Final Report
Phase I RCRA Facility Investigation for Appendix I Sites
VOLUME II-A
SWMU-14, Sludge Drying Beds

Department of the Air Force
Oklahoma City Air Logistics Center
Tinker Air Force Base, Oklahoma

September 1994

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RFI REPORT

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List of Acronyms

AFB	Air Force Base
AOC	areas of concern
°C	degrees centigrade
CAL	Corrective Action Levels
CDM	CDM Federal Programs Corporation
CEC	cation exchange capacity
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
cm/s	centimeters per second
COD	chemical oxygen demand
CMS	Corrective Measures Study
DCQAP	Data Collection Quality Assurance Plan
DERP	Defense Environmental Response Program
DOD	U.S. Department of Defense
DQO	Data Quality Objective
DWS	drinking water standards
EC	electric conductivity
ECD	ethylene chloride
EID	Engineering Installation Division
EPA	U.S. Environmental Protection Agency
ES	Engineering Science
FID	flame ionization detectors
ft/ft	foot per foot
FTMA	Fuel Truck Maintenance Area
GC/MS	gas chromatograph/mass spectrometry
HCl	hydrochloric acid
HRS	Hazardous Ranking System
HSWA	Hazardous and Solid Waste Amendments
I.D.	inside diameter
IRP	Installation Restoration Program
IWP-1	Industrial Waste Pit No. 1
IWTP	industrial wastewater treatment plant
JP-4	jet propulsion fuel grade 4
LSZ	lower saturated zone

List of Acronyms *(Continued)*

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
MCL	maximum contaminant level
mg/kg	milligrams per kilogram
mg/L	milligrams per liter
MS	matrix spike
MSD	matrix spike duplicate
msl	mean sea level
NAAQS	National Ambient Air Quality Standards
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NPL	National Priorities List
O.D.	outside diameter
PA/SI	preliminary assessment/site investigation
PCE	tetrachloroethene
PID	photoionization detectors
PVC	polyvinyl chloride
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFI	RCRA Facility Investigation
RI/FS	remedial investigation/feasibility study
ROD	Record of Decision
RPD	relative percent difference
SARA	Superfund Amendments and Reauthorization Act
SDB	Sludge Drying Beds
SP	self potential
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCA	trichloroethane
TCE	trichloroethene
TPH	total petroleum hydrocarbons
TSD	treatment, storage, and disposal (facility)
TOC	total organic carbon
TPH	total petroleum hydrocarbons
USACE	U.S. Army Corps of Engineers

List of Acronyms *(Continued)*

USC	U.S. Code
USDA	U.S. Department of Agriculture
USGS	U.S. Geological Survey
USZ	upper saturated zone
VOA	volatile organic analysis
VOC	volatile organic compounds
WQS	Water Quality Standards

Executive Summary

This report provides a summary of the Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) conducted at solid waste management unit (SWMU)-14, Sludge Drying Beds, Tinker Air Force Base (AFB), Oklahoma. The report has been prepared to determine whether hazardous constituents as defined by federal regulations have been released into the environment from the SWMU. The RFI for this unit has been conducted in accordance with the Work Plan prepared by CDM Federal Programs Corporation (CDM). This RFI Report presents the following information:

- Site characterization (Environmental Setting)
- Source term definition (Source Characterization), if any
- Degree of contamination (Contamination Characterization)
- Identification of actual or potential receptors
- Analytical results and analysis (Data Analysis)
- Identification of groundwater protection standards and action levels for the protection of human health and the environment (Protection Standards)
- Conclusions and recommendations for future work.

Tinker AFB is located in central Oklahoma, in the southeast portion of the Oklahoma City metropolitan area, in Oklahoma County. The Base is bounded by Sooner Road to the west, Douglas Boulevard to the east, Interstate 40 to the north, and Southeast 74th Street to the south. The Base encompasses approximately 5,000 acres.

Background. Tinker AFB began operations in 1942 and serves as a worldwide repair depot for a variety of aircraft, weapons, and engines. These activities require the use of hazardous materials and result in the generation of hazardous wastes. These wastes have included spent organic solvents, waste oils, waste paint strippers and sludges, electroplating wastewaters and sludges, alkaline cleaners, acids, Freon™, jet fuels, and radium paints.

In 1984, Congress amended the RCRA with the Hazardous and Solid Waste Amendments (HSWA), which allow U.S. Environmental Protection Agency (EPA) to require, as a permit condition, a facility to undertake corrective action for any release of hazardous waste or

constituents from any SWMU at a treatment, storage, and disposal (TSD) facility. On January 12, 1989, Tinker AFB submitted its Part B permit application for renewal of its operating RCRA Hazardous Waste Storage facility permit. The final RCRA HSWA permit issued on July 1, 1991, requires Tinker AFB to investigate all SWMUs and areas of concern (AOC) and to perform corrective action at those identified as posing a threat to human health or the environment. The permit specifies that a RFI be conducted for 43 identified SWMUs and two AOCs on the Base. This document has been prepared to determine whether sufficient investigations have been conducted to meet the permit requirements for SDB, Sludge Drying Beds (SDBs).

Source Description. Eight abandoned sludge drying beds, seven of them concrete-lined and one with an earthen floor, exist at the inactive Sewage Treatment Plant on the west side of the Base. From the early 1950's until 1971 the sludge drying beds were used to dry sanitary sludge. Since abandonment, from 1987 until 1992, the beds were used as a 90-day site for hazardous waste drum accumulation.

Site Investigations. An investigation of the soils beneath the pits was conducted by the Tulsa District Corps of Engineers (U.S. Army Corps of Engineers [USACE], 1989) to determine if any residual contamination remained from the previous storage operations. This investigation was conducted as part of the Air Force Installation Restoration Program (IRP). Eleven soil borings were drilled with a total of 16 samples collected for chemical analysis. The analytical results indicated that the underlying soils did not pose a threat to the environment.

During the RFI performed at the SDBs, ten soil borings (SB-029 through SB-038) were drilled in the sludge beds to determine the existence and/or degree, if any, of soil contamination directly below these beds. The soil borings were drilled in the deepest section of the sludge beds (the north end of the south sludge beds and the south end of the north sludge beds), with the exception of SB-029 and SB-030, which were drilled in the middle and southern end of the earth-lined sludge bed.

Three shallow monitoring wells (2-66B, 2-67B, and 2-68B) were installed in the shallow aquifer (upper saturated zone [USZ]) to determine the existence and degree, if any, of groundwater contamination in the uppermost aquifer attributable to activities at the former sludge drying beds.

Three deep, double-cased monitoring wells were installed in the top of the (lower saturated zone [LSZ]) and lower portion of the USZ to determine the existence and degree, if any, of groundwater contamination in this aquifer zone. The three deep wells (2-66A, 2-67A, and 2-68A) were installed adjacent to corresponding shallow wells forming three shallow-deep well pairs. A total of six groundwater samples and one field duplicate were collected from the wells at the SDBs.

A soil gas survey was performed at the SDBs, which consisted of 26 vapor gas survey points configured in a rough circle around the boundary of this site.

Conclusions

Soils. Volatile organics were detected at concentrations above the reporting limits in soils from one of three monitoring well boring locations and from 4 of 10 soil borings drilled through the floor of the sludge drying beds:

- No extractable organics were detected in the soils from the SDB investigation.
- Detected volatile organics and location of detection are:

Constituent	Location				
	2-67A	SB-032	SB-036	SB-037	SB-038
1,1-Dichloroethane		X	X		
1,1-Dichloroethene	X				
cis-1,2-Dichloroethene	X				
1,2-Dichloropropane	X				
Acetone		X			
Chlorobenzene				X	
Methylene chloride				X	X
Tetrachloroethene	X				

- 1,1-Dichloroethane only detected in soils just above water table and in near surface sample (1 to 1.5 feet) at SB-032 and SB-036.
- 1,1-Dichloroethene, cis-1,2-dichloroethene, and 1,2-dichloropropane only detected in soils just above water table in boring 2-67A.
- Acetone and chlorobenzene only detected in 1 sample out of 50. Acetone, detected at a concentration of 140 micrograms per kilogram (µg/kg) in the 1- to 1.5-foot depth sample at SB-032, is an order of magnitude greater in concentration than the reporting limit and may not be attributable to the laboratory blank contaminant.

- Methylene chloride concentrations either just above or below the detection limit found in all soils collected from borings SB-037 and SB-038 but still attributed to common laboratory blank contaminant.

- Tetrachloroethene detected in 3 of 4 samples collected from monitoring well boring 2-67A at concentrations from 6.6 to 9.0 µg/kg suggesting a local source for the contaminant. Tetrachloroethene also found in the locality of monitoring well boring 2-67 within the vadose zone soil gas as indicated by the results of the soil gas survey.

- Lead background limits were only exceeded in one sample (collected at 10 feet in depth in monitoring well boring 2-67A). All other metals were within background ranges.

Groundwater. The groundwater in the southwest portion of the site requires additional investigation due to the high concentrations of organics, particularly, 1,2-dichloroethane, trichloroethene, and tetrachloroethene. The soils contain no organic compounds above the SWMU CALs but tetrachloroethene was found throughout the soil column in monitoring well boring 2-67A, the well containing the most significant groundwater contamination. This well is located in the lower portion of the USZ.

Additional information about the LSZ is required to determine its direction of flow underneath SDB, whether it is hydraulically connected to the USZ, and whether it is potentially contaminated.

Recommendations for Additional Work. Based on the results of the investigation of SDBs, the following additional work is recommended:

- Install one additional monitoring well cluster 100 feet to the west of the northern SDB. One of the wells in the cluster will be completed deep enough to monitor the LSZ.

- Install one additional monitoring well cluster 75 to 100 feet to the west of monitoring well 2-67A. One of the wells in the cluster will be completed deep enough to monitor LSZ.

- Collect site-specific soil samples to use with the USGS soils data to distinguish site-related from background concentrations in a statistically significant manner.

- Develop a Phase II RFI work plan and submit to EPA for approval before beginning field work.

The purpose of these new well clusters will be to:

- Confirm the potentiometric head and groundwater flow direction in the USZ and LSZ.
- Better determine the extent of the groundwater contamination through the placement of the downgradient well clusters.
- Determine if a hydraulic connection exists between the USZ and LSZ.

The lack of human health and ecological risk assessments result in a data gap for this site. To correct this data gap, further evaluation of the potential receptors and a human and ecological risk assessment should be performed in two steps:

1) Qualitative evaluation of the potential for human and ecological receptors to become exposed to chemicals associated with the site, including:
   - Evaluation of sources of contamination
   - Evaluation of contaminant release and transport mechanisms
   - Evaluation of potential pathways, under current and future land-use scenarios, by which potential receptors may be exposed to chemicals.
2) Quantitative estimation of the potential for human exposure (cancer and noncancer risk).

For first step, the minimum evaluation should include investigation of complete exposure pathways from contamination of groundwater, either the USZ or the LSZ, and from contamination of ambient air. The second step should be performed using the most recent EPA guidance, default values for chemical intake variables, and toxicity values. Considerable care should be exercised in the site evaluation, sampling, and data evaluation to ensure that the data used in the risk assessments accurately reflect the contamination present at the site.

1.0 Introduction

The U.S. Department of the Air Force is conducting an Installation Restoration Program (IRP) at Tinker Air Force Base (AFB), Oklahoma (Figure 1-1). This program intends to identify sites through initial assessment and characterize each solid waste management unit (SWMU) or area of concern (AOC), study and select cleanup methods, if required, and implement a cleanup. In support of this effort, a Phase I Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) was conducted at SWMU-14, Sludge Drying Beds (SDB), at Tinker AFB, Oklahoma (Figure 1-2). This Phase I investigation focuses its efforts on determining if there have been any releases of contamination to the soil and groundwater resulting from activities within the confines of the SDB.

Adequate information must be gathered in a Phase I RFI to support a Phase II investigation, a Corrective Measures Study (CMS), or interim measures, if necessary. A phased approach has been taken by Tinker AFB for the SDB site investigation. This phasing of the RFI is in accordance with U.S. Environmental Protection Agency (EPA) RFI guidance documents and is also the most practical approach for this site where little or no information is available on past practices.

Outlined below are the minimum tasks generally required by the EPA for a RCRA investigation of a SWMU or AOC:

- Task I - Description of Current Conditions
- Task II - Work Plan
- Task III - Facility Investigation
- Task IV - Investigative Analysis
- Task V - Report.

The Task I requirements for the SDB have been addressed in the *Description of Current Conditions* (Tinker, 1992), which outlines the geology, hydrogeology, and current conditions of the site. Task II requirements have been addressed in the *Final RFI Work Plan* (CDM Federal Programs Corporation [CDM], 1992) and the Final RFI Work Plan - Amendments (IT Corporation [IT], 1993a). The *Final RFI Work Plan* and the Final RFI Work Plan - Amendments include a Data Management Plan, Project Management Plan, Data Collection Quality Assurance Plan, Health and Safety Plan, and amendments as necessary to perform a Phase I

STARTING DATE: 03/17/94	DATE LAST REV.:	DRAFT. CHCK. BY:G. PACHECO	INITIATOR: C. WALLACE	DWG. NO.:
DRAWN BY:P.O. TERRY	DRAWN BY:	ENGR. CHCK. BY: C. WALLACE	PROJ. MGR.:J. TAYLOR	PROJ. NO.:

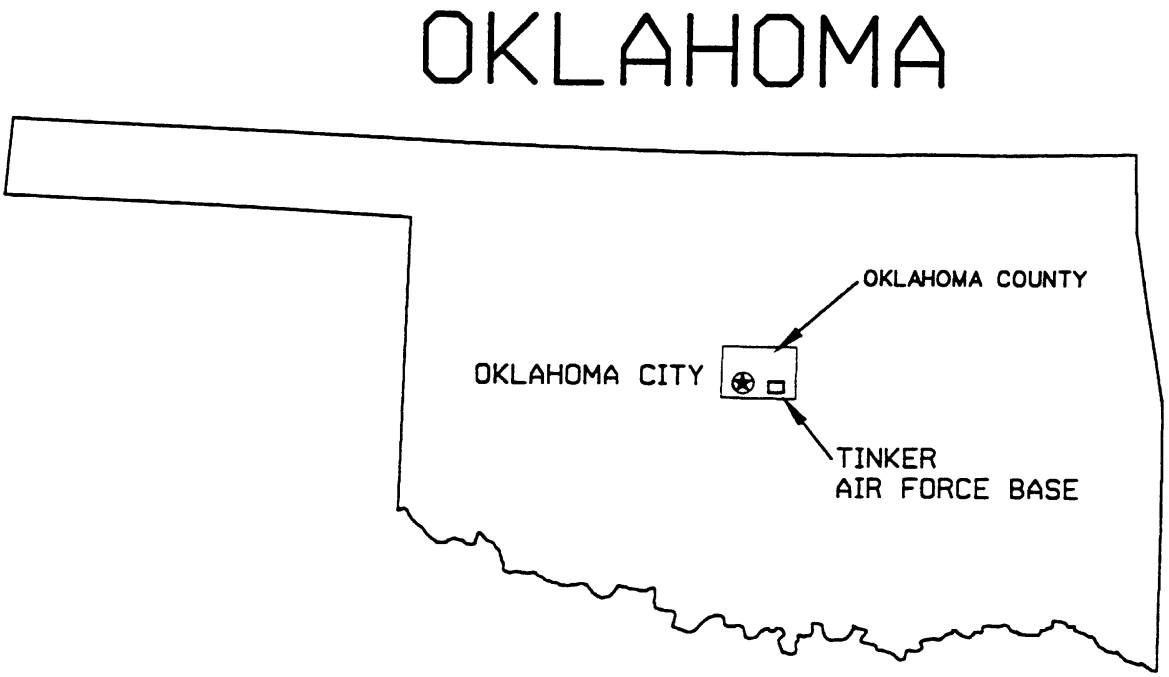

FIGURE 1-1
TINKER AIR FORCE BASE
OKLAHOMA
STATE INDEX MAP

PREPARED FOR
TINKER AFB
OKLAHOMA

3/23/94 POT
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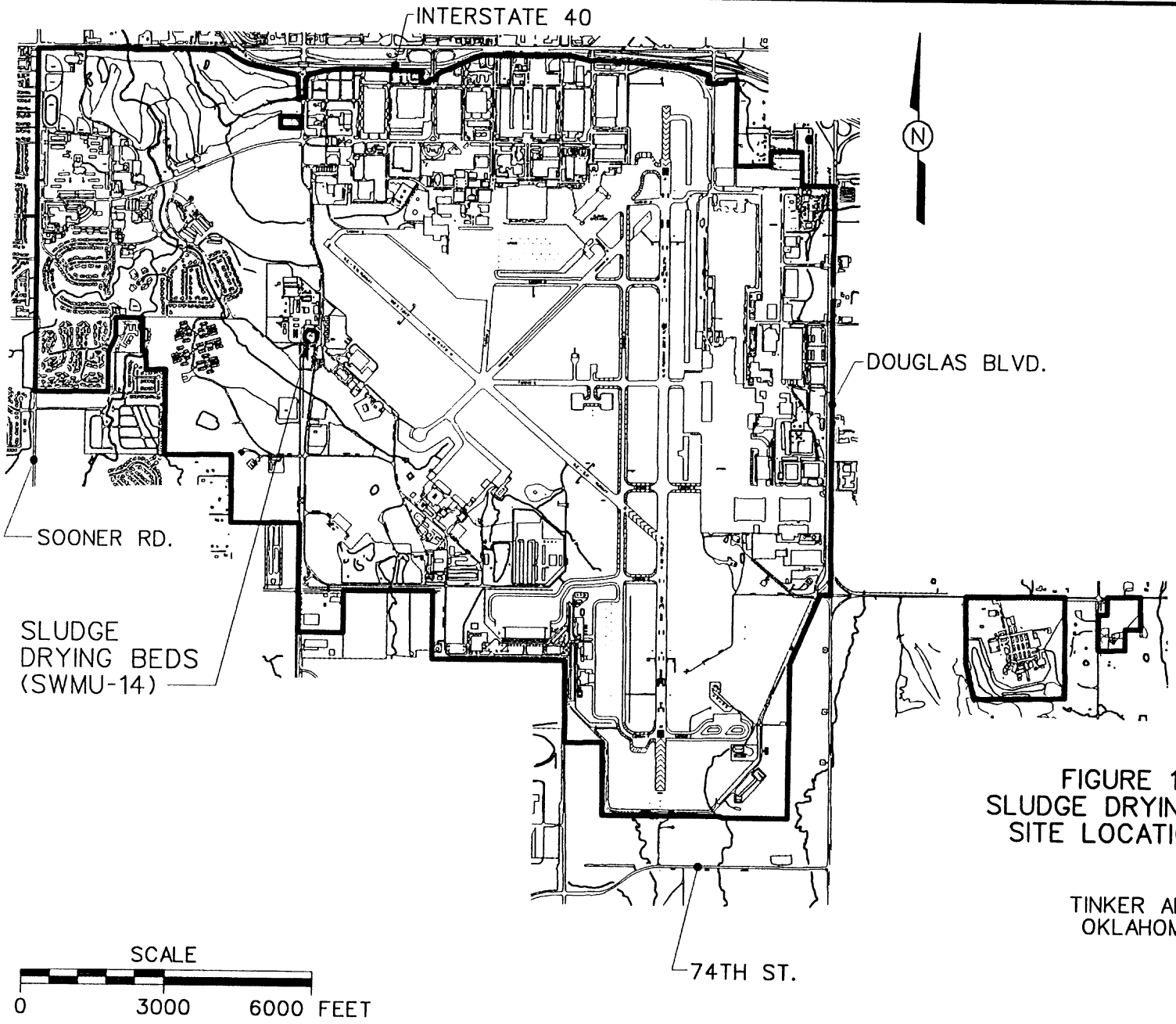


FIGURE 1-2
SLUDGE DRYING BEDS
SITE LOCATION MAP

TINKER AFB
OKLAHOMA

STARTING DATE: 3/31/94	DATE LAST REV.:	DRAFT. CHCK. BY: G. PACHECO	INITIATOR: C. WALLACE	DWG. NO.:
DRAWN BY: L. STOUT	DRAWN BY:	ENGR. CHCK. BY:	PROJ. MGR.: J. TAYLOR	PROJ. NO.:

FILENAME: G:\TINKER\40983202.122

RFI. Tasks III and IV requirements, which characterize the site, determine the presence of contamination, and identify actual and potential receptors have been addressed in this report. This report also satisfies the requirements of Task V.

1.1 Purpose

This report has been prepared in response to the U.S. Department of Air Force, Tinker AFB, Oklahoma request for a Phase I RFI and report for the SDB.

The purpose of this report is to document and present the findings of the RFI conducted at the SDB. The primary objective of the RFI was to determine if contaminant releases to the environment have occurred at the site and to determine if a more comprehensive Phase II RFI or a CMS is required. This RFI report presents the following information:

- Site characterization (Environmental Setting)
- Source term definition (Source Characterization), if any
- Degree of contamination (Contamination Characterization)
- Identification of actual or potential receptors
- Analytical results and analysis (Data Analysis)
- Identification of groundwater protection standards and action levels for the protection of human health and the environment (Protection Standards)
- Conclusions and recommendations for future work.

This document will also describe the procedures and methods of field sampling and cite any previous investigations conducted at the site.

1.2 Scope of Investigation

The soils and the groundwater below and around the SDBs were investigated. Soil samples were taken at various depths below the SDB to determine the presence of subsurface soil contamination. Groundwater samples were taken upgradient of the site from two monitoring wells, one in the LSZ (2-66A) and one in the USZ (2-66B). Two downgradient monitoring well clusters were originally intended to sample both the USZ and the LSZ, however, all four

wells were completed in the USZ. Soil gas surveys were also performed around the SDB to determine the presence of volatile organic compounds (VOC) in the surrounding subsurface soils.

2.0 Background

2.1 Tinker AFB Facility Description and History

Tinker AFB is located in central Oklahoma, in the southeast portion of the Oklahoma City metropolitan area, in Oklahoma County (Figure 1-1) with its approximate geographic center located at 35° 25' latitude and 97° 24' longitude (U.S. Geological Survey [USGS], 1978). The Base is bounded by Sooner Road to the west, Douglas Boulevard to the east, Interstate 40 to the north, and Southeast 74th Street to the south. An additional area east of the main Base is used by the Engineering Installation Division (EID) and is known as Area D. The Base encompasses approximately 5,000 acres.

Tinker AFB was originally known as the Midwest Air Depot and began operations in July 1941. The site was activated March 1942 and during World War II the depot was responsible for reconditioning, modifying, and modernizing aircraft, vehicles, and equipment. Tinker AFB now serves as a worldwide repair depot for a variety of aircraft, weapons, and engines. These activities require the use of hazardous materials and result in the generation of hazardous wastes. These wastes have included spent organic solvents, waste oils, waste paint strippers and sludges, electroplating wastewaters and sludges, alkaline cleaners, acids, Freon™, jet fuels, and radium paints. Wastes that are currently generated are presently managed at two permitted hazardous waste storage facilities. Prior to enactment of RCRA, however, industrial wastes were discharged into unlined landfills and waste pits, streams, sewers, and ponds. Releases from these areas as well as from underground tanks have occurred. As a result, there are numerous sites of soil, groundwater, and surface water contamination on Base.

2.2 Site Description and History

The SDB is located at the northwest corner of the intersection of Patrol Road and Rapcon Road (Figure 1-2). The SDBs consist of eight sludge drying beds that were used to passively dewater wastewater treatment sludge from the municipal wastewater treatment facility. The wastewater treatment facility has since been abandoned. The sludge drying beds are arranged on opposing ends of the digestors, with four beds on the north end and four to the south. Each bed includes approximately 1,875 square feet. Each bed is approximately 75 feet long, 25 feet wide, and approximately 3 feet deep. The area between the two sets of sludge drying beds, which is occupied by the two concrete vessels used as sludge digesters, is not accessible because the earth is contoured at a one-to-one slope from the drying beds to the top of the digesters.

After the wastewater treatment plant was abandoned the sludge drying beds were used as a temporary storage site for containerized liquid and solid waste from the various industrial operations on Base.

Before the beds were used for storage, the sludge drying beds were renovated. The renovation consisted of removing two walls in the north beds to create one large bed on the east side with two smaller beds on the west. Following removal of the walls, sloped concrete slabs were poured between the remaining walls except in the westernmost bed on the south side. With the removal of three of the walls and placement of the concrete slabs, the sludge drying beds provided four paved areas and one unpaved area that could be used for storage. The concrete slabs were sloped to a sump location providing a means of draining the beds because no drains were originally constructed.

2.3 Regulatory History and Status

In 1980, Congress passed the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) to address the cleanup of hazardous waste disposal sites across the country. CERCLA gave the president authority to require responsible parties to remediate the sites or to undertake response actions through use of a fund (the Superfund). The president, through Executive Order 12580, delegated the EPA with the responsibility to investigate and remediate private party hazardous waste disposal sites that created a threat to human health and the environment. The president delegated responsibility for investigation and cleanup of federal facility disposal sites to the various federal agency heads.

The Defense Environmental Restoration Program (DERP) was formally established by Congress in Title 10 U.S. Code (USC) 2701-2707 and 2810. DERP provides centralized management for the cleanup of U.S. Department of Defense (DOD) hazardous waste sites consistent with the provisions of CERCLA, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA), the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (40 Code of Federal Regulations [CFR] 300), and Executive Order 12580. To support the goals of the DERP, the IRP was developed to identify, investigate, and clean up contamination at installations.

Under the Air Force IRP, Tinker AFB began a Phase I study similar to a preliminary assessment/site investigation (PA/SI) in 1981 (Engineering Science [ES], 1982). This study helped locate 14 sites that needed further investigation. Phase II studies were performed in 1983 (Radian Corporation [Radian], 1985a,b).

In 1986, Congress amended CERCLA through the SARA, which waived sovereign immunity for federal facilities. SARA gave EPA authority to oversee the cleanup of federal facilities and to have the final authority for selecting the remedial action at federal facilities placed on the National Priorities List (NPL) if the EPA and the relevant federal agency cannot concur in the selection. Congress also codified the DERP (SARA Section 211), setting up a fund for the DOD to remediate its sites because the Superfund is not available for the cleanup of federal facilities. DERP specifies the type of clean up responses that the fund can be used to address.

In response to SARA, the DOD realigned its IRP to follow the investigation and cleanup stages of the EPA:

- PA/SI
- Remedial investigation/feasibility study (RI/FS)
- Record of Decision (ROD) for selection of a remedial action
- Remedial design/remedial action.

In 1984, Congress amended RCRA with the Hazardous and Solid Waste Amendments (HSWA) which allow the EPA to require, as a permit condition, a facility to undertake corrective action for any release of hazardous waste or constituents from any SWMU at a treatment, storage, and disposal (TSD) facility. On January 12, 1989 Tinker AFB submitted its Part B permit application for renewal of its operating RCRA hazardous waste storage facility permit.

EPA, in the Hazardous Waste Management Permit for Tinker AFB dated July 1, 1991, identified 43 SWMUs and two areas of concern (AOC) on Tinker AFB that need to be addressed. This permit requires Tinker AFB to investigate all SWMUs and AOCs and to perform corrective action at those identified as posing a threat to human health or the environment. Since receiving the Hazardous Waste Management Permit, many of the IRP sites have come under the jurisdiction of the RCRA Permits Branch of EPA.

2.4 Summary of Previous Investigations

An investigation of the soils beneath the SDBs was conducted by the Tulsa District U.S. Army Corps of Engineers (USACE, 1989) to determine if any residual contamination remained from the previous storage operations. This investigation was conducted as part of

the Air Force IRP. Eleven soil borings were drilled with a total of 16 samples collected for chemical analysis. The analytical results indicated that the underlying soils did not pose any threat to the environment.

3.0 Environmental Setting

3.1 Topography and Drainage

3.1.1 Topography

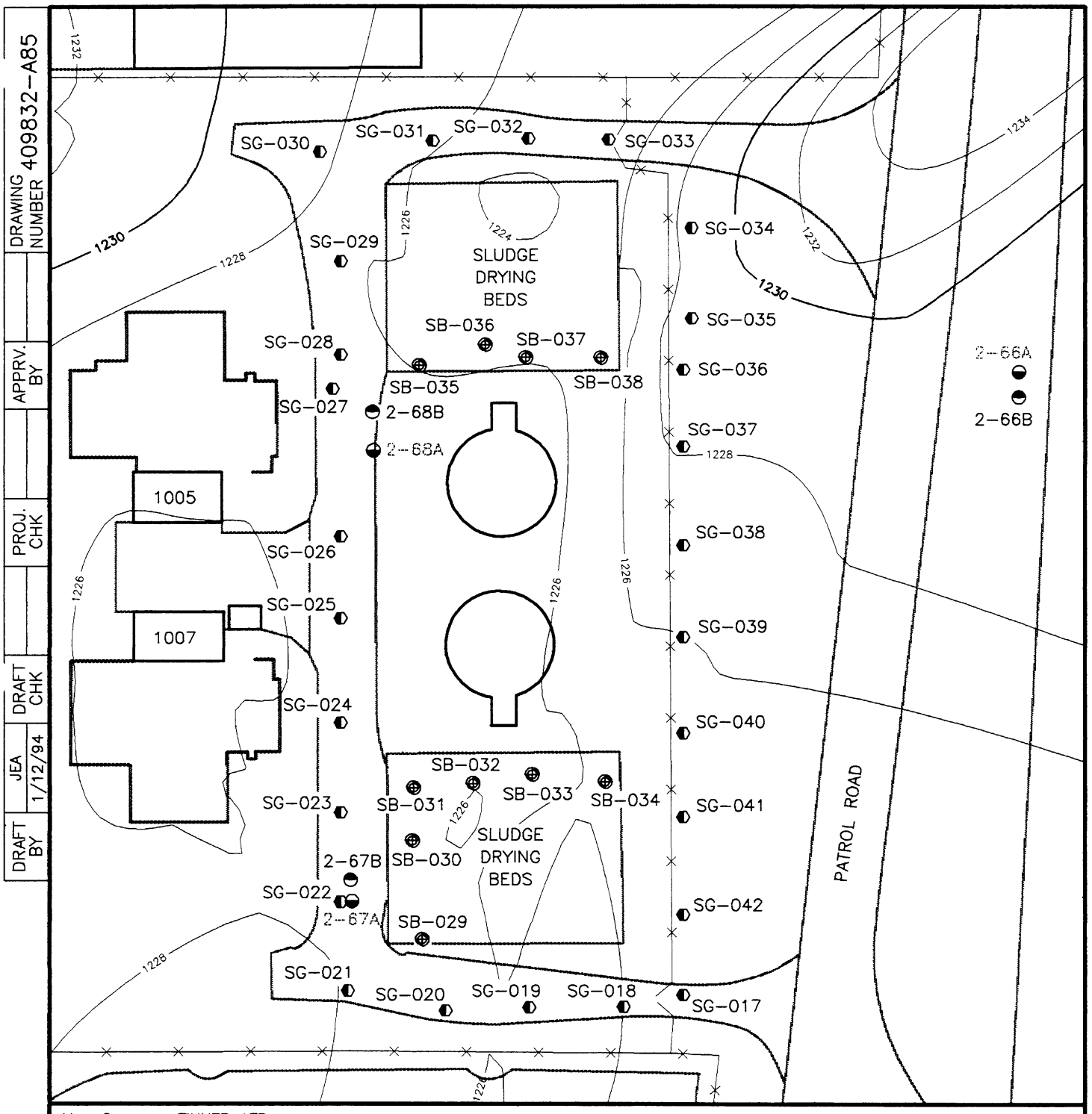
Regional/Tinker AFB. The topography of Oklahoma City and surrounding area varies from generally level to gently rolling in appearance. Local relief is primarily the result of dissection by erosional activity or stream channel development. At Oklahoma City, surface elevations are typically in the range of 1,070 to 1,400 feet mean sea level (msl). At Tinker AFB ground surface elevations vary from 1,190 feet msl near the northwest corner where Crutcho Creek intersects the Base boundary to approximately 1,320 feet msl at Area D (EID), located on 59th Street, east of the main installation.

Site. The SDB is located in the west central area of Tinker AFB (Figure 3-1). From the topographic map (USACE, 1993), the general surface elevation of the SDBs was reported to be approximately 1,226 feet msl.

3.1.2 Drainage

Regional/Tinker AFB. Drainage of Tinker AFB land areas is accomplished by overland flow of runoff to diversion structures and thence to area surface streams, which flow intermittently. The northeast portion of the Base is drained primarily by tributaries of Soldier Creek. The north and west sections of the Base, including the main instrument runway, drain to Crutcho Creek, a tributary of the North Canadian River. Two small unnamed intermittent streams crossing installation boundaries south of the main instrument runway generally do not receive significant quantities of Base runoff due to site grading designed to preclude such drainage. These streams, when flowing, extend to Stanley Draper Lake, approximately one-half mile south of the Base.

Site. Surface water runoff at the SDB area is to the southeast.



Map Source: TINKER AFB

LEGEND

SB-029	SOIL BORING LOCATION AND IDENTIFICATION NUMBER
2-67A	DEEP MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
2-67B	SHALLOW MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
SG-021	SOIL VAPOR SURVEY POINT AND IDENTIFICATION NUMBER
	FENCE
1228	CONTOUR INTERVAL

0 50 FEET

FIGURE 3-1

TOPOGRAPHIC MAP OF SLUDGE DRYING BEDS WITH LOCATIONS OF SOIL BORINGS, SOIL VAPOR SURVEY POINTS AND MONITORING WELLS

PREPARED FOR

TINKER AFB
OKLAHOMA

DRAWING NUMBER 409832-A85

APPRV. BY

PROJ. CHK

DRAFT CHK

JEA 1/12/94

DRAFT BY

Do Not Scale This Drawing

3.2 Geology

3.2.1 Regional/Tinker AFB Geology

Tinker AFB is located within the Central Redbed Plain Section of the Central Lowland physiographic province, which is tectonically stable. No major fault or fracture zones have been mapped near Tinker AFB. The major lithologic units in the area of the Base are relatively flat-lying and have a regional westward dip of about 0.0076 foot per foot (ft/ft) (Bingham and Moore, 1975).

Geologic formations that underlie Tinker AFB include, from oldest to youngest, the Wellington Formation, Garber Sandstone, and the Hennessey Group; all are Permian in age. All geologic units immediately underlying Tinker AFB are sedimentary in origin. The Garber Sandstone and Wellington Formation are commonly referred to as the Garber-Wellington Formation due to strong lithologic similarities. These formations are characterized by fine-grained, calcareously-cemented sandstones interbedded with shale. The Hennessey Group consists of the Fairmont Shale and the Kingman Siltstone. It overlies the Garber-Wellington Formation along the eastern portion of Cleveland and Oklahoma counties. Quaternary alluvium is found in many undisturbed streambeds and channels located within the area.

Stratigraphy. Tinker AFB lies atop a sedimentary rock column composed of strata that ranges in age from Cambrian to Permian above a Precambrian igneous basement. Quaternary alluvium and terrace deposits can be found overlying bedrock in and near present-day stream valleys. At Tinker AFB, Quaternary deposits consist of unconsolidated weathered bedrock, fill material, windblown sand, and interfingering lenses of sand, silt, clay, and gravel of fluvial origin. The terrace deposits are exposed where stream valleys have downcut through older strata and have left them topographically above present-day deposits. Alluvial sediments range in thickness from less than a foot to nearly 20 feet.

Subsurface (bedrock) geologic units which outcrop at Tinker AFB and that are important to understanding groundwater and contaminant concerns at the Base consist of, in descending order, the Hennessey Group, the Garber Sandstone, and the Wellington Formation (Table 3-1). These bedrock units were deposited during the Permian age (230 to 280 million years ago) and are typical of redbed deposits formed during that period. The units are composed of a conformable sequence of sandstones, siltstones, and shales. Individual beds are lenticular and vary in thickness over short horizontal distances. Because lithologies are similar and because of a lack of fossils or key beds, the Garber Sandstone and the Wellington Formation

Table 3-1

Major Geologic Units in the Vicinity of Tinker AFB (Modified from Wood and Burton, 1968) Tinker AFB

(Page 1 of 2)

System	Series	Stratigraphic Unit	Thickness (feet)	Description and Distribution	Water-Bearing Properties
QUATERNARY	PLEISTOCENE AND RECENT	Alluvium	0-70	Unconsolidated and interfingering lenses of sand, silt, clay, and gravel in the flood plains and channels of stream	Moderately permeable. Yields small to moderate quantities of water in valleys of larger streams. Water is very hard, but suitable for most uses, unless contaminated by industrial wastes or oil field brines.
		Terrace deposits	0-100	Unconsolidated and interfingering lenses of sand, silt, gravel, and clay that occur at one or more levels above the flood plains of the principal streams.	Moderately permeable. Locally above the water table and not saturated. Where deposits have sufficient saturated thickness, they are capable of yielding moderate quantities of water to wells. Water is moderately hard to very hard, but less mineralized than water in other aquifers. Suitable for most uses unless contaminated by oil field brines.

Table 3-1

(Page 2 of 2)

System	Series	Stratigraphic Unit	Thickness (feet)	Description and Distribution	Water-Bearing Properties
PERMIAN	LOWER PERMIAN	Hennessey Group (includes Kingman Siltstone and Fairmont Shale)	700	Deep-red clay shale containing thin beds of red sandstone and white or greenish bands of sandy or limey shale. Forms relatively flat to gently rolling grass-covered prairie.	Poorly permeable. Yields meager quantities or very hard, moderately to highly mineralized water to shallow domestic and stock wells. In places water contains large amounts of sulfate.
		Garber Sandstone	500±	Deep-red clay to reddish-orange, massive and cross-bedded fine-grained sandstone interbedded and interfingered with red shale and siltstone	Poorly to moderately permeable. Important source of groundwater in Cleveland and Oklahoma counties. Yields small to moderate quantities of water to deep wells; heavily pumped for industrial and municipal uses in the Norman and Midwest City areas. Water from shallow wells hard to very hard; water from deep wells moderately hard to soft. Lower part contains water too salty for domestic and most industrial uses.
		Wellington Formation	500±	Deep-red to reddish-orange massive and cross-bedded fine-grained sandstone interbedded with red, purple, maroon, and gray shale. Base of formation not exposed in the area.	

are difficult to distinguish and are often informally lumped together as the Garber-Wellington Formation. Together, they are about 900 feet thick at Tinker AFB. The interconnected, lenticular nature of sandstones within the sequence forms complex pathways for groundwater movement.

The surficial geology of the north section of the Base is dominated by the Garber Sandstone, which outcrops across a broad area of Oklahoma County. Generally, the Garber outcrop is covered by a thin veneer of soil and/or alluvium up to 20 feet thick. To the south the Garber Sandstone is overlain by outcropping strata of the Hennessey Group including the Kingman Siltstone and the Fairmont Shale (Bingham and Moore, 1975). Drilling information obtained as a result of geotechnical investigations and monitoring well installation confirms the presence of these units.

Depositional Environment. The Permian-age strata presently exposed at the surface in central Oklahoma were deposited along a low-lying north-south oriented coastline. Land features included meandering to braided sediment-loaded streams that flowed generally westward from highlands to the east (ancestral Ozarks). Sand dunes were common as were cut-off stream segments that rapidly evaporated. The climate was arid and vegetation sparse. Offshore the sea was shallow and deepened very gradually to the west. The shoreline position varied over a wide range. Isolated evaporitic basins frequently formed as the shoreline shifted.

Across Oklahoma, this depositional environment resulted in an interfingering collage of fluviatile and windblown sands, clays, shallow marine shales, and evaporite deposits. The overloaded streams and evaporitic basins acted as sumps for heavy metals such as barium, chromium, lead, and iron. Oxidation of iron in the arid climate resulted in the reddish color of many of the sediments. Erosion and chemical breakdown of granitic rocks from the highlands result in extensive clay deposits. Evaporite minerals such as anhydrite ($CaSO_4$), barite ($BaSO_4$), and gypsum ($CaSO_4 \cdot 2H_2O$) are common.

