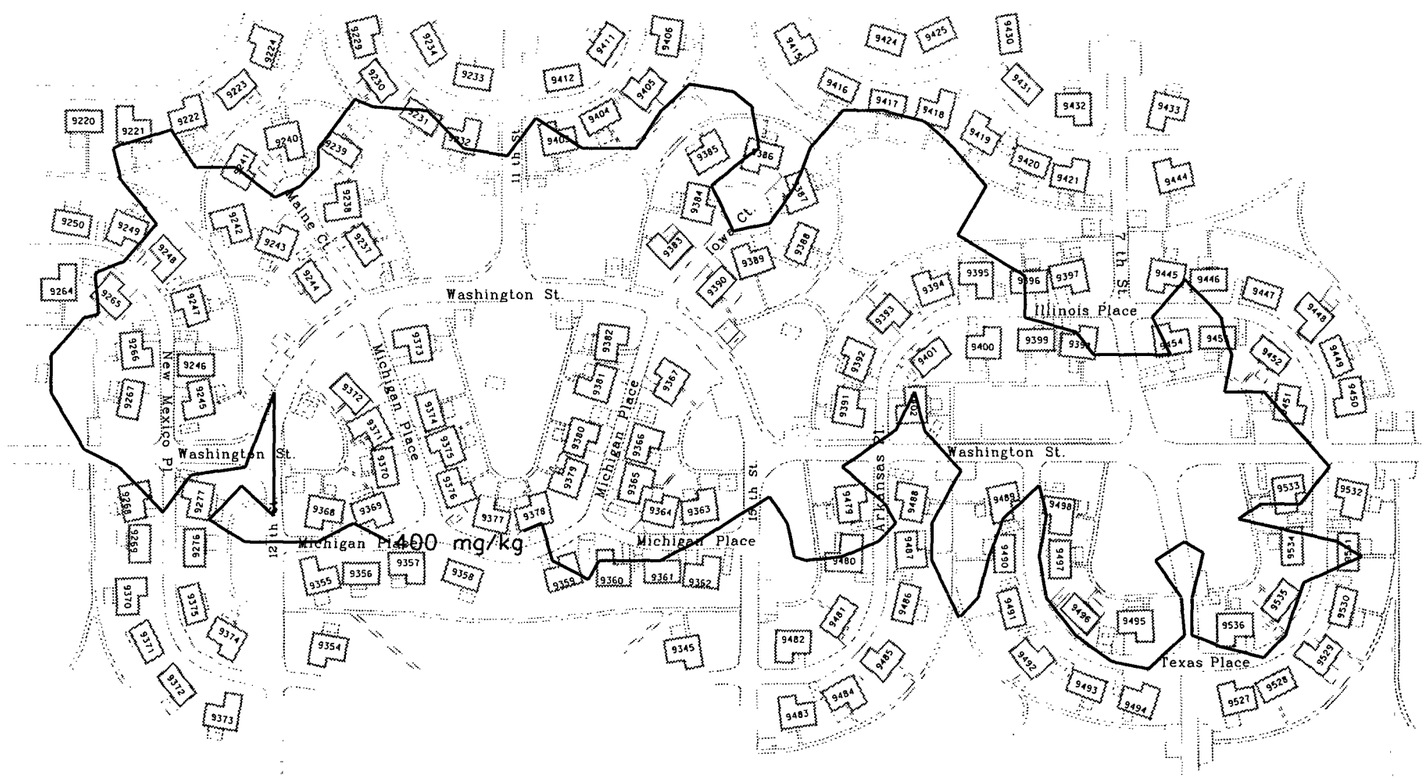
Based on average pellet size and lead content reported in the OU-4 RI report (IT, 1997a), a 400-mg/kg lead contour was plotted using the characterization data, and the area of the South Desert Village inside this contour became the RA area. Figure 2-4 presents this lead content contour within the South Desert Village.

2.6 OU-4 ROD

A ROD documents the RA for a site or OU. A ROD evaluates and selects preferred remedies for an RA based on nine criteria, and serves three functions: (1) it certifies that the remedy selection was carried out in accordance with CERCLA; (2) it describes the technical aspects of the remedy; and (3) it provides the public with a source of information about the site and the remedy. As part of the OU-4 ROD (IT, in progress), the remedy selected for SS-19 involved the removal of the top 6 inches of soil across the area that was defined as containing lead levels exceeding 400 mg/kg (Figure 2-4), except for soil beneath roadways, sidewalks, house foundations and slabs, paved parking areas, and concrete patio areas, the transport of excavated soil to an off-site disposal facility, and the replacement of the removed soil with a 6-inch protective cap of clean soil.

2.7 OU-4 RA

The OU-4 RA, selected as the remedy in the OU-4 ROD (IT, in progress), meets all criteria for protection of human health and the environment. A contractor was selected by the USAF to implement the remedy, and work plans were written and approved by the USAF and the regulatory agencies. Between February and May 1998, the top 6 inches of soil defined in the OU-4 RI report (IT, 1997a) and the OU-4 FS (IT, 1997b) as containing more than 400 mg/kg lead (Figure 2-4) were excavated and transported off site. The excavations were backfilled with clean soil to a consolidated depth of at least 6 inches. The USAF designated a contractor for oversight of the implementation of the remedy.



LEGEND

CONCRETE PARKING AREAS

SINGLE FAMILY HOUSES

PICNIC AREA

400 mg/kg LEAD IN SOIL

SCALE

0 200 400 FEET

FIGURE 2-4
AREA CONTAINING +400 mg/kg LEAD, FORMER SKEET RANGE, SS-19

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

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2.8 South Desert Village O&M Manual

This O&M manual was written during the RA to fulfill the requirement to establish maintenance and monitoring actions to protect the cap and to repair it, as necessary.

3.0 Property Ownership and Permitted Use

Of the original 125 housing units within the area of investigation for lead contamination in soil, 86 houses within the South Desert Village lie within the affected area. This O&M manual represents a condition of the OU-4 ROD that was approved by all parties before the affected property was eligible for transfer.

3.1 Permitted Use of the Affected Area

After establishment of the protective cap in accordance with the OU-4 ROD, and so long as the protective cap is monitored and repaired in accordance with this O&M manual, human habitation and work by humans in the affected area is permitted under applicable Federal and State of Arizona environmental laws and regulations.

3.2 Property Transfer

The portion of the South Desert Village not affected by the soil removal action and protective cap and the affected area will be transferred to the Department of Education for conveyance to ASU upon satisfaction of the conditions of the OU-4 ROD and the existing lease of the unaffected area.

3.3 Statement of Responsibility

Certain responsibilities exist, both before and after the transfer of ownership, as follows:

- Prior to ownership transfer of the affected area, responsibility for the site remains with the USAF.

- Responsibility for lead contamination remaining in the soil beneath the protective cap remains with the USAF after ownership transfer to ASU, except for the responsibilities assigned to ASU in the last bullet point below relating to shipment and disposal of lead-contaminated soil from beneath the protective cap removed by ASU or its agents.

- In the event the final remedy is no longer protective of human health and the environment or otherwise has failed to meet remediation objectives, the USAF shall perform additional remediation and institute appropriate controls in accordance with CERCLA Section 120(h). Five-year reviews will be conducted by the USAF, the EPA, and ADEQ to verify the continued success of the final remedy. Any additional remediation and institutional controls shall be consistent with the land use (human habitation in single family dwellings) contemplated at the time the property was transferred to ASU. The USAF will not have to perform additional

remediation or install institutional controls necessary to permit land uses inconsistent with the VEMUR and any deed restrictions contained in the quit-claim deed recorded at the time the property was transferred to ASU.

- Upon transfer of ownership, the responsibility for periodic inspection and maintenance of the protective cap will lie with ASU. In the event that ASU or its agents remove lead-contaminated soil from beneath the protective cap and some of the removed soil remains after the excavation is refilled with the removed soil, (1) ASU will be named as generator in the manifest for shipment for disposal and in the disposal arrangements, and (2) ASU is responsible for the cost of testing and disposal of the lead-contaminated soil from beneath the protective cap.

4.0 South Desert Village Protective Cap

4.1 Purpose of the Protective Cap

The protective cap across the affected area within the South Desert Village has been placed to comply with the requirements of the OU-4 ROD. The intent of the protective cap is to protect human health by the prevention of frequent and repeated human contact with soil containing lead at levels greater than 400 mg/kg, which could provide lead exposure from ingested soil or inhaled soil dust.

The protective cap of 6 inches of clean soil, existing roadways, paved parking areas, driveways, sidewalks, concrete patios, and building foundations and slabs will serve as a barrier to residents and workers from underlying lead-contaminated soil. This O&M manual describes the methods, requirements, and procedures necessary to maintain and inspect the protective cap. Successful implementation of the O&M manual will minimize resident and worker exposure.

4.2 Definition and Parameters of the Affected Area

The areal extent of the affected area is shown in Figure 1-1. The soil cap replaced exposed contaminated soil within the area defined as containing lead levels higher than 400 mg/kg. Exposed contaminated soil was excavated and replaced with a protective cap of clean soil at least 6 inches thick. Roadways, sidewalks, paved parking areas, driveways, concrete patio areas, and building foundations and slabs were disturbed as little as possible during the remediation. No soil removal occurred beneath them. Figure 4-1 depicts the location of contaminated soil in the vicinity of typical protective cap components.

The open areas and the 86 houses within the area of the protective cap will be designated by metal signs that will inform the reader of the existence of the cap, and list a contact agency for further information. Required text for the signage is displayed in Attachment B.

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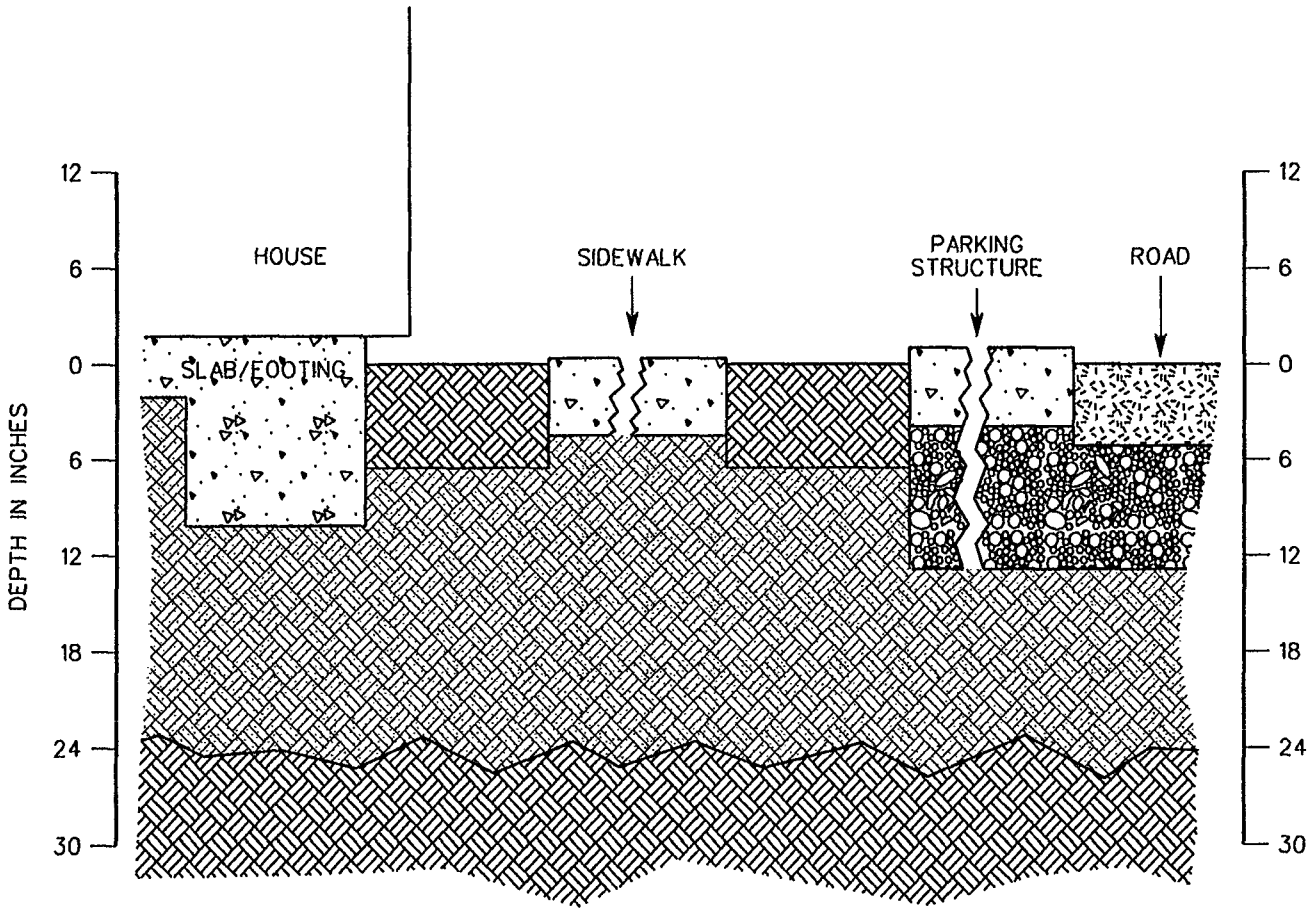

LEGEND:

- CONCRETE
- ASPHALT
- CLEAN SOIL
- SUBGRADE FILL
- CONTAMINATED SOIL

FIGURE 4-1
TYPICAL PROTECTIVE CAP CROSS SECTION
SOUTH DESERT VILLAGE

WILLIAMS AIR FORCE BASE
PHOENIX, ARIZONA

INTERNATIONAL TECHNOLOGY CORPORATION

5.0 Maintenance of the Protective Cap

The protective cap allows human habitation of houses within the affected area of the South Desert Village. Maintenance of the cap is of primary importance to allow continued human occupancy of the houses.