Around Tinker AFB, the Hennessey Group represents deposition in a tidal flat environment cut by shallow, narrow channels. The Hennessey Group comprises predominantly red shales that contain thin beds of sandstone (less than 10 feet thick) and siltstone. In outcrops, "mudball" conglomerates, burrow surfaces, and desiccation cracks are recognized. These units outcrop over roughly the southern half of the Base, thickening to approximately 70 feet

in the southwest from their erosional edge (zero thickness) across the central part of Tinker AFB.

In contrast, the Garber Sandstone and Wellington Formation around Tinker AFB consist of an irregularly interbedded system of lenticular sandstones, siltstones, and shales deposited either in meandering streams in the upper reaches of a delta or in a braided stream environment. Outcrop units north of Tinker AFB exhibit many small to medium channels with cut-and-fill geometries consistent with a stream setting. Sandstones are typically cross-bedded. Individual beds range in thickness from a few inches to about 50 feet and appear massive but thicker units are often formed from a series of "stacked" thinner beds. Geophysical and lithologic well logs indicate that from 65 to 75 percent of the Garber Sandstone and the Wellington Formation are composed of sandstone at Tinker AFB. The percentage of sandstone in the section decreases to the north, south, and west of the Base. These sandstones are typically fine to very fine grained, friable, and poorly cemented. However, where sandstone is cemented by red muds or by secondary carbonate or iron cements, local thin "hard" intervals exist along disconformities at the base of sandstone beds. Shales are described as ranging from clayey to sandy, are generally discontinuous, and range in thickness from a few inches to about 40 feet.

Stratigraphic Correlation. Correlation of geologic units is difficult due to the discontinuous nature of the sandstone and shale beds. However, cross sections demonstrate that two stratigraphic intervals can be correlated over most of the Base in the conceptual model. The location of these cross sections is shown in Figure 3-2. These intervals are represented on geologic cross-sections A-A' and B-B' in Figures 3-3 and 3-4, respectively. Section A-A' is roughly a dip section and B-B' is approximately a strike section. The first correlatable interval is marked by the base of the Hennessey Group and the first sandstone at the top of the Garber Sandstone. This interval is mappable over the southern half of Tinker AFB. The second interval consists of a shale zone within the Garber Sandstone, which in places is composed of a single shale layer and in other places of multiple shale layers. This interval is more continuous than other shale intervals and in cross sections appears mappable over a large part of the Base. It is extrapolated under the central portion of Tinker AFB where little well control exists.

Structure. Tinker AFB lies within a tectonically stable area; no major near-surface faults or fracture zones have been mapped near the Base. Most of the consolidated rock units of the Oklahoma City area dip westward at a low angle. A regional dip of 0.0057 to 0.0076 ft/ft in

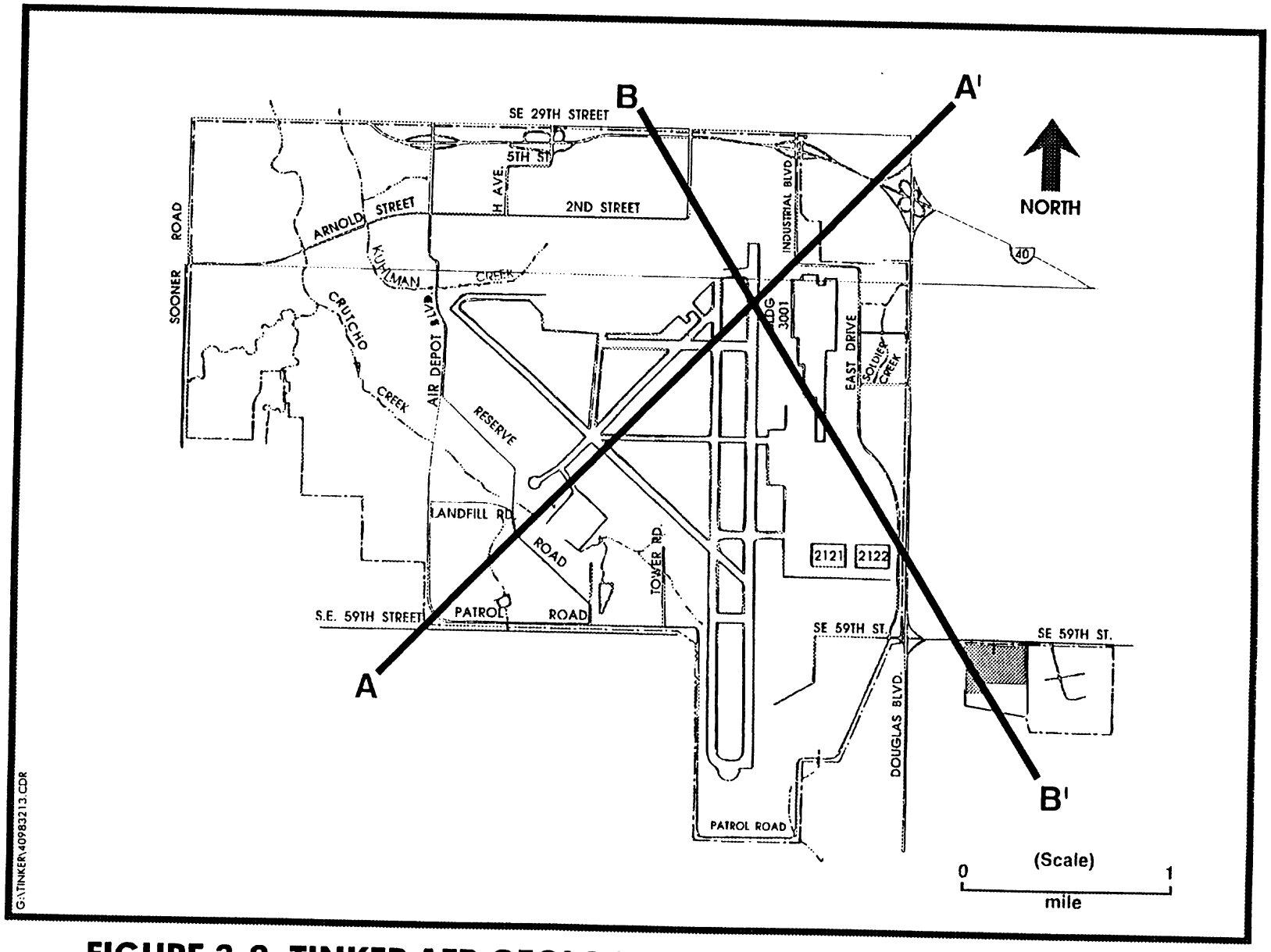


FIGURE 3-2 TINKER AFB GEOLOGIC CROSS SECTION LOCATION MAP

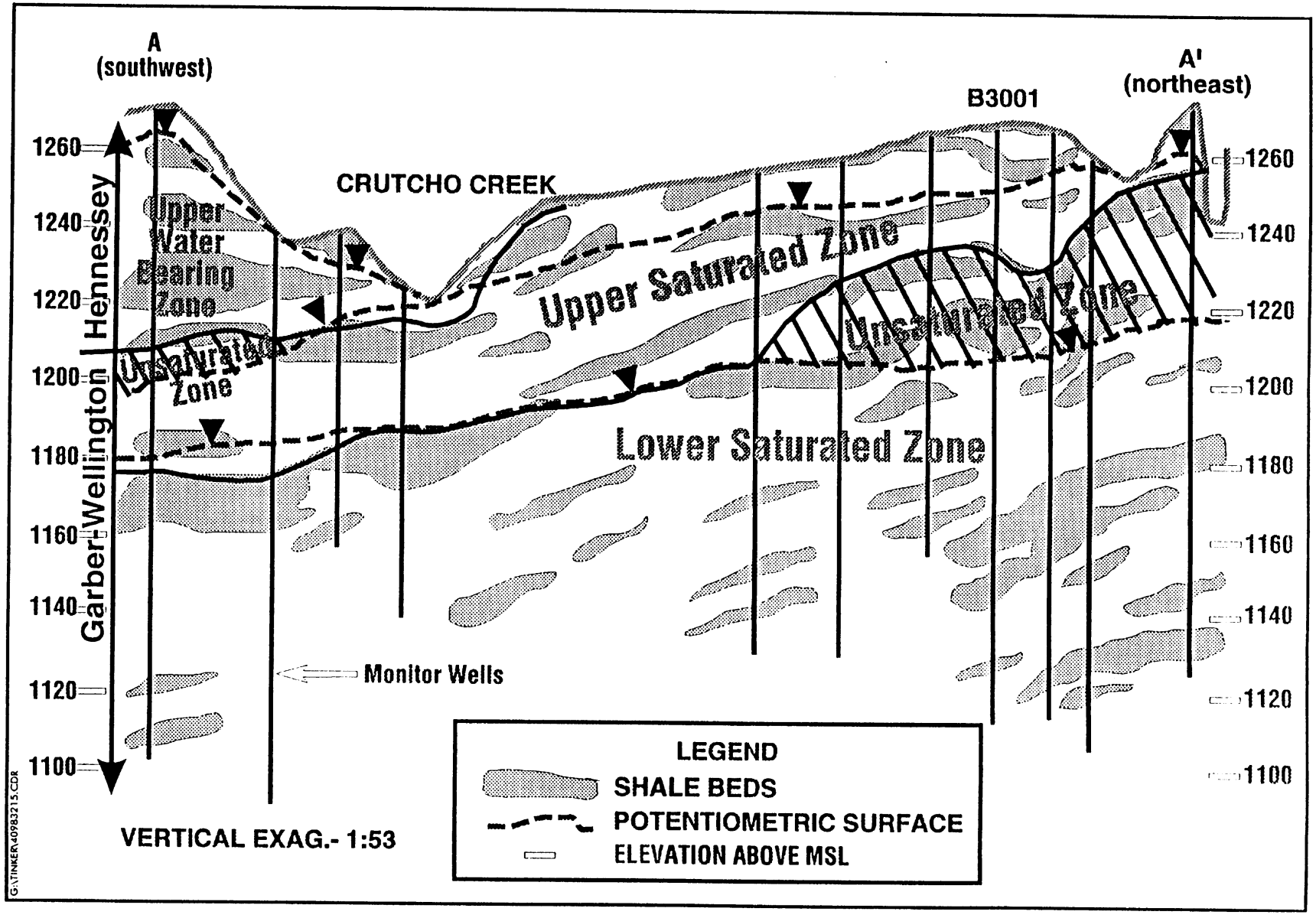


FIGURE 3-3 TINKER AFB GEOLOGIC CROSS SECTION A-A'

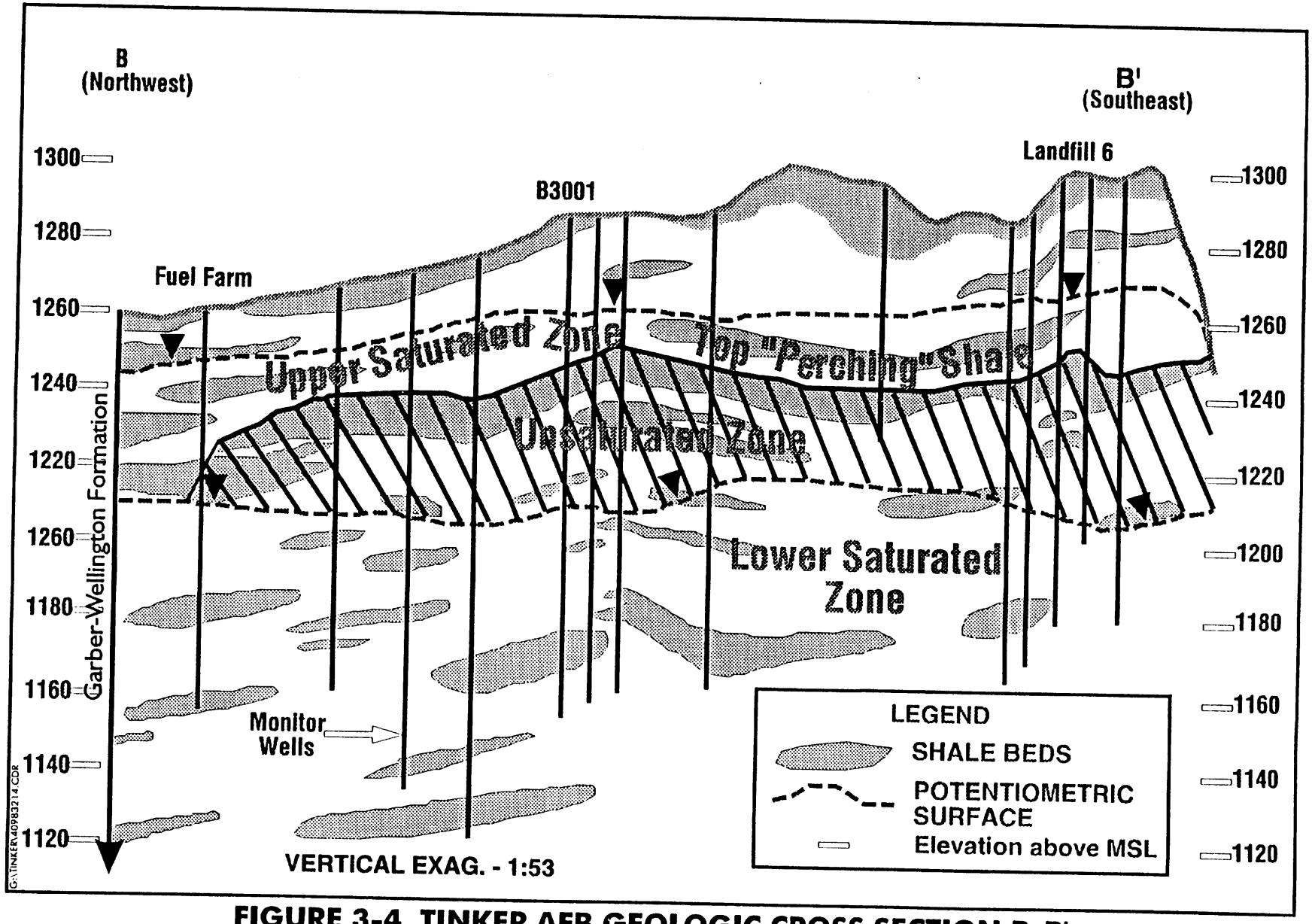


FIGURE 3-4 TINKER AFB GEOLOGIC CROSS SECTION B-B'

a generally westward direction is supported by stratigraphic correlation on geologic cross sections at Tinker AFB. Bedrock units strike slightly west of north.

Although Tinker AFB lies in a tectonically stable area, regional dips are interrupted by buried structural features located west of the Base. A published east to west generalized geologic cross section that includes Tinker AFB supports the existence of a northwest trending structural trough or syncline located near the western margin of the Base. The syncline is mapped adjacent to and just east of a faulted anticlinal structure located beneath the Oklahoma City Oil Field. The fault does not appear to offset Permian-age strata. There are indications that the syncline may act as a "sink" for some regional groundwater (southwest flow) at Tinker AFB before it continues to more distant discharge points.

3.2.2 Site Geology

Soil borings were completed at 13 locations at the SDB. The soil borings were drilled to collect soil samples for chemical analysis and stratigraphic data. Ten of the borings were completed to depths between 17.5 and 23 feet. Three borings were extended to depths between 67 and 117.5 feet. Monitoring wells were installed at the three deep boring locations. Geophysical logs, natural gamma, self potential (SP), resistivity, and caliper, were run on the deeper borings. Figure 4-1 shows the soil boring locations. Figures 5-2 and 5-3 are geologic cross sections illustrating the site stratigraphy.

The SDB is located within the outcrop area of the Garber-Wellington Formation. In this area the Garber-Wellington is composed of interbedded sands, silts, and clays. At other areas of the Base (SWMU-8, Fire Training Area 2 and AOC, Fuel Truck Maintenance Area) the Garber-Wellington is represented by two distinct upward fining clastic sequences, each about 40 feet thick. At the SDB, the upper clastic sequence is present, but the lower sequence is not well developed and consists of alternating sand and silt units. A clay to sandy clay interval extends from the ground surface to a depth of about 15 feet. A 20- to 30-foot thick interval of interbedded silts, clayey sands, and silty sands underlies the surficial clay unit. A 15- to 20-foot thick sand layer, which may mark the base of the first clastic sequence, underlies the interbedded silts and sands.

Immediately below the basal sand of the first clastic sequence is 5 to 10 feet of hard clayey silt. The remainder of the Garber-Wellington Formation penetrated by the investigation soil borings consists of interbedded clayey silts, clayey sands, and sands.

3.3 Hydrology

3.3.1 Regional/Tinker AFB Hydrology

The most important source of potable groundwater in the Oklahoma City metropolitan area is the Central Oklahoma aquifer system. This aquifer extends under much of central Oklahoma and includes water in the Garber Sandstone and Wellington Formation, the overlying alluvium and terrace deposits, and the underlying Chase, Council Grove, and Admire Groups. The Garber Sandstone and the Wellington Formation portion of the Central Oklahoma aquifer system is commonly referred to as the "Garber-Wellington aquifer" and is considered to be a single aquifer because these units were deposited under similar conditions and because many of the best producing wells are completed in this zone. On a regional scale, the aquifer is confined above by the less permeable Hennessey Group and below by the Late Pennsylvanian Vanoss Group.

Tinker AFB lies within the limits of the Garber-Wellington Groundwater Basin. Presently, Tinker AFB derives most of its water supply from this aquifer and supplements the supply by purchasing from the Oklahoma City Water Department. The nearby communities of Midwest City and Del City derive water supplies from both surface sources and wells tapping the aquifer. Industrial operations, individual homes, farm irrigation, and small communities not served by a municipal distribution system also depend on the Garber-Wellington aquifer. Communities presently depending upon surface supplies such as Oklahoma City also maintain a well system drilled into the Garber-Wellington aquifer as a standby source of water in the event of drought.

Recharge of the Garber-Wellington aquifer is accomplished principally by percolation of surface waters crossing the area of outcrop and by rainfall infiltration in this same area. Because most of Tinker AFB is located in an aquifer outcrop area, the Base is considered to be situated in a recharge zone.

According to Wood and Burton (1968) and Wickersham (1979), the quality of groundwater derived from the Garber-Wellington aquifer is generally good, although wide variations in the concentrations of some constituents are known to occur. Wells drilled to excessive depths may encounter a saline zone, generally greater than 900 feet below ground surface. Wells drilled to such depths or those accidentally encountering the saline zone are either grouted over the lowest screens or may be abandoned.

Tinker AFB presently obtains its water supplies from a distribution system that is composed of 29 water wells constructed along the east and west Base boundaries and by purchase from the Oklahoma City Water Department. All Base wells are finished into the Garber-Wellington aquifer. Base wells range from 700 to 900 feet in finished depth, with yields ranging from 205 to 250 gallons per minute. The wells incorporate multiple screens, deriving water supplies from sand zones with a combined thickness from 103 to 184 feet (Wickersham, 1979).

Conceptual Hydrologic Model. The hydrologic conceptual model of Tinker AFB involves a comprehensive review of available data, including those from direct measurement sources (borings, water level measurements, pump/slug tests, stream studies) as well as indirect sources (aerial photographs, topographic maps, published reports). The hydrologic system at Tinker AFB is complex, but the model provides both an approximation of depth to water and an estimated direction of groundwater movement and is therefore useful as a basis for designing field investigations. As information is derived from investigations the model is continually updated and refined.

Groundwater. As a result of ongoing environmental investigations and the approximately 450 groundwater monitoring wells installed on the Base during various investigations, a better understanding of the specific hydrological framework has emerged. The current conceptual model developed by Tinker AFB (Tinker, 1993), based on the increased understanding of the hydrological framework, has been revised from a previous model adopted by the U.S. Army Corps of Engineers (USACE). Previous studies reported that groundwater was divided into four water bearing zones: the perched aquifer, the top of regional aquifer, the regional aquifer, and the producing zone. In the current model, two principal water table aquifer zones and a third less extensive zone have been identified. The third is limited to the southwest quadrant. The third aquifer zone consisted of saturated siltstone and thin sandstone beds in the Hennessey Shale and equates to the upper water bearing zone (UWBZ) described by the USACE at Landfills 1 through 4 (SWMUs-3 through -6). In addition, numerous shallow, thin saturated beds of siltstone and sandstone exist throughout the Base. These beds are of limited areal extent and are often perched.

In the current conceptual hydrologic model by Tinker AFB, an upper saturated zone (USZ) and a lower saturated zone (LSZ) are recognized in the interval from ground surface to approximately 200 feet. Below this depth is found the producing zone from which the Base draws much of its water supply. Figure 3-5 shows the potentiometric surface for the USZ and Figure 3-6 shows the potentiometric surface for the LSZ. The USZ exists under water table (unconfined) conditions, but may be partially confined locally. Conditions in the LSZ are difficult to determine due to screen placement and overlie long sand packs below the screen interval.

The USZ is found at a depth of 5 to 70 feet below ground surface and has a saturated thickness ranging from less than 1 foot at its eastern boundary to more than 20 feet in places west of Building 3001. The USZ is erosionally truncated by Soldier Creek along the northeastern margin of Tinker AFB. This aquifer zone is considered to be a perched aquifer over the eastern one-third of Tinker AFB, where it is separated from the LSZ by an underlying confining shale layer and a vadose zone. The confining interval extends across the entire Base, but the vadose zone exists over the eastern one-third of this area. The available hydrologic data indicate that the vadose zone does not exist west of a north-south line located approximately 500 to 1,000 feet west of the main runway; consequently, the USZ is not perched west of this line. However, based on potentiometric head data from wells screened above and below the confining shale layer, the USZ remains a discrete aquifer zone distinct from the LSZ even over the western part of the Base. In areas where several shales interfinger to form the lower confining interval rather than a single shale bed, "gaps" may occur. In general, these gaps are not holes in the shale but are places where multiple shales exist that are separated by slightly more permeable strata. Hydrologic data from monitoring wells indicate that these zones allow increased downward flow of groundwater above what normally leaks through the confining layer.

The LSZ is hydraulically interconnected and can be considered one aquifer zone down to approximately 200 feet. This area includes what was referred to by the USACE as the top of regional and regional zones. Hydrologic data from wells screened at different depths at the same location within this zone, however, provide evidence that locally a significant vertical (downward) component of groundwater flow exists in conjunction with lateral flow. The magnitude of the vertical component is highly variable over the Base. Preliminary evidence suggests that the LSZ is hydraulically discrete from the producing zone. Due to variations in topography the top of the lower zone is found at depths ranging from 50 to 100 feet below ground surface under the eastern parts of the Base and as shallow as 30 feet to the west.

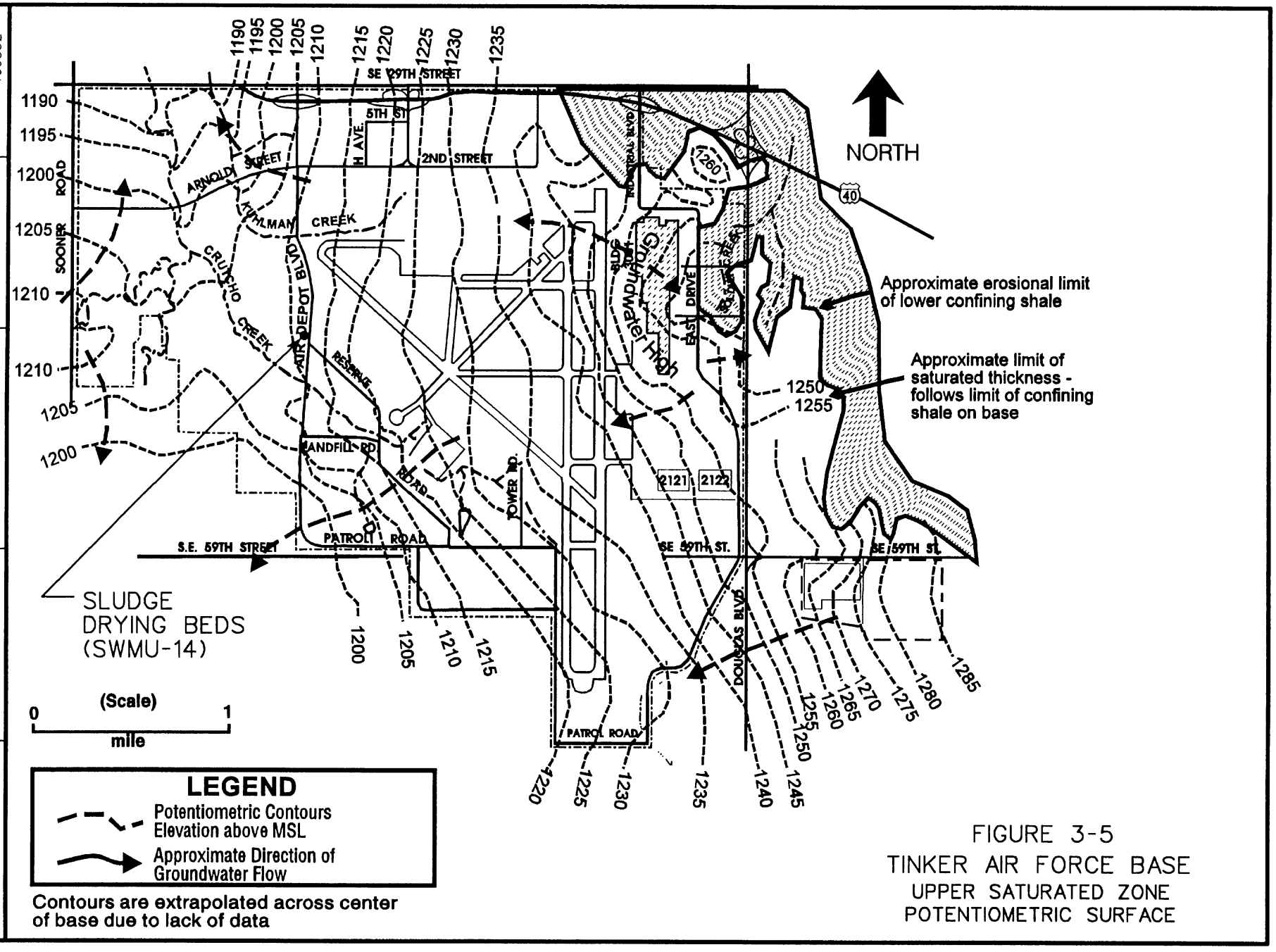


FIGURE 3-5
TINKER AIR FORCE BASE
UPPER SATURATED ZONE
POTENTIOMETRIC SURFACE

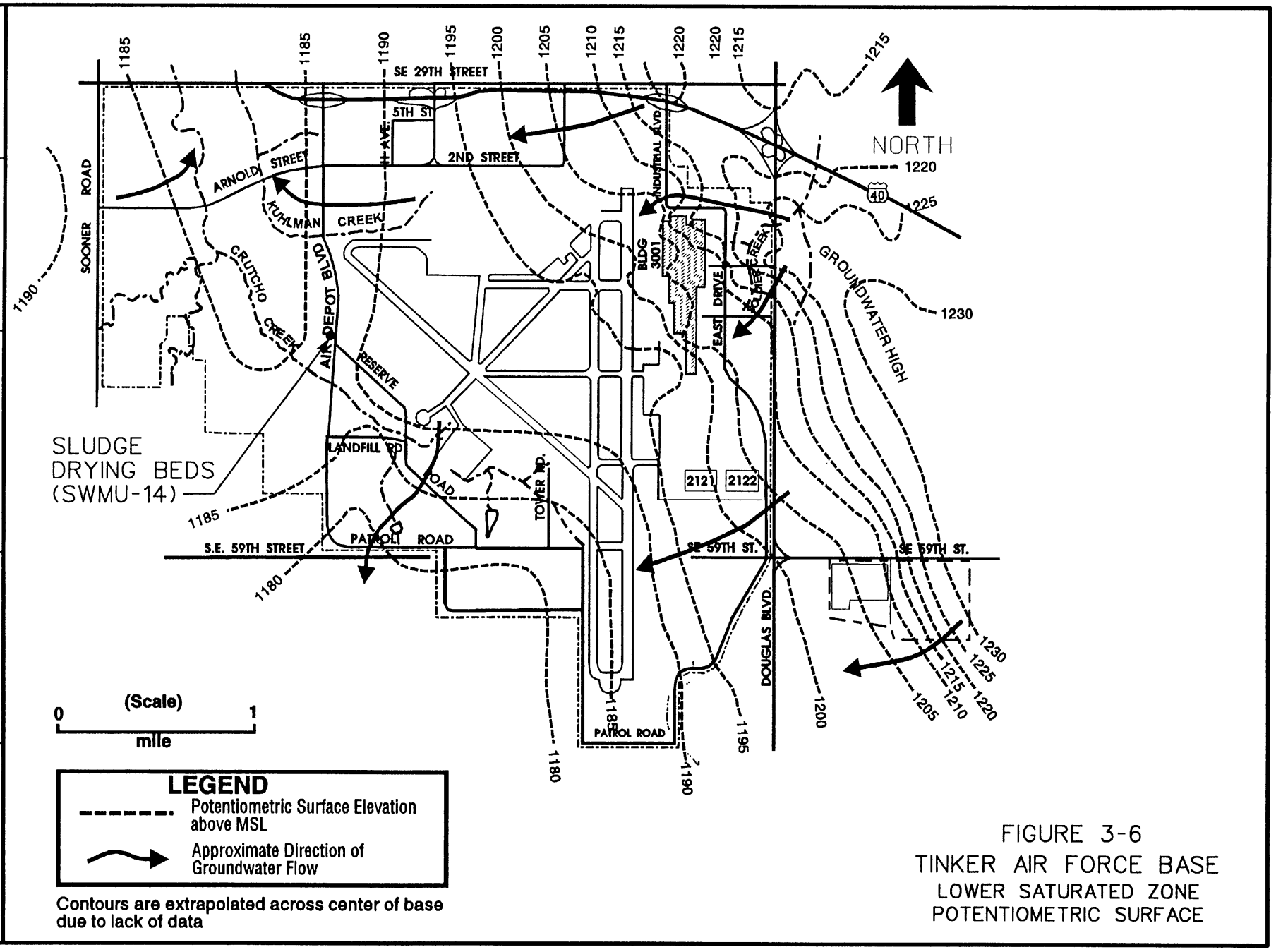


FIGURE 3-6
TINKER AIR FORCE BASE
LOWER SATURATED ZONE
POTENTIOMETRIC SURFACE

STARTING DATE: 23MAR94	DATE LAST REV.:	DRAFT. CHCK. BY:	INITIATOR: C.WALLACE	DWG. NO.:40983209C
DRAWN BY: C.E.TUMLIN	DRAWN BY:	ENGR. CHCK. BY:	PROJ. MGR.: J.TAYLOR	PROJ. NO.:409832

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Differences in potentiometric head values found at successive depths are due to a vertical (downward) component of groundwater flow in addition to lateral flow and the presence or absence of shale layers that locally confine the aquifer system. The LSZ extends east of the Base (east of Soldier Creek) beyond the limits of the USZ where it becomes the first groundwater zone encountered in off-Base wells. Because of the regional dip of bedding, groundwater gradient, and topography, the LSZ just east of the Base is generally encountered at depths of less than 20 feet.

Across the central portion of Tinker AFB, the unsaturated zone separating the USZ and LSZ disappears where the intervening shale layer dips below the surface of the LSZ. The disappearance of the unsaturated zone is supported by data from recently completed wells just west of the north-south runway and near Base Operations and by data from wells in the southwest portion of the Base. Measured water levels in two of the new wells show that the LSZ is confined at these locations by the shale separating the USZ and LSZ. No unsaturated interval is present.

To the southwest, measured water levels from wells screened in the Garber Sandstone at Landfills 2 and 4, SWMUs-4 and -6, which correspond in the conceptual model to the USZ under the east part of the Base, show that the USZ remains unconfined or is partially confined. This zone is essentially the first water level encountered in the Garber Sandstone on the Base. Potentiometric data from wells in the southwest screened in deeper intervals, that correspond roughly to the LSZ to the east indicate that the LSZ is confined in this area. Data from wells screened at various intervals to a depth of about 90 feet in this area also show that no vadose (unsaturated) zone separates the USZ from the rest of the aquifer. The upper and lower zones cannot be distinguished in this area except by correlating geologic units across Base.

Farther to the southwest of the landfills, near the edge of the Base, another unsaturated zone is found separating groundwater in the Hennessey Group from the Garber-Wellington aquifer. This unsaturated zone is not continuous with that encountered on the east side of the Base. The groundwater in the overlying Hennessey water bearing zone represents the third groundwater zone of more limited areal extent mentioned previously. This shallow unconfined aquifer system is located on a topographic high (groundwater divide) in the strata of the Hennessey Group. Radial flow of groundwater off the divide toward nearby tributaries of Crutcho Creek is suggested from limited water level measurements. Additional shallow perched saturated zones of limited areal extent are thought to exist in other sandstone and

siltstone beds within the Hennessey water bearing zone. Along the western margin of Tinker AFB west of Crutcho Creek, the shallow groundwater in the Hennessey water bearing zone and probably groundwater in the most shallow saturated zones in the Garber-Wellington aquifer appears to flow toward stream tributaries, and therefore, does not follow regional flow patterns to the west/southwest.

The aquifer zones in the conceptual model are hydraulically connected, although sometimes only to a very local extent, either directly as in the west part of the Base or indirectly through leakage and/or recharge patterns related to local streams. Because Tinker AFB is located in a recharge zone for the Central Oklahoma aquifer both horizontal and vertical (downward) components of groundwater flow exist. Measured potentiometric levels from well clusters with screens and filter packs placed at varying depths within the LSZ show that hydraulic heads decrease with depth and that the magnitude of the vertical component of flow varies with location. This finding is particularly important to recognize where data from these wells are being used to generate potentiometric contour maps.

Although the variability in the geology and the recharge system at Tinker AFB makes it difficult to predict local flow paths, Central Oklahoma aquifer water table data taken from the 1992 USGS Hydrologic Atlas show that regional groundwater flow under Tinker AFB varies from west/northwest to southwest depending on location. This finding is supported by contoured potentiometric data from Base monitoring wells, which show groundwater movement in the upper aquifer zones to generally follow regional dip. Measured normal to potentiometric contours, groundwater flow gradients range from 0.0019 to 0.0057 ft/ft. However, because flow in the near surface portions of the aquifer at Tinker AFB is strongly influenced by topography, local stream-based levels, complex subsurface geology and location in a recharge area, both direction and magnitude of groundwater movement is highly variable. The interaction of these factors not only influences regional flow, but gives rise to complicated local, often transient, flow patterns at individual sites.

Several examples demonstrate this variability. Historical water level data around Crutcho Creek indicate that groundwater flow in that area is predominantly to the southwest. However, during high flow conditions bank recharge occurs and shallow local flow patterns near the creek may be reversed. This pattern is probably in effect at other streams as well. In the northeast quadrant of the Base, several factors contribute to groundwater "mounding" in the USZ and to formation of a groundwater high in the LSZ. This mounding leads to radial or semiradial groundwater flow at shallow depths. Finally, in the northeast part of the Base

where sufficient data exist, comparison of potentiometric contours from successively deeper levels in the LSZ suggests that groundwater flow directions change with depth, gradually turning from west/southwest to northwest. This change in regional flow is attributed either to effects of pumping from deep water supply wells in the area and/or to the presence of the Deep Fork River located to the north. This river, along with the Canadian River south of Tinker AFB, has been demonstrated by the USGS to act as a major discharge point for regional groundwater in Central Oklahoma.

Surface Water. The interaction of surface water with groundwater is an important factor in predicting local groundwater flow patterns at Tinker AFB. Although no technical stream study data are presently available to determine what degree of interaction occurs between streams and groundwater, some qualitative observations provide clues to the importance of this system. The direction of stream flow on Tinker AFB appears to be controlled largely by a topographic divide that extends from southwest to northeast across the south part of the Base. Streams that originate on the north side of the divide flow to the north. These streams include Soldier Creek, Crutcho Creek, and Kuhlman Creek. Elm Creek, which has its origin on the southeast side flows to the south. Streams that flow northward become perennial before leaving the Base and with no other constant source of water available are considered to be recharged by the aquifer (gaining streams). Some data indicate, however, that these streams become dry north of the Base during periods of lower precipitation and lose water to the aquifer (losing streams). Information from wells and piezometers near the ponded section of Soldier Creek at the industrial wastewater treatment plant also suggests that the pond contributes to the groundwater (a losing stream) in the LSZ at that location. Portions of Soldier Creek tributaries (near their headwaters, off-Base) flow only intermittently and probably recharge the aquifer through infiltration during periods of higher precipitation. Finally, where groundwater and stream elevations are the same, the observed direction of groundwater flow may be affected by transient factors such as bank storage from periods of increased precipitation.

Man-Made Structures. In the conceptual model of Tinker AFB it is recognized that man-made features such as buried utilities (storm drains, waste lines) may further complicate the shallow groundwater picture. An additional problem encountered in generating the model involves improper monitoring well construction practices that not only may contribute preferred pathways for groundwater (and contaminant) movement where wells have multiple screens or overlie long filter packs, but also often provide nonrepresentative, biased groundwater, and sample data.

The complex groundwater system at Tinker AFB makes correct placement and construction of monitoring and extraction wells critical. A good understanding of the conceptual hydrologic framework is essential to obtain representative data and to minimize errors. An integrated hydrologic conceptual model provides an overview of the groundwater system and leads in turn to more effective site project management.

3.3.2 Site Hydrology

Six monitoring wells in three clusters were installed at the SDB to help define the hydrologic characteristics at the site. The first groundwater to be monitored is the upper saturated zone (USZ). This water bearing interval represents the uppermost groundwater zone in the Garber-Wellington aquifer and corresponds to the interval originally defined by the USACE as the "perched" aquifer under the eastern portion of Tinker AFB. However, based on the recent Tinker AFB conceptual hydrologic model no vadose zone is thought to exist under this site.

Five of the six wells at the site are screened in the USZ. Two wells are placed downgradient and one upgradient of the site in the shallower portion of the zone and two wells are placed downgradient in the deeper part of the same aquifer zone. Based on water levels from these wells, the USZ is encountered at depths below ground surface of approximately 15 to 20 feet at the SDB. Contoured water level data from wells screened in this zone indicate that the potentiometric surface for the USZ is relatively flat, varying from 1,211.16 feet above msl at 2-68B to 1,211.64 feet above msl at 2-66B, the upgradient well. These amounts correspond to a low hydraulic gradient of 0.0022 ft/ft. The groundwater flow direction is roughly to the west in the USZ and groundwater appears to be moving toward Crutcho Creek. The two deeper wells have approximately the same potentiometric head as the shallower wells, suggesting that the entire monitored interval to a depth of around 55 feet downgradient of the site is hydraulically connected and represents one aquifer zone. The difference in potential of approximately 1 foot between the shallow and deep wells at one of the clusters is believed to represent a slight downward component of flow due to recharge by infiltration at that location. The potentiometric surface map of the USZ for this SWMU is shown in Figure 5-4.

Original plans at the SDB called for three wells to be screened in the USZ and three wells to be placed in the LSZ. Based on the conceptual model, it was projected that a confining layer should exist around 40 feet below ground surface. After completion and initial water level measurements, however, it was recognized that the two deeper downgradient wells at the SDB (2-67A and 2-68A) actually monitor a deeper part of the same aquifer zone as the shallow wells at the same locations. This is not the case in the upgradient cluster, where a difference

in potentiometric head of 10 feet exists between the shallow B well and deep A well, with the A well being 10 feet lower. This indicates that the deep well is monitoring a different aquifer zone (LSZ) and that this zone is not hydraulically connected with the USZ. The vertical (downward) component of potential may be due in part to the site being located in a recharge area for the aquifer and the presence of a confining layer (as discussed in sections relating to Tinker AFB hydrology). Geologic correlations on cross sections C-C' and D-D' suggest that the clayey silt bed at 1,180 to 1,195 feet msl in 2-66A may directly overlie the clayey silt bed at 1,165 to 1,172 feet msl in 2-67A and the hard silt in 2-68A and that these units together create a confining layer that separates the overlying USZ from deeper groundwater. The confining unit would therefore be 10 to 15 feet deeper than originally projected.

3.4 Soils

The surface soils of Tinker AFB have been studied by the U.S. Department of Agriculture (USDA), Soil Conservation Service (1969) and by several soil boring projects conducted for geotechnical (foundation construction) investigations. Surface soils of the installation area are predominantly of two basic types: residual and alluvial. The three major soil associations mapped within installation limits are Darrell-Stephenville, Renfrow-Vernon-Bethany, and Dale-Canadian-Port. The residual soils associations (Table 3-2), Darrell-Stephenville and Renfrow-Vernon-Bethany are the products of the weathering of underlying bedrock. The alluvial materials of the Dale-Canadian-Port association are stream-deposited silts and sands, whose occurrence is typically restricted to floodplains of area streams.

Table 3-2

Tinker AFB Soil Associations
(Source: USDA, 1969)

Association	Description	Thickness (in.)	Unified Classification[a]	Permeability (in./hr)
Darrell-Stephenville: loamy soils of wooded uplands	Sandy loam Sandy clay loam Soft sandstone (Garber Sandstone)	12-54	SM,ML,SC	2.0-6.30
Renfrow-Vernon-Bethany: loamy and clayey soils on prairie uplands	Silt loam - clay Clay loam Shale (Fairmont Shale)	12-60	ML,CL,MH,CH	<0.60-0.20
Dale-Canadian-Port: loamy soil on low benches near large streams	Fine sandy loam Silty clay loam Loam Clay loam	12-60	SM,ML,CL	0.05-6.30

[a]Unified classifications defined in U.S. Bureau of Reclamation, 5005-86.

4.0 Description of Investigative Methods

The Phase I field investigation of the subsurface conditions at the Sludge Drying Beds was conducted from October through December 1993. All activities conducted during the field investigation program were performed in accordance with the Work Plan, the Data Management Plan, the Data Collection Quality Assurance Plan, the Health and Safety Plan, and their Amendments. As a Phase I investigation, field activities were designed to provide information on subsurface lithologies and the existence and nature of contamination, if any, in the soils and/or groundwater beneath the SDBs. Field investigation activities described in the following sections included subsurface soil sampling followed by monitoring well installation, a soil gas survey, and groundwater sampling (Table 4-1). A total of ten soil borings, and three shallow and three deep monitoring wells, were installed at the site (Figure 4-1).

4.1 Soil Gas Survey

A soil gas survey was performed at the SDBs and consisted of 26 vapor gas survey points configured in a rough circle around the boundary of the SDBs. One-inch rods were hydraulically driven to 10 feet, and soil gas samples were collected through the rods and analyzed for VOC.

4.2 Soil Boring Installation

Ten soil borings, SB-29 through SB-38, were drilled in the SDBs to determine the existence and degree, if any, of soil contamination directly below the SDBs. The soil borings were drilled in the deepest section of the SDB (the north end of the south SDBs and the south end of the north SDBs), with the exception of SB-29 and SB-30, which were drilled in the middle and at the southern end of the earthen-lined sludge bed, respectively. The area between the two sets of sludge drying beds was not sampled because the area is not accessible due to the location of two concrete digester vessels that have earthen contours from drying beds to top of the digesters of a one-to-one slope.

Soil borings were advanced with 8-inch hollow-stem augers. Conditions permitting, boreholes were sampled continuously for lithologic purposes with 5-foot tube samplers. Upon encountering harder strata resulting in auger refusal, the continuous tube sampler was exchanged for a center bit making it possible to advance borings through less penetrable materials. When the center bit was used, a 2-foot split spoon was used to sample the borehole. Analytical samples were collected from every 5-foot interval and at the groundwater interface, where the last sample for each boring was collected. The soil borings were completed at depths ranging

Table 4-1
Sludge Drying Beds
Summary of RFI Field Activities

Type of Activity	Number of Locations	Cumulative Footage of Borings/Wells	Average Footage per Boring/Well	No. of Samples Collected for Chemical Analysis					Analyses Performed	Geotechnical[2] Samples
				Normal Samples	Duplicates	Rinsates	Field Blanks	Totals		
Soil Borings	10	194.5	19.5	38	1	1	0	40	VOCs, SVOCs, Metals	0
Shallow Monitoring Well Installation[1]	3	181	60.3	4	0	0	0	4	VOCs, SVOCs, Metals	0
Deep Monitoring Well Installation	3	203	67.7	7	0	1	0	8	VOCs, SVOCs, Metals	1
TOTALS	16	578.5	n/a	49	1	2	0	52		1
Shallow Well Groundwater Sampling	3	n/a	n/a	3	1	0	0	4	VOCs, SVOCs, TOCs, TPH, Metals, Inorganic Parameters, COD, Phenols	n/a
Deep Well Groundwater Sampling	3	n/a	n/a	3	0	0	0	3	VOCs, SVOCs, TOCs, TPH, Metals, Inorganic Parameters, COD, Phenols	n/a
TOTALS	6	n/a	n/a	6	1	0	0	7		n/a
Soil Gas Survey	26	260	10.0	26	n/a	n/a	n/a	26	Halogenated Volatile Organics, BTEX	n/a

Notes:
[1] Shallow monitoring well installation included one stratigraphic boring advanced to 117.5' for geophysical logging purposes, which was later converted into well 2-66B.
[2] Geotechnical analysis included grain size distribution, moisture content, cation exchange capacity, and vertical permeability.
VOCs - Volatile Organic Compounds - EPA Method 8240
SVOCs - Semivolatile Organic Compounds - EPA Method 8270
Metals - EPA Method 6010-Al, Ag, As (EPA Method 7060), Ba, Be, Cd, Cr, hexavalent Cr (EPA Method 7196), Cu, Fe, Pb (EPA Method 7421), Ni, Zn, and Hg (EPA Method 7471)
TPH - Total Petroleum Hydrocarbon - EPA Method 418.1/9071
TOCs - Total Organic Carbon - EPA Method 415.1
Inorganic Parameters - PO_4, SO_4, Cl, Si, Alkalinity, Total Dissolved Solids, Total Suspended Solids, Nitrate/Nitrite, Total Kjeldahl Nitrogen (TKN), Ca, Mg, Mn, Na, K
COD - Chemical Oxygen Demand - EPA Method 410.1
Phenols - EPA Method 9066
BTEX - EPA Method 8020 (modified); Halogenated Volatile Organics - Method 8010 (modified)

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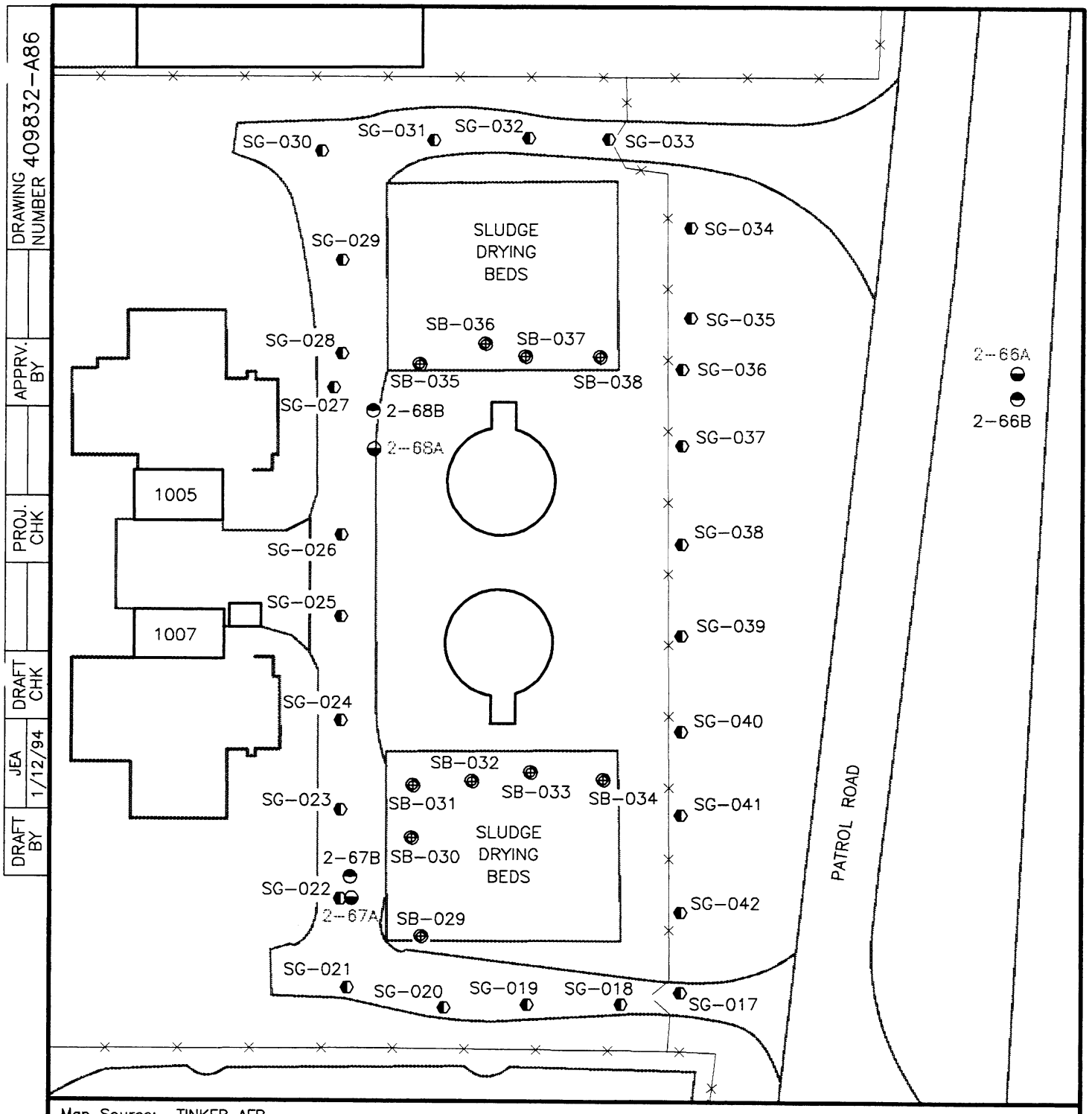


Map Source: TINKER AFB

LEGEND

SB-029	SOIL BORING LOCATION AND IDENTIFICATION NUMBER
2-67A	DEEP MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
2-67B	SHALLOW MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
SG-021	SOIL VAPOR SURVEY POINT AND IDENTIFICATION NUMBER
	FENCE

0 50
FEET

FIGURE 4-1
SLUDGE DRYING BEDS SITE MAP WITH LOCATIONS OF SOIL BORINGS, SOIL VAPOR SURVEY POINTS AND MONITORING WELLS

PREPARED FOR

TINKER AFB
OKLAHOMA

DRAWING NUMBER 409832-A86
APPRV. BY
PROJ. CHK
DRAFT CHK
JEA 1/12/94
DRAFT BY

Do Not Scale This Drawing

from 18.5 to 23.5 feet, which was based on the depth at which the first water bearing unit was encountered. A total of 39 soil samples were collected for laboratory analysis. After drilling and sampling activities were concluded, each boring was filled to the surface with grout consisting of Portland Type I cement mixed with no more than 10 gallons of water per 94-pound bag and 5 percent bentonite gel per volume. Samples were analyzed for VOCs, semivolatile organic compounds (SVOC), and priority pollutant metals (aluminum, arsenic, barium, beryllium, cadmium, chromium, hexavalent chromium, copper, iron, lead, mercury, nickel, silver, and zinc).

4.3 Shallow Monitoring Well Installation

Three shallow monitoring wells, 2-66B, 2-67B, and 2-68B were installed in the upper portion of the upper saturated zone (USZ) to determine the existence and degree, if any, of groundwater contamination in the uppermost aquifer attributable to activities at the former SDBs.

Following monitoring well installation, well development, and water level measurements of both the shallow monitoring wells and the deep monitoring wells, it is apparent that monitoring wells 2-67A and 2-68A are screened in the USZ rather than the LSZ as intended. Therefore, a total of five monitoring wells, 2-66B, 2-67B, 2-68B, 2-67A, and 2-68A were installed in the perched aquifer (USZ). A description of the well installations for 2-67A and 2-68A will follow in Section 4.4.

To establish background constituent levels for the soils and groundwater underlying the SDBs shallow monitoring well 2-66B was placed upgradient, approximately 100 feet east of the former SDBs (Figure 4-1). Two USZ monitoring wells, 2-67B and 2-68B, were placed downgradient from the SDBs to the southwest and west, respectively. Comparing analytical results from the upgradient well with results from the two downgradient wells will make it possible to determine whether constituents from the former SDBs have migrated into and are adversely impacting the USZ.

Boreholes for the shallow monitoring wells were advanced with 8-inch hollow-stem augers. Conditions permitting, boreholes were sampled continuously for lithologic purposes with 5-foot tube samplers. Upon encountering harder strata resulting in auger refusal, the continuous tube sampler was exchanged for a center bit making it possible to advance borings through less penetrable materials. When the center bit was used, a 2-foot split spoon was used to sample the borehole. Analytical samples were collected from one well in each shallow/deep monitoring well cluster: 2-66B, 2-67A, and 2-68B.

The borings were initially drilled to a target projected depth decided upon by Tinker AFB Project Management. Once the confining layer had been reached, the augers were removed from the borehole, and the hole was geophysically logged for the following parameters: natural gamma, spontaneous potential, resistivity, and borehole diameter. The depth that the screened interval was set was then decided upon by Tinker AFB Project Management based upon review of the geophysical and lithologic logs. The depths of the shallow wells in the SDBs range from 24 to 26 feet.

After the depth of the screened interval was decided, the boring was backfilled from total depth with bentonite pellets or chips to a depth equal to the bottom of the well screen. The well screen and riser were then inserted into the borehole with two stainless steel centralizers set at the bottom and the top of the screen, with the exception of well 2-66A, which has no centralizer. The length of screen and riser was not set on the bottom of the borehole, but was suspended from the surface and set just above the bottom. The screen consists of 10 feet of 2-inch diameter stainless steel with 0.010-inch slots. The riser pipe consists of 2-inch flush threaded stainless steel. The filter pack was then added to the annulus of the borehole. The filter pack consists of No. 20 silica sand and was poured in from the surface. The borehole was filled from the bottom of the screen to 2 feet to 5 feet above the top of the screen with the filter sand. Immediately after adding the filter pack, the annular seal was added to the annulus. The annular seal consists of a minimum of 5 feet of bentonite pellets or chips and was poured in from the surface. The bentonite was then left to sit for at least 30 minutes before adding the grout to allow the bentonite to fully hydrate and swell. After allowing the bentonite to swell, the remaining annular space was filled to the surface with grout consisting of Portland Type I cement mixed with no more than 10 gallons of water per 94-pound bag and 5 percent bentonite per volume. The grout was pumped into the annulus via tremmie pipe until returns were received on the surface.

After drilling and sampling to 28 feet with 8-inch hollow-stem augers, 2-66B was drilled to 117.5 feet as a stratigraphic pilot hole for geophysical logging purposes before a well was installed in the borehole. The primary purpose of this pilot hole was to provide a tie point for Base-wide and regional stratigraphic correlations. The pilot hole drilling of 2-66B was accomplished using mud rotary techniques with a 3-7/8-inch tricone rock bit. Samples were collected for lithologic logging purposes using a 2-foot split spoon. Upon reaching total depth, 2-66B was geophysically logged for the previously mentioned parameters. The borehole was then filled to 30 feet with grout consisting of Portland Type I cement mixed with no more than 10 gallons of water per 94-pound bag and 5 percent bentonite gel per

volume. After allowing the grout to cure for a minimum of 24 hours, the well was installed at 2-66B.

4.4 Deep Monitoring Well Installation

Two deep, double-cased monitoring wells were installed in the lower part of the upper saturated zone and one in the top of the lower saturated zone. The two deeper wells in the USZ (2-67A and 2-68A) were installed adjacent to corresponding shallower wells forming shallow-deep well pairs (Figure 4-1). The LSZ well (2-66A) is located upgradient of the site near 2-66B. In addition, soil samples collected from the deep monitoring well borings were chemically analyzed to determine the degree, if any, of subsurface soil contamination at the SDBs.

To establish background constituent levels for the soils and groundwater underlying the SDBs, deep monitoring well 2-66A was placed upgradient, approximately 100 feet east of the former SDBs (Figure 4-1). Two deep monitoring wells, 2-67A and 2-68A, were placed downgradient from the SDBs to the west and southwest, respectively. At this time, it is apparent that monitoring wells 2-67A and 2-68A were installed to 67 feet below ground surface and 70 feet below ground surface, respectively, and are actually screened in the lower part of the USZ. Monitoring well 2-66A will monitor the LSZ as planned.

Pilot borings for the deep well were initially drilled to a target confining layer decided upon by Tinker AFB Project Management. Borings for the deep wells were initially advanced with an 8-inch outside diameter (O.D.) hollow-stem auger. A 5-foot tube sampler was used to continuously sample the borings for lithologic logging purposes. Based upon odor, field screening with a photoionization detector/flame ionization detector (PID/FID), and visual inspection, one sample was collected from each 5-foot section for chemical analysis until the top of the water table was encountered, where the final analytical sample was collected. No samples for laboratory analysis were collected below the groundwater level, but monitoring well 2-66A was sampled for lithologic purposes to total depth using a wireline system employing a 5 inch NX core barrel. At the SDBs this sampling scheme resulted in the collection of 11 total soil samples (including samples from 2-66B) that were each analyzed for VOCs, SVOCs, and priority pollutant metals. One additional sample was collected from the boring for well 2-68A for geotechnical analysis that included the following parameters: grain-size distribution, moisture content, cation exchange capacity, and vertical permeability.

Once the total depth was reached, the borings were geophysically logged for natural gamma, spontaneous potential, resistivity, and borehole diameter. The set depth for the surface casing was then decided upon by Tinker AFB Project Management based upon review of the geophysical and lithologic logs. The depths of the bottom of the surface casings in the wells at SWMU-14 range from 25 to 33 feet.

After the depth of the surface casing was decided upon, the boring was then backfilled with bentonite pellets or chips from the bottom of the boring to the depth of the bottom of the surface casing. The boring was then reamed with 12-inch O.D. augers to the depth of the bottom of the surface casing. The surface casing, consisting of 8-inch inside diameter (I.D.) carbon steel with welded joints, was then inserted into the borehole. An aluminum shoe was welded onto the bottom of the surface casing to prevent grout from filling the inside of the casing. The annular space between the surface casing and the borehole wall was then filled to the surface with grout consisting of Portland Type I cement mixed with no more than 10 gallons of water per 94-pound bag and 5 percent bentonite gel per volume. The grout was pumped into the annulus via tremmie pipe until returns were received at the surface.

After allowing the grout to set for at least 24 hours, drilling continued on the lower section of the boring using mud rotary techniques with a 5-5/8 inch tricone rock bit. No bentonite gel was added to the drilling fluid because the geologic formations made its own mud. Once again, the lower part of the boring was advanced to a depth predetermined by Tinker AFB Project Management. When that depth was achieved, the hole was again geophysically logged for the same parameters as above. Tinker AFB Project Management then decided upon the screened interval and total depth of the well based upon review of the geophysical and lithologic logs. The total depth of the wells in the SDB range from 48 to 60.5 feet.

After the depth of the screened interval was decided, the boring was backfilled from total depth with bentonite pellets or chips to the depth of the bottom of the well casing. The well screen and riser were then inserted into the borehole with a stainless steel centralizer set between 5 and 10 feet above the top of the screen. The length of screen and riser did not rest on the bottom of the borehole, but was suspended from the surface and ranged approximately a foot above the bottom of the borehole. The screen consists of 10 feet of 2-inch diameter stainless steel with 0.010-inch slots. The riser pipe consists of 2-inch flush threaded stainless steel. The filter pack was then added to the annulus of the borehole. The filter pack consists of No. 20 silica sand and was poured in from the surface. The borehole was filled from a foot below the screen to 2 feet above the screen with the filter sand. After adding the sand,

the well was surged with a surge block for approximately 5 minutes to ensure that the sand was properly compacted. Then, if needed, more sand was added to raise the level of sand to 2 feet above the top of the screen. Immediately after adding the filter pack, the annular seal was added to the annulus. The annular seal consists of a minimum of 5 feet of bentonite pellets or chips and was poured in from the surface. The bentonite was then left to sit for at least 30 minutes before adding the grout to allow the bentonite to fully hydrate and swell. After allowing the bentonite to swell, the remaining annular space was filled to the surface with grout consisting of Portland Type I cement mixed with no more than 10 gallons of water per 94-pound bag and 5 percent bentonite per volume. The grout was pumped into the annulus via tremmie pipe until returns were received on the surface.

4.5 Surface Completion

The six wells installed at the SDBs received flush-mount surface completions, each consisting of a 12-inch-diameter iron manhole cover set into a 4-foot by 4-foot square concrete pad centered on the well casing stick-up. To facilitate runoff away from the wells, the concrete pads were sloped away from the manhole covers (set no more than 4 inches above the ground) to the outer edges of the pads, which were flush with the ground surface. To ensure the security of the wells, each well was fitted with a water- and air-tight, locking well cap. As requested, all the padlocks were keyed identically, and all bolts for the manhole covers were the same size.

4.6 Well Development

Once the surface completions had been given sufficient time to cure, wells were developed through a combination of surging, bailing, and pumping. A minimum of five well volumes of water was purged from each well during development. Pumping was accomplished by the use of a 2-inch diameter submersible pump. Bailing was accomplished using 1-1/2-inch by 5-foot polyvinyl chloride (PVC) bailers. Purging and/or surging continued until the pH of the well had dropped and stabilized, indicating that any drilling mud, dissolved grout, or other foreign material introduced during well installation had been sufficiently flushed out of the well. Well development was then considered complete when the pH and conductivity has stabilized and the well was producing water that was clear to the unaided eye meeting final approval of the Tinker AFB Project Manager.

4.7 Groundwater Sampling

To provide the wells with adequate time to recover and stabilize after development, the newly installed wells at the SDBs were allowed to sit for 3 days prior to the first groundwater

sampling event. Static groundwater levels and total depth measurements were recorded prior to purging for sampling. The water level data were later used to contour potentiometric surface maps of the USZ. All wells were then purged to ensure that fresh water samples representative of aquifer conditions would be obtained during sampling. Wells were considered sufficiently purged when three well volumes of water had been removed from a well or the well had been purged to dryness. Purging was accomplished by the use of dedicated 1-1/2-inch by 5-foot PVC bailers. While purging, pH, temperature, and conductivity readings were collected and monitored for unusual variations that would indicate that additional well volumes should be evacuated before sampling.

A total of six groundwater samples and one field duplicate were collected from the wells at the SDBs. To prevent cross contamination between the wells and to eliminate decontamination time, each well was sampled with a disposable polypropylene bailer and rope that were discarded with project waste after use. A final round of field pH, temperature and conductivity readings was recorded as the samples were being collected. Groundwater samples were each analyzed for the following parameters: VOCs, SVOCs, total organic carbon (TOC), chemical oxygen demand (COD), total petroleum hydrocarbons (TPH), phenols, priority pollutant metals, and standard inorganic groundwater parameters.

4.8 Elevation and Location Surveying

After completion, the elevations and locations of the monitoring wells and the soil borings at the SDBs were determined by a State of Oklahoma licensed surveyor. For each well, the ground surface, the top of the well casing, and the top of the concrete pad were surveyed in relative to Base data provided by Tinker AFB. For the borings, only the ground surface directly adjacent to the grouted hole was surveyed. Elevations and locations of any pre-existing monitoring wells and piezometers at the SDBs were also determined. All locations will be provided in the Base coordinate system, and all elevations will be measured from msl. All survey information is presented in Appendix E.

5.0 Investigation Results

The following sections provide an evaluation of the data quality and the results of the RFI performed at the SWMU-14, Sludge Drying Beds. Section 5.1 discusses the methods and procedures used to ensure data quality and useability. Section 5.2 provides a discussion of the source characterization and the potential of the SDB as a contributing source for contamination. Section 5.3 provides details regarding the contaminant characterization via analysis of the results of the soils and groundwater investigation.

5.1 Data Quality Evaluation

The quality of the analytical data used for the RFI must be sufficient to support the associated risk management decisions. Data quality is ensured through adherence to Data Quality Objectives (DQO) and the sampling and analysis program outlined in the Data Collection Quality Assurance Plan (DCQAP) (IT, 1993b). The DCQAP identifies sampling locations, sampling methods, DQOs, field and laboratory quality control testing, analytical methods and reporting, and data evaluation and verification. The quality control of field and laboratory activities; the assessment of precision, accuracy, and comparability of the data; and the verification of the data are the most significant activities designed to ensure compliance with the DQOs.

5.1.1 Field Quality Control

Field quality control testing involved the collection of control samples to aid in evaluating inaccuracies which may be induced by field activities. These control samples include:

- ***Field Blanks.*** A field blank is an amount of water, gas, or solid that is provided to demonstrate the absence of contamination during sampling. Field blanks were only collected for groundwater and waste samples.

- ***Trip Blanks.*** Volatile organics samples are susceptible to contamination by diffusion of organic contaminants into the sample container. Therefore, trip blanks were analyzed to monitor for sample contamination during shipment and storage. No trip blanks were obtained for soil samples, due to the dissimilarity in matrix between the blanks and the actual samples.

- ***Rinsate Blanks.*** A rinsate blank is a volume of rinse solution (e.g., deionized distilled laboratory water or organic solvent) used to rinse a sampling tool which contacts more than one sample. The rinse solution was collected after the sampling tool was used and cleaned, to demonstrate that no residual contamination remained on the tool to carry over to the next sample.

- ***Field Duplicates.*** Duplicate analyses were performed to evaluate the precision of analysis. Both field and laboratory duplicates were taken and analyzed. Results of these analyses were used to determine the relative percent difference (RPD) between replicate samples.

5.1.2 Laboratory Quality Control

Laboratory quality control testing involved the use of control samples to aid in evaluating quality control errors which may be induced by laboratory activities. The control samples include:

- ***Method Blanks.*** A method blank is a volume of deionized and distilled laboratory water for liquid samples, or a purified solid matrix for soil/sediment samples, carried through the entire analytical procedure to identify contaminants introduced during the procedure.

- ***Bottle Blanks.*** At a frequency of 1 percent or greater, laboratory-prepared sample containers were tested to verify that the container cleaning procedure is performed acceptable. Parameters of concern for the particular container were tested (e.g., metals for plastic containers).

- ***Laboratory Blanks.*** Distilled water-filled volatile organic analysis (VOA) vials were stored in the laboratory using the same method of storage used for field samples. If the field and trip blanks contained high concentrations of contaminants, the laboratory blank was analyzed to identify the source of contamination.

- ***Matrix Spikes.*** To evaluate the effect of sample matrix on analytical methodology accuracy, a separate sample aliquot was spiked with the analyte of interest and analyzed with approximately ten samples or, if a smaller number of samples are associated with a test series, for each group of samples.

- ***Surrogate Standards.*** Surrogate standards are compounds added to gas chromatography/mass spectrometry (GC/MS) standards, blanks, and samples prior to extraction or purging to monitor the recovery efficiencies of the sample preparation and analytical procedures on a sample-by-sample basis.

5.1.3 Evaluation of Precision and Accuracy

As part of the analytical quality control testing program, quality control sample results were used to apply precision and accuracy criteria for each parameter that was analyzed. When the analysis of a sample set was completed, the quality control data generated were evaluated based on the following criteria:

- ***Method Blank Evaluation.*** The method blank results were evaluated for high readings characteristic of background contamination. If high blank values were

observed, laboratory glassware and reagents were checked for contamination and the analysis of future samples halted until the system could be evaluated.

- ***Trip, Field, Laboratory, and Rinsate Blank Evaluation.*** Trip, field, laboratory, and rinsate blank results were evaluated for high readings similar to the method blanks described above. If high blank readings were encountered, the procedure for sample collection, shipment, and laboratory analysis would be reviewed.

- ***Duplicate Sample Evaluation.*** Duplicate sample analysis was used to determine the precision of the analytical method for the sample matrix. The duplicate results will be used to calculate the precision as defined by the RPD.

- ***Matrix Spike Evaluation.*** The observed recovery of the spike versus the theoretical spike recovery was used to calculate accuracy as defined by the percent recovery (%R).

- ***Surrogate Standard Evaluation.*** The results of surrogate standard determinations were compared with the true values spiked into the sample matrix prior to purging or extraction and analysis, and the percent recoveries of the surrogate standards were determined.

- ***Comparability Between Data Sets.*** Comparability is a qualitative parameter expressing the confidence with which one data set can be compared with another. Comparability for sampling and analysis was achieved by specifying and using only well-recognized techniques and accepted standard EPA methods and procedures for sampling and analysis reporting of representative samples.

5.1.4 Data Verification

Data packages and parameters were evaluated against the following criteria to ensure data validity prior to use:

- Sampling documentation (e.g., sample collection log, Chain-of-Custody Form, and Request for Analysis Form) matches samples submitted to samples analyzed.

- Chain-of-Custody Forms are complete.

- Sample identification summary for each sample is present.

- Analytical results for each sample include correct units, detection limits, method used, date sampled, date extracted, date analyzed, dilutions noted.

- Holding times were met.

- Data on field and laboratory duplicate samples for RPDs were within QC limits.

- Matrix spike/matrix spike duplicate (MS/MSD) recoveries were within QC limits.
- Method blanks were within control limits.

5.1.5 Data Useability

The data verification did not identify any reoccurring problems with analytical procedures or analytical reporting. Precision and accuracy for each analytical method as demonstrated by the evaluation or surrogate recoveries, laboratory control samples, MS, and MSD recoveries were satisfactory. The sample identification summaries for all samples and methods were present and complete. No data were found to be invalid. All deficiencies encountered were minor and did not affect the overall quality of the data, since other DQOs were met. Deficiencies were generally the result of matrix interference.

The analytical data generated from the RFI are of sufficient quality to make evaluations and support recommendations.

5.2 Source Characterization Results

This subsection will briefly review aspects of the SDB and its operational history which would have increased the potential of a contaminant release to the environment at the site. A detailed account of the site background appeared in Chapter 2.0 which included site description and history of operations subsections.

The eight SDBs were used to passively dewater wastewater treatment sludge from the municipal wastewater treatment facility. The wastewater treatment facility has since been abandoned.

After the wastewater treatment plant was abandoned the sludge drying beds were used as a temporary storage site for containerized liquid and solid waste from the various industrial operations on Base. Before the beds were used for storage the sludge drying beds were renovated. The drums are no longer stored at the SDBs and their contents are unknown. No samples of source material were available and therefore no characterization data exist.

5.3 Contaminant Characterization Results

Through the Phase I RFI, soils and groundwater have been sampled for contaminants potentially introduced into the environment as a result of past operational activities at the SDB.

5.3.1 Establishment of Surficial Soil Background Concentrations

Background soil concentrations for trace metals were determined based on a study performed by the USGS (1991). The study area was confined to approximately four counties in central Oklahoma. Tinker AFB lies at the approximate center of this area. A total of 293 B-horizon soil samples were collected throughout this area. Soil samples were collected at the top of the B-horizon, which was usually 20 to 30 centimeters below the surface but ranged from 3 to 50 centimeters below the surface. For site-specific analytes for which the USGS offered no background value (chromium VI, mercury), a site-specific background value was selected for comparison. This site-specific background sampling location was typically from an upgradient monitoring well boring. Monitoring well boring 2-66B was used to determine the soil background levels for chromium VI and mercury.

The use of B-horizon soil as selected by the USGS for metals background concentrations in soil is conservative in that the soil sampled does not reflect all possible anthropogenic influences. Most of the samples were obtained from hill crests and well drained areas in pasture and forested land, well away from roadways to minimize contamination from vehicular emissions (i.e., nearly "pristine" areas). Trace metal inputs to the study site soils on Base, however, will come from anthropogenic sources outside of the study area, in addition to those sources related to disposal activities or operations within the confines of the study site. Responsibility may therefore be taken for more trace metal impacts than are actually attributable to a given site.

An additional level of conservatism was added in the manner in which the site-specific metals concentrations were compared to the background levels. Typically, the environmental concentrations of trace metals at study sites are represented by the arithmetic upper 95th confidence interval on the mean of a normal distribution. This upper 95th confidence interval value is then compared to the background values. The intent of this typical approach is to estimate a Reasonable Maximum Exposure case (i.e., well above the average case) that is still within the range of possible exposures.

To expedite this comparison and establish greater conservatism, the maximum concentration found at the site of concern, rather than the upper 95th confidence interval value, was compared to the USGS background values. If the environmental concentration of a particular analyte was below or within the minimum-maximum range of the USGS background concentrations, that analyte was considered to be naturally occurring and of no further concern to this investigation. Given the conservative approach of the comparisons, site-

specific metals concentrations would have to significantly exceed the USGS background levels and be attributable to operations at the site before they would be considered a contaminant of concern.

The numerical comparison of site-specific metals concentrations to the USGS background concentrations is presented in the following section.

5.3.2 Soil Characterization

The locations of the site cross-sections are shown in Figure 5-1 and cross-sections C-C' and D-D' are shown in Figures 5-2 and 5-3, respectively. The analytical results for detected analytes in soil are presented in Table 5-1. Appendix D contains a complete listing of the analytical results and the Certificates of Analysis. The following assessment has been made from the analytical data for the soils collected from the SDB:

- No SVOCs were detected in the soils from the SDB investigation.

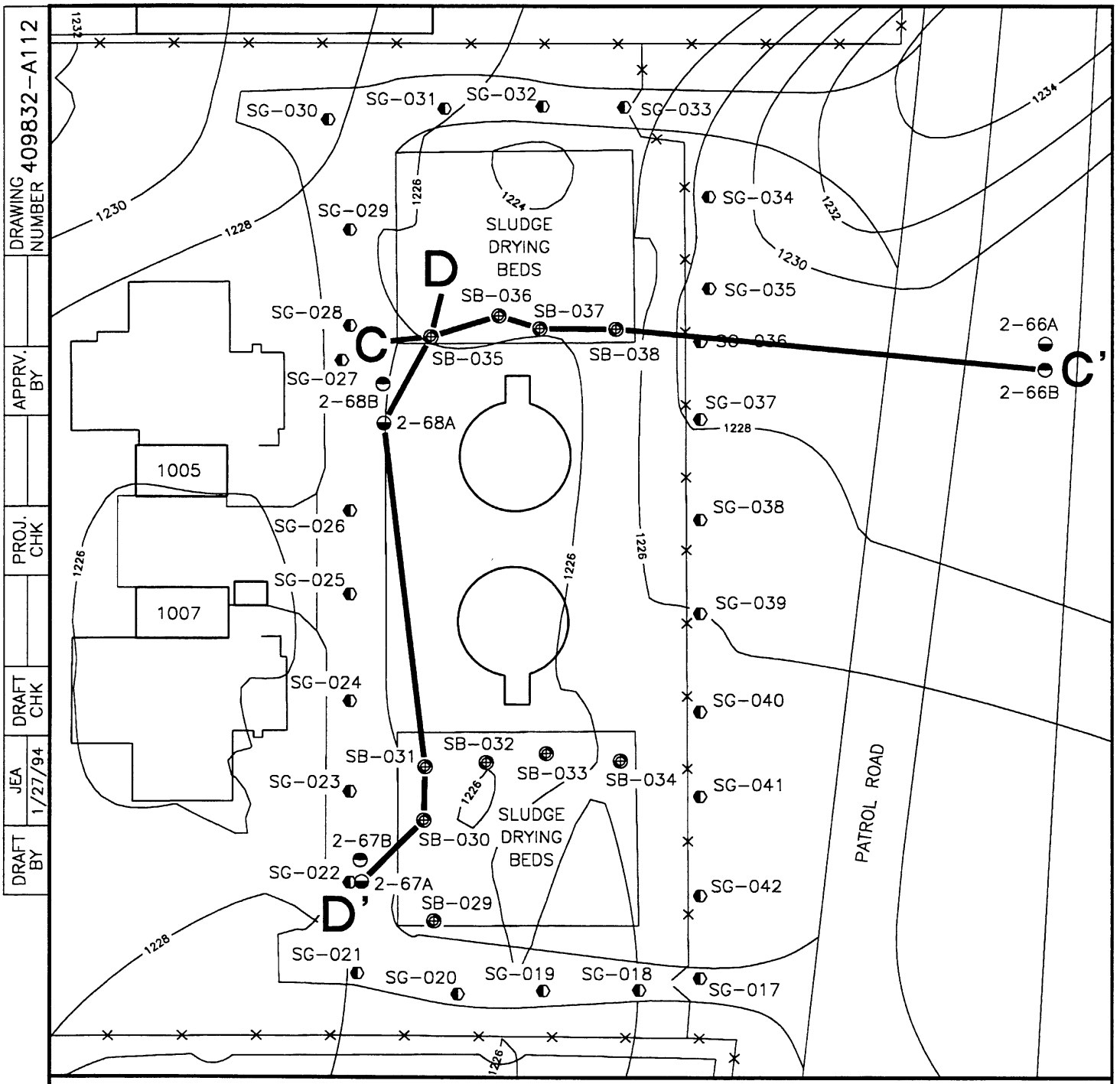
- Volatile organics were detected at concentrations above the reporting limits in soils from one of three monitoring well boring locations and from 4 of 10 soil borings drilled through the floor of the SDBs.

- Detected volatile organics and location of detection are:

Constituent	Location				
	2-67A	SB-032	SB-036	SB-037	SB-038
1,1-Dichloroethane		X	X		
1,1-Dichloroethene	X				
cis-1,2-Dichloroethene	X				
1,2-Dichloropropane	X				
Acetone		X			
Chlorobenzene				X	
Methylene chloride				X	X
Tetrachloroethene	X				

- 1,1-Dichloroethane only detected in soils just above water table and in near surface sample (1 to 1.5 feet) at SB-032 and SB-036.

- 1,1-Dichloroethene, cis-1,2-dichloroethene, and 1,2-dichloropropane only detected in soils just above water table in boring 2-67A.