5.1 Responsibilities

Responsibilities for protection and maintenance of the cap exist at several levels. Anyone who lives in, works in, or owns any affected area within the South Desert Village is responsible to avoid taking actions that may damage the cap. Institutions and persons involved in the protection and maintenance of the protective cap include the USAF as existing property owner, ASU as the future property owner, as well as third-party service providers such as a utility installer/maintainer, a landscape contractor, an asphalt and concrete repair or replacement contractor, and a construction contractor. Specific responsibilities follow.

5.1.1 USAF

Until the affected area within the South Desert Village is transferred to ASU, the USAF will have the responsibilities of the property owner for maintenance of the protective cap described in this manual.

5.1.2 Property Owner

ASU will be the owner/landlord of the affected area within the South Desert Village. Responsibilities as owner include the following:

- Maintaining the protective cap boundary and individual dwelling signage
- Acting as primary contact for any planned breach of the protective cap, such as landscaping, utility installation, street or sidewalk cutting or repair, or construction
- Reviewing and approving work plans for activities that would involve a penetration of the protective cap
- Including a map of the South Desert Village affected area in any utility blue stake request
- Distributing to each job foreman a copy of the *South Desert Village Excavation Awareness* booklet (see Attachment C), and retaining signed acknowledgement

forms as proof that the job crew participated in and understood a briefing about the booklet contents

- Scheduling semiannual protective cap inspections to monitor any deterioration of the protective cap due to erosion, pre- and post-disturbance
- Repairing any deterioration of the protective soil cap due to erosion
- File maintenance of all inspection documentation and postconstruction drawings.

Responsibilities as landlord include the following:

- Informing each tenant about the existence and purpose of the protective cap
- Instructing each tenant to avoid activities which could breach the protective soil cap or contribute to the erosion of the protective soil cap, such as digging, trenching, and gardening
- Requesting prompt notification of accidental or intentional damage to the protective cap
- Distributing to each tenant a copy of the *South Desert Village Tenant Protective Cap Awareness* booklet (see Attachment C), and requiring signatures as proof that the information in the booklet is understood.

5.1.3 Third-Party Service Providers

Excavation activities of certain third-party service providers in the affected area of the South Desert Village may damage or breach the protective cap. Such service providers include utilities (e.g., electric, natural gas, water, telephone/communications, and cable television), landscape contractors, asphalt and concrete repair or replacement contractors, and construction contractors. Responsibilities of service providers involved in excavation within the affected area include the following:

- Calling for underground line location (blue staking) before excavating, except in emergencies
- Completing work plan form (see Attachment D) and submitting it for review and timely approval by ASU prior to initiating field activities, except in emergencies
- Adherence to approved work plan form and to the procedures for protective cap disturbance, contaminated soil collection and disposal, and protective cap repair detailed in Section 5.2, and reiterated in the *South Desert Village Excavation Awareness* booklet (see Attachment C)

- Conducting a job site protective cap awareness briefing, to include a discussion of the purpose of the cap, the parameters of the cap, and the methods for proper cap repair.

- Obtaining signature proof of understanding from each crew member, and submitting the signatures to ASU at the completion of the work

- Preparation and adherence to a site-specific health and safety plan developed and implemented by the third-party services provider, or if ASU employees, by ASU

- Notification of ASU for pre- and post-construction inspections

- Submission to ASU of post-construction diagrams defining areas of disturbance.

5.2 Procedures

The future property owner, ASU, shall enforce strict adherence to the following procedures to maintain the integrity of the protective cap across the affected area in the South Desert Village. Procedures for planned disturbances and emergency disturbances are defined. Table 5-1 presents a requirement matrix. Requirements for handling and disposal of contaminated soil are presented in Section 5.2.2.4, and decontamination procedures are presented in Section 5.2.2.5.

5.2.1 Protective Cap Disturbance

Planned disturbances of the protective cap are activities such as replacement or installation of utilities, installation of landscaping irrigation lines, and the cutting, repair, or replacement of roadways and walkways. Such activities within the affected area of the South Desert Village must follow a specific planning and approval process and adherence to certain methods and procedures.

Unplanned disturbances of the protective cap are utility emergencies such as water line breaks, accidental disturbances such as root-ball exposure following a tree fall, unauthorized disturbances such as tenant digging, domestic or wild animal burrowing, and deterioration of the protective soil cap due to erosion. Procedures follow for minimizing such disturbances, for cleaning up contaminated soil, and for repairing the protective cap.

5.2.1.1 Plans and Approvals

All activities in the affected area that could disturb the protective cap shall be carefully planned in advance and in conjunction with ASU. ASU shall review and approve in a timely manner the submitted work plan form and shall attach a location map of the South Desert Village that clearly shows the boundaries of the protective cap. In the event of an emergency disturbance, ASU shall

Table 5-1

Requirement Matrix for Protective Cap Disturbance
South Desert Village
Williams Air Force Base, Arizona

Type	Requirements
Planned	• Coordinate with ASU • Blue stake survey • Work plan approval • Excavation Awareness booklet • Pre- and post-construction inspection • OSHA 40-hour training for workers • Lead awareness training for workers • Site-specific health and safety plan • Contaminated soil segregation • Protective cap replacement/repair • Contaminated soil waste disposal
Emergency	• Coordinate with ASU if possible • Excavation Awareness booklet • Pre- and post-construction inspection • OSHA 40-hour training for workers if possible • Lead awareness training for workers • Site-specific health and safety plan • Contaminated soil segregation • Protective cap replacement/repair • Cleanup of contaminated soil above cap • Contaminated soil waste disposal

ASU - Arizona State University.
OSHA - Occupational Safety and Health Administration.

be notified as soon as possible, but not more than 24 hours after activities commence. In addition, ASU shall perform the following:

- Conduct a predisturbance inspection of the area to be impacted by planned disturbance activities, or within 48 hours after commencement of emergency activities, and document the condition on an inspection form (Attachment D).
- Distribute a copy of the *South Desert Village Excavation Awareness* booklet (see Attachment C) to the job foreman before work starts.
- Maintain files for contractor-provided post-construction drawings and awareness briefing signature documentation.

5.2.1.2 Methods and Procedures

The protective cap consists of at least 6 inches of clean soil in uncovered areas and of roadways, walkways, paved parking areas, driveways, building foundations and slabs, etc., in areas where the soil is covered. Planned clean soil cap disturbances must follow these procedures:

- Clean soil from the cap must be stockpiled on 6-mil plastic sheeting next to the excavation for postconstruction return.
- Disturbance to the depth of the cap/contaminated soil interface must be carefully monitored. Soil 6 inches below the surface must be considered contaminated.

5.2.1.3 Protective Cap Replacement/Repair

The protective cap must be replaced or repaired following any disturbance, according to the following procedures:

- If it is found that the protective soil cap is deteriorating as a result of erosion processes, erosion control measures will be implemented to mitigate erosion of the protective soil cap.
- If the disturbed cap material is soil, then clean soil must be returned to the excavation and compacted to the original grade. This soil may be the stockpiled clean soil removed during the disturbance, or it may be native soil from an acceptable source.
- If the disturbed cap material is asphalt or concrete, it must be patched or replaced after compaction of any subgrade material.
- Under applicable Federal and state environmental laws and regulations, replacing contaminated soil into the excavation is permitted. Contaminated soil and/or approved clean soil that is replaced into an excavation must be compatible with the

protective cap, e.g., either clean soil or contaminated soil can be placed into an excavation up to the level of the base of the protective cap, but only clean soil or native soil from an acceptable source can be replaced above that level. Excavation backfill must be consolidated to nearly pre-excavation conditions, to prevent soil settling. This consolidation will be performed in accordance with accepted utility industry methods and standards.

5.2.2 Contaminated Soil Disturbance

As soon as the protective cap is removed, the underlying soil must be considered contaminated and be handled as such. Therefore, any planned or accidental removal of the top 6 inches of soil within the affected area will expose contaminated soil.

5.2.2.1 Definition/Parameters of Contaminated Soil

Contaminated soil within the affected area is that soil beneath the protective cap. Sampling and pellet counts performed during the OU-4 RI documented the local presence of lead shot within the affected area to depths of at least 2 feet below the surface. Along the trace of a former drainage ditch lead shot has been found to at least 4 feet below the surface (IT, 1997a). Because there are areas where the depth of contamination is uncertain, all soil beneath the cap must be considered to be contaminated.

Calculated levels of contamination within the top 6 inches of soil locally exceeded 5,000 mg/kg (approximately 195 pellets per sample). No calculations have been performed to evaluate levels of contamination below 6 inches, but pellet count data from the OU-4 RI indicate the possibility for local hot spots exceeding 5,000 mg/kg to a depth of 4 feet.

5.2.2.2 Containment

To protect the cap and prevent contamination of clean surface soil, all excavated contaminated soil must be segregated from the clean soil of the cap on a layer of 6-mil plastic sheeting until it is replaced in the excavation. Any contaminated soil that cannot be replaced in the excavation must be placed into a suitable container and removed from the site as waste, in accordance with the procedures outlined in Section 5.2.2.4.

5.2.2.3 Health and Safety Requirements

Because all soil below the protective cap is considered contaminated with lead, certain health and safety issues must be addressed during the planning process. Each utility company and contractor is responsible for training of its workers, and for the preparation of a programmatic health and safety program and an approved site-specific health and safety plan, in accordance

with the Occupational Safety and Health Administration (OSHA) requirements codified under Title 29 Code of Federal Regulations (CFR) Part 1910.120. Each contractor shall perform work in accordance with all applicable standards governing construction work practices. In addition, for workers on a hazardous materials site only occasionally for a specific limited task and who are unlikely to be exposed over permissible exposure limits and published exposure limits, OSHA requires a minimum of 24 hours of instruction off site, and a minimum of one day of actual field experience under the direct supervision of a trained, experienced supervisor. Personal protective equipment (PPE), such as respirators and disposable coveralls and gloves, may be required by the health and safety plan.

5.2.2.4 Material Handling and Disposal Requirements

Contaminated soil handling and disposal requirements follow:

- Handling of contaminated soil shall be performed in accordance with the site-specific health and safety plan developed and implemented by the third-party service provider, or if ASU employees, by ASU

- Contaminated soil shall be segregated from clean soil by placing it on a layer of 6-mil plastic sheeting

- Contaminated soil shall be replaced into the excavation up to the bottom of the protective cap during backfill operations whenever possible. Any contaminated soil that cannot be replaced into the excavation must be placed into suitable containers for disposal.

- Containerized soil waste must be characterized for disposal, using the toxicity characteristic leaching procedure (TCLP), and sampling and analysis performed in accordance with the requirements of SW-846 (EPA, 1992).

- Waste soil with a TCLP value for lead of less than 5 milligrams per milliliter (mg/mL) may be shipped to an approved non-hazardous solid waste facility.

- Waste soil with a TCLP value for lead of more than 5 mg/mL lead must be treated as a toxic hazardous waste. Such waste must either be treated and tested until it will pass universal treatment standards for land disposal restrictions, or it must be shipped to a Class 1 hazardous waste landfill.

5.2.2.5 Personnel and Equipment Decontamination

To prevent accidental ingestion of lead-contaminated soil, personnel working with the contaminated soil will perform personal decontamination in accordance with the approved site-specific health and safety plan. This will include, at a minimum, removing and discarding

disposable protective clothing and washing hands and faces before eating, drinking, smoking, or applying cosmetics. Any equipment that comes in contact with contaminated soil must be decontaminated before leaving the immediate area.

5.2.2.6 Animal Burrowing

Before the removal of the top 6 inches of top soil, gopher activity was widespread across the affected area of the South Desert Village. Their burrowing activities continually brought contaminated soil from below the sod to the surface. The removal of the dead grass in the top 6 inches of soil removed the food source for these animals. Although they are territorial, the combination of this food removal and the presence of humans should keep their cap-disturbing activities to a minimum. Prompt reporting of animal burrowing to an ASU representative will help minimize the cap disturbance. Responsibility for controlling the digging of pets, such as dogs, lies with the tenants.

5.3 Inspections

To document compliance with the covenants of this O&M manual, protective cap inspections will be performed before and after every disturbance and during a semiannual scheduled inspection. The site disturbance inspections will be confined to the site, and the semiannual inspections will include the entire protective cap.

5.3.1 Planned or Emergency Disturbance

5.3.1.1 Predisturbance

The purpose of a predisturbance inspection is to document the condition of the protective cap before the disturbance begins and to mark the boundaries of the affected area, if necessary. If, for example, part of the planned work is outside of the affected area, then the inspection should clearly indicate where the workers would be expected to encounter the cap. The location of the disturbance and the condition of the protective cap will be noted on an inspection form for later comparison to the cap repair (see Attachment D).

5.3.1.2 Postdisturbance

The purpose of the post-disturbance inspection is to verify and document the repair of the protective cap. The inspection will be performed in two stages: (1) an inspection of the backfilled excavation to the top of the contaminated soil level; and (2) observation of the replacement of the cap. This inspection will be documented on the same inspection form as the predisturbance inspection (see Attachment D).

5.3.2 Semiannual Monitoring

A semiannual formal inspection of the protective cap will be performed by an ASU representative. This inspection will perform the following:

- Inspect and document the condition of affected area perimeter designation signage.
- Inspect and document the condition of metal signs on the 86 houses in the affected area.
- Confirm tenant compliance with the restrictions of this O&M manual by a walkover inspection of entire affected area.
- Verify the integrity of the protective cap with a walkover inspection of entire affected area.

This inspection will be performed at all localities specified in the protective cap inspection form (see Attachment D), and documented with that form. The first semiannual inspection shall be conducted by the USAF no later than 30 days after the signature and acceptance of the final OU-4 ROD. Subsequent inspections shall be conducted by the then owner semiannually thereafter.

5.4 Documentation

All cap-disturbing activities will be documented by the job-specific work plans, briefing awareness acknowledgement signature sheets, inspection forms, and post-construction drawings, as required in Sections 5.2 and 5.3. ASU shall maintain files to accumulate such documentation every six months into semiannual roll-up packets.

6.0 Document Approval and Distribution

Distribution of this manual and other associated documents will follow review and approval by all affected parties as follows.

6.1 O&M Manual

The O&M manual is the umbrella document for the monitoring and repair of the protective cap in the affected area of the South Desert Village. As such, it must be approved or acknowledged by parties that will be affected by the manual: the USAF, EPA (Region IX), ADEQ, and ADWR. After the O&M Manual is finalized, copies will be distributed to all parties and archived in the administrative record for WAFB, located on the ASU East campus.

6.2 Awareness Booklets

The awareness booklets will be the first line of defense against damage to the protective cap, serving the purpose of site-specific education about the purpose and nature of the cap. These booklets are in a simple and informative format and are intended to be kept in the home by tenants and in the field by excavation crews. These booklets will originally be produced in color, and all subsequent reproduction of the booklets will be clear and legible.

6.2.1 South Desert Village Tenant Protective Cap Awareness Booklet

A copy of the *South Desert Village Tenant Protective Cap Awareness* booklet will be given to each tenant by ASU during the leasing process. As part of the explanation of the lease agreement, ASU shall review the booklet with each tenant of each rental unit and shall obtain signature proof of understanding and agreement. An example of the *South Desert Village Tenant Protective Cap Awareness* booklet is included in Attachment C; the proof of understanding signature form is included in Attachment D.

6.2.2 South Desert Village Excavation Awareness Booklet

A copy of the *South Desert Village Excavation Awareness* booklet will be given to each excavation crew by ASU during the work crew mobilization process. The excavation crew foreman shall review the booklet with the crew before the start of any excavation, and shall obtain signature proof of understanding and agreement from all crew members and submit the signature form to ASU after completion of the job. An example of the *South Desert Village Excavation Awareness* booklet is included in Attachment C; the proof of understanding form is included in Attachment D.

6.3 Semiannual Protective Cap Monitoring Roll-Up Packet

The semiannual protective cap monitoring roll-up packet will be maintained by ASU, and will be available for review by interested parties at the information repository located at the ASU East administrative services office. ASU shall forward to ADEQ and EPA (Region IX) a copy of the completed form for each semiannual inspection, within 30 days of the completed inspection. The USAF will forward to ASU a copy of any semiannual inspection reports prepared by the USAF.

7.0 References

Arizona Department of Environmental Quality (ADEQ), 1996, ***Appendix A, Human Health-Based Guidance Levels (HBGL) for Ingestion of Contaminants in Soil, Amended Soil Remediation Rules***, ADEQ, Phoenix, Arizona.

IT Corporation (IT), 1998, ***Final Record of Decision, Operable Unit 4, Williams Air Force Base, Arizona***, prepared for Air Force Center for Environmental Excellence, HSC/PKCVCB Headquarters Human Systems Center (AFMC), Brooks Air Force Base, Texas, June 1998.

IT Corporation (IT), 1997a, ***Final Remedial Investigation Report, Operable Unit 4, Williams Air Force Base, Arizona***, prepared for Air Force Center for Environmental Excellence, HSC/PKCVCB Headquarters Human Systems Center (AFMC), Brooks Air Force Base, Texas, May 1997.

IT Corporation (IT), 1997b, ***Final Feasibility Study Report, Operable Unit 4, Williams Air Force Base, Arizona***, prepared for Air Force Center for Environmental Excellence, HSC/PKCVCB Headquarters Human Systems Center (AFMC), Brooks Air Force Base, Texas, July 1997.

U.S. Environmental Protection Agency (EPA), 1992, ***Test Methods for Evaluating Solid Waste, Physical/Chemical Methods, SW-846, 3rd Edition***, U.S. Environmental Protection Agency Office of Solid Waste and Emergency Response, November 1986 with promulgated revisions through 1992.

ATTACHMENT A

CONSENSUS STATEMENT 97-02 AND SOUTH DESERT VILLAGE VEMUR

Consensus Statement No. 97-02
Agreement on Skeet Range/ South Desert Village (SS-19)

April 22, 1997

ISSUES:
Lead shot contamination at the former skeet range located in South Desert Village could pose a hazard to human health (i.e. children). The Arizona Amended Soil Remediation Rule allows an owner to record a Voluntary Environmental Mitigation Use Restriction (VEMUR) for non residential use if a cap is maintained over any area where the lead concentration in the upper 6 inches of soil exceeds 400 mg/kg. The Arizona Amended Soil Remediation Rule requires that this property be classified as non residential however it can be inhabited provided that frequent and repeated contact with the soil has been limited through the use of a protective cap thereby eliminating unacceptable risk to the inhabitants.

DECLARATION:
The Remedial Project Managers (RPM), representing the Parties to the Williams AFB Federal Facilities Agreement (FFA) have agreed to this consensus statement after considering all of the Parties' concerns.

CONSIDERATIONS:
This consensus statement considers actions that will be acceptable to the Parties leading to a permanent remedy as shown below.

AGREEMENT/CONSENSUS:
It is agreed that the Air Force will remove the top 6" of soil where characterization has shown the lead level to exceed 400 mg/kg and replace with material specified in the approved final OU-4 Feasibility Study Report. Soil below roadways, sidewalks, or foundations within the 400 mg/kg lead area will be retained in place and a VEMUR specifying restrictions for non residential use will be signed. The cap must be periodically monitored and repaired as necessary per the requirements specified in the operations and maintenance manual to be written and issued for review and use. The above agreemnet is contingent on acceptance by the public of the Proposed Plan.

Accepted by the Parties on the date signed and noted below:

Rich Freitas 4-22-97
Rich Freitas
EPA Region IX RPM

Amanda E. Stone 4-22-97
Amanda Stone
ADEQ RPM

Charles Helms 22 Apr 97
Charles Helms
AFBCA RPM

Mason R. Bolitho 4/23/97
Mason Bolitho
ADWR RPM

CS0422-1 4/22/97

Hold for FC

OFFICIAL RECORDS OF
MARICOPA COUNTY RECORDER
HELEN PURCELL
99-0358789 04/15/99 01:15
PAULA 1 OF 1

Return to:
U.S. Air Force
AFBCA/DC ROL
Regional Operating Location
3711 Outlaw Country Drive (Bldg 4531)
Austin, TX 78719-2557

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

FORMER SKEET RANGE
WILLIAMS AIR FORCE BASE
MESA, ARIZONA

Former Skeet Range
Williams Air Force Base
Mesa, Arizona

NOTICE OF VOLUNTARY ENVIRONMENTAL MITIGATION USE RESTRICTION BY THE UNITED STATES OF AMERICA

Pursuant to Arizona Revised Statute § 49-152(A), the UNITED STATES OF AMERICA, acting by and through the Secretary of the Air Force, Washington, DC, "Owner" of the following described property:

LEGAL DESCRIPTION: SOUTH DESERT VILLAGE

A portion of "PARCEL J1" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the South half of Section 31, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Northwest corner of the Southwest quarter of said Section 31;

thence South 00° 49' 18" East, along the West line of said Southwest quarter, a distance of 421.09 feet;

thence North 89° 10' 42" East, perpendicular to said West line, a distance of 1111.28 feet to the Point of Beginning;

thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 76° 32' 00" East, a distance of 20.62 feet;
thence North 04° 37' 30" West, a distance of 55.23 feet;
thence North 70° 00' 48" East, a distance of 42.72 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 39° 14' 10" West, a distance of 78.10 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence North 64° 00' 16" East, a distance of 11.18 feet;
thence North 74° 37' 27" East, a distance of 72.80 feet;
thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 53° 24' 11" East, a distance of 68.01 feet;
thence North 67° 22' 15" East, a distance of 38.08 feet;
thence North 45° 34' 10" East, a distance of 35.36 feet;
thence North 00° 34' 10" East, a distance of 25.00 feet;
thence North 38° 08' 17" East, a distance of 82.01 feet;
thence South 67° 37' 45" East, a distance of 26.93 feet;
thence South 86° 11' 09" East, a distance of 75.17 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence North 39° 13' 45" East, a distance of 64.03 feet;
thence South 57° 49' 23" East, a distance of 76.32 feet;

thence South 89° 25' 50" East, a distance of 75.00 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;
thence North 49° 23' 01" East, a distance of 53.15 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence South 50° 46' 15" East, a distance of 32.02 feet;
thence South 09° 44' 07" East, a distance of 55.90 feet;
thence South 55° 01' 54" West, a distance of 43.01 feet;
thence South 50° 45' 50" West, a distance of 39.05 feet;
thence South 25° 59' 44" East, a distance of 67.08 feet;
thence North 79° 15' 34" East, a distance of 50.99 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;
thence North 22° 22' 15" East, a distance of 53.85 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 75° 23' 40" East, a distance of 61.85 feet;
thence South 48° 14' 41" East, a distance of 53.15 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 32° 10' 37" West, a distance of 76.32 feet;
thence South 59° 21' 43" East, a distance of 109.77 feet;
thence South 00° 34' 10" West, a distance of 55.00 feet;
thence South 73° 29' 07" East, a distance of 72.80 feet;
thence South 39° 14' 10" East, a distance of 39.05 feet;
thence South 89° 25' 50" East, a distance of 105.00 feet;
thence North 25° 59' 44" West, a distance of 55.90 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 10° 44' 26" East, a distance of 25.50 feet;
thence South 21° 13' 55" East, a distance of 26.93 feet;
thence South 11° 52' 46" West, a distance of 50.99 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 39° 13' 45" West, a distance of 64.03 feet;
thence North 89° 25' 50" West, a distance of 55.00 feet;
thence South 56° 52' 46" West, a distance of 36.06 feet;
thence South 76° 54' 06" East, a distance of 138.29 feet;
thence South 59° 41' 08" East, a distance of 40.31 feet;
thence South 66° 56' 24" West, a distance of 87.32 feet;
thence South 20° 13' 24" West, a distance of 74.33 feet;
thence South 45° 34' 10" West, a distance of 42.43 feet;
thence North 75° 23' 40" West, a distance of 61.85 feet;
thence North 68° 52' 28" West, a distance of 42.72 feet;
thence North 00° 34' 10" East, a distance of 50.00 feet;

thence North 14° 36' 20" East, a distance of 61.85 feet;
thence North 58° 28' 00" West, a distance of 29.15 feet;
thence South 58° 33' 51" West, a distance of 47.17 feet;
thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 05° 08' 28" East, a distance of 50.25 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
thence North 78° 07' 14" West, a distance of 50.99 feet;
thence North 54° 26' 19" West, a distance of 61.03 feet;
thence North 38° 05' 25" West, a distance of 64.03 feet;
thence North 09° 44' 07" West, a distance of 55.90 feet;
thence North 10° 52' 27" East, a distance of 55.90 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
thence South 22° 22' 15" West, a distance of 53.85 feet;
thence South 15° 49' 28" West, a distance of 57.01 feet;
thence South 45° 34' 10" West, a distance of 35.36 feet;
thence North 30° 23' 40" West, a distance of 29.15 feet;
thence North 25° 59' 44" West, a distance of 55.90 feet;
thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 30° 18' 52" East, a distance of 80.62 feet;
thence North 41° 42' 15" West, a distance of 74.33 feet;
thence North 16° 07' 47" West, a distance of 52.20 feet;
thence South 27° 08' 04" West, a distance of 55.90 feet;
thence South 56° 52' 46" West, a distance of 90.14 feet;
thence South 49° 37' 30" East, a distance of 78.10 feet;
thence South 30° 23' 40" East, a distance of 29.15 feet;
thence South 45° 34' 10" West, a distance of 35.36 feet;
thence South 68° 46' 05" West, a distance of 53.85 feet;
thence South 84° 51' 32" West, a distance of 50.25 feet;
thence North 70° 59' 44" West, a distance of 15.81 feet;
thence North 11° 57' 34" West, a distance of 46.10 feet;
thence North 34° 58' 06" West, a distance of 43.01 feet;
thence South 59° 36' 20" West, a distance of 116.62 feet;
thence South 64° 00' 16" West, a distance of 55.90 feet;
thence North 89° 25' 50" West, a distance of 85.00 feet;
thence South 31° 32' 00' West, a distance of 29.15 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence North 16° 07' 47" West, a distance of 52.20 feet;
thence South 68° 46' 05" West, a distance of 53.85 feet;
thence South 85° 48' 21" West, a distance of 60.21 feet;
thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence South 64° 00' 16" West, a distance of 55.90 feet;

thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 58° 28' 00" West, a distance of 58.31 feet;
thence North 45° 34' 10" East, a distance of 63.64 feet;
thence South 47° 47' 49" East, a distance of 60.21 feet;
thence North 00° 34' 10" East, a distance of 165.00 feet;
thence South 22° 22' 15" West, a distance of 107.70 feet;
thence South 82° 58' 29" West, a distance of 75.66 feet;
thence South 39° 13' 45" West, a distance of 64.03 feet;
thence North 44° 25' 50" West, a distance of 84.85 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence North 30° 23' 40" West, a distance of 87.46 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising and area of 792,650 square feet or 18.1970 acres more or less.