Map Source: TINKER AFB

LEGEND

SB-029	SOIL BORING LOCATION AND IDENTIFICATION NUMBER
2-67A	DEEP MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
2-67B	SHALLOW MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
SG-021	SOIL VAPOR SURVEY POINT AND IDENTIFICATION NUMBER
	FENCE
1228	CONTOUR INTERVAL
	LINE OF CROSS-SECTION

0 50
FEET

FIGURE 5-1
SITE CROSS-SECTION LOCATION MAP

PREPARED FOR

TINKER AFB
OKLAHOMA

DRAWING NUMBER 409832-A112
APPRV. BY
PROJ. CHK
DRAFT CHK
JEA 1/27/94
DRAFT BY

Do Not Scale This Drawing

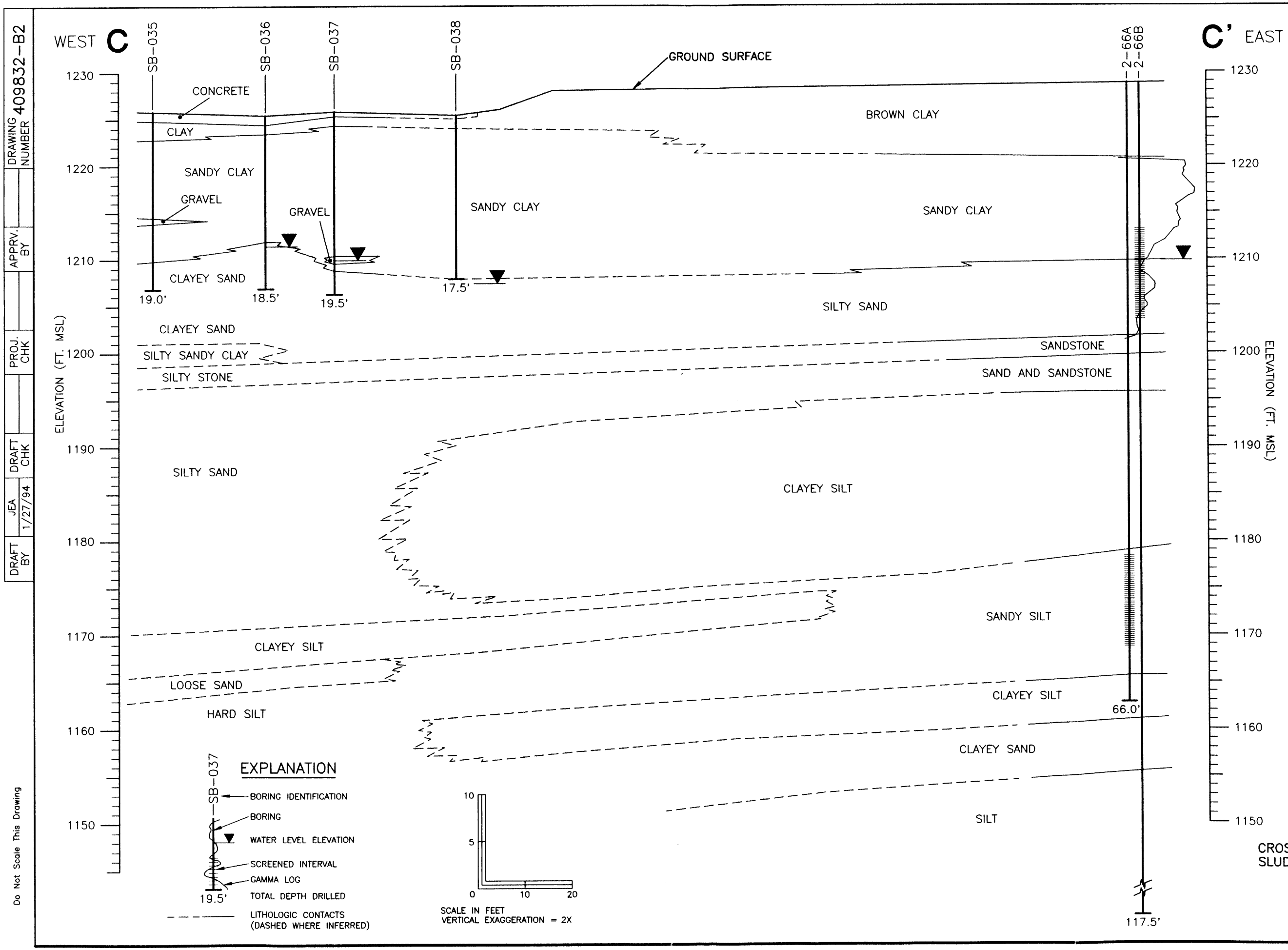


FIGURE 5-2
CROSS-SECTION C-C'
SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA

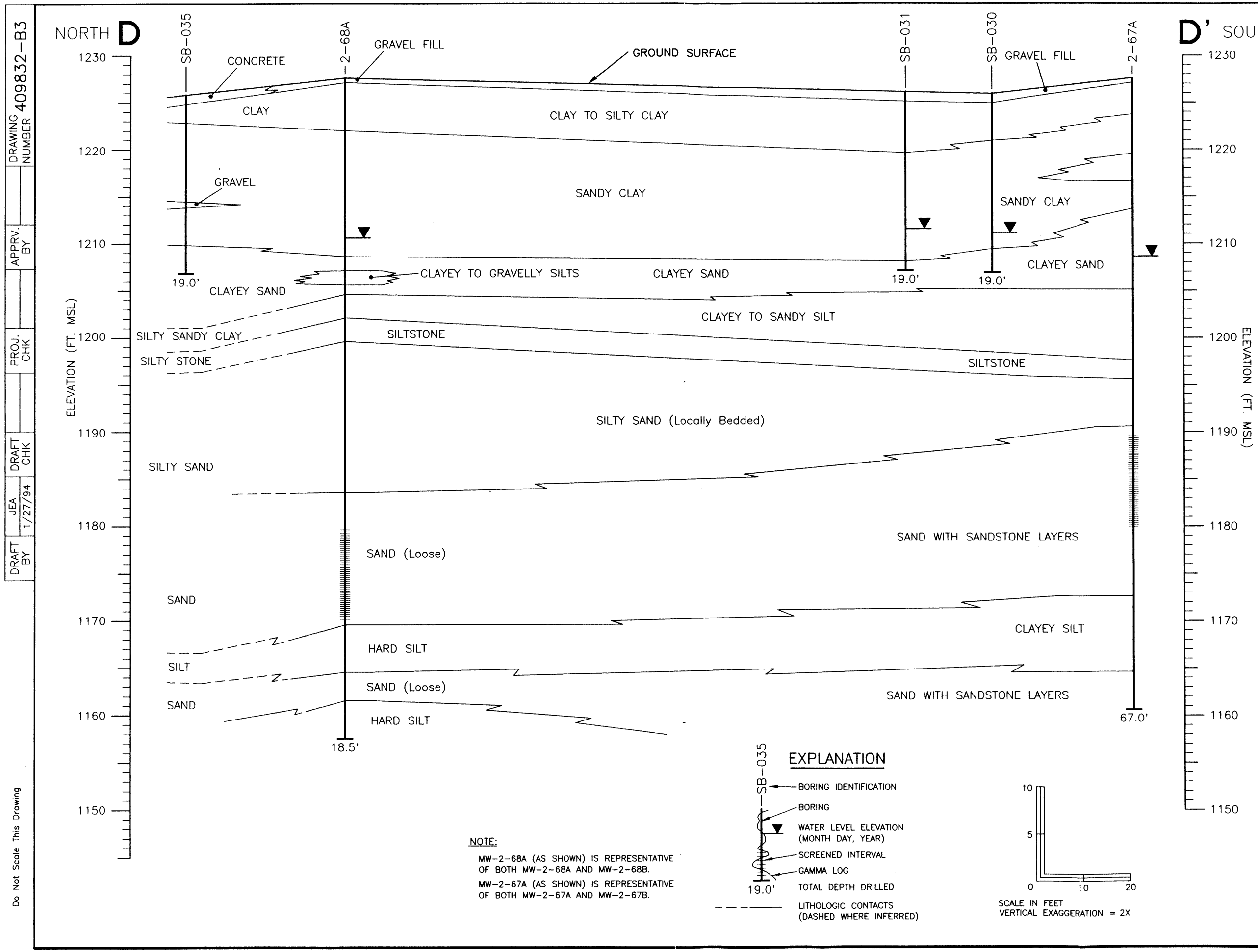


FIGURE 5-3
CROSS-SECTION D-D'
SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA

Analytical Results for Sludge Drying Beds
for Soil
Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	2-66A		2-66A		2-66A		2-66A		2-67A		2-67A		2-67A		2-67A	
Sample ID:	A1062		A1063		A1064		A1065		A1519		A1520		A1521		A1522	
Depth in Feet:	2.5 - 3		8 - 8.5		12 - 12.5		15.5 - 16		5 - 6		10 - 11		16.5 - 17.5		19 - 20	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/kg)																
Aluminum	10000	N	8600	N	8900	N	8100	N	13000	N	8900	N	9700	N	12000	N
Arsenic - Graphite Furnace	2.5		2.8		1.7		2.3						2	N	4.2	N
Barium	170	N	95	N	170	N	160	N	160	N	1200	N	1900	N	750	N
Beryllium	0.75		0.63		0.65		0.69		0.97		1.6		1.8		0.9	
Cadmium	0.36		0.49		0.91		1.1		0.67		1.1		0.95			
Chromium	9.6		13		13		13		12		14		18		16	
Chromium VI																
Copper	7.3	N	6	N	6.5	N	8.3	N	9		9.4		13		7.9	
Iron	9600	N	9700	N	11000	N	14000	N	8500	N	19000	N	23000	N	13000	N
Lead - Graphite Furnace	7	N	5.6	N	3.7	N	4.7	N	5.5	N	33	N	6.7	N	9.7	N
Mercury									0.031		0.031					
Nickel	8.4		10		15		15		8.2		25		19		12	
Silver	0.32		0.15		0.22		0.047				0.93		1			
Zinc	16		15		17		18		21		17		25		20	
Volatiles (ug/kg)																
1,1-Dichloroethane															1.7	J
1,1-Dichloroethene															7.4	
1,2-Dichloropropane													3.4	J	14	
Acetone	18	JB	11	JB	9.9	JB	9	JB	7.5	JB	2.5	JB	9.4	JB	16	JB
Chlorobenzene																
Methylene Chloride	0.6	JB							5.6	JB	5.8	JB	5.5	JB	9.4	JB
Tetrachloroethene									7.8		2.4	J	9		6.6	
Xylenes (total)																
cis-1,2-Dichloroethene													5.7		5.8	

Analytical Results for Sludge Drying Beds
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Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	2-68A		2-68A		2-68A		SB - 029		SB-029		SB-029		SB-029		SB-030	
Sample ID:	A1524		A1525		A1526		A1042		A1043		A1044		A1045		A1036	
Depth in Feet:	5 - 6		10 - 11		17 - 18		4.5 - 5		9 - 9.5		13.5 - 14		15.5 - 16		2.5 - 3	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/kg)																
Aluminum	7300	N	8600	N	8400	N	11000	N	7000	N	9800	N	8800	N	15000	N
Arsenic - Graphite Furnace	3.4	N	4.5	N	2	N	1	N	2.1	N	4.2	N	1.8	N		
Barium	260	N	940	N	95	N	110	N	56	N	270	N	410	N	250	N
Beryllium	0.9		1.3		0.96		1.3		1.2		1.9		1.6		0.99	
Cadmium			0.77				0.51		0.8		0.92		0.68		0.81	
Chromium	8.6		13		13		11		9.7		15		13		25	
Chromium VI							0.23		0.34				0.13			
Copper	5.8		11		7.8		5.9		4.6		8.6		7.9		9.5	
Iron	7900	N	14000	N	11000	N	8600	N	8200	N	14000	N	12000	N	11000	N
Lead - Graphite Furnace	7.9	N	8.4	N	4.8	N	3.4	N	4.4	N	4.5	N	6.6	N	5.2	N
Mercury																
Nickel	12		20		15		9		11		16		14		100	
Silver							0.15		0.24		0.2		0.098			
Zinc	12		20		18		17		14		20		18		28	
Volatiles (ug/kg)																
1,1-Dichloroethane																
1,1-Dichloroethene			2	J									2.6	J		
1,2-Dichloropropane											4.6	J				
Acetone	9.2	JB	5.7	JB	6	JB	8.9	JB	9.9	J	7.7	JB	13	JB	5.4	JB
Chlorobenzene			2.1	J												
Methylene Chloride	5.1	JB	3.4	JB	3	JB	2.5	J	1.6	JB	1.8	J			0.9	J
Tetrachloroethene																
Xylenes (total)																
cis-1,2-Dichloroethene													4.1	J		

Analytical Results for Sludge Drying Beds for Soil
Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	SB-030		SB-030		SB-030		SB-030		SB-031		SB-031		SB-031		SB-031	
Sample ID:	A1037		A1038		A1039		A1040		A1031		A1032		A1033		A1034	
Depth in Feet:	7 - 7.5		12 - 13		12 - 13		16.5 - 17		3 - 3.5		6.5 - 7		11 - 11.5		16 - 16.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/kg)																
Aluminum	16000	N	10000	N	11000	N	16000	N	14000	N	14000	N	13000	N	13000	N
Arsenic - Graphite Furnace	4	N	1.3	N	1.5	N	3	N	2.3	N	1.8	N	2	N	1.7	N
Barium	160	N	250	N	130	N	1000	N	590	N	68	N	450	N	440	N
Beryllium	0.99		0.81		0.84		0.99		0.98		0.71		0.96		0.84	
Cadmium	0.77												0.57			
Chromium	21		15		15		21		14		15		16		17	
Chromium VI													0.11			
Copper	7.1		7.5		7.1		7.8		8.3		7.2		12		8	
Iron	16000	N	12000	N	12000	N	15000	N	11000	N	10000	N	14000	N	12000	N
Lead - Graphite Furnace	5.7	N	4.4	N	3.9	N	5.6	N	6.2	N	4.4	N	6.2	N	5.6	N
Mercury																
Nickel	19		13		13		16		10		12		15		14	
Silver																
Zinc	26		21		21		24		24		23		26		23	
Volatiles (ug/kg)																
1,1-Dichloroethane																
1,1-Dichloroethene							1.5	J								
1,2-Dichloropropane			0.6	J												
Acetone	9.9	JB	5.1	JB	9.7	JB			4.3	JB			10	JB	4.9	JB
Chlorobenzene																
Methylene Chloride			0.6	J			1.7	JB								
Tetrachloroethene			0.6	J												
Xylenes (total)																
cis-1,2-Dichloroethene																

Analytical Results for Sludge Drying Beds
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Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	SB-032		SB-032		SB-032		SB-032		SB-033		SB-033		SB-033		SB-033	
Sample ID:	A1027		A1028		A1029		A1030		A1008		A1009		A1010		A1011	
Depth in Feet:	1 - 1.5		7 - 7.5		12 - 12.5		15.5 - 16		1 - 1.5		8 - 8.5		12 - 12.5		18.5 - 19	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/kg)																
Aluminum	18000	N	15000	N	12000	N	13000	N	18000		13000		11000		12000	
Arsenic - Graphite Furnace	4.8	N	5.4	N	1.9	N	2.1	N	2.6				1.2		3.7	
Barium	300	N	57	N	210	N	960	N	320	N	1100	N	260	N	520	N
Beryllium	1		0.87		0.87		1		0.82		0.91		0.61		0.6	
Cadmium	0.97				0.72				0.6						0.53	
Chromium	21		20		15		22		16		19		14		14	
Chromium VI																
Copper	8.5		6.9		8.4		10		8.6		9.6		7.3		8.3	
Iron	15000	N	13000	N	14000	N	17000	N	14000		17000		10000		13000	
Lead - Graphite Furnace	11	N	7.4	N	4.7	N	7.1	N	8.7	N	7.4	N	6.2	N	7.6	N
Mercury																
Nickel	15		18		14		21		13		20		14		14	
Silver																
Zinc	29		24		24		27		27		23		22		21	
Volatiles (ug/kg)																
1,1-Dichloroethane	9.1				1.4	J	6.1									
1,1-Dichloroethene																
1,2-Dichloropropane							1.3	J								
Acetone	140	B	9.8	JB	7.7	JB	6.4	JB	32	J	5	JB	6	JB	17	JB
Chlorobenzene	2.8	J					0.5	J								
Methylene Chloride	9.6	JB	1.3	JB					3.4	J	6	JB	4.7	JB	4.7	JB
Tetrachloroethene																
Xylenes (total)	22															
cis-1,2-Dichloroethene																

Analytical Results for Sludge Drying Beds
for Soil
Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	SB-034		SB-034		SB-034		SB-035		SB-035		SB-035		SB-035		SB-036	
Sample ID:	A1014		A1015		A1016		A1017		A1019		A1020		A1021		A1022	
Depth in Feet:	8.5 - 10		13.5 - 14		17 - 17.5		2 - 2.5		7.5 - 8		11.5 - 12		15 - 15.5		3 - 3.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/kg)																
Aluminum	8600	N	9500	N	6200	N	13000	N	7400	N	5200	N	6700	N	17000	N
Arsenic - Graphite Furnace	2.4	N					3.8	N	7.8	N	2	N			5.2	N
Barium	98	N	430	N	850	N	83	N	3400	N	80	N	630	N	230	N
Beryllium	0.87		0.87		0.61		1.1		1.1		0.58		0.72		0.89	
Cadmium									0.85						0.83	
Chromium	12		13		9.8		12		11		6.5		10		19	
Chromium VI																
Copper	7.1		6.7		5.3		7.6		14		4.7		6.2		7.4	
Iron	11000	N	10000	N	9200	N	12000	N	16000	N	4700	N	10000	N	15000	N
Lead - Graphite Furnace	5.3	N	5.9	N	6	N	9.5	N	18	N	5.8	N	5.4	N	7.7	N
Mercury																
Nickel	12	N	12	N	10	N	10	N	34	N	9.4	N	11	N	15	
Silver																
Zinc	19		18		12		20		17		13		14		24	
Volatiles (ug/kg)																
1,1-Dichloroethane							3.7	J			3.4	J	3.4	J		
1,1-Dichloroethene																
1,2-Dichloropropane																
Acetone	7.1	JB	8.4	J	8.6	J	6.9	J	8.9	J	6.1	J	7.2	J	14	JB
Chlorobenzene							2.3	J								
Methylene Chloride	1.1	J	6.9	J	6.9	J	7	J	4.8	J	3.7	J	3	J		
Tetrachloroethene																
Xylenes (total)																
cis-1,2-Dichloroethene																

Analytical Results for Sludge Drying Beds for Soil
Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	SB-036		SB-036		SB-036		SB-037		SB-037		SB-037		SB-037		SB-038	
Sample ID:	A1023		A1025		A1026		A1004		A1005		A1006		A1007		A1001	
Depth in Feet:	7 - 7.5		12 - 12.5		15 - 15.5		.5 - 1.5		8 - 8.5		13 - 13.5		15.5 - 16		8.5 - 10.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/kg)																
Aluminum	17000	N	11000	N	13000	N	16000		11000		11000		8500		13000	
Arsenic - Graphite Furnace	6	N	3	N	2	N	2.3		1.7		3.8		10		2.9	
Barium	310	N	430	N	510	N	100	N	68	N	510	N	790	N	59	N
Beryllium	0.95		0.72		0.77		0.74		0.66		0.6					
Cadmium	0.7															
Chromium	35		16		17		17		16		15		19		24	
Chromium VI																
Copper	9.4		7.6		8.5		7.3		7.6		7.9		6.9		7.3	
Iron	17000	N	14000	N	14000	N	12000		14000		13000		11000		13000	
Lead - Graphite Furnace	6.1	N	5.9	N	5.7	N	6	N	5.1	N	6	N	6.9	N	5.1	N
Mercury																
Nickel	22		15		15		15		16		12		14		15	
Silver																
Zinc	26		20		21		24		22		19		16		22	
Volatiles (ug/kg)																
1,1-Dichloroethane					15											
1,1-Dichloroethene																
1,2-Dichloropropane																
Acetone	6.1	JB	8.9	JB	6.5	JB	30	JB	7	JB	9.7	JB	12	JB	15	JB
Chlorobenzene							7.5						0.7	J		
Methylene Chloride	0.9	JB			1.4	JB	7.5	JB	9.6	JB	11	B	9.8	JB	13	B
Tetrachloroethene											1.2	J				
Xylenes (total)																
cis-1,2-Dichloroethene					3.5	J										

Analytical Results for Sludge Drying Beds
for Soil
Tinker Air Force Base, Oklahoma
Table 5-1

Well/Boring:	SB-038		SB-038	
Sample ID:	A1002		A1003	
Depth in Feet:	13.5 - 15.5		17.5 - 18.5	
Parameters	Result	QFR	Result	QFR
Metals (mg/kg)				
Aluminum	12000		3000	
Arsenic - Graphite Furnace			1	
Barium	160	N	900	N
Beryllium				
Cadmium			0.54	
Chromium	25		8.1	
Chromium VI				
Copper	7.7		2.3	
Iron	13000		6500	
Lead - Graphite Furnace	4.9	N	2.7	N
Mercury				
Nickel	19		6.6	
Silver				
Zinc	21		7.7	
Volatiles (ug/kg)				
1,1-Dichloroethane				
1,1-Dichloroethene				
1,2-Dichloropropane				
Acetone	21	JB	9.4	JB
Chlorobenzene	0.8	J		
Methylene Chloride	17	B	9	JB
Tetrachloroethene				
Xylenes (total)				
cis-1,2-Dichloroethene				

B = Analyte was also found in sample blank
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC Limit
< = Not detected
QFR = Qualifier
Analytical data has not been validated

- Acetone and chlorobenzene were detected above the method reporting limit in only 1 of 50 samples. Acetone, detected at a concentration of 140 µg/kg in the 1- to 1.5-foot depth sample at SB-032, is an order of magnitude greater in concentration than the reporting limit and may not be attributable to the lab blank contaminant.

- Methylene chloride concentrations above the method detection limit were found in only 3 of 50 soil samples, but can likely be attributed to laboratory contamination since methylene chloride was also detected at a similar magnitude in the laboratory and trip blanks for those samples.

- Tetrachloroethene was detected in 3 of 4 samples collected from monitoring well boring 2-67A at concentrations from 6.6 to 9.0 µg/kg suggesting a local source for the contaminant. Tetrachloroethene was also found in the locality of 2-67 within the vadose zone soil gas as indicated by the results of the soil gas survey.

- All metals except lead were within the USGS background range for metals in soils. Lead exceeded the USGS background range in only one sample (10 feet in 2-67A). However, the matrix spike/matrix spike duplicate (MS/MSD) recovery was outside of QC limits for lead in this sample. Samples above and below this sample were well within the range of USGS background concentrations. No indication is given of a release from the SDB. The comparison of soil metals concentrations to USGS background values is presented in Table 5-2.

A soil boring summary is provided as Table 5-3.

During the installation of deep monitoring well 2-68A, a soil sample was collected for geotechnical analysis to determine vadose zone properties. A Shelby tube was used to collect a soil core from the boring. The sample was submitted for geotechnical analysis of the following parameters: grain-size distribution, moisture content, cation exchange capacity (CEC), and vertical permeability. Certificates of analysis are provided as Appendix F. The analytical results are summarized as follows:

Sample number	2-68A14.5
Sample location	Well 2-68A
Sample depth	-14.5 feet
Vertical permeability (cm/s)	4.5×10^{-8}
Moisture content (percent)	22.4
CEC (MEQ/100 grams)	15.41
Particle size distribution	See Appendix F graph.

Table 5-2

Soil Metals Background Comparison
SWMU-14, SDB, Tinker AFB

Analyte	Site	USGS Background Concentration	
	Maximum Value (ppm)	Detection Limit (ppm)	Range (ppm)
Aluminum	18,000	50	3,800-89,000
Arsenic	10	0.1	0.6-21
Barium	3,400	1	47-6,400
Beryllium	1.9	1	<1-3
Cadmium	1.1	2	<2
Chromium	35	1	5-110
Chromium VI	0.34	0.5	<0.1-<0.5[a]
Copper	14	1	<1-59
Iron	23,000	50	1,800-58,000
Lead	33	4	<4-27
Mercury	0.031	0.24	<0.23-<0.24[a]
Nickel	100	2	<2-61
Silver	1	2	<2
Zinc	29	2	3-79

[a]Site-specific background value. USGS value not available.

Table 5-3
Sludge Drying Beds
RFI Soil Borings Summary

Boring ID	Date Completed	Boring Coordinates		Surface Elevation (msl)	Total Depth Drilled (fbgs)	Soil Samples[1] Collected for Analysis
		Northing	Easting			
SB-029	10/25/93	153285.911	2177284.758	1226.929	19.5	4
SB-030	10/22/93	153320.501	2177281.365	1225.960	19.0	5
SB-031	10/22/93	153338.949	2177281.766	1226.145	19.0	4
SB-032	10/22/93	153340.504	2177302.376	1226.026	18.5	4
SB-033	10/20/93	153343.640	2177322.855	1226.205	23.5	4
SB-034	10/21/93	153341.088	2177348.133	1225.884	18.5	3
SB-035	10/21/93	153486.704	2177283.644	1225.832	19.0	4
SB-036	10/22/93	153493.958	2177306.573	1225.408	18.5	4
SB-037	10/20/93	153489.509	2177320.543	1225.822	20.0	4
SB-038	10/19/93	153489.394	2177346.511	1225.397	19.0	3
				Totals	194.5	39

[1] Number of soil samples collected includes field duplicates.

msl - mean sea level
fbgs - feet below ground surface

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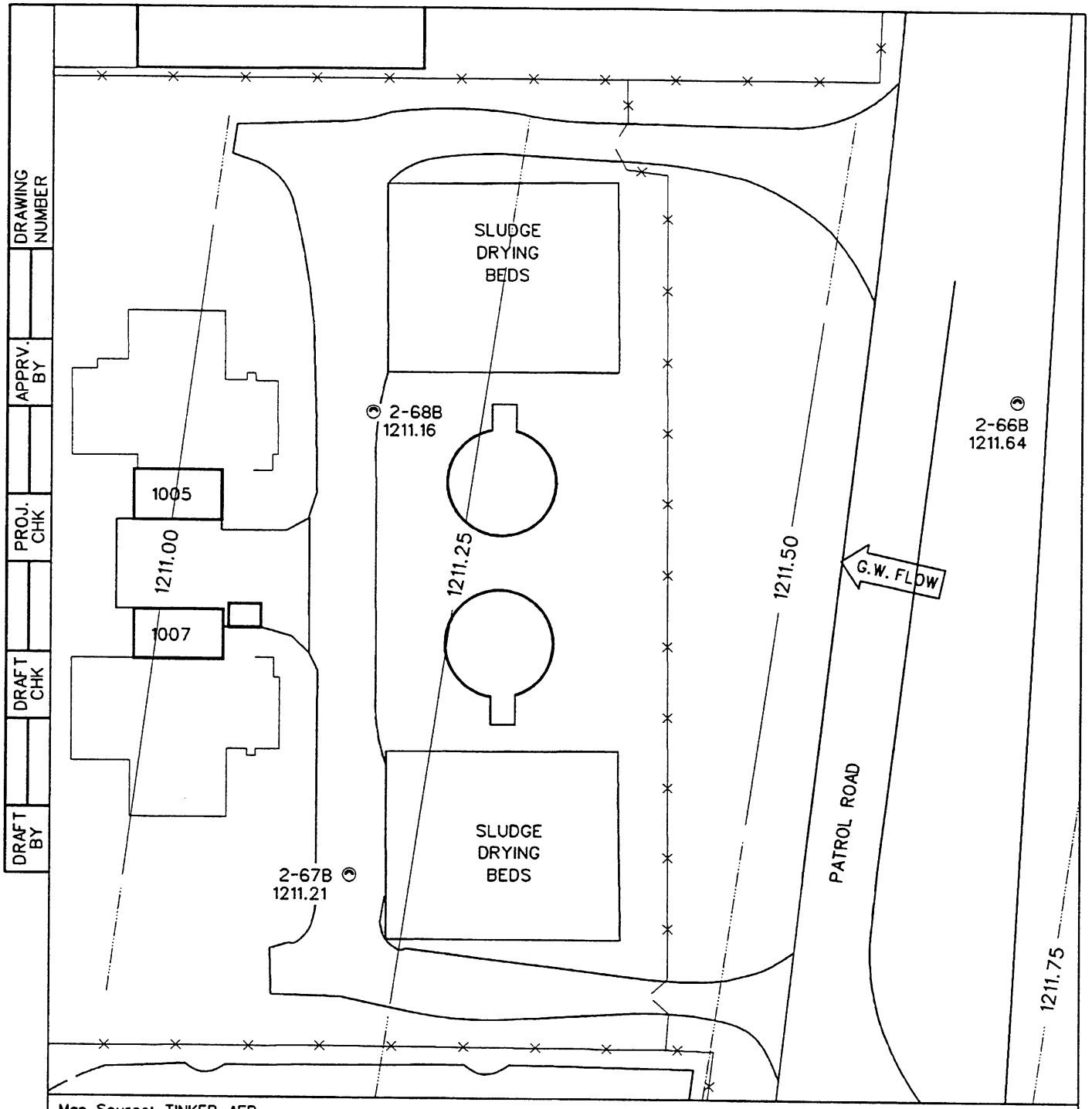
5.3.3 Groundwater Characterization

Two monitoring well clusters (at 2-67 and 2-68) were installed downgradient of the SDB and one well cluster was installed upgradient of the SDB based on the conceptual model provided by Tinker AFB. Both monitoring wells of the downgradient well clusters are completed in the USZ and one well each is completed in the USZ and the LSZ in the upgradient well cluster. Depth to groundwater was measured to determine the groundwater flow direction in the USZ. Groundwater samples were collected from the wells to determine if the quality of the groundwater has been impacted by operations at the SDB.

Figure 5-4 presents the potentiometric surface map of the USZ in the vicinity of the SDB. Groundwater flow is in a general west-northwest direction. No potentiometric surface map was constructed for the LSZ since only one well (2-66A) is completed in the LSZ of the SDB. The measured values for 2-66A, however, fits well with potentiometric values from wells in the LSZ located to the south at the SWMU-11, Supernatant Pond and SWMU-7, Fire Training Area 1.

The groundwater beneath the SDB in the USZ has been impacted by organic contamination. Contamination within the USZ is visually depicted in Figures 5-5, 5-6, 5-7, and 5-8. Figures 5-5 and 5-7 present isopleth maps of 1,2-dichloroethane and chloroform concentrations for the shallower USZ wells. Figures 5-6 and 5-8 present isopleth maps of the same two constituents in the deeper USZ wells. Figures 5-9 and 5-10 present soil gas results. Most of the organics found in the groundwater were in monitoring well 2-67A and 2-67B. The only metal found in the groundwater at an elevated level was barium in monitoring well 2-68B.

Monitoring well construction details are provided in Table 5-4. Analytical results for the USZ and LSZ are presented in Tables 5-5 and 5-6.



Map Source: TINKER AFB

LEGEND

2-67B 1211.21 — SHALLOW MONITORING WELL LOCATION, IDENTIFICATION NUMBER, AND ELEVATION OF POTENTIOMETRIC SURFACE

FENCE

LINE OF EQUAL POTENTIOMETRIC SURFACE ELEVATION (DASHED WHERE INFERRED)

N

0 50 FEET

NOTE: CONTOUR INTERVAL - .25 FOOT

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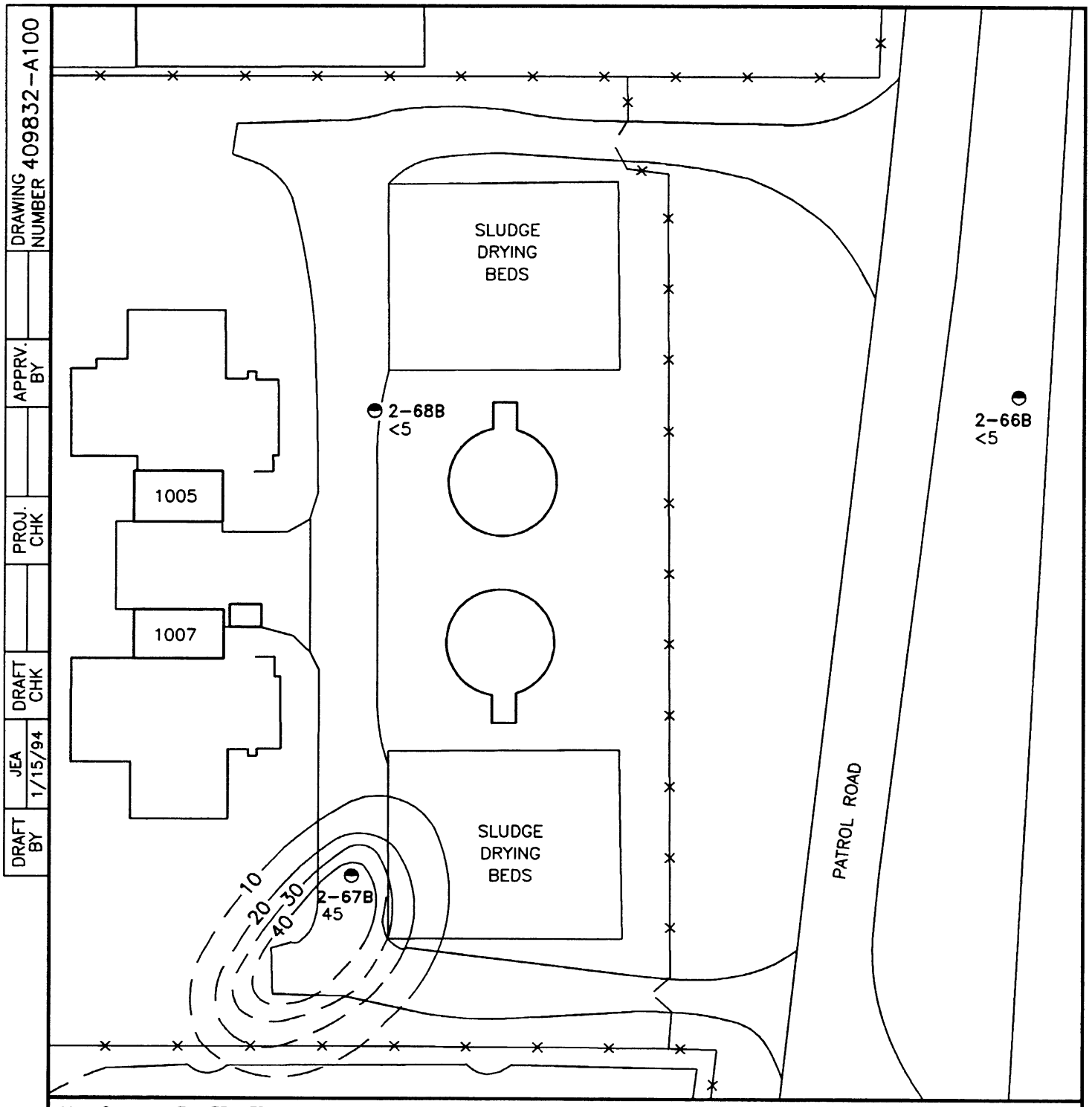
Do Not Scale This Drawing

FIGURE 5-4
POTENTIOMETRIC SURFACE MAP OF THE UPPER SATURATED ZONE IN THE VICINITY OF THE SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA



Map Source: TINKER AFB

LEGEND

2-67B 45 — SHALLOW MONITORING WELL LOCATION, IDENTIFICATION NUMBER, AND 1,2 DICHLOROETHANE CONCENTRATION IN $\mu g/L$

FENCE

10 — LINE OF EQUAL 1,2 DICHLOROETHANE CONCENTRATION IN $\mu g/L$ (DASHED WHERE INFERRED)

N

0 50
FEET

FIGURE 5-5
ISOPLETH MAP OF
1,2 DICHLOROETHANE CONCENTRATION
IN THE UPPER SATURATED ZONE
AT THE SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA

DRAWING NUMBER 409832-A100
APPRV. BY
PROJ. CHK
DRAFT CHK
JEA 1/15/94
DRAFT BY

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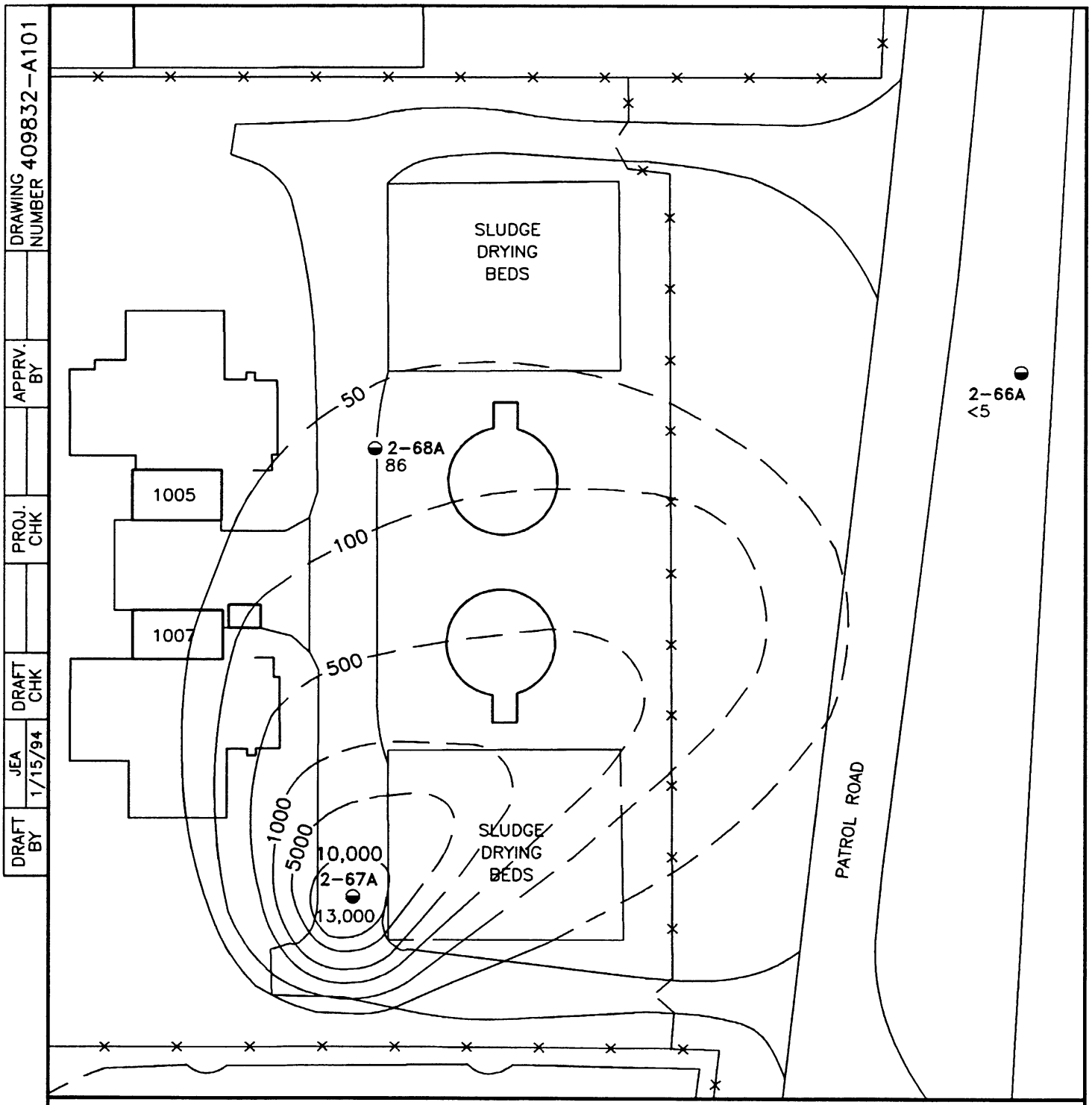

Map Source: TINKER AFB

LEGEND

2-67A 13,000 — DEEP MONITORING WELL LOCATION, IDENTIFICATION NUMBER, AND 1,2 DICHLOROETHANE CONCENTRATION IN $\mu g/L$

FENCE

—50— LINE OF EQUAL 1,2 DICHLOROETHANE CONCENTRATION IN $\mu g/L$ (DASHED WHERE INFERRED)

0 50 FEET

FIGURE 5-6
ISOPLETH MAP OF
1,2 DICHLOROETHANE CONCENTRATION
IN THE UPPER SATURATED ZONE
(LOWER PORTION)
AT THE SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA

DRAWING NUMBER 409832-A101
APPRV. BY
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DRAFT CHK
JEA 1/15/94
DRAFT BY

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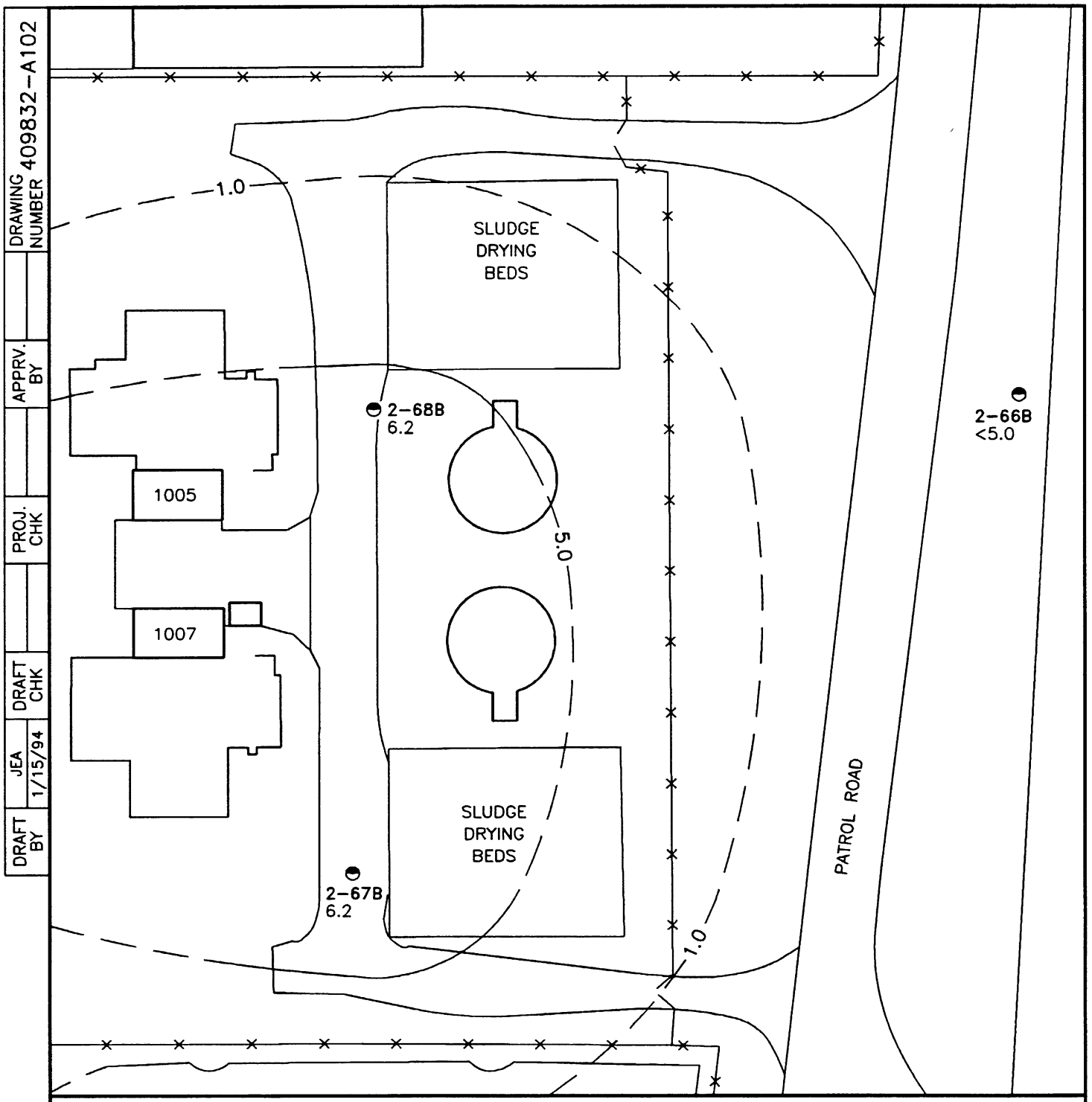


Map Source: TINKER AFB

LEGEND

2-67B 6.2 — SHALLOW MONITORING WELL LOCATION, IDENTIFICATION NUMBER, AND CHLOROFORM CONCENTRATION IN $\mu g/L$

FENCE

1.0 — LINE OF EQUAL CHLOROFORM CONCENTRATION IN $\mu g/L$ (DASHED WHERE INFERRED)

N

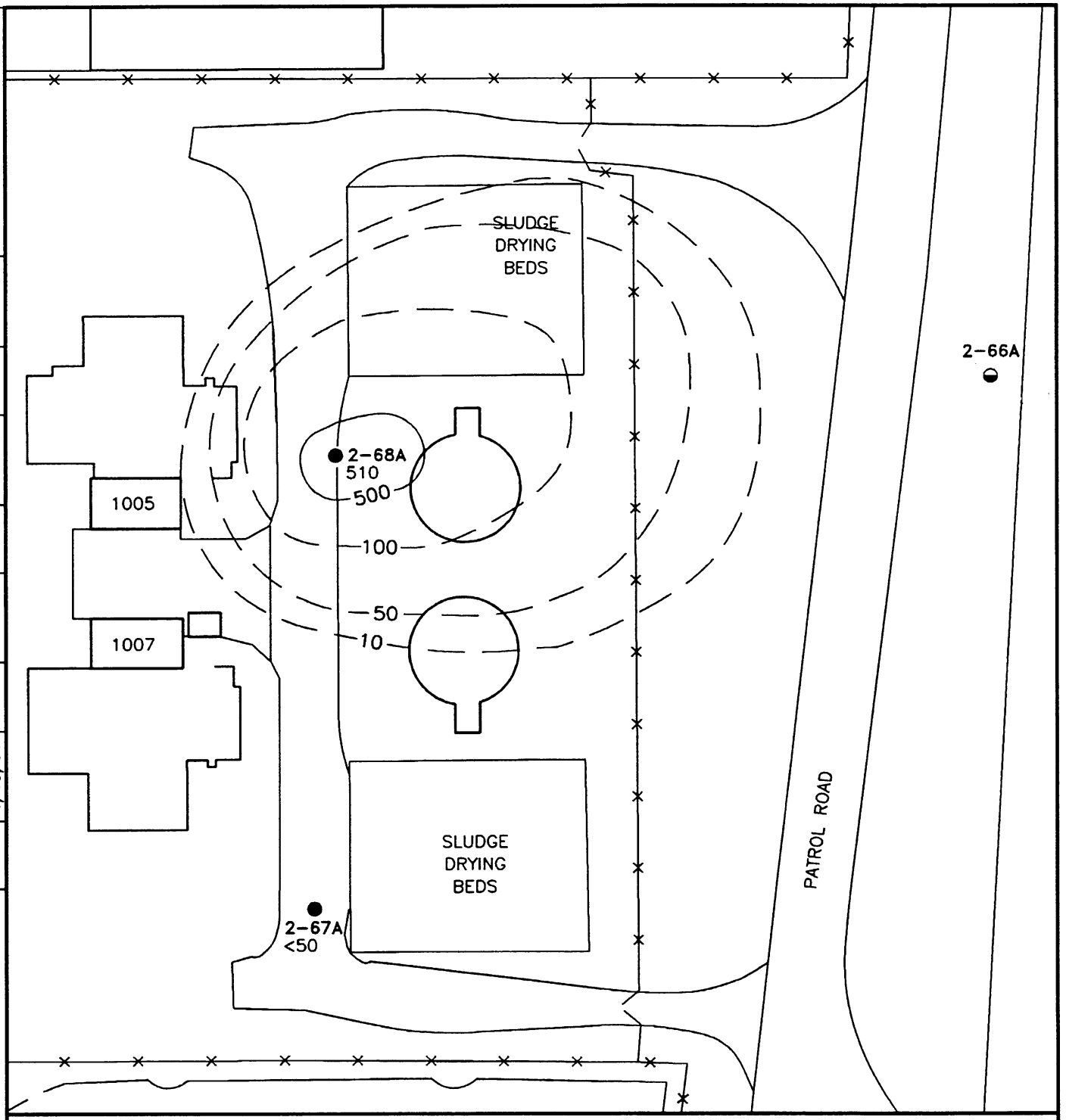
0 50 FEET

Do Not Scale This Drawing

FIGURE 5-7
ISOPLETH MAP OF CHLOROFORM CONCENTRATION IN THE UPPER SATURATED ZONE AT THE SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA



Map Source: TINKER AFB

LEGEND

● 2-67A <50	MONITORING WELL LOCATION, IDENTIFICATION NUMBER, AND CHLOROFORM CONCENTRATION IN $\mu g/L$
◒ 2-66A 29	DEEP MONITORING WELL LOCATION, IDENTIFICATION NUMBER, AND CHLOROFORM CONCENTRATION IN $\mu g/L$
—×—×—	FENCE
—10—	LINE OF EQUAL CHLOROFORM CONCENTRATION IN $\mu g/L$ (DASHED WHERE INFERRED)

0 50
FEET

FIGURE 5-8
ISOPLETH MAP OF CHLOROFORM CONCENTRATION IN THE UPPER SATURATED ZONE (LOWER PORTION) AT THE SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA

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DRAFT BY

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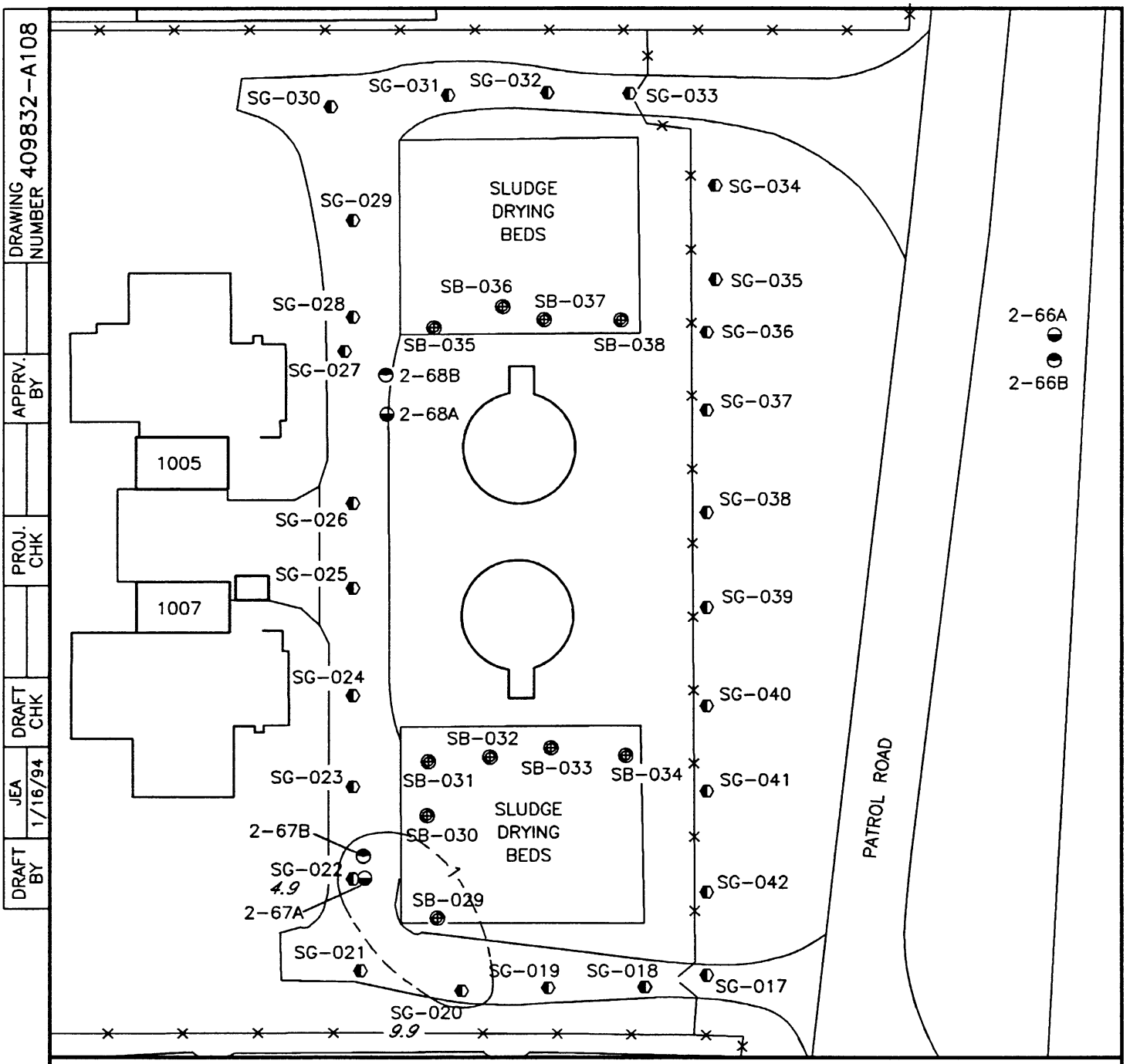
SG-030
SG-031
SG-032
SG-033
SG-034
SG-035
SG-036
SG-037
SG-038
SG-039
SG-040
SG-041
SG-042
SG-017
SG-018
SG-019
SG-020
SG-021
SG-022
SG-023
SG-024
SG-025
SG-026
SG-027
SG-028
SG-029
SLUDGE DRYING BEDS
SB-036
SB-037
SB-035
SB-038
2-68B
2-68A
1005
1007
SB-032
SB-033
SB-031
SB-034
SB-030
SB-029
SLUDGE DRYING BEDS
2-67B
2-67A
4.9
9.9
2-66A
2-66B
PATROL ROAD
DRAWING NUMBER 409832-A108
APPRV. BY
PROJ. CHK
DRAFT CHK
JEA 1/16/94
DRAFT BY
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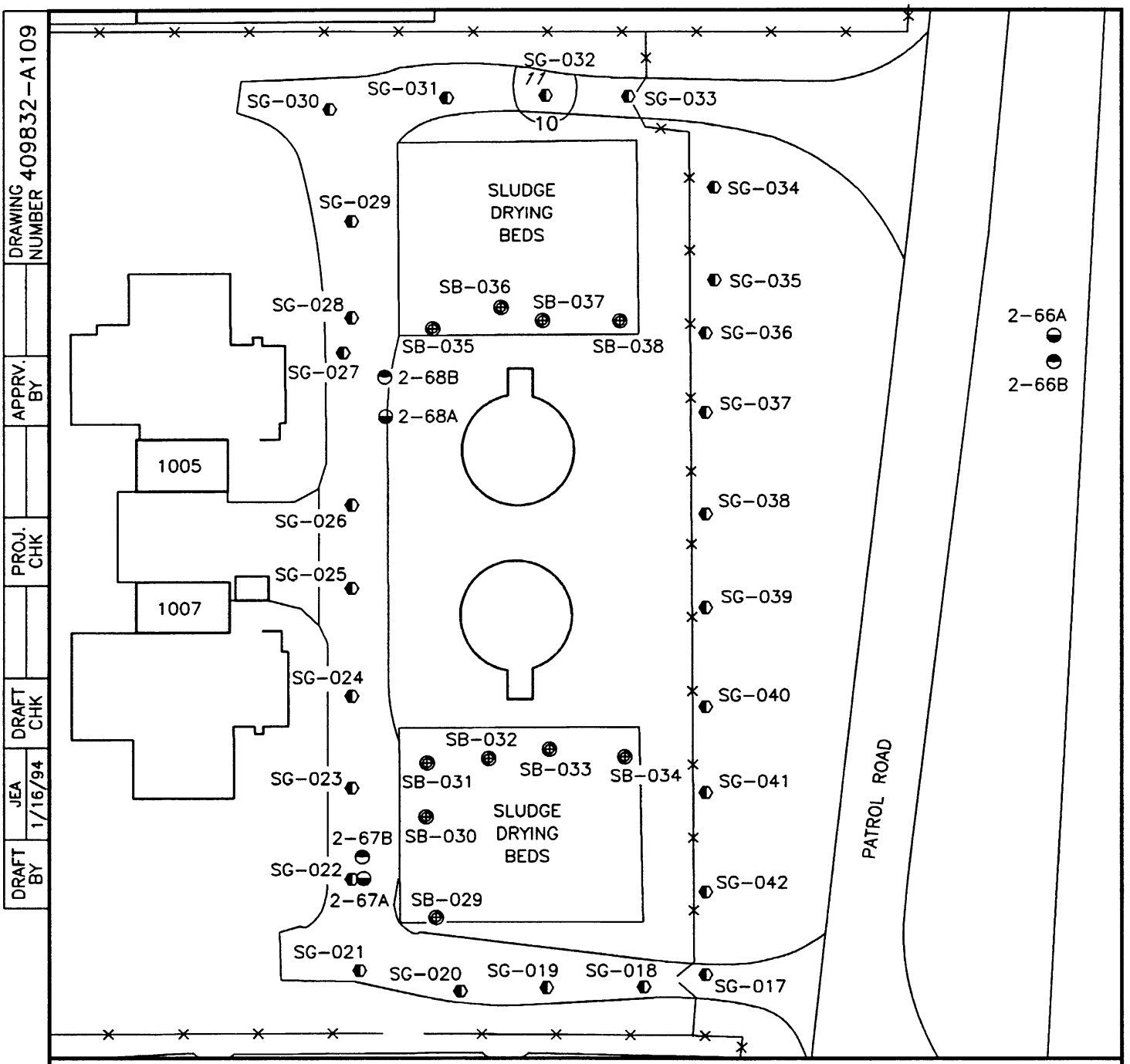
Map Source: TINKER AFB
LEGEND
SB-029 SOIL BORING LOCATION AND IDENTIFICATION NUMBER
2-67A DEEP MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
2-67B SHALLOW MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
SG-021 SOIL VAPOR SURVEY POINT, IDENTIFICATION NUMBER, AND
4.9 TETRACHLOROETHENE (PCE) CONCENTRATION IN µg/L
FENCE
1 LINE OF EQUAL TETRACHLOROETHENE (PCE) CONCENTRATION IN µg/L (DASHED WHERE INFERRED)
N
0 50
FEET
FIGURE 5-9
TETRACHLOROETHENE (PCE) CONCENTRATIONS DETECTED BY SOIL VAPOR SURVEY FOR THE SLUDGE DRYING BEDS
PREPARED FOR
TINKER AFB
OKLAHOMA



Map Source: TINKER AFB

LEGEND

SB-029	SOIL BORING LOCATION AND IDENTIFICATION NUMBER
2-67A	DEEP MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
2-67B	SHALLOW MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
SG-021	SOIL VAPOR SURVEY POINT, IDENTIFICATION NUMBER, AND
11	TOTAL FID VOLATILES CONCENTRATION IN $\mu g/L$
	FENCE
10	LINE OF EQUAL TOTAL FID VOLATILES CONCENTRATION IN $\mu g/L$ (DASHED WHERE INFERRED)

0 50 FEET

Do Not Scale This Drawing

FIGURE 5-10
TOTAL FID VOLATILES CONCENTRATIONS DETECTED BY SOIL VAPOR SURVEY FOR THE SLUDGE DRYING BEDS

PREPARED FOR

TINKER AFB
OKLAHOMA

Table 5-4

Sludge Drying Beds
Monitoring Well Construction Details

Well ID	Date Completed	Well Coordinates		Well Elevations (msl)			Total Depth Drilled (fbgs)	Soil[1] Samples Collected for Analysis	Filter[2] Sand Interval (fbgs)	Bentonite Seal Interval (fbgs)	Screen[3] Interval (fbgs)	Riser[4] Pipe Interval (fbgs)	Surface[5] Casing Interval (fbgs)
		Northing	Easting	TOC	Top of Pad	Ground Surface							
Deep Wells (Lower Saturated Zone)													
2-66A	11/10/93	153484.356	2177491.782	1228.209	1228.601	1228.458	66.0	0	47.5-61.0	45.8-47.5	50.5-60.5	0-50.5	0-32.8
2-67A	11/9/93	153299.317	2177260.427	1227.880	1228.252	1227.987	67.0	4	37.0-49.1	31.8-37.0	38.0-48.0	0-38.0	0-26.0
2-68A	11/11/93	153456.977	2177267.817	1227.639	1227.992	1227.773	70.0	4	45.3-58.9	39.9-45.3	47.8-57.8	0-47.8	0-25.0
Shallow Wells (Upper Saturated Zone)													
2-66B	11/1/93	153475.491	2177491.726	1228.424	1228.786	1228.566	117.5	4	12.3-26.3	7.1-12.3	15.6-25.6	0-15.6	n/a
2-67B	10/29/93	153306.771	2177259.941	1227.749	1228.136	1227.942	33.5	0	8.8-24.0	3.8-8.8	13.8-23.8	0-13.8	n/a
2-68B	10/29/93	153470.445	2177267.505	1227.501	1227.801	1227.737	30.0	0	11.6-23.8	9.0-11.6	13.6-23.6	0-13.6	n/a
						Totals	384.0	12					

1 Soil samples collected for analysis include field duplicates and geotechnical samples.
2 #20 silica sand used for filter pack
3 2" ID stainless steel, wire wound, 0.010 slot screen
4 2" ID flush threaded, stainless steel riser pipe
5 8" ID welded carbon steel surface casing

msl - mean sea level
fbgs - feet below ground surface
n/a - not applicable
TOC - top of casing

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Analytical Results for Sludge Drying Beds
For USZ Groundwater
Tinker Air Force Base, Oklahoma
Table 5-5

Well/Boring:	2-66B		2-67B		2-67B		2-68B		2-67A		2-68A	
Sample ID:	A1591		A1593		A1594		A1596		A1595		A1597	
Depth in Feet:	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Metals (mg/L)												
Aluminum	2.9	N	6.2	N	6.4	N	13	N			0.72	N
Arsenic - Graphite Furnace									0.016			
Barium	0.7	N	0.75	N	0.78	N	3.5	N	1.4	N	0.54	N
Calcium	67	N	67	N	71	N	88	N	66	N	56	N
Chromium			0.012	N	0.012	N	0.03	N				
Chromium VI									0.014			
Iron	3.5	N	7.1	N	6.9	N	18	N	0.62	N	2.1	N
Lead - Graphite Furnace							0.0059					
Magnesium	27	N	35	N	37	N	45	N	36	N	35	N
Manganese	0.14	N	0.34	N	0.33	N	1.2	N	0.63	N	0.052	N
Potassium											7.6	N
Sodium	98	N	76	N	81	N	74	N	48	N	49	N
Zinc							0.033	N			0.024	N
Semivolatiles (ug/L)												
bis(2-Ethylhexyl)phthalate	13											
2-Methylphenol									34			
Volatiles (ug/L)												
1,1,1-Trichloroethane			16		17		9.8					
1,1-Dichloroethane			21		21							
1,1-Dichloroethene			99		100		26					
1,2-Dichloroethane			45		45				13000	D	86	
1,2-Dichloropropane			46		47							
Benzene									280			
Carbon Tetrachloride											290	D
Chloroform			6.2		6.4		6.2				510	D
Methylene Chloride									42	J		
Tetrachloroethene			91		89		98					
Toluene					8.1							
Trichloroethene			6.4		33		2.4	J	48	J	36	
cis-1,2-Dichloroethene			20		21		2.5	J	120		3.2	J

Analytical Results for Sludge Drying Beds
For USZ Groundwater
Tinker Air Force Base, Oklahoma
Table 5-5

Well/Boring:	2-66B		2-67B		2-67B		2-68B		2-67A		2-68A	
Sample ID:	A1591		A1593		A1594		A1596		A1595		A1597	
Depth in Feet:	0 - 0		0 - 0		0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Miscellaneous (mg/L)												
Alkalinity, Titrimetric	430		420		390		410		400		400	
Chemical Oxygen Demand									36			
Chloride by Ion Chrom.	110		110		110		110		89		72	
Nitrate and Nitrite	0.067		7.4		7.4		3.1				3	
Phenolics									0.042			
Silica	8.6		6.1		5.6		8.1		11		9.2	
Sulfate by Ion Chrom.	18		20		20		17		11		16	
Total Phosphorus							0.13					
Total Dissolved Solids	690		690		670		630		530		500	
Total Organic Carbon	2.5		2.8		3.4		1.4		4.8		1.4	
Total Suspended Solids	140		270		380		410		17		16	

B = Analyte was also found in sample blank
D = Compound identified at a secondary dilution factor.
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC Limit
< = Not detected
QFR = Qualifier
Analytical data has not been validated

Analytical Results for Sludge Drying Beds
For LSZ Groundwater
Tinker Air Force Base, Oklahoma
Table 5-6

Parameters	Result	QFR
Well/Boring:	2-66A	
Sample ID:	A1592	
Depth in Feet:	0 - 0	
Metals (mg/L)		
Aluminum	1.1	N
Arsenic - Graphite Furnace		
Barium	0.53	N
Calcium	60	N
Chromium	0.018	N
Chromium VI		
Iron	1.9	N
Magnesium	34	N
Manganese	0.025	N
Potassium		
Sodium	43	N
Zinc	0.023	N
Semivolatiles (ug/L)		
2-Methylphenol		
Volatiles (ug/L)		
1,2-Dichloroethane		
Benzene		
Carbon Tetrachloride	49	
Chloroform	29	
Trichloroethene	1.8	J
cis-1,2-Dichloroethene		

Parameters	Result	QFR
Well/Boring:	2-66A	
Sample ID:	A1592	
Depth in Feet:	0 - 0	
Miscellaneous (mg/L)		
Alkalinity, Titrimetric	410	
Chemical Oxygen Demand		
Chloride by Ion Chrom.	52	
Nitrate and Nitrite	4.9	
Phenolics		
Silica	7.2	
Sulfate by Ion Chrom.	9.4	
Total Dissolved Solids	490	
Total Organic Carbon		
Total Suspended Solids	62	

B = Analyte was also found in sample blank
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC Limit
< = Not detected
QFR = Qualifier
Analytical data has not been validated

6.0 Potential Receptors

A specific potential human and ecological receptor search has not been performed for the SDB. Data are available in the form of chemical analysis of soils, soil gas, and groundwater; current use of these media and site; and can be used to initiate a potential receptors search. The following sections describe the data available to begin identification of potential receptors.

6.1 Human Receptors

Tinker AFB is situated on a relatively flat expanse of grassland. Prior to the development of the Base, the area was characterized by large tracts of agricultural land. The Base currently occupies approximately 5,000 acres of semi-improved and unimproved grounds that are used for the airfield, golf course, housing area, offices, shops, and other uses characteristic of military installations.

The Garber-Wellington aquifer, which underlies Tinker AFB, is the single most important source of potable groundwater in the Oklahoma City area. The recharge area for the Garber-Wellington aquifer covers the eastern half of Oklahoma County, including Tinker AFB. Approximately 75 percent of the Base's water supply is obtained from production wells pumping from this aquifer. Industrial operations, individual homes, farm irrigation, and small communities not served by municipal distribution systems also depend on the Garber-Wellington aquifer. Communities, such as Oklahoma City, presently depending upon surface water supplies also maintain a well system drilled into this aquifer as a standby source of water in the event of drought. Lake Stanley Draper, a local surface water supply reservoir with a small portion of its drainage basin within the boundaries of Tinker AFB, serves a significant recreational function as well.

In 1989, approximately 26,000 military and civilian personnel worked at Tinker AFB. Of these, approximately 2,722 personnel occupied on-Base housing, which consisted of 530 family housing units and seven dormitories. At that time, 1,262 of these residents were children. Military personnel and their families who reside on Base represent the nearest receptors to releases from Tinker AFB.

The current land use at and near the Base is not expected to change because the facilities have decades of useful life remaining and the Base has an important and continuing mission.

However, other future land use scenarios and any human receptors associated with those scenarios may need to be considered.

6.2 Ecological Receptors

Tinker AFB lies within a grassland ecosystem, which is typically composed of grasses, forbes, and riparian (i.e., trees, shrubs, and vines associated with water courses) vegetation. This ecosystem has generally experienced fragmentation and disturbances as result of urbanization and industrialization at and near the Base. While no threatened or endangered plant species occur on the Base, the Oklahoma penstemon (*Penstemon oklahomensis*), identified as a rare plant under the Oklahoma Natural Heritage Inventory Program, thrives in several locations on Base. Tinker AFB policy considers rare species as if they were threatened or endangered and provides the same level of protection for these species.

In general, wildlife on the Base is typically tolerant of human activities and urban environments. No federal threatened or endangered species have been reported at the Base. However, one specie found on the Base, the Texas horned lizard (*Phrynosoma cornutum*), is a Federal Category 2 candidate specie and under review for consideration to be listed as threatened or endangered. Air Force policy (AFR 126-1) considers candidate species as threatened or endangered and provides the same level of protection.

The Oklahoma Department of Wildlife Conservation also lists several species within the state as Species of Special Concern. Information on these species suggests declining populations but information is inadequate to support listing, and additional monitoring of populations is needed to determine the species status. These species also receive protection by Tinker AFB as threatened or endangered species. Of these species, the Swainson's hawk (*Buteo swainsoni*) and the burrowing owl (*Athene cunicularia*) have been sighted on Tinker AFB. The Swainson hawk, a summer visitor and prairie/meadow inhabitant, has been encountered Basewide. The burrowing owl has been known to inhabit the Air Field at the Base.

7.0 Action Levels

An "action level" is defined by EPA in proposed rule 40 CFR 264.521 (55 FR 30798; 7/27/90), "Corrective Action for Solid Waste Management Units (SWMU) at Hazardous Waste Management Facilities," as a health- and environment-based level, determined by EPA to be an indicator for protection of human health and the environment. In the preamble to this proposed rule, the focus of the RFI phase is defined as "characterizing the actual environmental problems at the facilities." As part of this characterization, a comparison of the contaminant concentrations to certain action levels should be made to determine if a significant release of hazardous constituents has occurred. This comparison is then used to determine if further action or corrective measures are required for a SWMU or an AOC. The preamble to the proposed rule states that the concept of action levels was introduced because of the need for "a trigger that will indicate the need for a Corrective Measures Study (CMS) and below which a CMS would not ordinarily be required" (55 FR 30798; 7/27/90). If constituent concentrations exceed certain action levels at a SWMU or an AOC, further action or a CMS may be warranted; if constituent concentrations are below action levels, a finding of no further action may be warranted. This chapter of the report presents the initial analytical data as compared to certain potential action levels.

Action levels are concentrations of contaminants at or below which exposure to humans or the environment should not produce acute or chronic effects.

The action level information is presented in this chapter so that a constituent concentration at a sample location can be compared with its potential action level. Only constituents identified in the analysis are listed in the SWMU-14, SDB table. Table 7-1 shows the action levels for soil, water, and air as published in federal or state regulations, policies, guidance documents, or proposed rules.

The action levels listed in Table 7-1 are:

- ***SWMU Corrective Action Levels (CAL)*** - The first set of action levels provided in the table are those taken from the proposed rule (40 CFR 264.521) and provided as Appendix A to the rule as "Examples of Concentrations Meeting Criteria for Action Levels." These levels are health-risk based and are provided

Table 7-1

Action Levels
SWMU 14, SDB, Tinker AFB

(Page 1 of 5)

Parameters	SWMU CAL[a] Soil (mg/kg)	USGS[c] Background Soil (mg/kg)	2-67A 5 ft - 20 ft Range (mg/kg)	2-68A 4.5 ft - 16 ft Range (mg/kg)	SB-029 4.5 ft - 16 ft Range (mg/kg)	SB-030 2.5 ft - 17 ft Range (mg/kg)
Organics						
1,1-Dichloroethene	10		0.0074			
1,2-Dichloropropane			0.0034-0.014			
Cis-1,2-Dichloroethene	8.0		0.0057-0.0058			
Tetrachloroethene	10		0.0024-0.009			
Inorganics						
Aluminum		89,000	8900-13000	7300-8600	7000-11000	10000-16000
Arsenic	80	21	2.0-4.2	2.0-4.5	1.0-4.2	1.3-4.0
Barium	4000	6400	160-1900	95-940	56-410	130-1000
Beryllium	0.2	3	0.9-1.8	0.90-1.3	1.2-1.9	0.81-0.99
Cadmium	40	<2	0.67-1.1	0.77	0.51-0.92	0.77-0.81
Chromium		110	12-18	8.6-13	9.7-15	15-25
Chromium VI	400	<0.5[d]			0.13-0.34	
Copper		59	7.9-13	5.8-11	4.6-8.6	7.1-9.5
Iron		58,000	8500-23000	7900-14000	8200-14000	11000-16000
Lead		27	5.5-33	4.8-8.4	3.4-6.6	3.9-5.7
Mercury	20	<0.024[d]	0.031			
Nickel	2000	61	8.2-25	12-20	9-16	13-100
Silver	200	<2	0.93-1.0		0.098-0.24	
Zinc		79	17-25	12-20	14-20	21-28

Table 7-1

(Page 2 of 5)

Parameters	SWMU CAL[a] Soil (mg/kg)	USGS[c] Background Soil (mg/kg)	SB-031 3 ft - 16.5 ft Range (mg/kg)	SB-032 1ft - 16 ft Range (mg/kg)	SB-033 1 ft - 19 ft Range (mg/kg)	SB-034 8.5 ft - 17.5 ft Range (mg/kg)	SB-035 2 ft - 15.5 ft Range (mg/kg)
Organics							
1,1-Dichloroethane				0.0014-0.0091			
Acetone	8000			0.0064-0.14			
Xylenes	2E+05			0.022			
Inorganics							
Aluminum		89,000		12000-18000	11000-18000	6200-9500	5200-13000
Arsenic	80	21	1.7-2.3	1.9-5.4	1.2-3.7	2.4	2.0-7.8
Barium	4000	6400	68-590	57-960	260-1100	98-850	80-3400
Beryllium	0.2	3	0.71-0.98	0.87-1.0	0.60-0.91	0.61-0.87	0.58-1.1
Cadmium	40	<2	0.57	0.72-0.97	0.53-0.60		0.85
Chromium		110	14-17	15-22	14-19	9.8-13	6.5-12
Chromium VI	400	<0.5[d]	0.11				
Copper		59	7.2-12	6.9-10	7.3-9.6	5.3-7.1	4.7-14
Iron		58,000	10000-14000	13000-17000	10000-17000	9200-11000	4700-16000
Lead		27	4.4-6.2	4.7-11	6.2-8.7	5.3-6.0	5.4-18
Nickel	2000	59	10-15	14-21	13-20	10-12	9.4-34
Zinc		79	23-26	24-29	21-27	12-19	13-20

Table 7-1

(Page 3 of 5)

Parameters	SWMU CAL[a] Soil (mg/kg)	USGS[c] Background Soil (mg/kg)	SB-036 3 ft - 15.5 ft Range (mg/kg)	SB-037 .5 ft - 16 ft Range (mg/kg)	SB-038 8.5 ft - 18.5 ft Range (mg/kg)
Organics					
1,1-Dichloroethane			0.015		
Chlorobenzene	2000			0.0007-0.0075	
Methylene chloride	90			0.0075-0.011	0.009-0.017
Inorganics					
Aluminum		89,000	11000-17000	8500-16000	3000-13000
Arsenic	80	21	2.0-6.0	1.7-10	1.0-2.9
Barium	4000	6400	230-510	68-790	59-900
Beryllium	0.2	3	0.72-0.95	0.60-0.74	
Cadmium	40	<2	0.70-0.83		0.54
Chromium		110	16-35	15-19	8.1-25
Copper		59	7.4-9.4	6.9-7.9	2.3-7.7
Iron		58,000	14000-17000	11000-14000	6500-13000
Lead		27	5.7-7.7	5.1-6.9	2.7-5.1
Nickel	2000	61	15-22	12-16	6.9-19
Zinc		79	20-26	16-24	7.7-22

Table 7-1

(Page 4 of 5)

Parameters	SWMU CAL[a] Water (mg/L)	MCL[b] Water (mg/L)	2-66A (mg/L)	2-66B (mg/L)	2-67A (mg/L)	2-67B (mg/L)	2-68A (mg/L)
Organics							
1,1-Dichloroethene		0.007				0.099-0.1	
1,1,1-Trichloroethane	3	0.2				0.016-0.017	
1,2-Dichloroethane		0.005			13.0	0.045	0.086
1,2-Dichloropropane		0.005			0.037	0.046-0.047	
2-Methylphenol					0.034		
Benzene		0.005			0.28		
Bis(2-ethylhexyl)phthalate	0.003	0.006		0.013			
Carbon tetrachloride	0.0003	0.005	0.049				0.29
Chloroform	0.006	0.1	0.029			0.0062-0.0064	0.50
Cis-1,2-dichloroethene		0.07			0.120	0.020-0.021	
Methylene chloride	0.005	0.005			0.042		
Tetrachloroethene	0.0007	0.005				0.089-0.091	
Toluene	10	1			0.02	0.0081	
Trichloroethene		0.005			0.048	0.0064-0.033	0.036
Inorganics							
Aluminum			1.1	2.9		6.2-6.4	0.72
Arsenic		0.05			0.016		
Barium		2	0.53	0.7	1.4	0.75-0.78	0.54
Chromium		0.1	0.018			0.012	
Chromium VI					0.014		
Iron			1.9	3.5	0.62	6.9-7.1	2.1
Nitrate/nitrite		10	4.9	0.067		7.4	2.0
Zinc			0.023				0.024

Table 7-1

(Page 5 of 5)

Parameters	SWMU CAL[a] Water (mg/L)	MCL[b] Water (mg/L)	2-68B (mg/L)
Organics			
1,1-Dichloroethene		0.007	0.026
1,1,1-Trichloroethane	3	0.2	0.098
Chloroform	0.006	0.1	0.0062
Tetrachloroethene	0.0007	0.005	0.098
Inorganics			
Aluminum			13
Barium		2	3.5
Chromium		0.1	0.03
Iron			18
Lead		0.015[f]	0.0059
Nitrate/nitrite		10	3.1
Zinc			0.033

[a]CAL - Corrective Action Levels.
[b]MCL - Maximum Contaminant Levels.
[c]USGS - United States Geological Survey.
[d]Site background

as specific examples of levels below which corrective action would not be required.

- ***Maximum Contaminant Levels (MCL)*** - These values are provided from 40 CFR Subpart G, Sections 141.60 through 0.63 as promulgated under the Safe Drinking Water Act. These levels are designated for water media only.

- ***USGS Background*** - These values are provided from the USGS report titled "Elemental Composition of Surficial Materials from Central Oklahoma" (USGS, 1991). These values represent the levels of metals which naturally occur in Central Oklahoma soils.

- ***Background*** - These levels are provided where background could be determined. Where available, background concentrations are listed for metals in soil samples taken on site, which were thought to be unaffected by releases from a unit.

- ***National Ambient Air Quality Standards (NAAQS)*** - These standards are published in 40 CFR Part 50 under the Clean Air Act and apply to point sources that emit a limited number of constituents to the air. The constituents regulated are nitrogen dioxide, sulphur dioxide, carbon monoxide, lead, ozone, and particulate matter. Currently, it is assumed that none of the SWMUs or AOCs emit these compounds in regulated quantities and no air samples have been taken which would allow for a valid comparison.

- ***Water Quality Standards (WQS)*** - The WQS are the standards for surface water quality as established by the State of Oklahoma. These standards apply to point source discharges to surface waters and have been listed for those units adjacent to surface water.

Table 7-1 also gives a brief comparative evaluation of the data collected and the related action levels. The data for each detected compound are compared with the appropriate action level in order to identify those constituents (compounds) with concentrations exceeding the action levels. This identification of the compounds above the action levels provides an indication of a potential environmental problem at a specific site. In addition, this information indicates whether there is a need for conducting a CMS so that a corrective action can be implemented/undertaken at the site.

For constituents that have a SWMU CAL and an MCL for water, the MCL will be used for the comparison. Also, constituents that do not have a USGS background value will be compared to the site background value if available.

The data included in Table 7-1 are representative of the data presented in Chapter 5.0. For each soil boring, a range was identified and used in the comparison to the action levels. For the groundwater samples, the results for the most recent sampling event were included in Table 7-1.