The subject of this VEMUR, Installation Restoration Program (IRP) Site SS-19, is a former six station skeet range. The range was demolished and graded in 1950, prior to construction of the Base housing units now known as South Desert Village. The range occupied what is now an area south of Coolidge Street, between 5th Street and Perimeter Road.

This site was identified in the 1993 Facilities Assessment Report as an area requiring further investigation. In 1994, five (5) soil samples were collected from locations representative of the area affected by lead shot. Analysis indicated one (1) lead value in excess of the Base-specific background range, the regional background range, and the Environmental Protection Agency (EPA) - Region IX residential Preliminary Remediation Goal (PRG) and the Arizona residential Health Based Guidance Level (HBGL) of 400 mg/kg. Based on this finding, the site was recommended for further investigation during Operable Unit 4 (OU-4).

While conducting soil borings, as part of the OU-4 investigation, visible lead shot and broken skeet targets were observed; brought to the surface by widespread rodent burrowing. Because of the widespread lead-shot contamination visible on the surface, a supplemental investigation was proposed to determine the aerial and vertical extent of lead contamination.

The supplemental investigation was performed in January and February of 1996. Over 1,000 locations were bored to a depth of 2 feet below ground surface (bgs), and approximately 100 locations were bored to a total depth of 4 feet bgs. Samples were sieved and the remaining lead pellets counted and documented.

It has been established that lead from lead shot is not a threat to groundwater at this site; however, the lead shot in the surface soil represents a potential health risk to residents of the South Desert Village. Since risk based PRGs for lead (as lead shot) in soil could not be quantified for the site (because of lack of empirical data) the EPA Region IX and Arizona HBGL for lead in soil was adopted as a surrogate PRG for the upperbound estimate of lead available for

ingestion. A conversion of lead pellet abundance to potential lead in soil was performed and the data was used to generate a map of South Desert Village indicating the area where lead values in soil could be expected to exceed the PRG.

The selected remedy (completed in June 1998) for this site is excavation, removal, and replacement of the top six (6) inches of soil within the 400 mg/kg area. The replacement soil is a protective cap over the remaining contamination, and is subject to repair and maintenance in accordance with an EPA, Arizona Department of Environmental Quality (ADEQ), and Air Force approved Operation & Maintenance Manual.

This VEMUR is to be recorded with the county recorder on the chain of title to indicate the selected remedy has been completed, and to give notice that the remediated portion of the property has not been cleaned up to residential standards. However, in accordance with Consensus Statement No. 97-02, dated 22 April 1997, and the Arizona Amended Soil Remediation Rule, the US EPA, Region IX, and the ADEQ have agreed that the remedy properly maintained in accordance with the South Desert Village Protective Cap Operation and Maintenance Manual, dated May 1998, is sufficiently protective of human health and the environment to allow human habitation. In order to augment the physical remedy, the property will be subjected to a deed restriction that prohibits the habitation of children under seven (7) years of age.

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Former Skeet Range
Williams Air Force Base
Mesa, Arizona

The **UNITED STATES OF AMERICA**, acting by and through the Secretary of the Air Force, voluntarily agrees to limit and restrict the use of the described portion of the property to habitation by persons over the age of seven (7) years and above, and agrees that the repair and maintenance of the protective cap be in accordance with an EPA, Arizona Department of Environmental Quality (ADEQ), and Air Force approved Operation & Maintenance Manual.

for: **UNITED STATES OF AMERICA**

Date: September 18, 1998

Albert F. Lowas, Jr.
ALBERT F. LOWAS, JR.
Director
Air Force Base Conversion Agency

COMMONWEALTH OF VIRGINIA)
) ss.:
COUNTY OF ARLINGTON)

On the 18 day of September, 1998, before me, Helen J. Wardlaw, the undersigned Notary Public, personally appeared Albert F. Lowas, Jr., personally known to me to be the Director, Air Force Base Conversion Agency, and acknowledged that the same was the act and deed of the Secretary of the Air Force and that he executed the same as the act of the Secretary of the Air Force.

Helen J. Wardlaw
Notary Public, Commonwealth of Virginia
My commission expires: Jul 31, 20001

for: ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY

Date: 4/1/99

Approved: Jan Callahan

Title: Director, Waste Programs Division

990358789

for: **ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY**

Date: 4/1/99

Jean A. Calhoun
Director, Waste Program Division

Notary Public
My commission expires:
1/18/00

PAMELA J. STAWNEY
Notary Public - Arizona
Maricopa County
My Comm. Expires Jan 18, 2000

APPENDIX

LEGAL DESCRIPTION OF PROPERTY BY REGISTERED LAND SURVEYOR

BRADY • AULERICH & ASSOCIATES, INC.
Civil Engineering • Land Surveying
Construction Staking

Dennis H. Brady P.L.S.
C.E. Aulerich P.L.S.
Robert N. Hermon P.E./P.L.S.

LEGAL DESCRIPTION: SOUTH DESERT VILLAGE VEMUR

A portion of "PARCEL J1" - RECORD OF SURVEY - LAND BOUNDARY SURVEY AT FORMER WILLIAMS AIR FORCE BASE, as recorded in Book 409 of Maps, page 13, Maricopa County Records and located within the South half of Section 31, Township 1 South, Range 7 East of the Gila and Salt River Base and Meridian, Maricopa County, Arizona, more particularly described as follows:

Commencing at the Northwest corner of the Southwest quarter of said Section 31;

thence South 00° 49' 18" East, along the West line of said Southwest quarter, a distance of 421.09 feet;

thence North 89° 10' 42" East, perpendicular to said West line, a distance of 1111.28 feet to the Point of Beginning;

thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 76° 32' 00" East, a distance of 20.62 feet;
thence North 04° 37' 30" West, a distance of 55.23 feet;
thence North 70° 00' 48" East, a distance of 42.72 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence North 39° 14' 10" West, a distance of 78.10 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence North 64° 00' 16" East, a distance of 11.18 feet;
thence North 74° 37' 27" East, a distance of 72.80 feet;
thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 53° 24' 11" East, a distance of 68.01 feet;
thence North 67° 22' 15" East, a distance of 38.08 feet;
thence North 45° 34' 10" East, a distance of 35.36 feet;
thence North 00° 34' 10" East, a distance of 25.00 feet;
thence North 38° 08' 17" East, a distance of 82.01 feet;
thence South 67° 37' 45" East, a distance of 26.93 feet;
thence South 86° 11' 09" East, a distance of 75.17 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence North 39° 13' 45" East, a distance of 64.03 feet;
thence South 57° 49' 23" East, a distance of 76.32 fee;
thence South 89° 25' 50" East, a distance of 75.00 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;

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thence North 49° 23' 01" East, a distance of 53.15 feet;
thence South 79° 58' 06" East, a distance of 60.83 feet;
thence South 50° 46' 15" East, a distance of 32.02 feet;
thence South 09° 44' 07" East, a distance of 55.90 feet;
thence South 55° 01' 54" West, a distance of 43.01 feet;
thence South 50° 45' 50" West, a distance of 39.05 feet;
thence South 25° 59' 44" East, a distance of 67.08 feet;
thence North 79° 15' 34" East, a distance of 50.99 feet;
thence North 35° 33' 41" East, a distance of 61.03 feet;
thence North 22° 22' 15" East, a distance of 53.85 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 75° 23' 40" East, a distance of 61.85 feet;
thence South 48° 14' 41" East, a distance of 53.15 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 32° 10' 37" West, a distance of 76.32 feet;
thence South 59° 21' 43" East, a distance of 109.77 feet;
thence South 00° 34' 10" West, a distance of 55.00 feet;
thence South 73° 29' 07" East, a distance of 72.80 feet;
thence South 39° 14' 10" East, a distance of 39.05 feet;
thence South 89° 25' 50" East, a distance of 105.00 feet;
thence North 25° 59' 44" West, a distance of 55.90 feet;
thence North 42° 33' 24" East, a distance of 67.27 feet;
thence South 44° 25' 50" East, a distance of 70.71 feet;
thence South 10° 44' 26" East, a distance of 25.50 feet;
thence South 21° 13' 55" East, a distance of 26.93 feet;
thence South 11° 52' 46" West, a distance of 50.99 feet;
thence South 89° 25' 50" East, a distance of 55.00 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 41° 25' 04" East, a distance of 67.27 feet;
thence South 39° 13' 45" West, a distance of 64.03 feet;
thence North 89° 25' 50" West, a distance of 55.00 feet;
thence South 56° 52' 46" West, a distance of 36.06 feet;
thence South 76° 54' 06" East, a distance of 138.29 feet;
thence South 59° 41' 08" East, a distance of 40.31 feet;
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thence South 20° 13' 24" West, a distance of 74.33 feet;
thence South 45° 34' 10" West, a distance of 42.43 feet;
thence North 75° 23' 40" West, a distance of 61.85 feet;
thence North 68° 52' 28" West, a distance of 42.72 feet;
thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 14° 36' 20" East, a distance of 61.85 feet;
thence North 58° 28' 00" West, a distance of 29.15 feet;
thence South 58° 33' 51" West, a distance of 47.17 feet;

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thence South 34° 25' 21" East, a distance of 61.03 feet;
thence South 05° 08' 28" East, a distance of 50.25 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
thence North 78° 07' 14" West, a distance of 50.99 feet;
thence North 54° 26' 19" West, a distance of 61.03 feet;
thence North 38° 05' 25" West, a distance of 64.03 feet;
thence North 09° 44' 07" West, a distance of 55.90 feet;
thence North 10° 52' 27" East, a distance of 55.90 feet;
thence North 13° 28' 00" West, a distance of 41.23 feet;
thence South 48° 34' 56" West, a distance of 67.27 feet;
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thence South 45° 34' 10" West, a distance of 35.36 feet;
thence North 30° 23' 40" West, a distance of 29.15 feet;
thence North 25° 59' 44" West, a distance of 55.90 feet;
thence North 00° 34' 10" East, a distance of 50.00 feet;
thence North 30° 18' 52" East, a distance of 80.62 feet;
thence North 41° 42' 15" West, a distance of 74.33 feet;
thence North 16° 07' 47" West, a distance of 52.20 feet;
thence South 27° 08' 04" West, a distance of 55.90 feet;
thence South 56° 52' 46" West, a distance of 90.14 feet;
thence South 49° 37' 30" East, a distance of 78.10 feet;
thence South 30° 23' 40" East, a distance of 29.15 feet;
thence South 45° 34' 10" West, a distance of 35.36 feet;
thence South 68° 46' 05" West, a distance of 53.85 feet;
thence South 84° 51' 32" West, a distance of 50.25 feet;
thence North 70° 59' 44" West, a distance of 15.81 feet;
thence North 11° 57' 34" West, a distance of 46.10 feet;
thence North 34° 58' 06" West, a distance of 43.01 feet;
thence South 59° 36' 20" West, a distance of 116.62 feet;
thence South 64° 00' 16" West, a distance of 55.90 feet;
thence North 89° 25' 50" West, a distance of 85.00 feet;
thence South 31° 32' 00' West, a distance of 29.15 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence North 16° 07' 47" West, a distance of 52.20 feet;
thence South 68° 46' 05" West, a distance of 53.85 feet;
thence South 85° 48' 21" West, a distance of 60.21 feet;
thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence South 64° 00' 16" West, a distance of 55.90 feet;
thence North 89° 25' 50" West, a distance of 100.00 feet;
thence North 58° 28' 00" West, a distance of 58.31 feet;
thence North 45° 34' 10" East, a distance of 63.64 feet;
thence South 47° 47' 49" East, a distance of 60.21 feet;
thence North 00° 34' 10" East, a distance of 165.00 feet;

1030 East Guadalupe Road • Tempe, Arizona 85283 • (602) 839-4000 • FAX (602) 345-9259

thence South 22° 22' 15" West, a distance of 107.70 feet;
thence South 82° 58' 29" West, a distance of 75.66 feet;
thence South 39° 13' 45" West, a distance of 64.03 feet;
thence North 44° 25' 50" West, a distance of 84.85 feet;
thence North 62° 51' 56" West, a distance of 55.90 feet;
thence North 30° 23' 40" West, a distance of 87.46 feet to the Point of Beginning.

Described property being in and forming a part of the City of Mesa, Arizona and comprising and area of 792,650 square feet or 18.1970 acres more or less.

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
18209
CHRISTOPHER E.
AULERICH
Registered
ARIZONA U.S.A.