No organic compounds were detected above SWMU CAL for soils. The only metal detected in soils above the SWMU CAL for soils was beryllium, but all levels of beryllium were within the range of beryllium found in background soils, as reported by the USGS. No constituents of concern are present in the soils at SDB.

Several organics that were detected in the groundwater above MCLs include 1,1-dichloroethene, 1,2-dichloroethane, 1,2-dichloropropane, cis-1,2-dichloroethene, benzene, bis(2-ethylhexyl)phthalate, carbon tetrachloride, chloroform, methylene chloride, tetrachloroethene, and trichloroethene. Barium was also detected in the groundwater above MCL.

8.0 Summary and Conclusions

8.1 Summary

No organic constituents were found above action levels in the soils beneath SDB. The USZ has been contaminated by organics, primarily at the southwest portion of the site. The following sections provide a description of the impacts to soils and groundwater at the SDB.

8.2 Conclusions

Soils. Volatile organics were detected at concentrations above the reporting limits in soils from one of three monitoring well boring locations and from 4 of 10 soil borings drilled through the floor of the SDBs (SWMU-14):

- No SVOCs were detected in the soils from the SDB investigation.
- Detected volatile organics and location of detection are:

Constituent	Location				
	2-67A	SB-032	SB-036	SB-037	SB-038
1,1-Dichloroethane		X	X		
1,1-Dichloroethene	X				
cis-1,2-Dichloroethene	X				
1,2-Dichloropropane	X				
Acetone		X			
Chlorobenzene				X	
Methylene chloride				X	X
Tetrachloroethene	X				

- 1,1-Dichloroethane only detected in soils just above water table and in near surface sample (1 to 1.5 feet) at SB-032 and SB-036.
- 1,1-Dichloroethene, cis-1,2-dichloroethene, and 1,2-dichloropropane only detected in soils just above water table in boring 2-67A.
- Acetone and chlorobenzene were detected above the reporting limit in only 1 of 50 samples. Acetone, detected at a concentration of 140 µg/kg in the 1 to 1.5 foot depth sample at SB-032, is an order of magnitude greater in concentration than the reporting limit and may not be attributable to the lab blank contaminant.
- Methylene chloride concentrations above the method detection limit were found in only 3 of 50 samples, but can likely be attributed to laboratory contamination

since it was also detected at a similar magnitude in laboratory and trip blanks for these samples.

- Tetrachloroethene was detected in three of four samples collected from monitoring well boring 2-67A at concentrations from 6.6 to 9.0 µg/kg suggesting a local source for the contaminant. Tetrachloroethene was also found in the locality of 2-67 within the vadose zone soil gas as indicated by the results of the soil gas survey.

- All metals except lead were within the USGS background range for metals in soils. Lead background limits were only exceeded in one sample (collected at 10 feet in depth in 2-67A). However, the MS/MSD recovery was outside of the limits for lead in this sample.

Groundwater. The groundwater in the southwest portion of the site requires additional investigation due to the high concentrations of organics, particularly, 1,2-dichloroethane, trichloroethene, and tetrachloroethene. The soils contain no organic compounds above the SWMU CALs but tetrachloroethene was found throughout the soil column in monitoring well boring 2-67A, the well containing the most significant groundwater contamination. This well is located in the lower portion of the USZ.

Additional information about the LSZ is required to determine its direction of flow underneath SDB, whether it is hydraulically connected to the USZ, and whether it is potentially contaminated.

Geotechnical analysis of the soil sample(s) as discussed in Section 5.2.1 suggests that in general, near surface soils are fine grained (primarily silt and clay) with relatively low vertical permeability. The low permeability soils limit infiltration of surface water, which inhibits transport of contaminants to the subsurface. If appropriate, additional geotechnical samples will be collected within contaminant source areas delineated during the Phase II field investigation. If warranted, geotechnical data will be evaluated to determine flow and transport within the vadose zone after the completion of Phase II activities.

9.0 Recommendations

Based on the results of the investigation of the SDBs (SWMU-14), the following additional work is recommended:

- Install one additional monitoring well cluster, 75 to 100 feet to the west of monitoring well 2-67A. One of the wells in the cluster will be completed deep enough to monitor the LSZ.

- Install one additional monitoring well cluster 100 feet to the west of the northern sludge drying bed. One of the wells in the cluster will be completed deep enough to monitor the LSZ.

The purpose of these new well clusters will be to:

- Confirm the potentiometric head and groundwater flow direction in the USZ and LSZ.

- Better determine the extent of the groundwater contamination through the placement of downgradient well clusters.

- Determine if a hydraulic connection exists between the USZ and LSZ.

Site-specific soil background samples were not collected, nor were the soil background values available for inclusion in this Phase I RFI report. Therefore, it is recommended that site-specific soil samples from uncontaminated areas be collected for analysis during the Phase II RFI field work. This additional information along with the USGS background values should be used in the Phase II report to distinguish site-related from background concentrations in a statistically significant manner.

A Phase II RFI work plan should be developed to indicate the locations of the two proposed monitoring well clusters and the soil background borings. The work plan should also determine the number of samples and the types of analysis required. Additional soil samples will be drilled if needed. The work plan should be submitted to EPA for approval before starting the field work.

The lack of human health and ecological risk assessments result in a data gap for this site. To correct this data gap, further evaluation of the potential receptors and a human and ecological risk assessment should be performed in two steps:

1) Qualitative evaluation of the potential for human and ecological receptors to become exposed to chemicals associated with the site, including:

   - Evaluation of sources of contamination
   - Evaluation of contaminant release and transport mechanisms
   - Evaluation of potential pathways, under current and future land-use scenarios, by which potential receptors may be exposed to chemicals.

2) Quantitative estimation of the potential for human exposure (cancer and noncancer risk).

For first step, the minimum evaluation should include investigation of complete exposure pathways from contamination of groundwater, either the USZ or the LSZ, and from contamination of ambient air. The second step should be performed using the most recent EPA guidance, default values for chemical intake variables, and toxicity values. Considerable care should be exercised in the site evaluation, sampling, and data evaluation to ensure that the data used in the risk assessments accurately reflect the contamination present at the site.

10.0 References

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APPENDIX A
BORING LOGS/WELL CONSTRUCTION DIAGRAMS

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-029

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHWEST CORNER OF SUDGE BEDS SOUTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1226.929
TOTAL DEPTH(FT.): 19.5
Date Started: 10/25/93
Date Completed: 10/25/93

Sampling Method: 3"x5' CONTINUOUS CORE BARREL

Notes: N 153285.911, E 2177284.758

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID	USCS	GRAPHIC LOG	DEPTH IN FEET
GRAVEL – fill		48				
SANDY CLAY – slightly plastic; 25% medium grained sand; very hard; sharp contact; brown (7.5YR-5/2); dry				cl		
– gradational contact	A 1042	12 / 60	1			5
– 10% to 20% fine grained sand; dark red (2.5YR-4/8)						
– stiff; black nodules; slightly moist	A 1043	60	0.8			
– moderately plastic; firm		60				10
– soft; moist	A 1044	60	2			
– very soft; very moist	A 1045	60	0.5			15 ▼
CLAYEY SAND – 40% clay, 60% fine to coarse grained sand; compact; wet; dark red (2.5YR-4/8); gradational		48		sp		20
TOTAL DEPTH = 19.5 FEET						25
						30
						35
						40

DRAFT BY	RPS 11/20/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A13 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-030

DRILLING AND SAMPLING INFORMATION

Boring Location: WEST CORNER OF SLUDGE BEDS SOUTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1225.960
TOTAL DEPTH(FT.): 19.0
Date Started: 10/22/93
Date Completed: 10/22/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153320.501, E 2177281.365

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
GRAVEL – fill		48				
CLAY – slightly plastic; 5% fine grained sand; stiff; slightly moist; grayish brown (10YR-5/2); sharp contact	A 1036	48	0.5	cl		
		60				5
SANDY CLAY – slightly plastic; 15% fine grained sand; stiff; slightly moist; brown (7.5YR-5/2); gradational contact – 20% fine grained sand; black nodules; red (2.5YR-5/8)	A 1037	60		cl		
		60				10
– moderately plastic; 20% to 25% fine grained sand; firm; moist; dark red (2.5YR-4/8)	A 1038 A 1039	60	1.8			
		60				15
CLAYEY SAND – 40% clay, 60% fine grained sand; compact; moist to wet; dark red (2.5YR-4/8); gradational contact – 30% clay, 70% fine to coarse grained sand; wet; sharp contact	A 1040	60	1.8	sp		
TOTAL DEPTH = 19.0 FEET						20 25 30 35 40

DRAFT BY	RPS 11/20/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A14 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-031

DRILLING AND SAMPLING INFORMATION

Boring Location: NORTHWEST CORNER OF SLUDGE BEDS SOUTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN
GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1226.145
TOTAL DEPTH(FT.): 19.0
Date Started: 10/22/93
Date Completed: 10/22/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153338.949, E 2177281.766

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
GRAVEL – fill		48				
CLAY – slightly plastic; 5% to 10% vey fine grained sand; firm; slightly moist; dark gray (10YR-4/1); sharp contact	A 1031	48 / 60	0.5	cl		5
SANDY CLAY – slightly plastic; 20% very fine grained sand; hard; slightly moist; dark red (2.5YR-4/8); black nodules; gradational contact	A 1032	60 / 60	0.8	cl		
– moderately plastic; firm; moist	A 1033	60 / 60	0.8			10
	A 1034	60 / 60	0.8			15
CLAYEY SAND – 60% fine to coarse grained sand; compact; wet; dark red (2.5YR-4/8); sharp contact				sp		
TOTAL DEPTH = 19.0 FEET						20
						25
						30
						35
						40

DRAFT BY	RPS 11/20/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A15 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-032

DRILLING AND SAMPLING INFORMATION

Boring Location: MIDDLE NORTHSIDE OF SLUDGE BEDS SOUTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1226.026
TOTAL DEPTH(FT.): 18.5
Date Started: 10/22/93
Date Completed: 10/22/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153340.504, E 2177302.376

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	FID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
CONCRETE						
CLAY – slightly plastic; 5% fine grained sand; hard; slightly moist; dark gray (2.5YR-4/1); sharp contact	A 1027	30 / 30	50	cl		
SANDY CLAY – nonplastic; 10% to 15% fine grained sand; very hard; slightly moist; brown (10YR-5/3); gradational contact		60		cl		5
– dark red (2.5YR-4/8)	A 1028	60	20			
– slightly plastic; 20% to 25% fine grained sand; firm; moist		60				10
	A 1029	60	40			
– moderately plastic; soft; very moist	A 1030	60				15
CLAYEY SAND – 40% clay, 60% fine to coarse grained sand; compact; very moist; dark red (2.5YR-4/8); sharp contact		60		sp		▼
TOTAL DEPTH = 18.5 FEET						20
						25
						30
						35
						40

DRAFT BY	RPS 11/20/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A16 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-033

DRILLING AND SAMPLING INFORMATION

Boring Location: NORTHEAST SIDE OF SLUDGE BEDS SOUTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1226.205
TOTAL DEPTH(FT.): 23.5
Date Started: 10/20/93
Date Completed: 10/20/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153343.640, E 2177322.855

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
CONCRETE	A 1008	42 / 42				
SANDY CLAY – slightly plastic; 10% fine to medium grained sand; firm; moist; dark grayish brown (2.5YR-4/2)				cl		
– 20% to 25% fine to medium grained sand; strong brown (7.5YR-5/6); black nodules; gradational contact		60				5
– 10% to 15% fine grained sand; hard; dark red (2.5YR-4/8)	A 1009	60 / 60				10
	A 1010	60 / 60				15
– 40% fine to medium grained sand; soft; very moist	A 1011	60 / 60				20
– 30% to 40% fine grained sand; hard; slightly moist; sharp contact		60				
TOTAL DEPTH = 23.5 FEET						25
						30
						35
						40

DRAFT BY	RPS 11/20/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A17 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-034

DRILLING AND SAMPLING INFORMATION

Boring Location: NORTHEAST CORNER OF SLUDGE BEDS SOUTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1225.884
TOTAL DEPTH(FT.): 18.5
Date Started: 10/21/93
Date Completed: 10/21/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: NO RECOVERY UNTIL 8.5', PROBABLY DUE TO CONCRETE CUTTINGS IN HOLE
N 153341.088, E 2177348.133

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
CONCRETE		42 / 0				
no recovery (1-8.5')		60 / 0				5
SANDY CLAY - slightly plastic; 10% to 15% fine grained sand; hard; slightly moist; dark red (2.5YR-4/8); gradational contact	A 1014	24 / 18	0	cl		10
- moderately plastic; firm; moist	A 1015	60	1			15
CLAYEY SAND - 40% clay, 10% coarse and 50% fine to medium grained sand; compact; very moist to wet; dark red (2.5YR-4/8); sharp contact	A 1016	60	7	sp		
TOTAL DEPTH = 18.5 FEET						20, 25, 30, 35, 40

DRAFT BY	RPS 11/20/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A18 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-035

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHWEST CORNER OF SLUDGE BEDS NORTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN
GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1225.832
TOTAL DEPTH(FT.): 19.0
Date Started: 10/21/93
Date Completed: 10/21/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153486.704, E 2177283.644

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	FID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
CONCRETE						
CLAY – moderately plastic; 3% to 5% sand; stiff; slightly moist; dark gray (10YR-4/1); sharp contact	A 1017	36 / 36	4	cl		
SANDY CLAY – slightly plastic; 20% to 25% fine grained sand; firm; slightly moist; dark red (2.5YR-4/6); gradational contact	A 1019	60 / 60	4	cl		5
– moderately plastic; 25% fine grained sand; soft; very moist		60 / 60				10
– gravelly zone (11.5-12.0'); grades to firm below 12'	A 1020		4			
– 25% to 30% fine grained sand; very soft; wet	A 1021	60 / 60	5			15
CLAYEY SAND – 40% clay, 10% coarse and 50% fine grained sand; compact; wet; dark red (2.5YR-4/8); sharp contact		60		sp		
TOTAL DEPTH = 19.0 FEET						20
						25
						30
						35
						40

DRAFT BY	RPS 11/22/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A19 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-036

DRILLING AND SAMPLING INFORMATION

Boring Location: MIDDLE SOUTHSIDE OF SLUDGE BEDS NORTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1225.408
TOTAL DEPTH(FT.): 18.5
Date Started: 10/22/93
Date Completed: 10/22/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153493.958, E 2177306.573

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	FID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
CONCRETE						
CLAY – slightly plastic; 10% fine grained sand; firm; slightly moist; very dark gray (10YR-2/1); sharp contact		30		cl		
SANDY CLAY – slightly plastic; 20% fine grained sand; hard; slightly moist; red (2.5YR-5/6); black nodules; gradational contact	A 1022	30 / 60	8	cl		
– 10% to 15% fine grained sand; nodules at 3'						5
– moderately plastic; firm; moist; dark red (2.5YR-4/6)	A 1023	60 / 60	15			
– 25% to 30% fine grained sand; soft	A 1025	60	4			10
CLAYEY SAND – 40% clay, 20% medium and 40% fine grained sand; compact; very moist; dark red (2.5YR-4/6); gradational contact		60		sp		▼
– 60% fine to medium grained sand; wet	A 1026		1			15
– 30% clay, 70% fine to coarse grained sand; very moist; sharp contact		60				
TOTAL DEPTH = 18.5 FEET						20
						25
						30
						35
						40

DRAFT BY	RPS 11/22/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A20 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-037

DRILLING AND SAMPLING INFORMATION

Boring Location: MIDDLE SOUTHSIDE OF SLUDGE BEDS NORTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1225.822
TOTAL DEPTH(FT.): 20.0
Date Started: 10/20/93
Date Completed: 10/20/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: N 153489.509, E 2177320.543

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
CONCRETE						
CLAY – moderately plastic; stiff; dry; very dark gray (10YR-3/1)	A 1004	18 / 12		cl		
SANDY CLAY – slightly plastic; firm; dry; brown (7.5YR-4/4)		42		cl		
– non to slightly plastic; stiff; dark red (2.5YR-4/8); black organic nodules		42				5
		60				
– slight to moderately plastic; 10% fine grained sand; moist	A 1005	60				10
		60				
– moderately plastic; soft	A 1006	60				15
– nonplastic; 25% to 50% medium to coarse grained sand; firm; some gravel; compact; wet; sharp contact	A 1007	54				
SAND – nonplastic; fine grained; firm; dry; dark red (2.5YR-4/8); sharp contact				sp		
– 10% to 20% clay; loose; dry to slightly moist at 17.5'						
– compact; wet to saturated		54				20
TOTAL DEPTH = 20.0 FEET						25
						30
						35
						40

DRAFT BY	RPS 11/22/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A21 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

SOIL BORING SB-038

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHEAST CORNER OF SLUDGE BEDS NORTH
Logged By: K. KIRSCHENMANN
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

SURFACE ELEV.(FT): 1225.397
TOTAL DEPTH(FT.): 19.0
Date Started: 10/19/93
Date Completed: 10/19/93

Sampling Method: 3"x5' CONTINUOUS SAMPLER AND 2"x2' SPLIT SPOON
Notes: NO RECOVERY UNTIL 8.5 FEET
N 153489.394, E 2177346.511

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
no recovery (0-8.5')						5
SANDY CLAY - slightly plastic; 10% very fine grained sand; firm; moist; dark red (2.5YR-4/6)	A 1001	24 / 24	0	cl		10
- 10% fine to medium grained sand	A 1002	24 / 24	0			15
- 20% to 25% medium grained sand; stiff	A 1003	24 / 9 / 12 / 12	0			▼
TOTAL DEPTH = 19.0 FEET						20
						25
						30
						35
						40

DRAFT BY	RPS 11/22/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A22 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-66A

DRILLING AND SAMPLING INFORMATION

Boring Location: EAST OF SLUDGE DRYING BEDS ON PATROL RD
SURFACE ELEV.(FT): 1228.209
TOTAL DEPTH(FT.): 66
Logged By: M. WILSON
Date Started: 11/2/93
Drilled By: D. MEYER GEOTECHNOLOGY, INC.
Date Completed: 11/10/93
Drill Rig Type: CME-75
Drilling Method: 8" AND 12" HOLLOW STEM AUGERS AND MUD ROTARY WITH 5-5/8" TRICONE ROCK BIT
Sampling Method: 1-1/2"x2' SPLIT SPOON AND 1-1/2"x5' NX CORE BARREL
Notes: N 153484.356, E 2177491.782

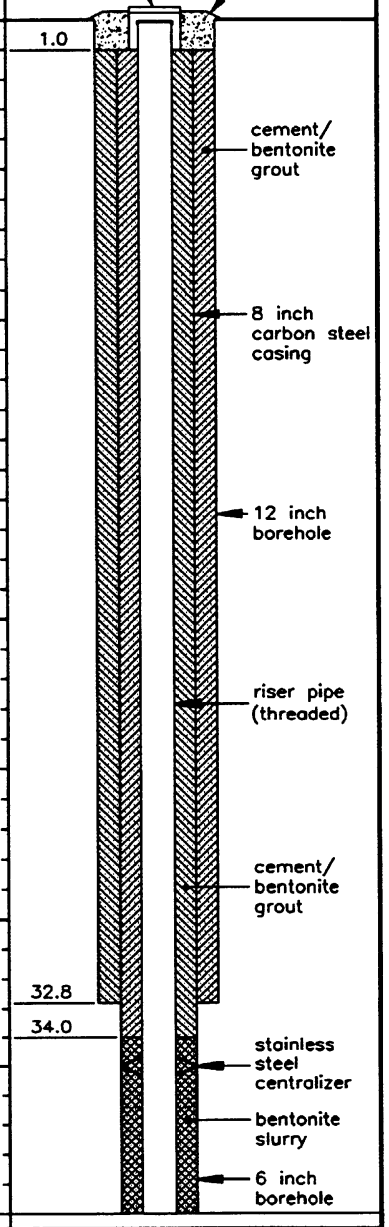
WELL COMPLETION DATA

Elev-Top of Casing(ft.):
Ref. Datum: MSL
1. Surf Casing-I.D.(in.): 8 — Depth(ft.): 32.8 Type: Carbon Steel
   Centralizers-Type: — Depths(ft.):
2. Riser Pipe-I.D.(in.): 2 — Depth(ft.): 50.5 Type: S.Steel
   Centralizers-Type: S.Steel — Depths(ft.): 35
3. Screen Dia.(in.): 2 — Type: S.Steel Wire Wound
   Depth Interval(ft.): 50.5-60.2 — Slot Size(in.): .010
   Centralizers-Type: — Depths(ft.):
4. Filter Pack Type: Silica Sand — Depth Interval(ft.): 47.5-61
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS
CLAY - nonplastic; <10% fine grained sand; hard; dry; brown (7.5YR-4/3)			cl
CLAYEY SILT - slightly plastic; hard; dense; slightly moist; red (2.5YR-4/8)			ml
- <5% very fine grained sand; moist; black carbon imprints	24 / 24	0.0	
- moderately plastic; firm; white gravel chunks	24 / 24		
SANDY CLAYEY SILT - highly plastic; 20% very fine grained sand; soft; moist; no carbon	24 / 24		ml
- very soft; very moist	24 / 24	0.0	
- saturated	24 / 24		
SILTY GRAVELLY SAND - 20% silt, 30% granule size gravel, 50% fine grained sand; firm; poorly graded; compact; red (2.5YR-4/8); gravel is chunks of well cemented sandstone, light red (2.5YR-6/4)	14 / 24		sm
SILTY SAND - 30% silt, 70% fine grained sand; soft; poorly graded; compact; wet; red (2.5YR-4/8); trace of black carbon imprints	13 / 24		sm
- 10% silt, 90% fine grained sand at 23'	10 / 8 / 8	0.3	
- trace of chunks of moderately well cemented sandstone	14 / 14		
	6 / 6		
SAND AND SANDSTONE - alternating layers of fine grained sand and well cemented fine grained sandstone; wet; red (2.5YR-4/8)	13 / 13		sp
SILT - nonplastic; very hard; moist; red (2.5YR-4/8); sharp contact	9 / 9		ml
SILTY SAND - slightly plastic; 30% silt, 70% very fine grained sand; red (2.5YR-4/8) and gray (2.5YR-6/0); alternating thin layers; gradational contact			sm
SILTY SANDSTONE - 25% silt, 75% fine grained sand; hard; dense; wet	60	0.0	sm
- 10% silt, 90% sand at 37.5'			
SANDY SILTSTONE - hard; dense; moist; red			ml

GEOPHYSICAL LOG (GAMMA): 10 20 30 40

DEPTH IN FEET: 5, 10, 15, 20, 25, 30, 35, 40



DRAFT BY	RPS 1/15/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A61 Sheet 1 of 2

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-66A

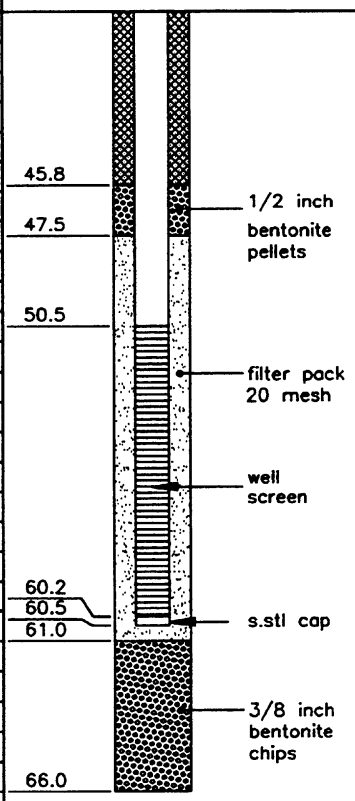
DRILLING AND SAMPLING INFORMATION

Boring Location: EAST OF SLUDGE DRYING BEDS ON PATROL RD
SURFACE ELEV.(FT): 1228.209
TOTAL DEPTH(FT.): 66
Logged By: M. WILSON
Date Started: 11/2/93
Drilled By: D. MEYER GEOTECHNOLOGY. INC.
Date Completed: 11/10/93
Drill Rig Type: CME-75
Drilling Method: 8" AND 12" HOLLOW STEM AUGERS AND MUD ROTARY WITH 5-5/8" TRICONE ROCK BIT
Sampling Method: 1-1/2"x2' SPLIT SPOON AND 1-1/2"x5' NX CORE BARREL
Notes: N 153484.356, E 2177491.782

WELL COMPLETION DATA

Elev-Top of Casing(ft.): Ref. Datum: MSL
1. Surf Casing-I.D.(in.): 8 — Depth(ft.): 32.8 Type: Carbon Steel
   Centralizers-Type: — Depths(ft.):
2. Riser Pipe-I.D.(in.): 2 — Depth(ft.): 50.5 Type: S.Steel
   Centralizers-Type: S.Steel — Depths(ft.): 35
3. Screen Dia.(in.): 2 — Type: S.Steel Wire Wound
   Depth Interval(ft.): 50.5-60.2 — Slot Size(in.): .010
   Centralizers-Type: — Depths(ft.):
4. Filter Pack Type: Silica Sand — Depth Interval(ft.): 47.5-61
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	GEOPHYSICAL LOG (GAMMA)	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
(2.5YR-4/8); trace amounts of calcification; sharp contact - 30% very fine grained sand, 70% silt at 40' - more sandy; intermittent thin sandy layers; grayish pink			48 / 60	0.0			
SANDSTONE - <5% silt; hard; dense; well cemented; wet; red (2.5YR-4/8); gradational contact; sandstone breaks along thin laminations of softer sand; trace laminations of yellowish green clay or silt; poorly graded - <5% trace amounts of pebble size gravel			60 / 60 / 42		sp		45
SANDY SILTSTONE - 40% very fine grained sand, 60% silt; hard; moist; red (2.5YR-4/8); sharp contact			60	0.0	ml		50
SANDSTONE - <5% silt; poorly graded; hard; well cemented; wet; red (2.5YR-4/8); sharp contact					sp		
SANDY SILTSTONE - 40% very fine grained sand, 60% silt; hard; moist; red (2.5YR-4/8); sharp contact			60	0.0	ml		55
SANDSTONE - <5% silt; poorly graded; hard; moderately well cemented; wet; red (2.5YR-4/8); sharp contact - thin silty layers at 60 and 60.5'			60 / 48 / 60		sp		60
SANDY SILT - 40% very fine grained sand, 60% silt; soft; loose; wet; red (2.5R-4/8)			42		ml sw		65
CONGLOMERITIC SANDSTONE - 30% gravel, 70% very fine grained sand; gravel composed of chunks of siltstone; very hard; dense; well cemented; dry; variagated color							70
TOTAL DEPTH = 66.0 FEET							75
							80



DRAFT BY	RPS 1/15/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A61 Sheet 2 of 2

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-67A

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHWEST CORNER OF SLUDGE DRYING BEDS
SURFACE ELEV.(FT): 1227.88
TOTAL DEPTH(FT.): 67
Logged By: M. WILSON
Date Started: 11/3/93
Drilled By: D. MEYER GEOTECHNOLOGY. INC.
Date Completed: 11/9/93
Drill Rig Type: CME-75
Drilling Method: 8" AND 12" HOLLOW STEM AUGERS AND MUD ROTARY WITH 5-5/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS TUBE SAMPLER

Notes: N 153299.317, E 2177260.427

WELL COMPLETION DATA

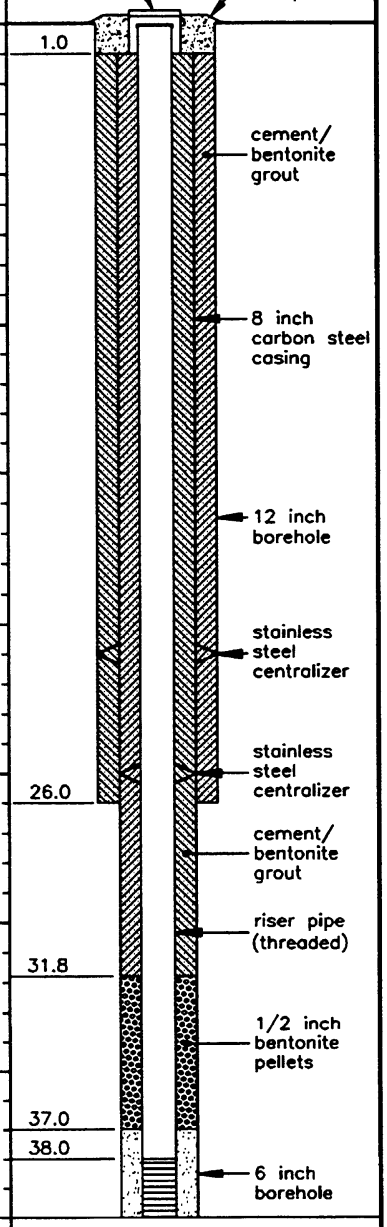
Elev-Top of Casing(ft.):
Ref. Datum: MSL

1. Surf Casing-I.D.(in.): 8 — Depth(ft.): 26 — Type: Carbon Steel
   Centralizers-Type: S.Steel — Depths(ft.): 21
2. Riser Pipe-I.D.(in.): 2 — Depth(ft.): 38 — Type: S.Steel
   Centralizers-Type: S.Steel — Depths(ft.): 25
3. Screen Dia.(in.): 2 — Type: S.Steel Wire Wound
   Depth Interval(ft.): 38-47.7 — Slot Size(in.): .010
   Centralizers-Type: — Depths(ft.):
4. Filter Pack Type: Silica Sand — Depth Interval(ft.): 37-49.1
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS
GRAVEL - fill		48		ml
CLAYEY SILT - slightly plastic; stiff; slightly moist; very dark grayish brown (10YR-3/2)		24 / 60		ml
- hard	A 1519		1.3	
- gradational change to red (2.5YR-4/8)		60		
- black carbon stains	A 1520	60	4.9	
SANDY SILT - nonplastic; 15% very fine grained sand, 85% silt; stiff; dry; red (2.5YR-4/8); gradational contact		60 / 60		ml
- 30% very fine grained sand, 70% silt; very moist	A 1521			
- saturated	A 1522	60 / 60		
- thin sandy gravel layer; 30% silt, 30% gravel, 40% sand				
CLAYEY SILT - slightly plastic; stiff; moist; red (2.5YR-4/8); sharp contact; black carbon stains		48 / 60	0.4	ml
SANDY CLAYEY SILT - slightly plastic; soft; saturated; red (2.5YR-4/8); black carbon stains		60		ml
SILTY SAND - 30% silt, 70% fine grained sand; soft; compact; wet; red (2.5YR-4/8)		24 / 24		sm
SILT - nonplastic; hard				ml
SILTY SAND - 40% silt, 60% fine grained sand; stiff; alternating layers of hard, well cemented gray sandstone; red (2.5YR-4/8)				sm-sp
				ml
SILT - nonplastic; hard; dense; red (2.5YR-4/8)				sm
SILTY SAND - 10% silt, 90% fine grained sand; firm; compact; poorly graded; red (2.5YR-4/8);				

GEOPHYSICAL LOG (GAMMA): 10 20 30 40

DEPTH IN FEET: 5, 10, 15, 20, 25, 30, 35, 40



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A62 Sheet 1 of 2

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-67A

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHWEST CORNER OF SLUDGE DRYING BEDS
SURFACE ELEV.(FT): 1227.88
TOTAL DEPTH(FT.): 67
Logged By: M. WILSON
Date Started: 11/3/93
Drilled By: D. MEYER GEOTECHNOLOGY. INC.
Date Completed: 11/9/93
Drill Rig Type: CME-75
Drilling Method: 8" AND 12" HOLLOW STEM AUGERS AND MUD ROTARY WITH 5-5/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS TUBE SAMPLER

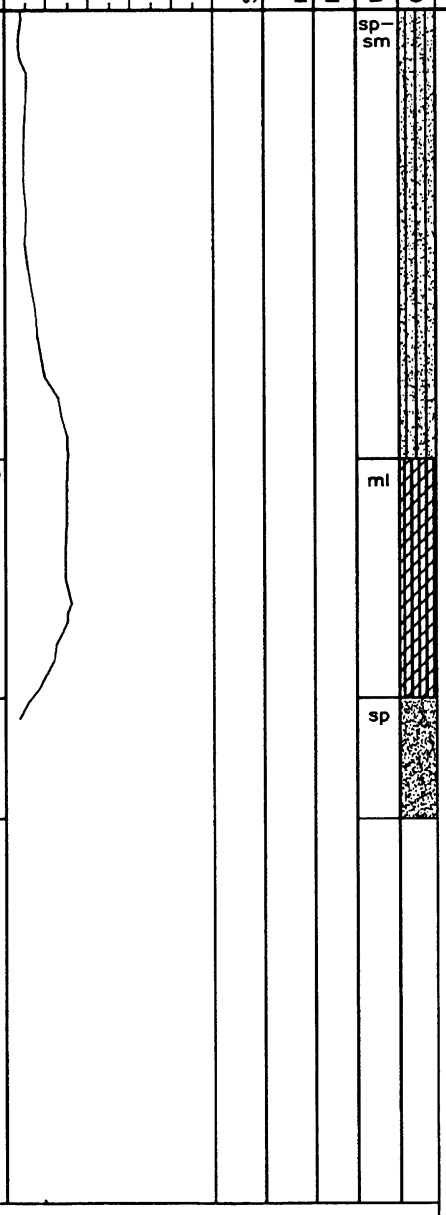
Notes: N 153299.317, E 2177260.427

WELL COMPLETION DATA

Elev-Top of Casing(ft.): Ref. Datum: MSL

1. Surf Casing-I.D.(in.): 8 Depth(ft.): 26 Type: Carbon Steel
   Centralizers-Type: S.Steel Depths(ft.): 21
2. Riser Pipe-I.D.(in.): 2 Depth(ft.): 38 Type: S.Steel
   Centralizers-Type: S.Steel Depths(ft.): 25
3. Screen Dia.(in.): 2 Type: S.Steel Wire Wound
   Depth Interval(ft.): 38-47.7 Slot Size(in.): .010
   Centralizers-Type: Depths(ft.):
4. Filter Pack Type: Silica Sand Depth Interval(ft.): 37-49.1
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	USCS	DEPTH IN FEET
SANDSTONE AND SILTY SAND - intermittent thin, moderately cemented sandstone layers alternating with silty sand	sp-sm	45, 50
CLAYEY SILT - hard; very dense; red (2.5YR-4/8)	ml	55, 60
SAND AND SANDSTONE - fine grained, poorly graded, compact sand; moderately well cemented sandstone; alternating layers	sp	65
TOTAL DEPTH = 67.0 FEET		70, 75, 80



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A62 Sheet 2 of 2

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-68A

DRILLING AND SAMPLING INFORMATION

Boring Location: NORTHWEST SECTION OF SLUDGE DRYING BEDS AREA
SURFACE ELEV.(FT): 1227.639
TOTAL DEPTH(FT.): 70
Logged By: M. WILSON
Date Started: 11/4/93
Drilled By: D. MEYER GEOTECHNOLOGY, INC.
Date Completed: 11/11/93
Drill Rig Type: CME-75
Drilling Method: 8" AND 12" HOLLOW STEM AUGERS AND MUD ROTARY WITH 5-5/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS TUBE SAMPLER

Notes: N 153456.977, E 2177267.817

WELL COMPLETION DATA

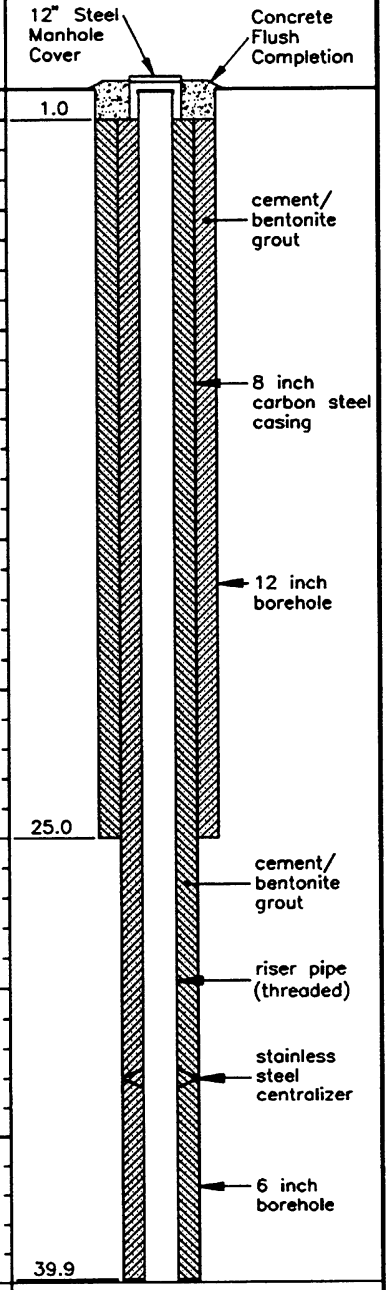
Elev-Top of Casing(ft.):
Ref. Datum: MSL

1. Surf Casing-I.D.(in.): 8 — Depth(ft.): 25 — Type: Carbon Steel
   Centralizers-Type: — Depths(ft.):
2. Riser Pipe-I.D.(in.): 2 — Depth(ft.): 47.8 — Type: S.Steel
   Centralizers-Type: S.Steel — Depths(ft.): 33
3. Screen Dia.(in.): 2 — Type: S.Steel Wire Wound
   Depth Interval(ft.): 47.8-57.5 — Slot Size(in.): .010
   Centralizers-Type: — Depths(ft.):
4. Filter Pack Type: Silica Sand — Depth Interval(ft.): 45.3-58.9
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS
GRAVEL - fill		48		ml
CLAYEY SILT - moderately plastic; stiff; moist; very dark grayish brown (10YR-3/2); gravel chunks from 0-1'			1.4	
	A 1524	36 / 60	1.4	
- slightly plastic; hard; dense; red (2.5YR-4/8); black carbon stains; gradational change to red at 5'				
	A 1525	60 / 60	1.4	
- softer; small granule sized black carbon nodules				
- very moist		60 / 60		
	2-68A A 1526		1.4	
- saturated		36 / 60		
CLAYEY SANDY SILT - 50% fine grained sand; soft; wet; red (2.5YR-4/8); black carbon stains				ml
GRAVELLY SANDY SILT - 20% fine grained sand, 40% pebble gravel, 40% silt; soft; loose; wet; red (2.5YR-4/8)				gm
CLAYEY SILT - hard; dense; slightly moist; brittle; red (2.5YR-4/8); black carbon stains				ml
		60 / 60		gm
GRAVELLY SANDY SILT - 20% fine grained sand, 30% pebble gravel, 50% silt; soft; loose; wet; red (2.5YR-4/8)				ml
CLAYEY SILT - hard; dense; slightly moist; brittle; red (2.5YR-4/8); black carbon stains				
SILTY SAND - 20% silt, 80% fine grained sand; loose; soft; wet; red (2.5YR-4/8)		42 / 60		sm
- poorly cemented; forms 2-6 inch layers				
- harder; moderately cemented; thinner layers (0.1-1 inch)				
- thicker layers (3-6 inches thick)		42 / 12 / 12		
- hard				
SILT - hard; dense; red (2.5YR-4/8)				ml

GEOPHYSICAL LOG (GAMMA): 10 20 30 40

DEPTH IN FEET: 5, 10, 15, 20, 25, 30, 35, 40



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A63 Sheet 1 of 2

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-68A

DRILLING AND SAMPLING INFORMATION

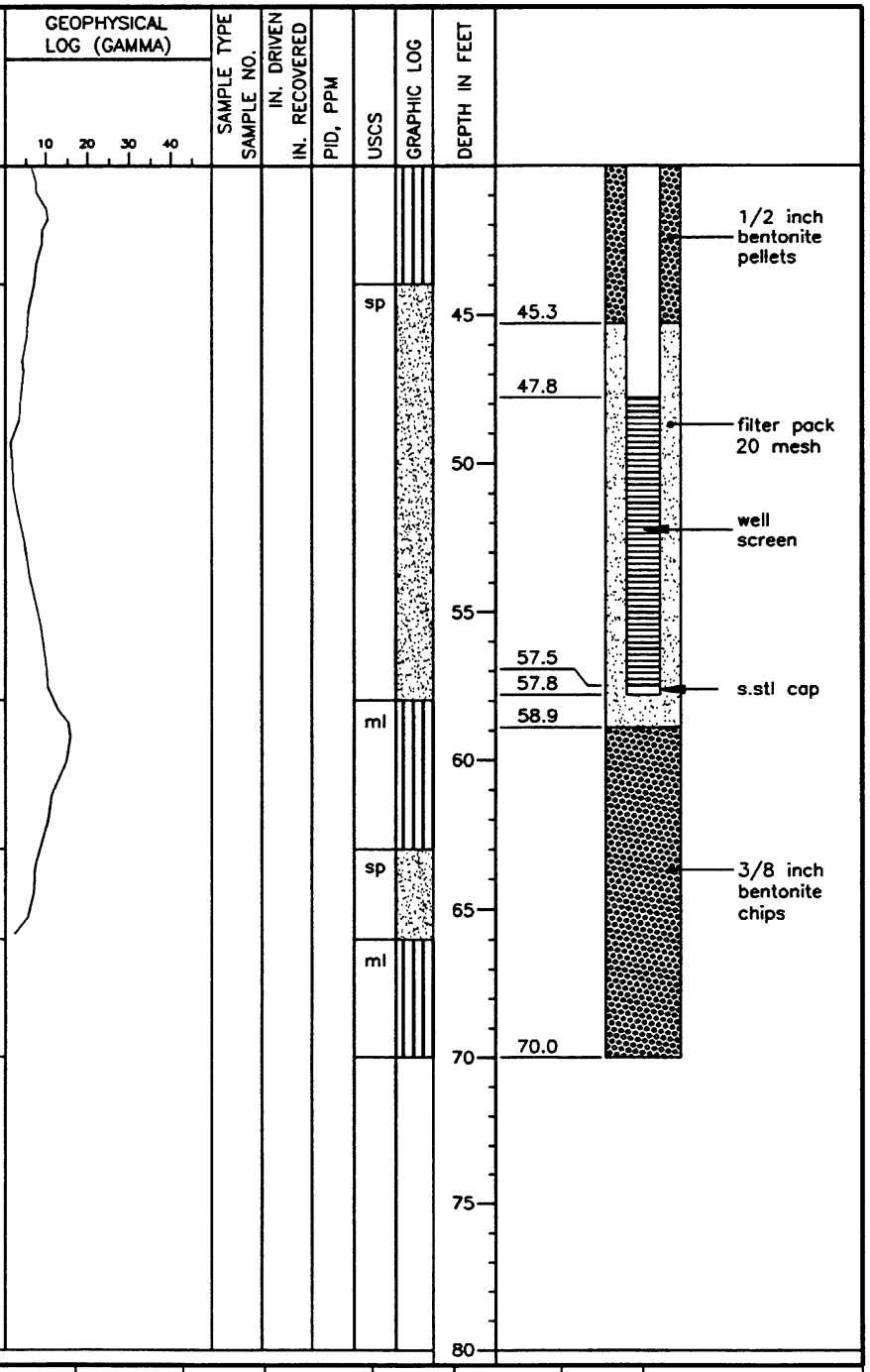
Boring Location: NORTHWEST SECTION OF SLUDGE DRYING BEDS AREA
SURFACE ELEV.(FT): 1227.639
TOTAL DEPTH(FT.): 70
Logged By: M. WILSON
Date Started: 11/4/93
Drilled By: D. MEYER GEOTECHNOLOGY. INC.
Date Completed: 11/11/93
Drill Rig Type: CME-75
Drilling Method: 8" AND 12" HOLLOW STEM AUGERS AND MUD ROTARY WITH 5-5/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS TUBE SAMPLER

Notes: N 153456.977, E 2177267.817

WELL COMPLETION DATA

Elev-Top of Casing(ft.): Ref. Datum: MSL
1. Surf Casing-I.D.(in.): 8 — Depth(ft.): 25 Type: Carbon Steel
   Centralizers-Type: — Depths(ft.):
2. Riser Pipe-I.D.(in.): 2 — Depth(ft.): 47.8 Type: S.Steel
   Centralizers-Type: S.Steel — Depths(ft.): 33
3. Screen Dia.(in.): 2 — Type: S.Steel Wire Wound
   Depth Interval(ft.): 47.8-57.5 — Slot Size(in.): .010
   Centralizers-Type: — Depths(ft.):
4. Filter Pack Type: Silica Sand — Depth Interval(ft.): 45.3-58.9
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	USCS
SAND - <10% fines; poorly cemented; clean; saturated; red (2.5YR-4/8)	sp
SILT - hard; dense; red (2.5YR-4/8)	ml
SAND - <10% fines; poorly cemented	sp
SILT - hard; dense; red (2.5YR-4/8)	ml
TOTAL DEPTH = 70.0 FEET	



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A63 Sheet 2 of 2

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-66B

DRILLING AND SAMPLING INFORMATION

Boring Location: EAST OF SLUDGE DRYING BEDS ON PATROL RD
Logged By: M. WILSON & K. KIRSCHENMANN
Drilled By: D. MEYER & P. GUERREIN GEOTECHNOLOGY. INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER AND MUD ROTARY WITH 2-7/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS SAMPLER 1-1/2"x2' SPLIT SPOON
Notes: N 153475.491, E 2177491.726

SURFACE ELEV.(FT): 1228.424
TOTAL DEPTH(FT.): 117.5
Date Started: 10/26/93
Date Completed: 11/1/93

WELL COMPLETION DATA

Elev-Top of Casing(ft.):
1. Riser Pipe-I.D.(in.): 2
   Centralizers-Type:
2. Screen Dia.(in.): 2
   Depth Interval(ft.): 15.6-25.3
   Centralizers-Type:
3. Filter Pack Type: Silica Sand
   Conc. Pad Size: 4'x4'x6"

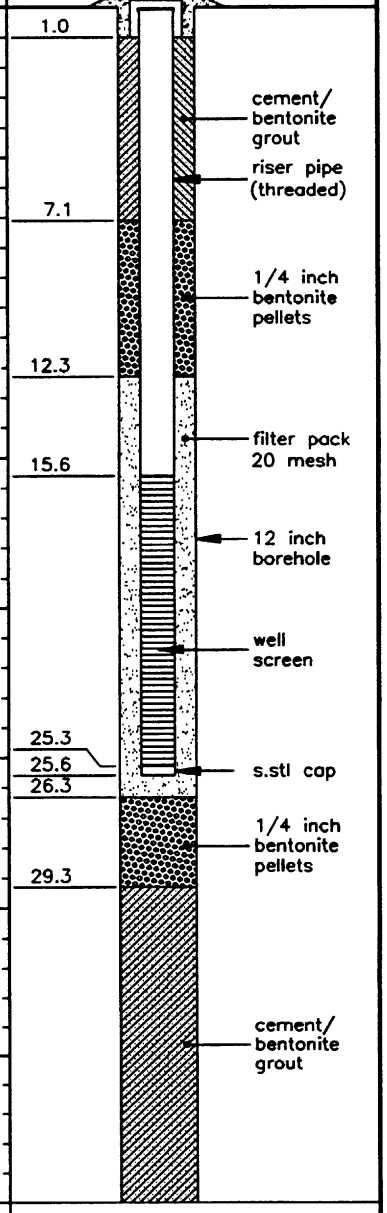
Ref. Datum: MSL
Depth(ft.): 15.6 Type: S.Steel
Depths(ft.):
Type: S.Steel Wire Wound
Slot Size(in.): .010
Depths(ft.):
Depth Interval(ft.): 12.3-26.3

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS
CLAY - nonplastic; <10% fine grained sand; hard; dry; brown (7.5YR-4/3)	A 1062	48 / 48		cl
SANDY CLAY - slightly plastic; 10%-15% fine grained sand; hard; slightly moist; dark red (2.5YR-4/8); gradational	A 1063	60 / 60		cl
- moderately plastic; 15%-25% fine grained sand; soft; moist	A 1064	60 / 60		
CLAYEY SAND - 40% clay, 60% fine grained sand; compact; very moist; dark red (2.5YR-4/8); gradational	A 1065	60 / 60		sc
SILTY SAND - 30% silt and clay, 70% fine to coarse grained sand; compact; wet; dark red (2.5YR-4/8); sharp contact - 70% fine grained sand; very firm; moist - 30% silt, 70% fine to medium grained sand; slightly compact; saturated		60 / 60		sm
SANDSTONE - fine grained; 1%-2% silt or clay; very hard; wet		48 / 48		sp
SAND - 5% clay, 95% sand; poorly graded; loose; saturated; red (2.5YR-4/8); small well cemented sandstone chunks - alternating thin layers of sand and well cemented sandstone; fine grained		12 / 12	0.0	sp
CLAYEY SILT - nonplastic; <10% very fine grained sand; very hard; dense; dry; red (2.5YR-4/8)		6 / 6	0.0	ml

GEOPHYSICAL LOG (GAMMA): 10 20 30 40

GRAPHIC LOG

DEPTH IN FEET: 5, 10, 15, 20, 25, 30, 35, 40



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A64 Sheet 1 of 3

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-66B

DRILLING AND SAMPLING INFORMATION

Boring Location: EAST OF SLUDGE DRYING BEDS ON PATROL RD
Logged By: M. WILSON & K. KIRSCHENMANN
Drilled By: D. MEYER & P. GUERREIN GEOTECHNOLOGY. INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER AND MUD ROTARY WITH 2-7/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS SAMPLER 1-1/2"x2' SPLIT SPOON
Notes: N 153475.491, E 2177491.726

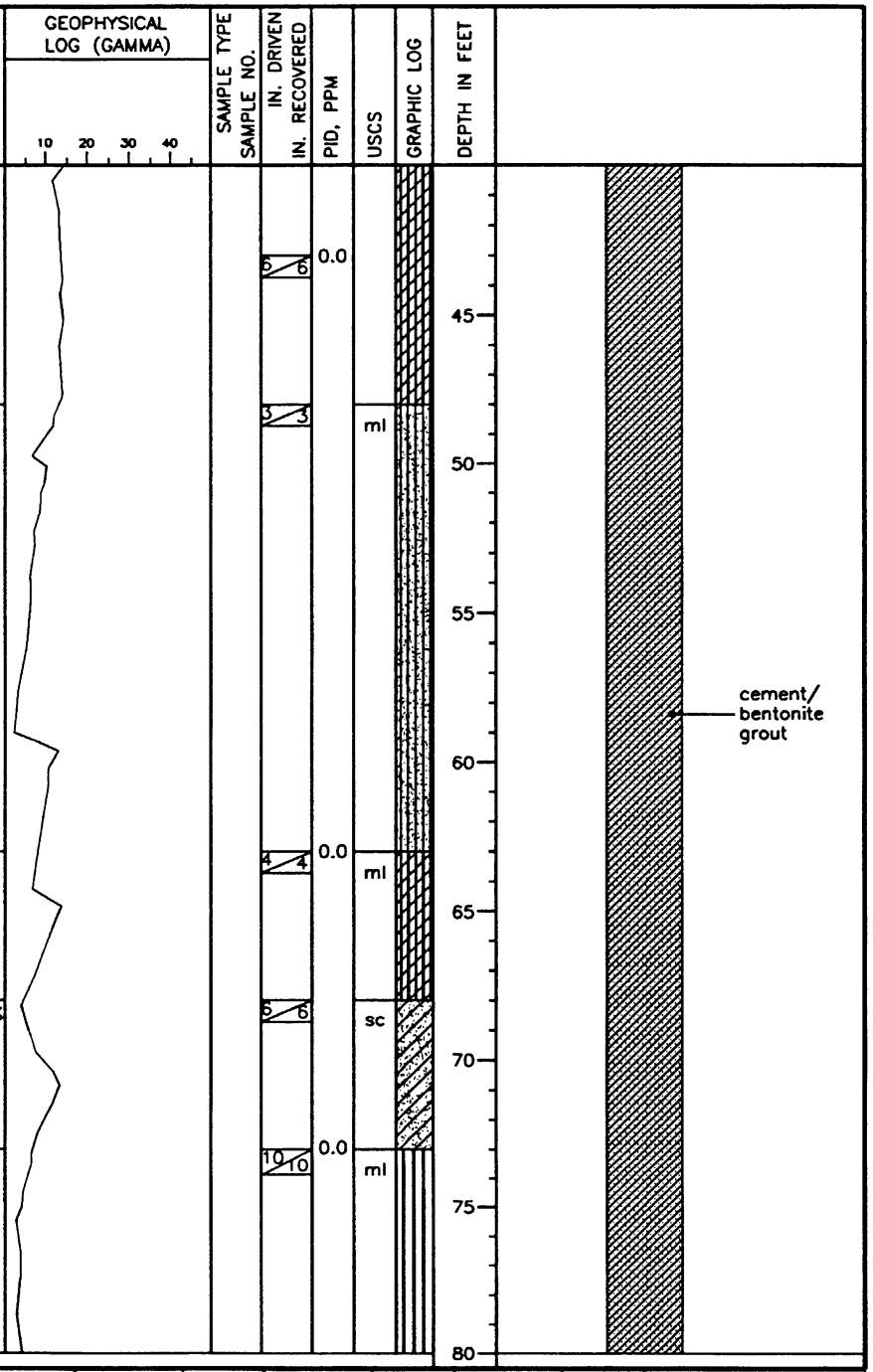
SURFACE ELEV.(FT): 1228.424
TOTAL DEPTH(FT.): 117.5
Date Started: 10/26/93
Date Completed: 11/1/93

WELL COMPLETION DATA

Elev-Top of Casing(ft.):
1. Riser Pipe-I.D.(in.): 2
   Centralizers-Type:
2. Screen Dia.(in.): 2
   Depth Interval(ft.): 15.6-25.3
   Centralizers-Type:
3. Filter Pack Type: Silica Sand
   Conc. Pad Size: 4'x4'x6"

Ref. Datum: MSL
Depth(ft.): 15.6 Type: S.Steel
Depths(ft.):
Type: S.Steel Wire Wound
Slot Size(in.): .010
Depths(ft.):
Depth Interval(ft.): 12.3-26.3

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG
- 100% fines; firm; hard; thin layers of moderately plastic clay		6/6	0.0		
SANDY SILT - 40% very fine grained sand, 60% silt; stiff; saturated; red (2.5YR-4/8)		3/3		ml	
CLAYEY SILT - slightly plastic; <5% very fine grained sand; hard; very dense; moist; red (2.5YR-4/8)		4/4	0.0	ml	
CLAYEY SAND - moderately plastic; 40% clay, 60% very fine to fine grained sand; firm; wet; red (2.5YR-4/8)		6/6		sc	
SILT - nonplastic; stiff; moist to dry; dense; red (2.5YR-4/8); thin laminations of white to pink to yellow very fine grained sand		10/10	0.0	ml	



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A64 Sheet 2 of 3

Client: TINKER AFB
Project Name: TINKER 5001

Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-66B

DRILLING AND SAMPLING INFORMATION

Boring Location: EAST OF SLUDGE DRYING BEDS ON PATROL RD
Logged By: M. WILSON & K. KIRSCHENMANN
Drilled By: D. MEYER & P. GUERREIN GEOTECHNOLOGY. INC.
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER AND MUD ROTARY WITH 2-7/8" TRICONE ROCK BIT
Sampling Method: 3"x5' CONTINUOUS SAMPLER 1-1/2"x2' SPLIT SPOON
Notes: N 153475.491, E 2177491.726

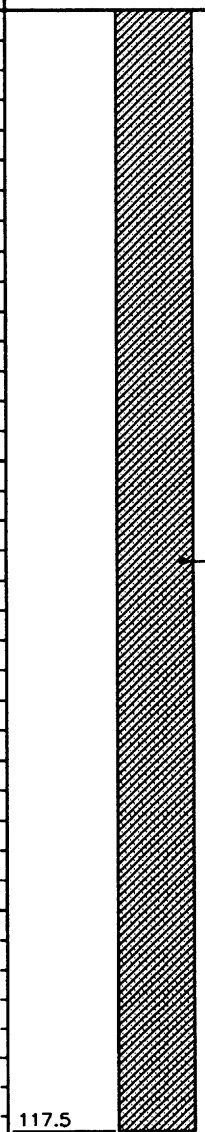
SURFACE ELEV.(FT): 1228.424
TOTAL DEPTH(FT.): 117.5
Date Started: 10/26/93
Date Completed: 11/1/93

WELL COMPLETION DATA

Elev-Top of Casing(ft.):
Ref. Datum: MSL

1. Riser Pipe-I.D.(in.): 2 — Depth(ft.): 15.6 — Type: S.Steel
   Centralizers-Type: — Depths(ft.):
2. Screen Dia.(in.): 2 — Type: S.Steel Wire Wound
   Depth Interval(ft.): 15.6-25.3 — Slot Size(in.): .010
   Centralizers-Type: — Depths(ft.):
3. Filter Pack Type: Silica Sand — Depth Interval(ft.): 12.3-26.3
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	GEOPHYSICAL LOG (GAMMA) 10 20 30 40	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG	DEPTH IN FEET
- <10% very fine grained sand; hard; dense;			6/6				85, 90, 95
			6/6				
SILTY SAND - 30% silt, 70% fine grained sand; poorly graded; firm; wet; red (2.5YR-4/8)			4/4	0.0	sm		100, 105, 110, 115
- hard							
TOTAL DEPTH = 117.5 FEET							120



DRAFT BY	RPS 1/16/94	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A64 Sheet 3 of 3

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-67B

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHWEST OF SLUDGE BEDS SOUTH
SURFACE ELEV.(FT): 1227.749
TOTAL DEPTH(FT.): 33.5
Logged By: K. KIRSCHENMANN
Date Started: 10/28/93
Drilled By: P. GUERREIN GEOTECHNOLOGY, INC.
Date Completed: 10/28/93
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

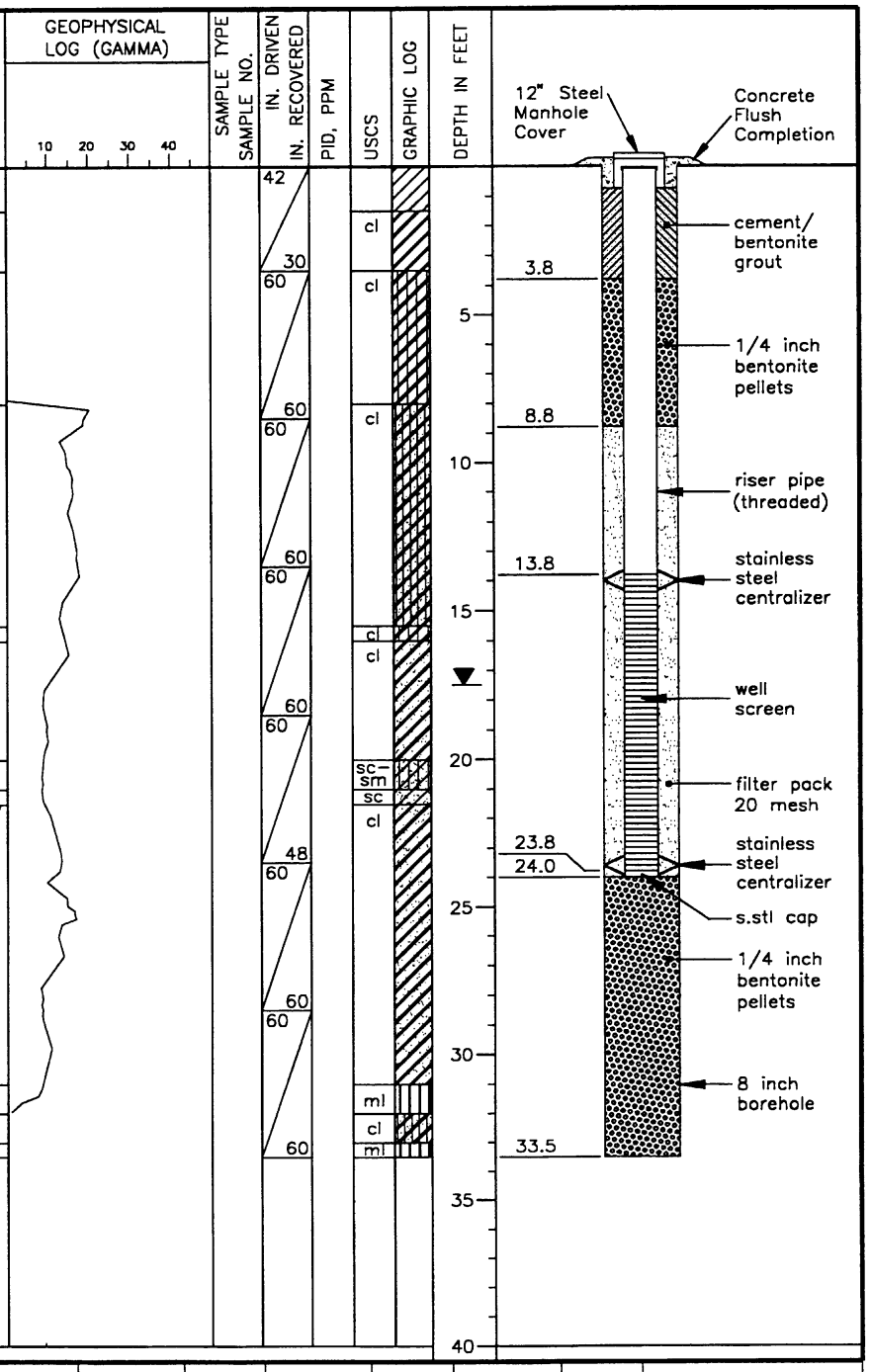
Sampling Method: 3"x5' CONTINUOUS SAMPLER

Notes: NO ANALYTICAL SAMPLES TAKEN IN THIS BORING
N 153306.771, E 2177259.941

WELL COMPLETION DATA

Elev-Top of Casing(ft.): Ref. Datum: MSL
1. Riser Pipe-I.D.(in.): 2 Depth(ft.): 13.8 Type: S.Steel
   Centralizers-Type: Depths(ft.):
2. Screen Dia.(in.): 2 Type: S.Steel Millslotted
   Depth Interval(ft.): 13.8-23.8 Slot Size(in.): .010
   Centralizers-Type: S.Steel Depths(ft.): 14, 24
3. Filter Pack Type: Silica Sand Depth Interval(ft.): 8.8-24.0
   Conc. Pad Size: 4'x4'x6"

DESCRIPTION	SAMPLE TYPE / SAMPLE NO.	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS	GRAPHIC LOG
FILL - gravel road		42 / 30			
CLAY - slightly plastic; 5% fine grained sand and silt; firm; slightly moist; very dark grayish brown (10YR-3/2); sharp contact				cl	
SILTY CLAY - moderately plastic; 5% fine grained sand and silt; firm; moist; dark grayish brown (10YR-4/2); gradational contact		60		cl	
SANDY SILTY CLAY - nonplastic; 10% to 20% fine grained sand and silt; hard; slightly moist; dark red (2.5YR-4/8)		60 / 60		cl	
- slightly plastic; moist; gradational contact		60 / 60			
SILTY CLAY - moderately plastic; 10% to 20% silt; some fine grained sand; soft; very moist; dark red (2.5YR-4/8); gradational contact				cl / cl	
SANDY CLAY - moderately plastic; 10% to 20% very fine grained sand; very soft; wet; dark red (2.5YR-4/8); fairly sharp contact		60 / 60			
CLAYEY SILTY SAND - 40% to 50% silt and clay, 50% to 60% fine grained sand; compact; wet; dark red (2.5YR-4/8); gradational contact				sc-sm / sc	
CLAYEY SAND - 30% silt and clay, 60% to 70% fine to coarse grained sand; compact; wet; dark red (2.5YR-4/8); sharp contact		48 / 60		cl	
SANDY CLAY - slightly plastic; 10% to 20% fine to medium grained sand; stiff; moist; dark red (2.5YR-4/8); sharp contact - moderately plastic; firm at 26'		60 / 60			
SILTSTONE - hard; moist; dark red (2.5YR-4/8); sharp contact				ml	
SANDY SILTY CLAY - slightly plastic; 10% to 20% fine grained sand and silt; firm; moist; dark red (2.5YR-4/8); sharp contact		60		cl / ml	
SILTSTONE - very hard; slightly moist; dark red (2.5YR-4/8); sharp contact					
TOTAL DEPTH = 33.5 FEET					



DRAFT BY	RPS 11/29/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A28 Sheet 1 of 1

Client: TINKER AFB
Project Name: TINKER 5001
Project Location: TINKER AFB, OKLAHOMA
Project Number: 409832

MONITORING WELL 2-68B

DRILLING AND SAMPLING INFORMATION

Boring Location: SOUTHWEST OF SLUDGE BEDS NORTH
SURFACE ELEV.(FT): 1227.501
TOTAL DEPTH(FT.): 30.0
Logged By: K. KIRSCHENMANN
Date Started: 10/29/93
Drilled By: P. GUERREIN GEOTECHNOLOGY. INC.
Date Completed: 10/29/93
Drill Rig Type: CME-75
Drilling Method: 8" HOLLOW STEM AUGER

Sampling Method: 3"x5' CONTINUOUS SAMPLER

Notes: NO ANALYTICAL SAMPLES TAKEN IN THIS BORING
N 153470.445, E 2177267.505

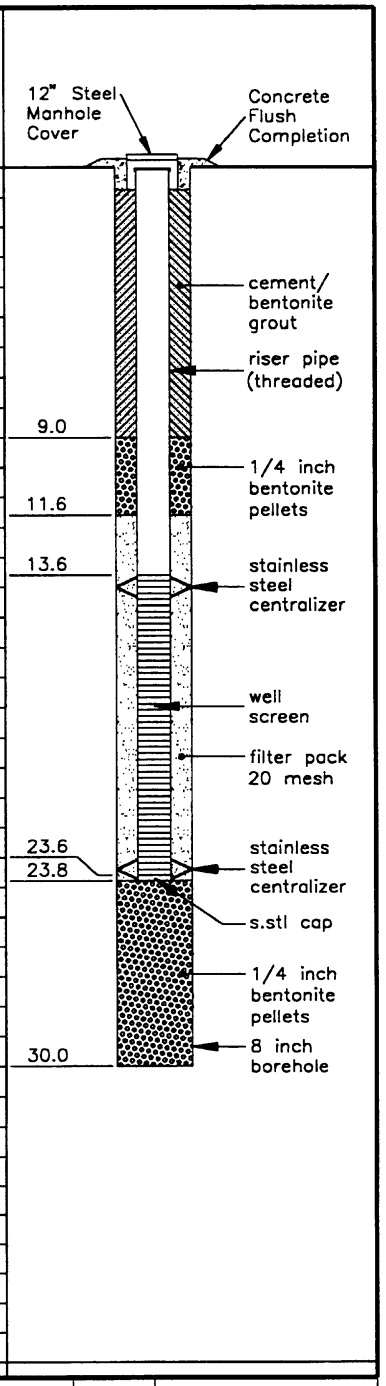
WELL COMPLETION DATA

Elev-Top of Casing(ft.):
Ref. Datum: MSL
1. Riser Pipe-I.D.(in.): 2
Depth(ft.): 13.6 Type: S.Steel
Centralizers-Type:
Depths(ft.):
2. Screen Dia.(in.): 2
Type: S.Steel Millslotted
Depth Interval(ft.): 13.6-23.6
Slot Size(in.): .010
Centralizers-Type: S.Steel
Depths(ft.): 14, 24
3. Filter Pack Type: Silica Sand
Depth Interval(ft.): 11.6-23.8
Conc. Pad Size: 4'x4'x6"

DESCRIPTION	IN. DRIVEN / IN. RECOVERED	PID, PPM	USCS
CLAY - nonplastic; 5% sand and silt; firm; dry; dark brown (10YR-3/3); organic - slightly plastic; 5% fine grained sand and silt; slightly moist; black (2.5Y-2.5/1); gradational contact	42 / 42		cl
SILTY SANDY CLAY - moderately plastic; 40% fine grained sand and silt; stiff; slightly moist; dark red (2.5YR-4/6); gradational contact	60 / 60		cl
SANDY SILTY CLAY - moderately plastic; 10% to 15% fine grained sand and silt; soft; moist; dark red (2.5YR-4/6); sharp contact	60 / 60		cl
SILTY SANDY CLAY - moderately plastic; 10% to 15% fine grained sand and silt; firm; moist; dark red (2.5YR-4/6); sharp contact	60 / 60		cl
SILTY CLAY - moderately plastic; 2% to 3% very fine grained sand; very soft; very moist; dark red (2.5YR-4/8); sharp contact	54 / 60		cl
CLAYEY SAND - 30% clay and silt; 70% fine to coarse grained sand and gravel; compact; wet; dark red (2.5YR-4/8); sharp contact	60 / 60		sc
SILTY SANDY CLAY - nonplastic; 10% to 15% fine grained sand and silt; stiff; moist; dark red (2.5YR-4/8); crumbles easily; sharp contact	60		cl
SILTSTONE - very hard; cemented; dark red (2.5YR-4/8); sharp contact	60		ml
TOTAL DEPTH = 30.0 FEET			

GEOPHYSICAL LOG (GAMMA) 10 20 30 40

SAMPLE TYPE / SAMPLE NO. / GRAPHIC LOG / DEPTH IN FEET



DRAFT BY	RPS 11/30/93	DRAFT CHK		PROJ. CHK		APPRV. BY		DWG. NO.	409832-A29 Sheet 1 of 1

APPENDIX B
GEOPHYSICAL LOGS

APPENDIX C
SOIL GAS REPORT

SOIL GAS SURVEY

TINKER AIR FORCE BASE
OKLAHOMA CITY, OKLAHOMA

PREPARED FOR

IT CORPORATION
312 DIRECTORS DRIVE
KNOXVILLE, TENNESSEE 37923

PREPARED BY

TARGET ENVIRONMENTAL SERVICES, INC.
9180 RUMSEY ROAD
COLUMBIA, MARYLAND 21045
(410) 992-6622

DECEMBER 1993

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Results and Interpretation	3
Fuel Truck Maintenance Area	4
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Old Pesticide Storage Area	5
Conclusions	5

FIGURES

Figure 1A. Sample Locations Fuel Truck Maintenance Area

Figure 1B. Sample Locations Sludge Drying Beds

Figure 1C. Sample Locations Old Pesticide Storage Area

Figure 2. Tetrachloroethene (PCE) Sludge Drying Beds

Figure 3. Total FID Volatiles Sludge Drying Beds

Figure 4. 1,1-Dichloroethene (1,1-DCE) Old Pesticide Storage Area

TABLES

Table 1. Analyte Concentrations via GC/FID

Table 2. Analyte Concentrations via GC/ECD

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APPENDIX A - Field Procedures

APPENDIX B - Laboratory Procedures

APPENDIX C - Detectability & Terminology

EXECUTIVE SUMMARY

On November 9-11, 1993, **TARGET Environmental Services, Inc. (TARGET)** conducted soil gas surveys in three areas at **Tinker Air Force Base** in Oklahoma City, Oklahoma. The areas included the Fuel Truck Maintenance Area, Sludge Drying Beds and Old Pesticide Storage Area. A total of 45 soil gas samples were collected from depths of 9 to 10 feet. The samples were analyzed on a gas chromatograph equipped with a flame ionization detector (GC/FID) for petroleum hydrocarbons and an electron capture detector for chlorinated hydrocarbons. The objective of the surveys was to identify potential areas of volatile hydrocarbon contamination at each of the sites through quantitative analysis of the vadose zone soil gas.

GC/FID and GC/ECD analysis of the samples from Fuel Truck Maintenance area revealed that none of the individual petroleum or chlorinated analytes were present in any of the samples.

Low levels of tetrachloroethene (PCE) were present in two samples from the southwestern corner of the Sludge Drying Beds area. None of the remaining chlorinated analytes were present above the 1 μg/l reporting limit in any of the samples. GC/FID analysis revealed only a very low level of Total FID Volatiles in a sample from the northern survey boundary. None of the individual petroleum analytes were present above the 1 μg/l reporting limit in this or any other sample from this site. Soil gas data does not suggest the presence of a significant petroleum hydrocarbon contamination problem in the Sludge Drying Beds area.

GC/ECD analysis revealed only a low level of 1,1-dichloroethene (1,1-DCE) in one sample from the Old Pesticide Storage Area. GC/FID analysis revealed that none of the individual petroleum analytes were present above the 1 μg/l reporting limit in any of the samples from this area.

Introduction

IT Corporation (IT) contracted **Target Environmental Services, Inc. (TARGET)** to perform soil gas surveys in three areas of **Tinker Air Force Base** in Oklahoma City, Oklahoma. The areas included the Fuel Truck Maintenance Area, Sludge Drying Beds and Old Pesticide Storage Area. The objective of the surveys was to identify potential areas of volatile hydrocarbon contamination at each of the sites through quantitative analysis of the vadose zone soil gas.

The surveys were designed by **IT** to cover the areas of concern with a total of 45 samples. Sixteen (16) samples were allocated to the Fuel Truck Maintenance Area, 26 to the Sludge Drying Beds and 3 to the Old Pesticide Storage Area. Additional information was not provided. A 10-foot sampling depth was planned. The field phase of the soil gas surveys was conducted on November 9-11, 1993.

Sample Collection and Analysis

Soil gas samples were collected at a total of 45 locations at the site, as shown in Figures 1A through 1C. Sixteen (16) samples were collected from the Fuel Truck Maintenance Area (Figure 1A), 26 from the Sludge Drying Beds (Figure 1B) and 3 from the Old Pesticide Storage Area (Figure 1C). Samples 2 and 7 from the Fuel Truck Maintenance Area were collected from a depth of 9 feet due to probe refusal. All remaining samples were collected from a depth of 10 feet. A detailed explanation of the sampling procedure is provided in Appendix A.

All of the samples collected during the field phase of the survey were subjected to dual analyses. One analysis was conducted according to EPA Method 8010 (modified) on a gas chromatograph equipped with an electron capture detector (ECD), and using direct injection.

Specific analytes standardized for this analysis were:

1,1-dichloroethene (11DCE)
methylene chloride (CH_2Cl_2)
trans-1,2-dichloroethene (t12DCE)
1,1-dichloroethane (11DCA)
cis-1,2-dichloroethene (c12DCE)
chloroform ($CHCl_3$)
1,1,1-trichloroethane (111TCA)
carbon tetrachloride (CCl_4)
trichloroethene (TCE)
1,1,2-trichloroethane (112TCA)
tetrachloroethene (PCE)

The chlorinated hydrocarbons in this suite were chosen because of their common usage in industrial solvents, and/or their degradational relationship to commonly used compounds.

The second analysis was conducted according to EPA Method 8020 (modified) on a gas chromatograph equipped with a flame ionization detector (FID), and using direct injection. The analytes selected for standardization in this analysis were:

benzene
toluene
ethylbenzene
meta- and para- xylene
ortho- xylene

These compounds were chosen because of their utility in evaluating the presence of fuel products, or petroleum based solvents. An explanation of the laboratory procedures is provided in Appendix B.

The tabulated results of the laboratory analyses of the soil gas samples are reported in micrograms per liter (μg/l) in Tables 1 and 2. Although "micrograms per liter" is equivalent to "parts per billion (v/v)" in water analyses, they are not equivalent in gas analyses, due to the difference in the mass of equal volumes of water and gas matrices. The xylenes concentrations

reported in Table 1 are the sum of the m- and p-xylene and the o-xylene concentrations for each sample.

Quality Assurance/Quality Control (QA/QC) Evaluation

Field QA/QC Samples

Field control samples were collected at the beginning and end of each day's field activities. These QA/QC samples were obtained by filtering ambient air through a dust and organic vapor filter cartridge and encapsulating as described in the "Field Procedures" in Appendix A. The laboratory results are reported in Tables 1 and 2. Concentrations of all analytes were below the reporting limit in all field control samples, indicating that the QA/QC measures employed were sufficient to prevent cross-contamination of the samples during collection.

Laboratory QA/QC Samples

To document analytical repeatability, a duplicate analysis was performed on every tenth field sample. Laboratory blanks of nitrogen gas were also analyzed after every tenth field sample. The results of these analyses are reported in Tables 1 and 2. The duplicate analyses were within acceptable limits. Concentrations of all analytes were below the reporting limit in all laboratory blanks.

Results and Interpretation

In order to provide graphic presentation of the results, selected individual data sets in Tables 1 and 2 have been mapped and contoured to produce Figures 2 through 4. Dashed contours are used where patterns are extrapolated into areas of less complete data, or as auxiliary contours. Map sample points with no data shown indicate that the analyte concentrations in the sample

were below the reporting limit. An explanation of the terminology used in this report is provided in Appendix C. Each of the three sites is discussed separately below.

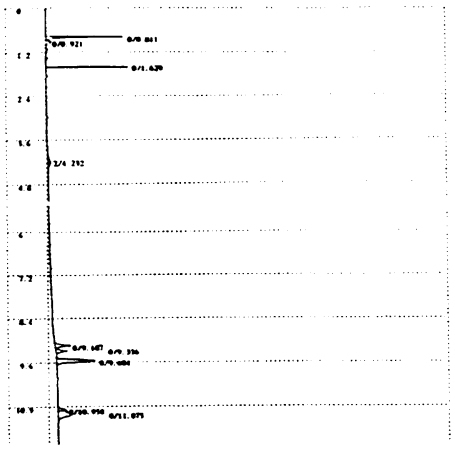
Fuel Truck Maintenance Area

GC/FID and GC/ECD analysis of the samples from this area revealed that none of the individual petroleum or chlorinated analytes were present in any of the samples.

Sludge Drying Beds

GC/ECD analysis revealed low levels of tetrachloroethene (PCE, Figure 2) in Samples 20 and 22, from the southwestern corner of the survey area. None of the remaining chlorinated analytes were present above the 1 µg/l reporting limit in any of the samples.

GC/FID analysis revealed only a very low level of Total FID Volatiles (Figure 3) in Sample 32, from the northern survey boundary. None of the individual petroleum analytes were present above the 1 µg/l reporting limit in this or any other sample from this site. The FID chromatogram signature of Sample 32 (left) reveals a few small late-eluting peaks which represent unidentified hydrocarbons of relatively low volatility. The very low concentration of hydrocarbons represented by these peaks does not suggest the presence of a significant petroleum hydrocarbon contamination problem in this area.



GC/FID Chromatogram Signature of Sample 32

Old Pesticide Storage Area

GC/ECD analysis revealed a low level of 1,1-dichloroethene (1,1-DCE, Figure 4) in Sample 45. None of the remaining chlorinated analytes were present above the 1 µg/l reporting limit in any of the samples.