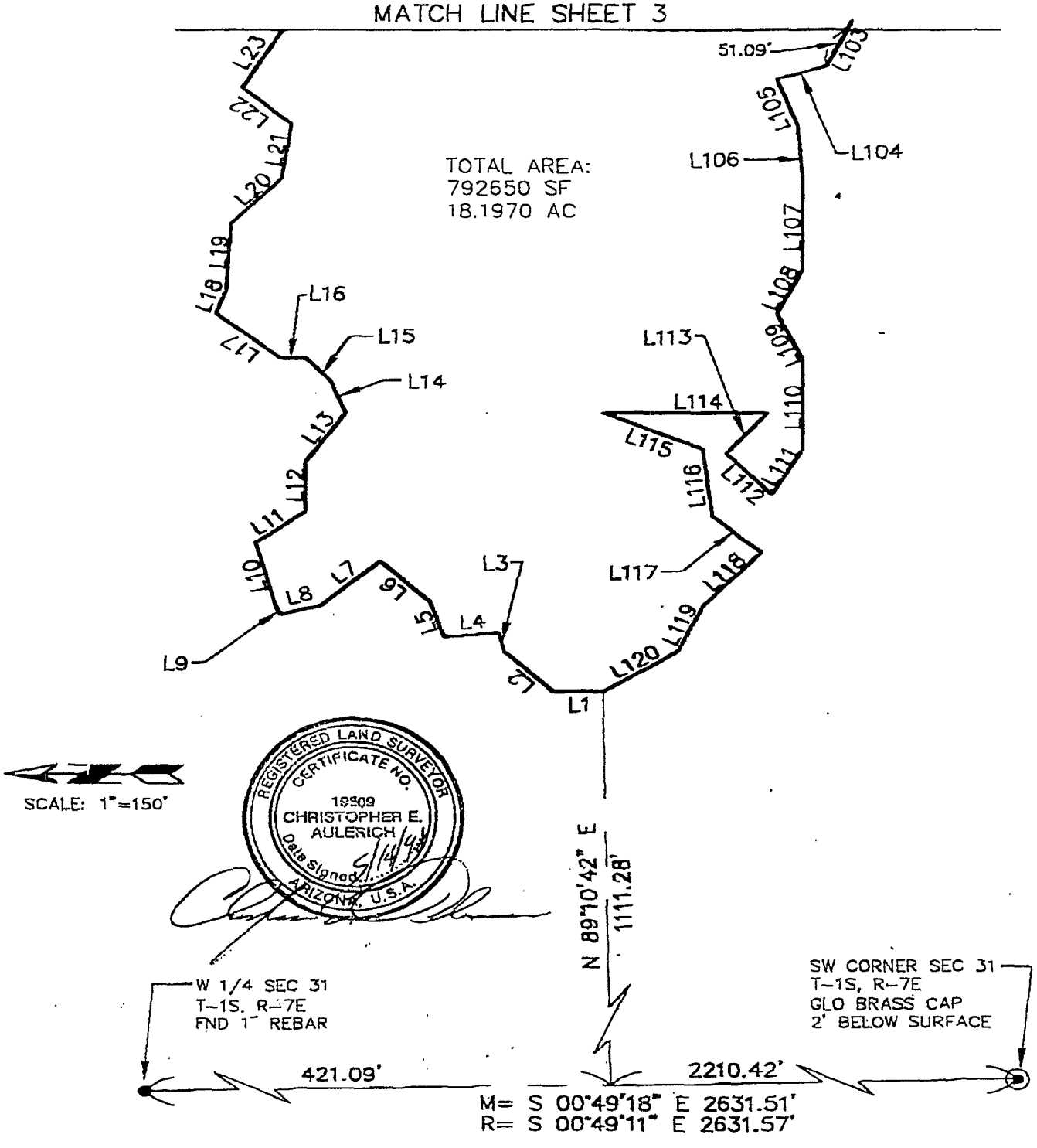
1030 East Guadalupe Road • Tempe, Arizona 85283 • (602) 839-4000 • FAX (602) 345-9259

BRADY-AULERICH & ASSOCIATES, INC.
1030 E. Guadalupe Road
Tempe, Arizona 85283
Phone (602) 839-4000 Fax (602) 345-9259

PAGE 5 OF 7 PAGES

PROJECT: SOUTH DESERT VILLAGE VEMUR DATE: 5-12-98

MATCH LINE SHEET 3



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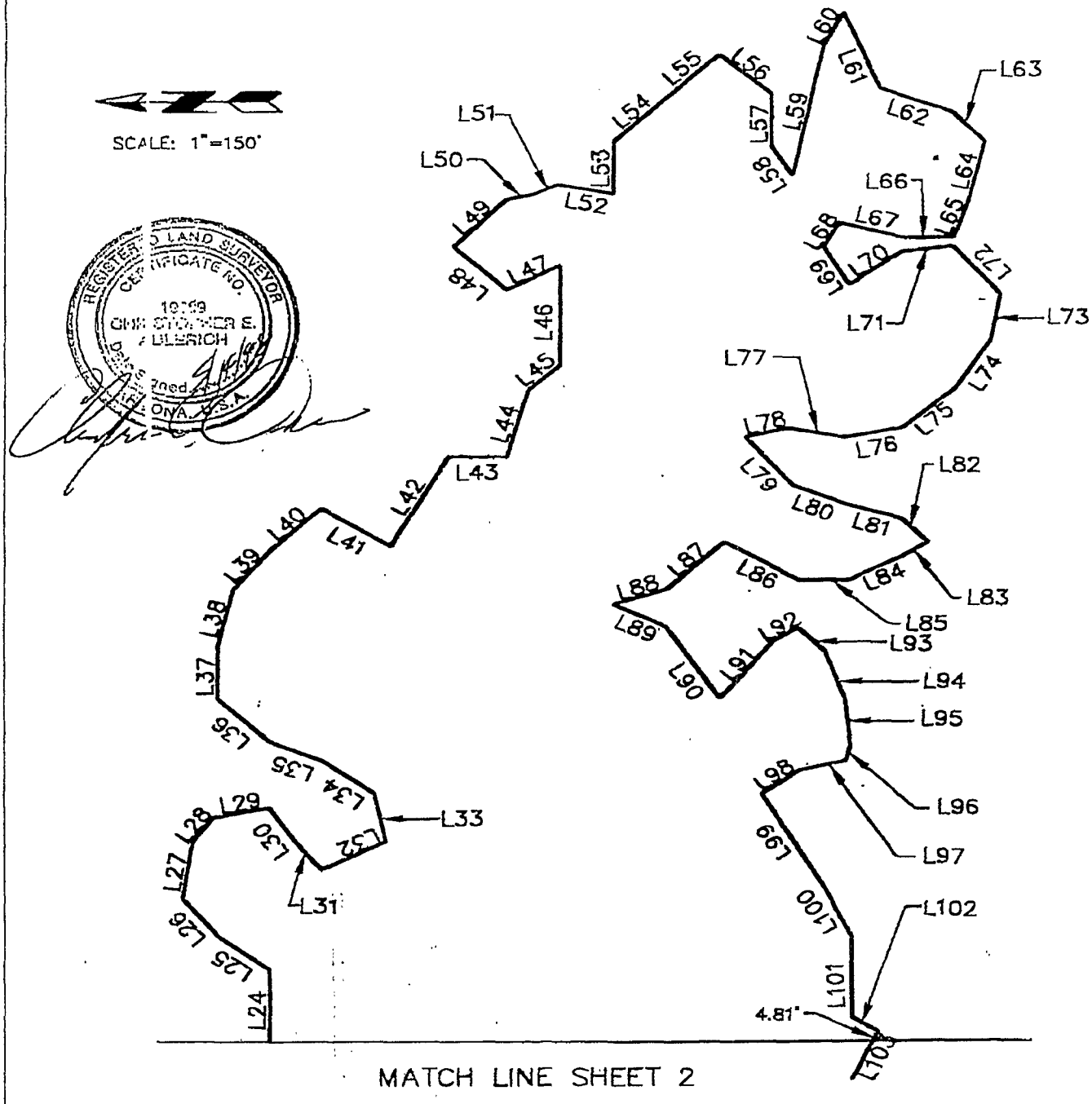
PAGE 6 OF 7 PAGES

PROJECT: SOUTH DESERT VILLAGE VEMUR DATE: 5-12-98

SCALE: 1"=150'



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Tempe, Arizona 85283
Phone (602) 839-4000 Fax (602) 345-9259

PROJECT: SOUTH DESERT VILLAGE VEMUR DATE: 5-12-98

LINE#	DIRECTION	DIST
L1	N 00°34'10" E	50.00'
L2	N 42°33'24" E	67.27'
L3	N 76°32'00" E	20.62'
L4	N 04°37'30" W	55.23'
L5	N 70°00'48" E	42.72'
L6	N 42°33'24" E	67.27'
L7	N 39°14'10" W	78.10'
L8	N 13°28'00" W	41.23'
L9	N 64°00'16" E	11.18'
L10	N 74°37'27" E	72.80'
L11	S 34°25'21" E	61.03'
L12	S 89°25'50" E	55.00'
L13	S 53°24'11" E	68.01'
L14	N 67°22'15" E	38.08'
L15	N 45°34'10" E	35.36'
L16	N 00°34'10" E	25.00'
L17	N 38°08'17" E	82.01'
L18	S 67°37'45" E	26.93'
L19	S 86°11'09" E	75.17'
L20	S 44°25'50" E	70.71'
L21	S 79°58'06" E	60.83'
L22	N 39°13'45" E	64.03'
L23	S 57°49'23" E	76.32'
L24	S 89°25'50" E	75.00'
L25	N 35°33'41" E	61.03'
L26	N 49°23'01" E	53.15'
L27	S 79°58'06" E	60.83'
L28	S 50°46'15" E	32.02'
L29	S 09°44'07" E	55.90'
L30	S 55°01'54" W	43.01'
L31	S 50°45'50" W	39.05'
L32	S 25°59'44" E	67.08'
L33	N 79°15'34" E	50.99'
L34	N 35°33'41" E	61.03'
L35	N 22°22'15" E	53.85'
L36	N 42°33'24" E	67.27'
L37	S 89°25'50" E	55.00'
L38	S 75°23'40" E	61.85'
L39	S 48°14'41" E	53.15'
L40	S 41°25'04" E	67.27'
L41	S 32°10'37" W	76.32'
L42	S 59°11'43" E	109.77'
L43	S 00°34'10" W	55.00'
L44	S 73°19'07" E	72.80'
L45	S 39°14'10" E	39.05'
L46	S 89°25'50" E	105.00'
L47	N 25°59'44" W	55.90'
L48	N 42°33'24" E	67.27'
L49	S 44°25'50" E	70.71'
L50	S 10°44'26" E	25.50'
L51	S 21°13'55" E	26.93'
L52	S 11°52'46" W	50.99'

LINE#	DIRECTION	DIST
L53	S 89°25'50" E	55.00'
L54	S 41°25'04" E	67.27'
L55	S 41°25'04" E	67.27'
L56	S 39°13'45" W	64.03'
L57	N 89°25'50" W	55.00'
L58	S 56°52'46" W	36.06'
L59	S 76°54'06" E	138.29'
L60	S 59°41'08" E	40.31'
L61	S 66°56'24" W	87.32'
L62	S 20°13'24" W	74.33'
L63	S 45°34'10" W	42.43'
L64	N 75°23'40" W	61.85'
L65	N 68°52'28" W	42.72'
L66	N 00°34'10" E	50.00'
L67	N 14°36'20" E	61.85'
L68	N 58°28'00" W	29.15'
L69	S 58°33'51" W	47.17'
L70	S 34°25'21" E	61.03'
L71	S 05°08'28" E	50.25'
L72	S 48°34'56" W	67.27'
L73	N 78°07'14" W	50.99'
L74	N 54°26'19" W	61.03'
L75	N 38°05'25" W	64.03'
L76	N 09°44'07" W	55.90'
L77	N 10°52'27" E	55.90'
L78	N 13°28'00" W	41.23'
L79	S 48°34'56" W	67.27'
L80	S 22°22'15" W	53.85'
L81	S 15°49'28" W	57.01'
L82	S 45°34'10" W	35.36'
L83	N 30°23'40" W	29.15'
L84	N 25°59'44" W	55.90'
L85	N 00°34'10" E	50.00'
L86	N 30°18'52" E	80.62'
L87	N 41°42'15" W	74.33'
L88	N 16°07'47" W	52.20'
L89	S 27°08'04" W	55.90'
L90	S 56°52'46" W	90.14'
L91	S 49°37'30" E	78.10'
L92	S 30°23'40" E	29.15'
L93	S 45°34'10" W	35.36'
L94	S 68°46'05" W	53.85'
L95	S 84°51'32" W	50.25'
L96	N 70°59'44" W	15.81'
L97	N 11°57'34" W	46.10'
L98	N 34°58'06" W	43.01'
L99	S 59°36'20" W	116.62'
L100	S 64°00'16" W	55.90'
L101	N 89°25'50" W	85.00'
L102	S 31°32'00" W	29.15'
L103	N 62°51'56" W	55.90'
L104	N 16°07'47" W	52.20'

LINE#	DIRECTION	DIST
L105	S 68°46'05" W	53.85'
L106	S 85°48'21" W	60.21'
L107	N 89°25'50" W	100.00'
L108	N 62°51'56" W	55.90'
L109	S 64°00'16" W	55.90'
L110	N 89°25'50" W	100.00'
L111	N 58°28'00" W	58.31'
L112	N 45°34'10" E	63.64'
L113	S 47°47'49" E	60.21'
L114	N 00°34'10" E	165.00'
L115	S 22°22'15" W	107.70'
L116	S 82°58'29" W	75.66'
L117	S 39°13'45" W	64.03'
L118	N 44°25'50" W	84.85'
L119	N 62°51'56" W	55.90'
L120	N 30°23'40" W	87.46'

REGISTERED LAND SURVEYOR
CERTIFICATE NO.
19309
CHRISTOPHER E.
AULERICH
Date Signed 5/14/98
ARIZONA, U.S.A.

ATTACHMENT B

REQUIRED TEXT FOR SOUTH DESERT VILLAGE PROTECTIVE CAP SIGNAGE

Open Area Posted Metal Sign

Notice
The open play area beyond this sign is covered by a protective soil cap. Do not dig or disturb the soil without permission from the Arizona State University Director of Administrative Services.

Metal Sign Mounted on Affected Area Houses at Service Entrance

Notice
The surrounding soil, driveway, paved parking structure, road, sidewalk, foundation, slab, and concrete patio of this dwelling is part of a protective cap. Do not disturb any part of the cap without approval from the Arizona State University Director of Administrative Services.

ATTACHMENT C

SOUTH DESERT VILLAGE TENANT AND EXCAVATION AWARENESS BOOKLETS

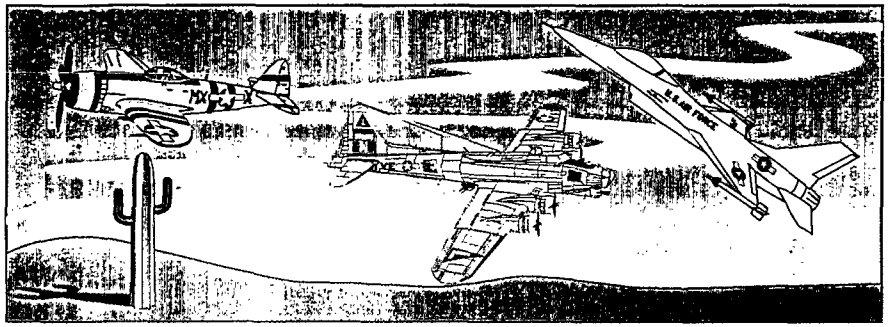
Arizona State University East Campus

South Desert Village

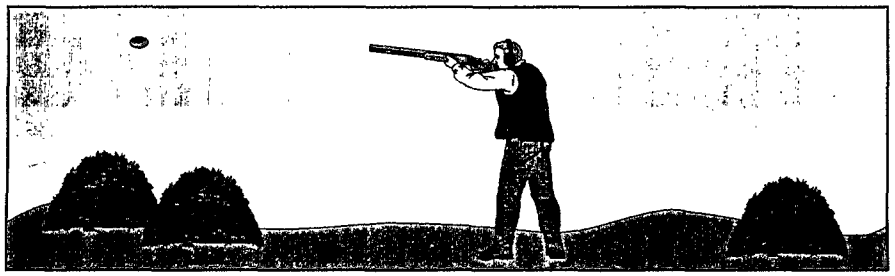
Tenant Protective Cap Awareness

409877 01 00.90.60 B1

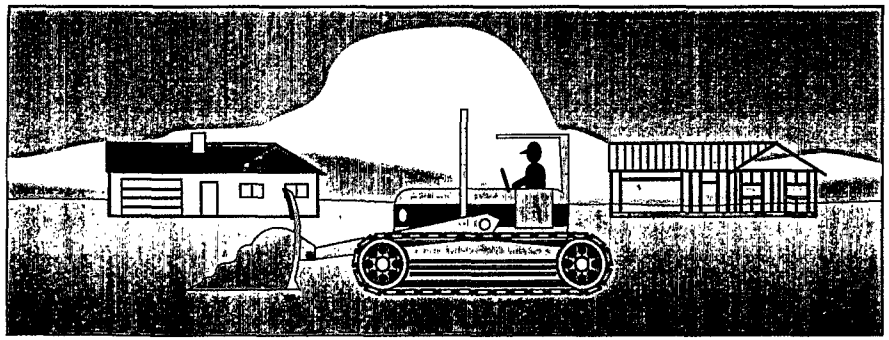
South Desert Village History



South Desert Village is located at the former Williams Air Force Base, used to train more than 26,500 U.S. Air Force pilots from 1941 to 1993.

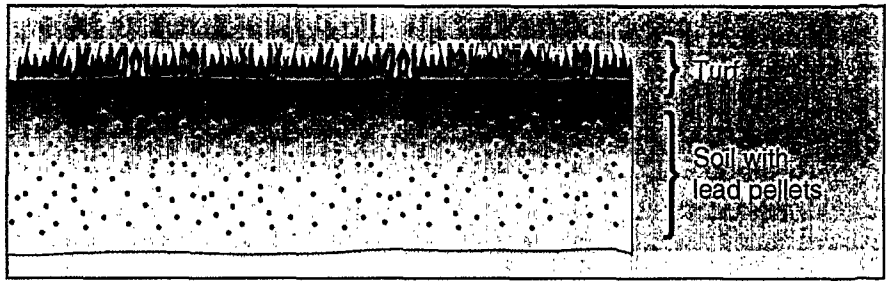


South Desert Village is located on the site of the former Williams Air Force Base skeet range. Because of this, much of the soil is contaminated with lead pellets the size of a pinhead.

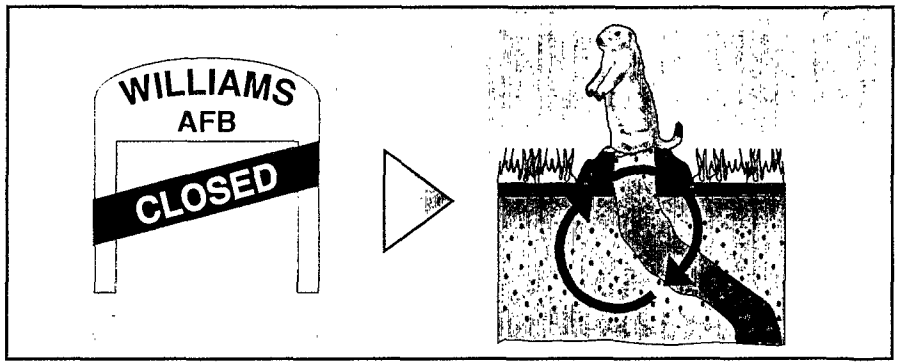


In 1950, South Desert Village was constructed over the site of the former skeet range. The lead pellets became mixed with the topsoil.

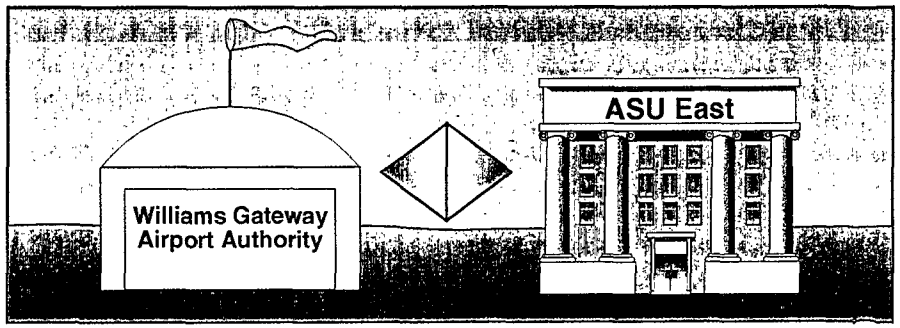
South Desert Village History



Air Force residents were protected by lawns, sidewalks, and roads. Digging was discouraged.



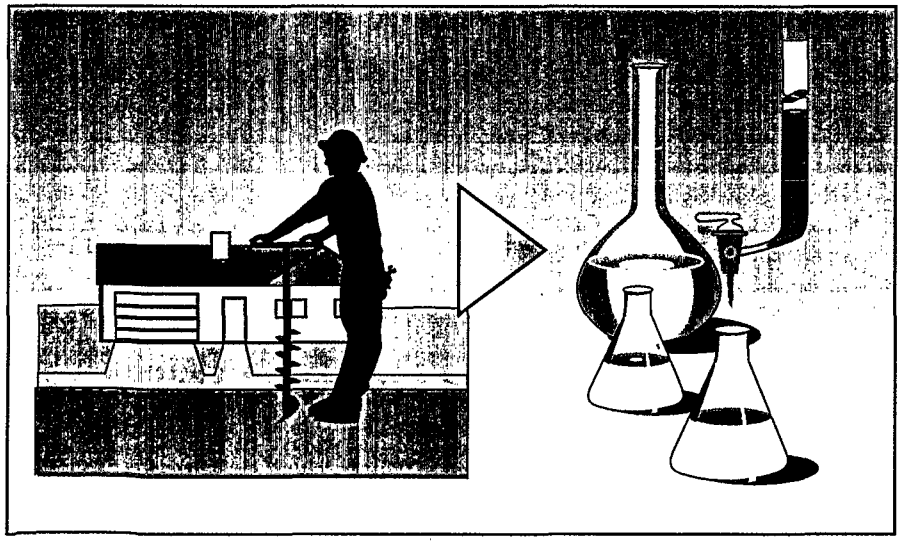
When the base was closed in 1993, the lawns died, and burrowing rodents brought lead pellets to the surface.



When the base was closed, the Williams Redevelopment Partnership was formed to develop new uses for the base. Arizona State University East became a major entitity in the reuse plan.

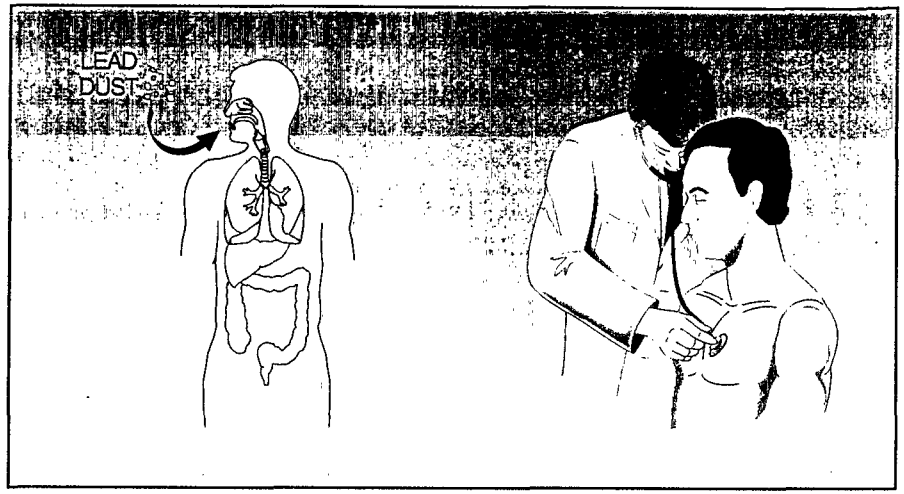
South Desert Village History

ASU East planned to use South Desert Village for student and faculty housing.



In 1995 and 1996, the Air Force collected many soil samples at South Desert Village. Sample results showed how much lead there was. ASU East plans were put on hold.

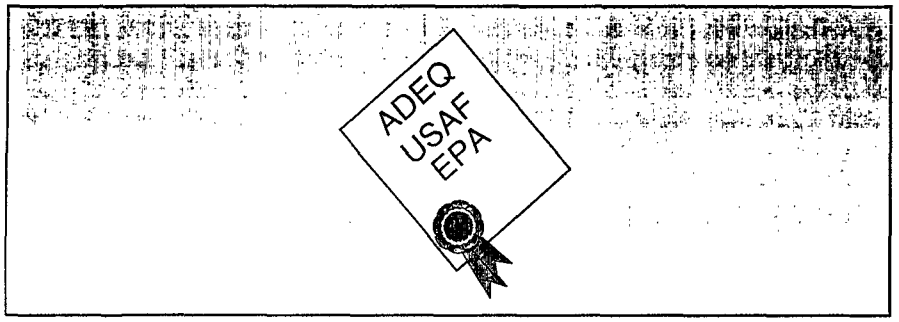
Health Effects



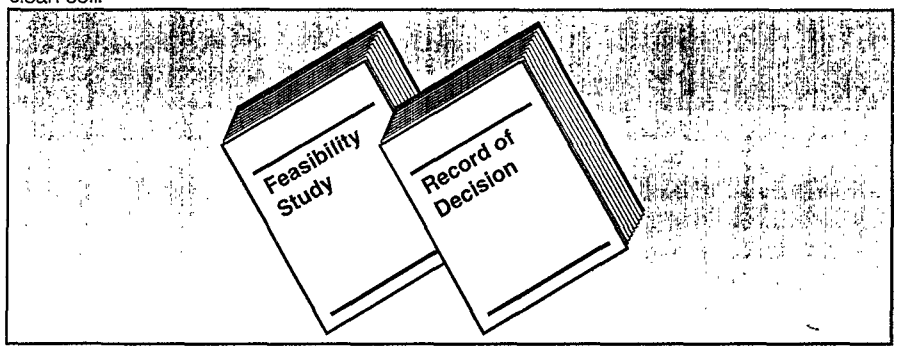
Lead is a metal that can accumulate in the body and cause health problems such as nervous system damage, anemia, stomach pain, hypertension, and kidney damage. The two ways that lead in soil can enter the body are breathing soil dust into the lungs or swallowing the soil.

Use of a barrier is an accepted way to keep lead in the soil from being inhaled or eaten. This is called breaking the exposure pathway.

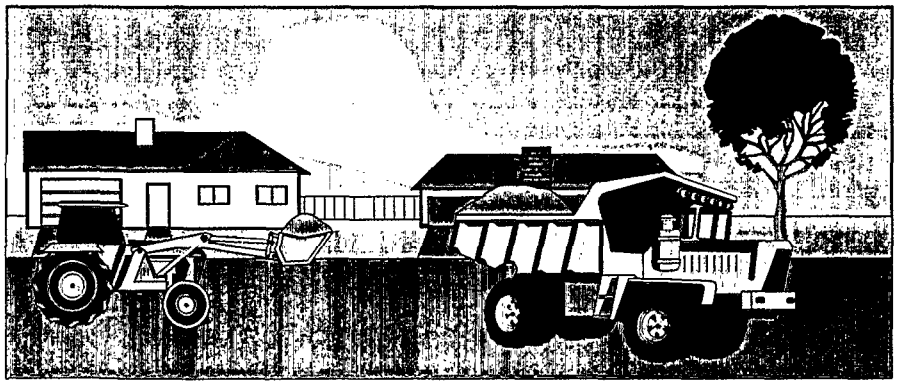
South Desert Village Residence Protection



An agreement between the Air Force, U.S. Environmental Protection Agency, and the State of Arizona Department of Environmental Quality was signed in 1997. It required that the top 6 inches of soil in contaminated areas be removed and replaced with a protective cap of clean soil.