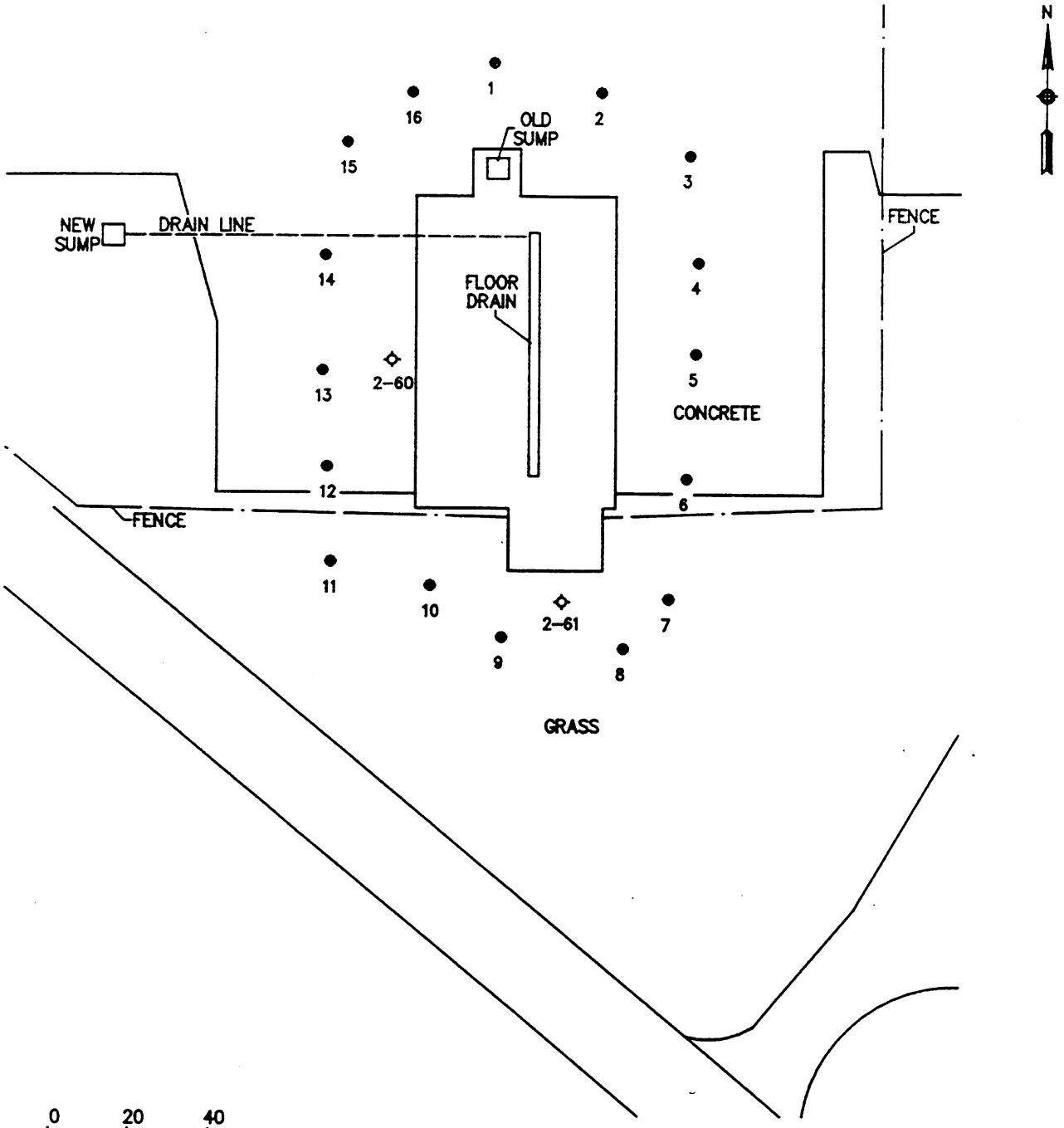
GC/FID analysis revealed that none of the individual petroleum analytes were present above the 1 µg/l reporting limit in any of the samples.

Conclusions

- Petroleum and chlorinated hydrocarbon contamination was not present in the Fuel Truck Maintenance Area.

- Tetrachloroethene (PCE) was present near the southwestern corner of the Sludge Drying Beds Area. The very low level of petroleum hydrocarbons observed at the northern boundary of this area does not suggest the presence of significant petroleum-related contamination.

- 1,1-Dichloroethene (1,1-DCE) was present in the Old Pesticide Storage Area.



0 20 40
FEET

● SOIL GAS SAMPLE LOCATION
◇ PROPOSED DEEP MONITORING WELL LOCATION

FIGURE 1A. Sample Locations

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TINKER AIR FORCE BASE
FUEL TRUCK MAINTENANCE AREA
OKLAHOMA CITY, OKLAHOMA

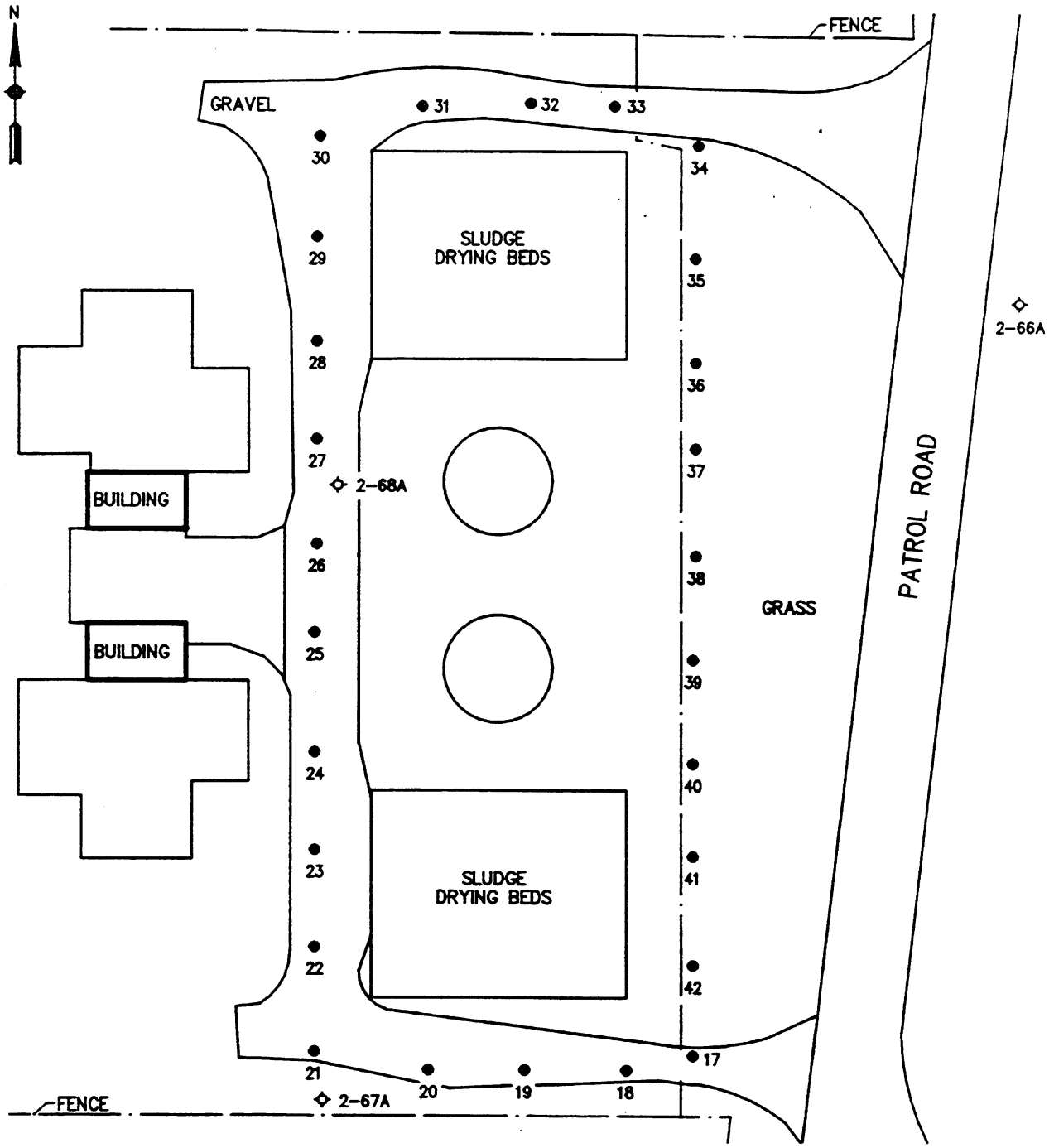


FIGURE 1B. Sample Locations

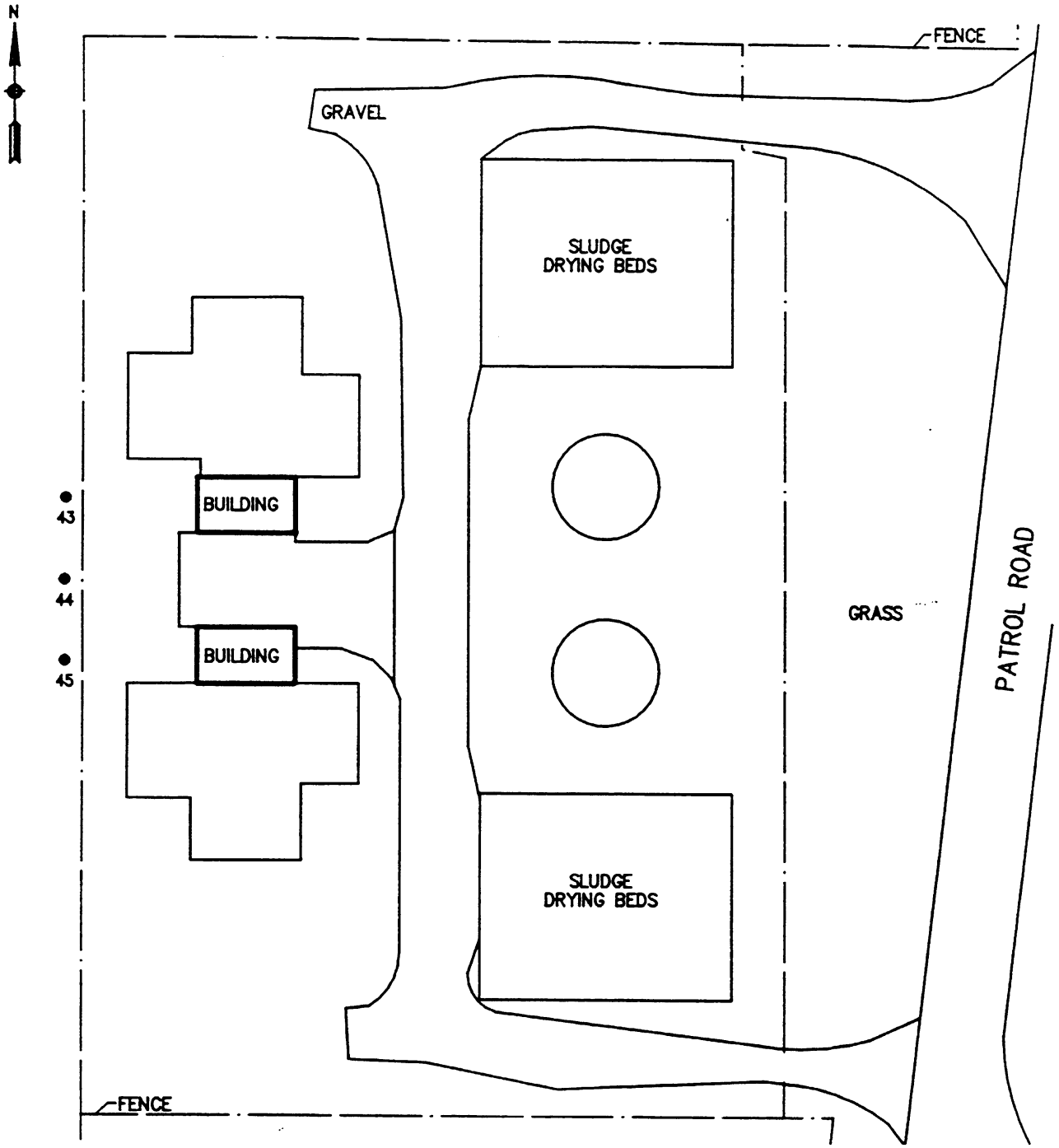
● SOIL GAS SAMPLE LOCATION

◇ PROPOSED DEEP MONITORING WELL LOCATION

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TINKER AIR FORCE BASE
SLUDGE DRYING BEDS
OKLAHOMA CITY, OKLAHOMA



0 25 50
FEET

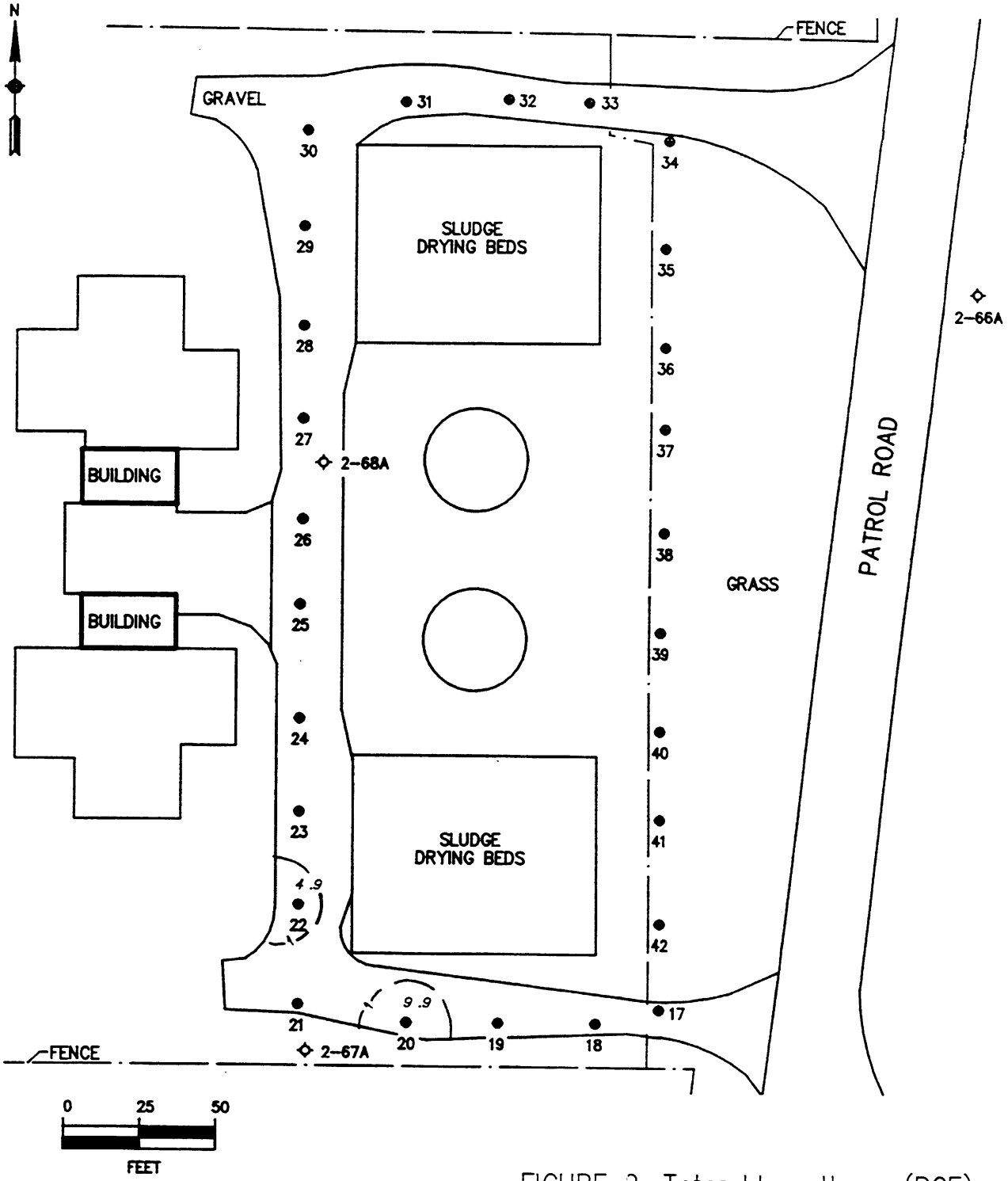
● SOIL GAS SAMPLE LOCATION

FIGURE 1C. Sample Locations

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TINKER AIR FORCE BASE
OLD PESTICIDE STORAGE AREA
OKLAHOMA CITY, OKLAHOMA



● SOIL GAS SAMPLE LOCATION

◇ PROPOSED DEEP MONITORING WELL LOCATION

FIGURE 2. Tetrachloroethene (PCE) (μg/l)

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TINKER AIR FORCE BASE
SLUDGE DRYING BEDS
OKLAHOMA CITY, OKLAHOMA

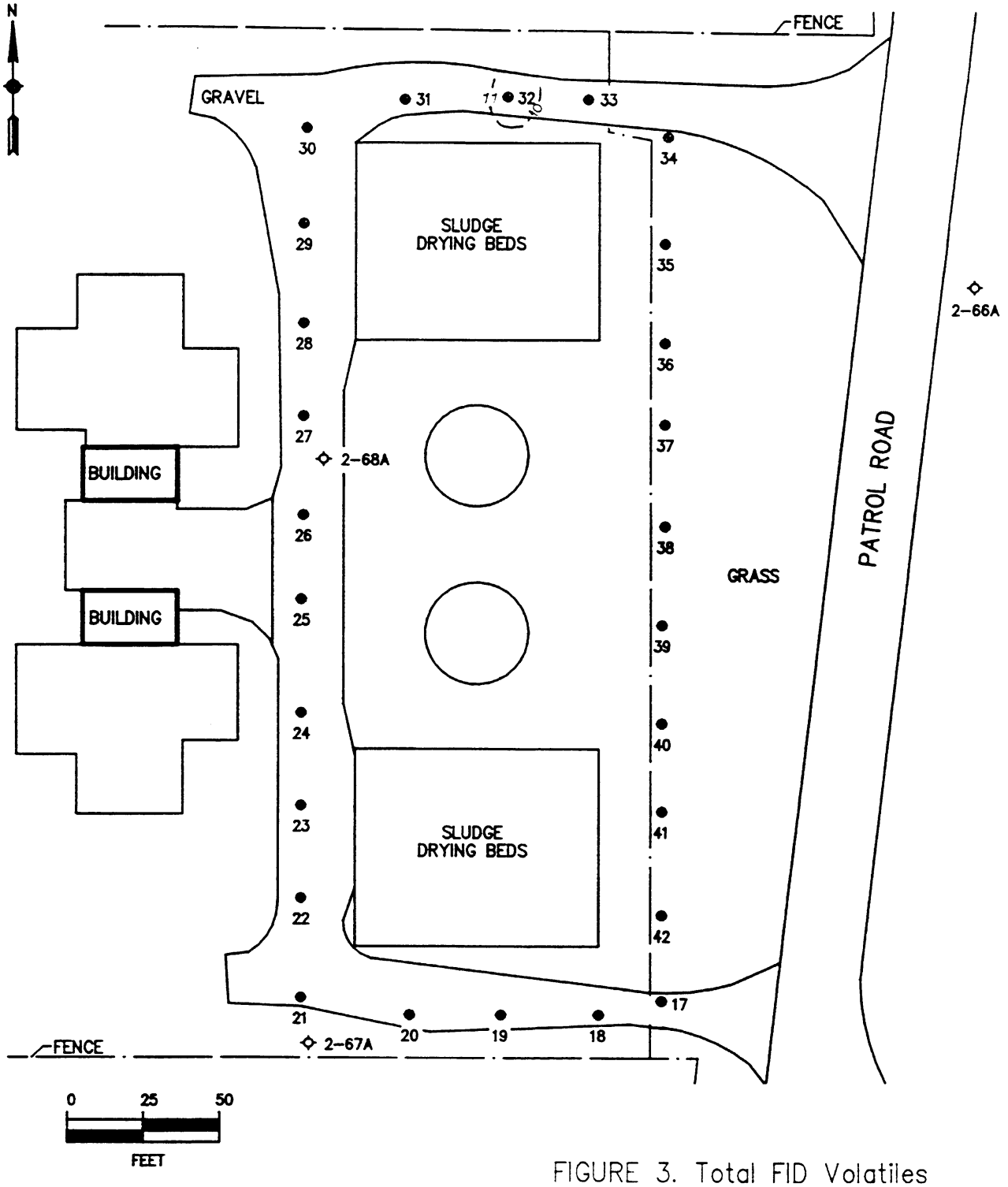


FIGURE 3. Total FID Volatiles (calc'd μg/l)

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TINKER AIR FORCE BASE
SLUDGE DRYING BEDS
OKLAHOMA CITY, OKLAHOMA

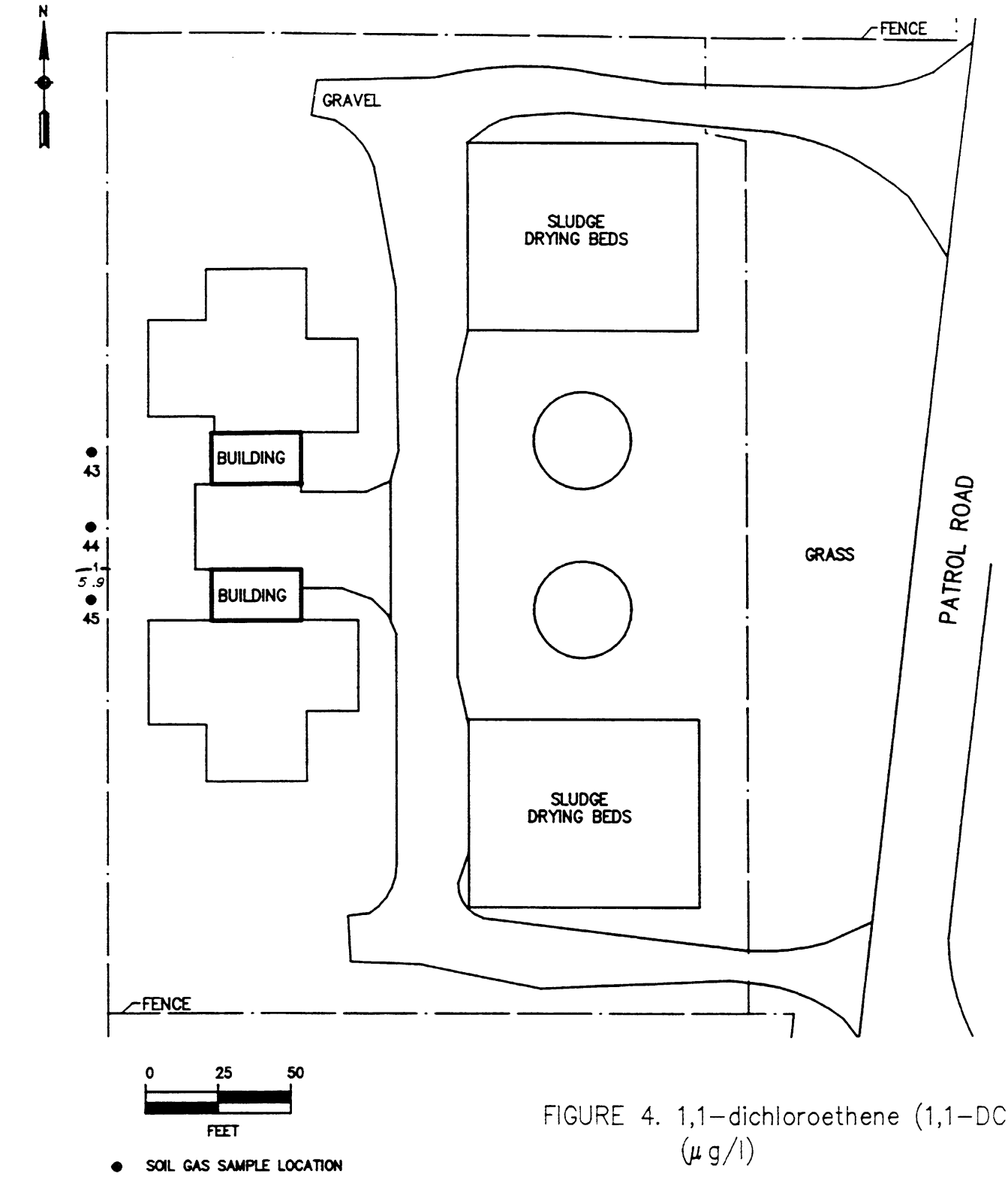


FIGURE 4. 1,1-dichloroethene (1,1-DCE) ($\mu g/l$)

TARGET ENVIRONMENTAL SERVICES, INC.

This map is integral to a written report and should be viewed in that context.

TINKER AIR FORCE BASE
OLD PESTICIDE STORAGE AREA
OKLAHOMA CITY, OKLAHOMA

TABLE 1

ANALYTE CONCENTRATIONS VIA GC/FID (µg/l)

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TOTAL FID VOLATILES*
REPORTING LIMIT	1.0	1.0	1.0	1.0	10
1	<1.0	<1.0	<1.0	<1.0	<10
2	<1.0	<1.0	<1.0	<1.0	<10
3	<1.0	<1.0	<1.0	<1.0	<10
4	<1.0	<1.0	<1.0	<1.0	<10
5	<1.0	<1.0	<1.0	<1.0	<10
6	<1.0	<1.0	<1.0	<1.0	<10
7	<1.0	<1.0	<1.0	<1.0	<10
8	<1.0	<1.0	<1.0	<1.0	<10
9	<1.0	<1.0	<1.0	<1.0	<10
10	<1.0	<1.0	<1.0	<1.0	<10
11	<1.0	<1.0	<1.0	<1.0	<10
12	<1.0	<1.0	<1.0	<1.0	<10
13	<1.0	<1.0	<1.0	<1.0	<10
14	<1.0	<1.0	<1.0	<1.0	<10
15	<1.0	<1.0	<1.0	<1.0	<10
16	<1.0	<1.0	<1.0	<1.0	<10
17	<1.0	<1.0	<1.0	<1.0	<10
18	<1.0	<1.0	<1.0	<1.0	<10
19	<1.0	<1.0	<1.0	<1.0	<10
20	<1.0	<1.0	<1.0	<1.0	<10
21	<1.0	<1.0	<1.0	<1.0	<10
22	<1.0	<1.0	<1.0	<1.0	<10
23	<1.0	<1.0	<1.0	<1.0	<10
24	<1.0	<1.0	<1.0	<1.0	<10
25	<1.0	<1.0	<1.0	<1.0	<10
26	<1.0	<1.0	<1.0	<1.0	<10
27	<1.0	<1.0	<1.0	<1.0	<10
28	<1.0	<1.0	<1.0	<1.0	<10
29	<1.0	<1.0	<1.0	<1.0	<10
30	<1.0	<1.0	<1.0	<1.0	<10
31	<1.0	<1.0	<1.0	<1.0	<10
32	<1.0	<1.0	<1.0	<1.0	11
33	<1.0	<1.0	<1.0	<1.0	<10

** CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE*

TABLE 1 (CONT.)

ANALYTE CONCENTRATIONS VIA GC/FID (µg/l)

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TOTAL FID VOLATILES*
REPORTING LIMIT	1.0	1.0	1.0	1.0	10
34	<1.0	<1.0	<1.0	<1.0	<10
35	<1.0	<1.0	<1.0	<1.0	<10
36	<1.0	<1.0	<1.0	<1.0	<10
37	<1.0	<1.0	<1.0	<1.0	<10
38	<1.0	<1.0	<1.0	<1.0	<10
39	<1.0	<1.0	<1.0	<1.0	<10
40	<1.0	<1.0	<1.0	<1.0	<10
41	<1.0	<1.0	<1.0	<1.0	<10
42	<1.0	<1.0	<1.0	<1.0	<10
43	<1.0	<1.0	<1.0	<1.0	<10
44	<1.0	<1.0	<1.0	<1.0	<10
45	<1.0	<1.0	<1.0	<1.0	<10
FIELD CONTROL SAMPLES					
101	<1.0	<1.0	<1.0	<1.0	<10
102	<1.0	<1.0	<1.0	<1.0	<10
103	<1.0	<1.0	<1.0	<1.0	<10
104	<1.0	<1.0	<1.0	<1.0	<10
105	<1.0	<1.0	<1.0	<1.0	<10
106	<1.0	<1.0	<1.0	<1.0	<10
LABORATORY DUPLICATE ANALYSIS					
10	<1.0	<1.0	<1.0	<1.0	<10
10R	<1.0	<1.0	<1.0	<1.0	<10
33	<1.0	<1.0	<1.0	<1.0	<10
33R	<1.0	<1.0	<1.0	<1.0	<10
45	<1.0	<1.0	<1.0	<1.0	<10
45R	<1.0	<1.0	<1.0	<1.0	<10
106	<1.0	<1.0	<1.0	<1.0	<10
106R	<1.0	<1.0	<1.0	<1.0	<10
101	<1.0	<1.0	<1.0	<1.0	<10
101R	<1.0	<1.0	<1.0	<1.0	<10

** CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE*

TABLE 1 (CONT.)

ANALYTE CONCENTRATIONS VIA GC/FID (µg/l)

SAMPLE	BENZENE	TOLUENE	ETHYL-BENZENE	XYLENES	TOTAL FID VOLATILES*
REPORTING LIMIT	1.0	1.0	1.0	1.0	10
LABORATORY BLANKS					
10B	<1.0	<1.0	<1.0	<1.0	<10
33B	<1.0	<1.0	<1.0	<1.0	<10
45B	<1.0	<1.0	<1.0	<1.0	<10
106B	<1.0	<1.0	<1.0	<1.0	<10
101B	<1.0	<1.0	<1.0	<1.0	<10

** CALCULATED USING THE SUM OF THE AREAS OF ALL INTEGRATED CHROMATOGRAM PEAKS AND THE INSTRUMENT RESPONSE FACTOR FOR TOLUENE*

TABLE 2

ANALYTE CONCENTRATIONS VIA GC/ECD (µg/l)

SAMPLE	11DCE	CH2Cl2	t12DCE	11DCA	c12DCE	CHCl3	111TCA	CCl4	TCE	112TCA	PCE
REPORTING LIMIT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
2	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
3	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
4	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
5	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
6	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
8	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
11	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
12	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
13	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
14	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
15	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
16	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
17	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
18	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
19	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
20	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	9.9
21	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
22	1.1	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	4.9
23	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
24	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
25	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
26	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
27	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
28	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
29	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
30	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
31	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
32	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

11DCE = 1,1-dichloroethene
11DCA = 1,1-dichloroethane
111TCA = 1,1,1-trichloroethane
112TCA = 1,1,2-trichloroethane
CH2Cl2 = methylene chloride
c12DCE = cis-1,2-dichloroethene
CCl4 = carbon tetrachloride
PCE = tetrachloroethene
t12DCE = trans-1,2-dichloroethene
CHCl3 = chloroform
TCE = trichloroethene

TABLE 2 (CONT.)

ANALYTE CONCENTRATIONS VIA GC/ECD (µg/l)

SAMPLE	11DCE	CH2Cl2	t12DCE	11DCA	c12DCE	CHCl3	111TCA	CCl4	TCE	112TCA	PCE
REPORTING LIMIT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
34	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
35	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
36	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
37	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
38	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
39	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
40	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
41	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
42	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
43	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
44	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
45	5.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
FIELD CONTROL SAMPLES											
101	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
102	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
103	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
104	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
105	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
106	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
LABORATORY DUPLICATE ANALYSIS											
10	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
10R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
33	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
33R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
45	5.9	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
45R	5.7	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

11DCE = 1,1-dichloroethene
11DCA = 1,1-dichloroethane
111TCA = 1,1,1-trichloroethane
112TCA = 1,1,2-trichloroethane
CH2Cl2 = methylene chloride
c12DCE = cis-1,2-dichloroethene
CCl4 = carbon tetrachloride
PCE = tetrachloroethene
t12DCE = trans-1,2-dichloroethene
CHCl3 = chloroform
TCE = trichloroethene

TABLE 2 (CONT.)

ANALYTE CONCENTRATIONS VIA GC/ECD (µg/l)

SAMPLE	11DCE	CH2Cl2	t12DCE	11DCA	c12DCE	CHCl3	111TCA	CCl4	TCE	112TCA	PCE
REPORTING LIMIT	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
LABORATORY DUPLICATE ANALYSIS (cont.)											
101	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
101R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
106	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
106R	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
LABORATORY BLANKS											
10B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
33B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
45B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
101B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0
106B	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0

11DCE = 1,1-dichloroethene
11DCA = 1,1-dichloroethane
111TCA = 1,1,1-trichloroethane
112TCA = 1,1,2-trichloroethane
CH2Cl2 = methylene chloride
c12DCE = cis-1,2-dichloroethene
CCl4 = carbon tetrachloride
PCE = tetrachloroethene
t12DCE = trans-1,2-dichloroethene
CHCl3 = chloroform
TCE = trichloroethene

FIELD PROCEDURES

Prior to the collection of each sample, the entire sampling system (including down-hole probe, tubing, syringe, and all associated plumbing) was purged with ambient air drawn through an organic vapor filter cartridge. To collect the samples, a van-mounted hydraulic probe was used to advance connected 3-foot sections of 1-inch diameter threaded steel casing down to the sampling depth. Once at depth, the casing was hydraulically raised several inches in order to release a disposable drive point and open the bottom of the casing. A teflon line with a perforated hollow stainless steel probe end was inserted into the casing to the bottom of the hole, and the bottom-hole line perforations were isolated from the up-hole annulus by an inflatable packer. A sample of in-situ soil gas was then withdrawn through the probe and used to purge atmospheric air from the sampling system. A second sample of soil gas was withdrawn through the probe and encapsulated in a pre-evacuated glass vial at two atmospheres of pressure (15 psig). The self-sealing vial was detached from the sampling system, packaged, labeled, and stored for laboratory analysis. All sampling holes were backfilled with bentonite and the surface repaired with like material upon completion of the sampling.

Prior to the day's field activities all sampling equipment and probes were decontaminated by washing with soapy water and rinsing thoroughly. Internal surfaces were flushed dry using pre-purified nitrogen or filtered ambient air, and external surfaces were wiped clean using clean paper towels.

LABORATORY PROCEDURES

The analyses were performed using a research grade gas chromatograph (Shimadzu Model 14A), equipped with capillary columns, thermal oven, Shimadzu CR4A data processor and associated hardware. The GC was equipped with an electron capture detector (ECD) for chlorinated hydrocarbons and a flame ionization detector (FID) for petroleum and non-halogenated compounds. 800 microliters (μl) of sample was directly injected into the GC using a Shimadzu gas-tight syringe.

The ECD and FID stock standards were purchased from Scott Specialty Gases (Plumsteadville, PA). The concentration of the standard is certified by Scott and is traceable to weights certified by the State of Pennsylvania. The analytical equipment was calibrated using a 3-point instrument-response curve and injection of known concentrations of the target compounds. Retention times of the standards were used to identify the peaks in the chromatograms of the field samples, and their response factors were used to calculate the analyte concentrations.

The standards were prepared by filling a Tedlar bag from a tank containing the stock standards. Vials were evacuated, pressurized with nitrogen and then equilibrated to atmospheric pressure. Aliquots of known quantity were removed from the vials and replaced with the same size aliquot of the standard from the Tedlar bag. The lowest standard concentration was near, but above, the instrument detection limit, the second concentration was within the expected range of concentrations in the field samples, and the third concentration was below the upper linear range of the instrument. Three-point least-squares linear regression calibration curves were generated for each analyte. The correlation coefficients were calculated for each standardized

analyte to ensure that they equalled or exceeded 0.99. The retention time windows were determined by examining the retention times of the three standards. The mid range retention time was selected with a window of ± 0.05 minutes. A check standard was run to confirm the retention times and instrument response no less often than after every 40 samples. Check standards were also run at the beginning of each day and new calibration curves were generated as described above whenever a retention time shift or change in instrument response occurred which caused the concentrations of analytes in the check standards to vary by more than 20% from the original concentrations.

The ECD analysis was conducted at instrument Range 0. The FID analysis was conducted at instrument Range 1. The syringe was cleaned using a purge cycle with UPC nitrogen. The syringe was purged for 10 seconds prior to removal of an aliquot from the sample vial and for 10 seconds after injection of the sample into the GC.

Total FID Volatiles values were generated by summing the areas of all integrated chromatogram peaks and calculated using the instrument response factor for toluene. Injection peaks, which also contain the light hydrocarbon methane, were excluded to avoid the skewing of Total FID Volatiles values due to injection disturbances and biogenic methane. For samples with low hydrocarbon concentrations, the calculated Total FID Volatiles concentration is occasionally lower than the sum of the individual analytes. This is because the response factor used for the Total FID Volatiles calculation is a constant, whereas the individual analyte response factors are compound specific. It is important to understand that the Total FID Volatiles levels reported are relative, not absolute, values.

DETECTABILITY & TERMINOLOGY

Detectability

The soil gas survey data presented in this report are the result of precise sampling and measurement of contaminant concentrations in the vadose zone. Analyte detection at a particular location is representative of vapor, dissolved, and/or liquid phase contamination at that location. The presence of detectable levels of target analytes in the vadose zone is dependent upon several factors, including the presence of vapor-phase hydrocarbons or dissolved or liquid concentrations adequate to facilitate volatilization into the unsaturated zone.

Terminology

In order to prevent misunderstanding of certain terms used in **TARGET**'s reports, the following clarifications are offered:

Analyte refers to any of the hydrocarbons standardized for quantification in the chromatographic analysis.

Anomaly refers to an area where hydrocarbons were measured in excess of what would normally be considered "natural" or "background" levels.

Elevated and **significant** are used to describe concentrations of analytes which indicate the existence of a potential problem in the soil or ground water.

Feature is used in reference to a discernible pattern in the contoured data. It denotes a contour form rather than a definite or separate chemical occurrence.

Indicates is used when evidence dictates a unique conclusion. **Suggests** is used when several explanations of certain evidence are possible, but one in particular seems more likely. As a result, "indicates" carries a higher degree of confidence in a conclusion than does "suggests."

Occurrence is used to indicate an area where chemical compounds are present in sufficient concentrations to be detected by the analysis of soil vapors. The term is not indicative of any specific mode of occurrence (vapor, dissolved, etc.), and does not necessarily indicate or suggest the presence of "free product" or "phase-separated hydrocarbons."

Reporting Limit refers to the minimum concentration reported for each analyte.

Vadose zone represents the unsaturated zone between the ground water table and the ground surface.

APPENDIX D
DATA TABLES, CERTIFICATES OF ANALYSIS, CHAIN-OF-CUSTODY

ANALYTICAL RESULTS

SOIL

Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-67A		2-67A		2-67A		2-67A		2-68A	
Sample ID:	A1519		A1520		A1521		A1522		A1524	
Depth:	5 - 6		10 - 11		16.5 - 17.5		19 - 20		5 - 6	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	13000	N	8900	N	9700	N	12000	N	7300	N
Arsenic - Graphite Furnace	<1.1	UN	<12	UN	2.0	N	4.2	N	3.4	N
Barium	160	N	1200	N	1900	N	750	N	260	N
Beryllium	0.97		1.6		1.8		0.90		0.90	
Cadmium	0.67		1.1		0.95		<0.46	U	<0.48	U
Chromium	12		14		18		16		8.6	
Chromium VI	<0.50	U	<0.49	U	<0.51	U	<0.50	U	<0.099	U
Copper	9.0		9.4		13		7.9		5.8	
Iron	8500	N	19000	N	23000	N	13000	N	7900	N
Lead - Graphite Furnace	5.5	N	33	N	6.7	N	9.7	N	7.9	N
Mercury	0.031		0.031		<0.027	U	<0.029	U	<0.022	U
Nickel	8.2		25		19		12		12	
Silver	<1.1	U	0.93		1.0		<0.92	U	<0.95	U
Zinc	21		17		25		20		12	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

B = Analyte was also found in sample blank
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC limit
< = Not detected
QFR = Qualifier
Analytical data has not been validated.

Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-68A		2-68A		SB-029		SB-029		SB-029	
Sample ID:	A1525		A1526		A1042		A1043		A1044	
Depth:	10 - 11		17 - 18		4.5 - 5		9 - 9.5		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	8600	N	8400	N	11000	N	7000	N	9800	N
Arsenic - Graphite Furnace	4.5	N	2.0	N	1.0	N	2.1	N	4.2	N
Barium	940	N	95	N	110	N	56	N	270	N
Beryllium	1.3		0.96		1.3		1.2		1.9	
Cadmium	0.77		<0.