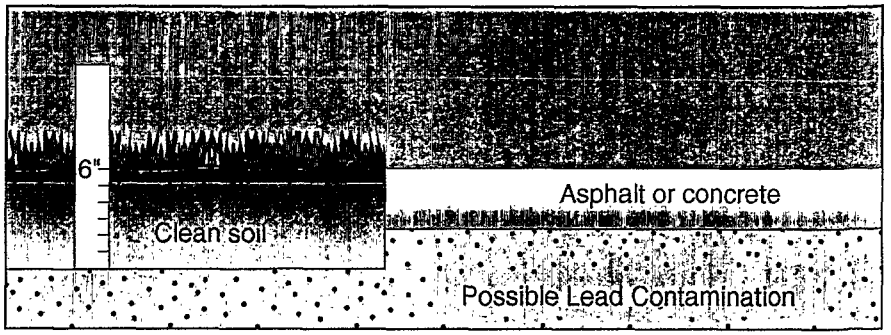


The 6-inch protective cap was included in site cleanup plans and documents.



In 1998, the top 6 inches of soil were removed and replaced with clean soil within the affected area of the South Desert Village. **As long as this protective cap is in place, the risk to human health from the lead in the soil is eliminated.**

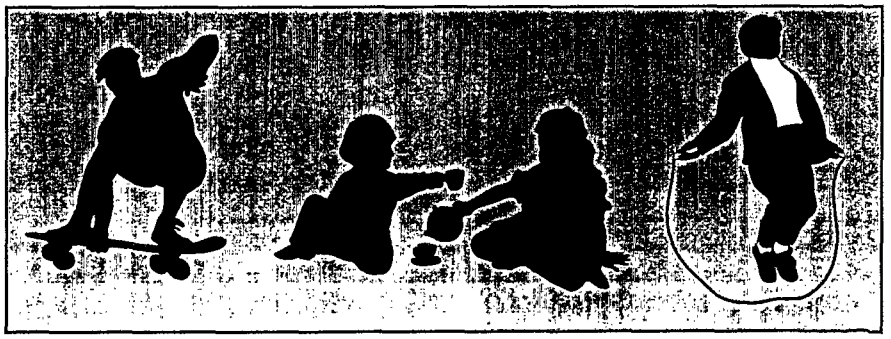
South Desert Village Residence Protection



Because lead contamination still exists in the affected area beneath roads, sidewalks, and in the soil at depths of greater than 6 inches, those living in the affected area of the South Desert Village are required to observe rules to reduce frequent and repeated contact with the soil (the foldout map shows where the lead may still be present.) **The general requirement is to not disturb the protective soil cap and to promptly report any soil disturbance.**

Some restrictions for residents of the affected area of the South Desert Village are:

Surface play is allowed in the affected area of the South Desert Village:

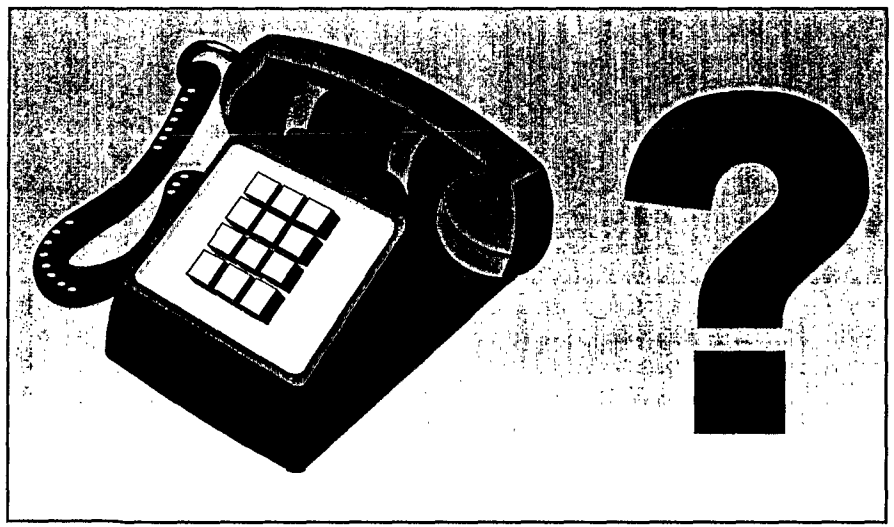


What If..?

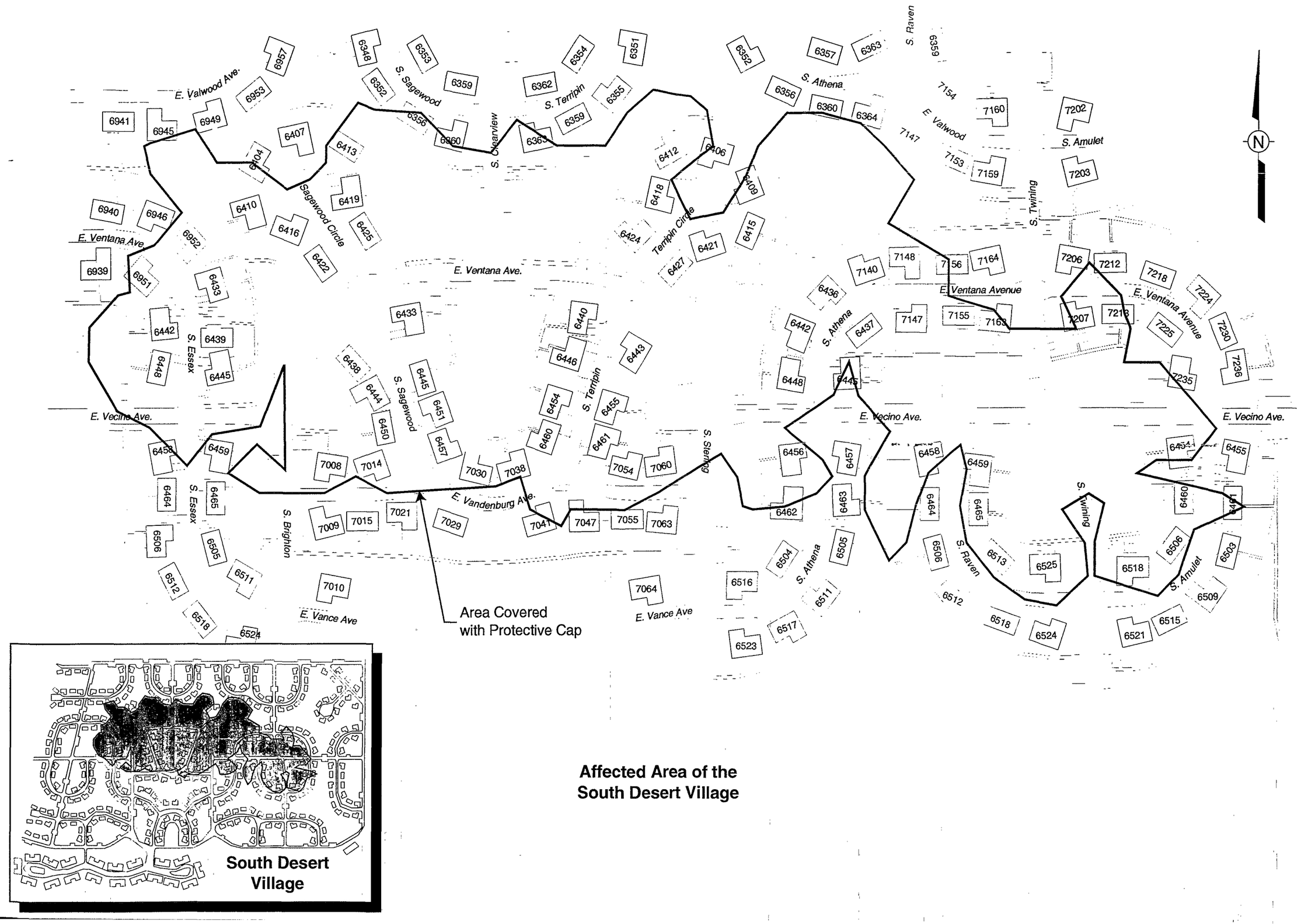
These items may be found in the soil:

Lead pellets
(the size of a pinhead)
- Do not touch!
- Contact landlord if found

Clay target pieces
(the size of a quarter)
- These are harmless



If you notice any accidental, intentional, or other disturbance of the protective cap, or if you have any questions, please call the ASU Housing Office.



Affected Area of the South Desert Village

UNSCANNABLE MEDIA

See Document # 75131
for scanned image(s) of the media document(s) label(s).

To use the unscannable media document(s),
contact the Superfund Records Center.

ATTACHMENT D

REQUIRED FORMS

List of Forms

South Desert Village Signage Inspection—3 pages
South Desert Village Protective Cap Inspection—8 pages
South Desert Village Tenant Agreement of Understanding—Signature Form
South Desert Village Excavator Agreement of Understanding—Signature Form
South Desert Village Predisturbance and Postdisturbance Inspection
South Desert Village Protective Cap Penetration Work Plan—3 pages

South Desert Village
Signage Inspection

Date:	Time:	Inspected by:
Open Areas	Condition	Comments
S. Twining & E. Vecino (NE corner)	☐ Good ☐ Fair ☐ Poor	
S. Twining & E. Vecino (NW corner)	☐ Good ☐ Fair ☐ Poor	
S. Twining & E. Vecino (SE corner)	☐ Good ☐ Fair ☐ Poor	
S. Twining & E. Vecino (SW corner)	☐ Good ☐ Fair ☐ Poor	
S of E. Vecino between S. Athena and S. Raven	☐ Good ☐ Fair ☐ Poor	
E. Vecino & S. Sterling (SE corner)	☐ Good ☐ Fair ☐ Poor	
E. Vecino & S. Sterling (W of corner)	☐ Good ☐ Fair ☐ Poor	
E. Ventana between Terripin Cir. & E. Vecino (NE of road [close])	☐ Good ☐ Fair ☐ Poor	
E. Ventana between Terripin Cir. & E. Vecino (NE of road [distant])	☐ Good ☐ Fair ☐ Poor	
E. Ventana & S. Clearview (S of corner)	☐ Good ☐ Fair ☐ Poor	
S. Clearview between E. Ventana & S. Terripin (E of road)	☐ Good ☐ Fair ☐ Poor	
S. Clearview between E. Ventana & S. Terripin (W of road)	☐ Good ☐ Fair ☐ Poor	
E. Vecino & S. Brighton (E of corner)	☐ Good ☐ Fair ☐ Poor	
E. Ventana between E. Vecino & Sagewood Cir. (W of road [close])	☐ Good ☐ Fair ☐ Poor	
E. Ventana between E. Vecino & Sagewood Cir. (W of road [distant])	☐ Good ☐ Fair ☐ Poor	
E. Vecino between S. Edgewater & S. Essex (N of road)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Signage Inspection (Continued)

Date:	Time:	Inspected by:	
House	Condition	House	Condition
6945 E. Valwood	☐ Good ☐ Fair ☐ Poor	7014 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6949 E. Valwood	☐ Good ☐ Fair ☐ Poor	6450 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6356 S. Sagewood	☐ Good ☐ Fair ☐ Poor	6444 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6360 S. Sagewood	☐ Good ☐ Fair ☐ Poor	6438 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6425 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	6433 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6419 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	6445 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6413 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	6451 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6404 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	6457 S. Sagewood	☐ Good ☐ Fair ☐ Poor
6410 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	7030 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6416 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	7038 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6422 Sagewood Cir.	☐ Good ☐ Fair ☐ Poor	7041 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6445 S. Essex	☐ Good ☐ Fair ☐ Poor	7047 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6439 S. Essex	☐ Good ☐ Fair ☐ Poor	7055 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6433 S. Essex	☐ Good ☐ Fair ☐ Poor	7060 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6952 E. Ventana	☐ Good ☐ Fair ☐ Poor	7054 E. Vandenburg	☐ Good ☐ Fair ☐ Poor
6946 E. Ventana	☐ Good ☐ Fair ☐ Poor	6461 S. Terripin	☐ Good ☐ Fair ☐ Poor
6951 E. Ventana	☐ Good ☐ Fair ☐ Poor	6455 S. Terripin	☐ Good ☐ Fair ☐ Poor
6442 S. Essex	☐ Good ☐ Fair ☐ Poor	6443 S. Terripin	☐ Good ☐ Fair ☐ Poor
6448 S. Essex	☐ Good ☐ Fair ☐ Poor	6424 Terripin Cir.	☐ Good ☐ Fair ☐ Poor
6458 S. Essex	☐ Good ☐ Fair ☐ Poor	6418 Terripin Cir.	☐ Good ☐ Fair ☐ Poor
6459 S. Essex	☐ Good ☐ Fair ☐ Poor	6412 Terripin Cir.	☐ Good ☐ Fair ☐ Poor
7008 E. Vandenburg	☐ Good ☐ Fair ☐ Poor	6406 Terripin Cir.	☐ Good ☐ Fair ☐ Poor

South Desert Village
Signage Inspection (Continued)

House	Condition	House	Condition
6409 Terripin Cir.	☐ Good ☐ Fair ☐ Poor	6464 S. Raven	☐ Good ☐ Fair ☐ Poor
6415 Terripin Cir.	☐ Good ☐ Fair ☐ Poor	6465 S. Raven	☐ Good ☐ Fair ☐ Poor
6421 Terripin Cir.	☐ Good ☐ Fair ☐ Poor	6513 S. Raven	☐ Good ☐ Fair ☐ Poor
6427 Terripin Cir.	☐ Good ☐ Fair ☐ Poor	6525 S. Raven	☐ Good ☐ Fair ☐ Poor
6440 S. Terripin	☐ Good ☐ Fair ☐ Poor	6518 S. Amulet	☐ Good ☐ Fair ☐ Poor
6446 S. Terripin	☐ Good ☐ Fair ☐ Poor	6506 S. Amulet	☐ Good ☐ Fair ☐ Poor
6454 S. Terripin	☐ Good ☐ Fair ☐ Poor	6461 S. Amulet	☐ Good ☐ Fair ☐ Poor
6460 S. Terripin	☐ Good ☐ Fair ☐ Poor	6454 S. Amulet	☐ Good ☐ Fair ☐ Poor
6456 S. Athena	☐ Good ☐ Fair ☐ Poor	7235 E. Ventana	☐ Good ☐ Fair ☐ Poor
6462 S. Athena	☐ Good ☐ Fair ☐ Poor	7213 E. Ventana	☐ Good ☐ Fair ☐ Poor
6448 S. Athena	☐ Good ☐ Fair ☐ Poor	7212 E. Ventana	☐ Good ☐ Fair ☐ Poor
6442 S. Athena	☐ Good ☐ Fair ☐ Poor	7206 E. Ventana	☐ Good ☐ Fair ☐ Poor
6436 S. Athena	☐ Good ☐ Fair ☐ Poor	7207 E. Ventana	☐ Good ☐ Fair ☐ Poor
7140 E. Ventana	☐ Good ☐ Fair ☐ Poor	6364 S. Athena	☐ Good ☐ Fair ☐ Poor
7148 E. Ventana	☐ Good ☐ Fair ☐ Poor	6360 S. Athena	☐ Good ☐ Fair ☐ Poor
7156 E. Ventana	☐ Good ☐ Fair ☐ Poor	6456 S. Athena	☐ Good ☐ Fair ☐ Poor
7163 E. Ventana	☐ Good ☐ Fair ☐ Poor	6355 S. Terripin	☐ Good ☐ Fair ☐ Poor
7155 E. Ventana	☐ Good ☐ Fair ☐ Poor	6363 S. Terripin	☐ Good ☐ Fair ☐ Poor
7147 E. Ventana	☐ Good ☐ Fair ☐ Poor		
6437 S. Athena	☐ Good ☐ Fair ☐ Poor		
6445 S. Athena	☐ Good ☐ Fair ☐ Poor		
6458 S. Raven	☐ Good ☐ Fair ☐ Poor		
6459 S. Raven	☐ Good ☐ Fair ☐ Poor		

South Desert Village
Protective Cap Inspection

Date:	Time:	Inspected by:
Open Areas	Condition	Comments
S. Twining & E. Vecino (NE corner)	☐ Good ☐ Fair ☐ Poor	
S. Twining & E. Vecino (NW corner)	☐ Good ☐ Fair ☐ Poor	
S. Twining & E. Vecino (SE corner)	☐ Good ☐ Fair ☐ Poor	
S. Twining & E. Vecino (SW corner)	☐ Good ☐ Fair ☐ Poor	
S of E. Vecino between S. Athena and S. Raven	☐ Good ☐ Fair ☐ Poor	
E. Vecino & S. Sterling (SE corner)	☐ Good ☐ Fair ☐ Poor	
E. Vecino & S. Sterling (W of corner)	☐ Good ☐ Fair ☐ Poor	
E. Ventana between Terripin Cir. and E. Vecino (NE of road [close])	☐ Good ☐ Fair ☐ Poor	
E. Ventana between Terripin Cir. and E. Vecino (NE of road [distant])	☐ Good ☐ Fair ☐ Poor	
E. Ventana & S. Clearview (S of corner)	☐ Good ☐ Fair ☐ Poor	
S. Clearview between E. Ventana & S. Terripin (E of road)	☐ Good ☐ Fair ☐ Poor	
S. Clearview between E. Ventana & S. Terripin (W of road)	☐ Good ☐ Fair ☐ Poor	
E. Vecino & S. Brighton (E of corner)	☐ Good ☐ Fair ☐ Poor	
E. Ventana between E. Vecino & Sagewood Cir. (W of road [close])	☐ Good ☐ Fair ☐ Poor	
E. Ventana between E. Vecino & Sagewood Cir. (W of road [distant])	☐ Good ☐ Fair ☐ Poor	
E. Vecino between S. Edgewater & S. Essex (N of road)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Date:	Time:	Inspected by:
Houses	Condition	Comments
6945 E. Valwood (back only)	☐ Good ☐ Fair ☐ Poor	
6949 E. Valwood (back only)	☐ Good ☐ Fair ☐ Poor	
6356 S. Sagewood (back only)	☐ Good ☐ Fair ☐ Poor	
6360 S. Sagewood (back only)	☐ Good ☐ Fair ☐ Poor	
6425 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6425 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6419 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6419 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6413 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6413 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6404 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6404 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6410 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6410 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6416 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6416 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6422 Sagewood Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6422 Sagewood Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6445 S. Essex (front)	☐ Good ☐ Fair ☐ Poor	
6445 S. Essex (back)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Houses	Condition	Comments
6439 S. Essex (front)	☐ Good ☐ Fair ☐ Poor	
6439 S. Essex (back)	☐ Good ☐ Fair ☐ Poor	
6433 S. Essex (front)	☐ Good ☐ Fair ☐ Poor	
6433 S. Essex (back)	☐ Good ☐ Fair ☐ Poor	
6952 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
6952 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
6946 E. Ventana (front only)	☐ Good ☐ Fair ☐ Poor	
6951 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
6951 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
6442 S. Essex (front)	☐ Good ☐ Fair ☐ Poor	
6442 S. Essex (back)	☐ Good ☐ Fair ☐ Poor	
6448 S. Essex (front)	☐ Good ☐ Fair ☐ Poor	
6448 S. Essex (back)	☐ Good ☐ Fair ☐ Poor	
6458 S. Essex (front only)	☐ Good ☐ Fair ☐ Poor	
6459 S. Essex (front)	☐ Good ☐ Fair ☐ Poor	
6459 S. Essex (back)	☐ Good ☐ Fair ☐ Poor	
7008 E. Vandenburg (front)	☐ Good ☐ Fair ☐ Poor	
7008 E. Vandenburg (back)	☐ Good ☐ Fair ☐ Poor	
7014 E. Vandenburg (front)	☐ Good ☐ Fair ☐ Poor	
7014 E. Vandenburg (back)	☐ Good ☐ Fair ☐ Poor	
6450 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	
6450 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
6444 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	
6444 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
6438 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Houses	Condition	Comments
6438 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
6433 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	
6433 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
6445 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	
6445 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
6451 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	
6451 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
6457 S. Sagewood (front)	☐ Good ☐ Fair ☐ Poor	
6457 S. Sagewood (back)	☐ Good ☐ Fair ☐ Poor	
7030 E. Vandenburg (front)	☐ Good ☐ Fair ☐ Poor	
7030 E. Vandenburg (back)	☐ Good ☐ Fair ☐ Poor	
7038 E. Vandenburg (front)	☐ Good ☐ Fair ☐ Poor	
7038 E. Vandenburg (back)	☐ Good ☐ Fair ☐ Poor	
7041 E. Vandenburg (front only)	☐ Good ☐ Fair ☐ Poor	
7047 E. Vandenburg (front only)	☐ Good ☐ Fair ☐ Poor	
7055 E. Vandenburg (front only)	☐ Good ☐ Fair ☐ Poor	
7060 E. Vandenburg (front)	☐ Good ☐ Fair ☐ Poor	
7060 E. Vandenburg (back)	☐ Good ☐ Fair ☐ Poor	
7054 E. Vandenburg (front)	☐ Good ☐ Fair ☐ Poor	
7054 E. Vandenburg (back)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Houses	Condition	Comments
6461 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	
6461 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6455 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	
6455 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6443 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	
6443 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6424 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6424 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6418 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6418 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6412 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6412 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6406 Terripin Cir. (front only)	☐ Good ☐ Fair ☐ Poor	
6409 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6409 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6415 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6415 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6421 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6421 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6427 Terripin Cir. (front)	☐ Good ☐ Fair ☐ Poor	
6427 Terripin Cir. (back)	☐ Good ☐ Fair ☐ Poor	
6440 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Houses	Condition	Comments
6440 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6446 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	
6446 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6454 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	
6454 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6460 S. Terripin (front)	☐ Good ☐ Fair ☐ Poor	
6460 S. Terripin (back)	☐ Good ☐ Fair ☐ Poor	
6456 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6456 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	
6462 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6462 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	
6448 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6448 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	
6442 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6442 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	
6436 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6436 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	
7140 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
7140 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
7148 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
7148 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
7156 E. Ventana (front only)	☐ Good ☐ Fair ☐ Poor	
7163 E. Ventana (back only)	☐ Good ☐ Fair ☐ Poor	
7155 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
7155 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
7147 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
7147 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
6437 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6437 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Houses	Condition	Comments
6445 S. Athena (front)	☐ Good ☐ Fair ☐ Poor	
6445 S. Athena (back)	☐ Good ☐ Fair ☐ Poor	
6458 S. Raven (front)	☐ Good ☐ Fair ☐ Poor	
6458 S. Raven (back)	☐ Good ☐ Fair ☐ Poor	
6459 S. Raven (front)	☐ Good ☐ Fair ☐ Poor	
6459 S. Raven (back)	☐ Good ☐ Fair ☐ Poor	
6464 S. Raven (back only)	☐ Good ☐ Fair ☐ Poor	
6465 S. Raven (front)	☐ Good ☐ Fair ☐ Poor	
6465 S. Raven (back)	☐ Good ☐ Fair ☐ Poor	
6513 S. Raven (front)	☐ Good ☐ Fair ☐ Poor	
6513 S. Raven (back)	☐ Good ☐ Fair ☐ Poor	
6525 S. Raven (front)	☐ Good ☐ Fair ☐ Poor	
6525 S. Raven (back)	☐ Good ☐ Fair ☐ Poor	
6518 S. Amulet (front)	☐ Good ☐ Fair ☐ Poor	
6518 S. Amulet (back)	☐ Good ☐ Fair ☐ Poor	
6506 S. Amulet (front)	☐ Good ☐ Fair ☐ Poor	
6506 S. Amulet (back)	☐ Good ☐ Fair ☐ Poor	
6460 S. Amulet (front)	☐ Good ☐ Fair ☐ Poor	
6460 S. Amulet (back)	☐ Good ☐ Fair ☐ Poor	
6461 S. Amulet (front only)	☐ Good ☐ Fair ☐ Poor	
6454 S. Amulet (front)	☐ Good ☐ Fair ☐ Poor	
6454 S. Amulet (back)	☐ Good ☐ Fair ☐ Poor	
7235 E. Ventana (back only)	☐ Good ☐ Fair ☐ Poor	
7213 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	
7213 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
7212 E. Ventana (front only)	☐ Good ☐ Fair ☐ Poor	
7206 E. Ventana (front only)	☐ Good ☐ Fair ☐ Poor	
7207 E. Ventana (front)	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Inspection (Continued)

Houses	Condition	Comments
7207 E. Ventana (back)	☐ Good ☐ Fair ☐ Poor	
6364 S. Athena (back only)	☐ Good ☐ Fair ☐ Poor	
6360 S. Athena (back only)	☐ Good ☐ Fair ☐ Poor	
6356 S. Athena (back only)	☐ Good ☐ Fair ☐ Poor	
6355 S. Terripin (back only)	☐ Good ☐ Fair ☐ Poor	
6363 S. Terripin (back only)	☐ Good ☐ Fair ☐ Poor	

South Desert Village

Tenant Agreement of Understanding

I hereby acknowledge, by my signature below, that I have received a briefing about the presence of lead shot beneath the protective cap in the vicinity of this rental house in the South Desert Village. I understand that I have certain responsibilities to not disturb the protective cap, to promptly report any disturbances of the soil, and to abide by restrictions designed to protect the cap. All my questions about the purpose and location of the cap have been answered.

Name	Rental House #	Date
Witnessed by:		

Excavator Agreement of Understanding
About Maintaining the Protective Cap at the South Desert Village

I hereby acknowledge, by my signature below, that I have received a briefing about the presence of lead shot beneath the protective cap in the South Desert Village. I understand that I have certain responsibilities to maintain the protective cap, and I will abide by restrictions designed to protect the cap. All my questions about the purpose and location of the cap have been answered.

Name	Affiliation/Title	Date
Witnessed by:		

South Desert Village
Predisturbance and Postdisturbance Inspection

Predisturbance Inspection		
Date:	Time:	Inspected by:
Location	Condition	Comments
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	

Postdisturbance Inspection		
Date:	Time:	Inspected by:
Location	Condition	Comments
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	
	☐ Good ☐ Fair ☐ Poor	

South Desert Village
Protective Cap Penetration Work Plan

SUBMIT TO: ASU EAST, DIRECTOR OF ADMINISTRATIVE SERVICES

1. Description of proposed activity (e.g., trenching, plowing, etc.):
2. Location of proposed activity (e.g., description referencing nearby streets and house numbers, sketch map, or reference an attached map):
3. Dimensions of area(s) to be excavated (width x length x depth):
4. Estimated volume of clean soil to be excavated:
5. Estimated volume of contaminated soil to be excavated:

South Desert Village
Protective Cap Penetration Work Plan (Continued)

6. Proposed method(s) of excavation, backfill, and site cleanup:
7. Source of backfill material:
8. Proposed fugitive dust control methods:
9. Proposed method(s) of clean and contaminated on-site soil storage (including location and description of proposed stockpiling areas):
10. Proposed method of waste soil characterization (e.g., soil sampling and TCLP analysis):
11. Proposed method of contaminated soil transport and disposal:
12. Proposed method(s) of personnel and equipment decontamination:

South Desert Village
Protective Cap Penetration Work Plan (Continued)

13. Health and safety plan details, or reference attached H&S plan:		
14. Sketch of post-construction installation (submit to ASU East, Director of Administrative Services):		
Requested by:	Agency:	Phone:
Approved by:	Agency:	Phone: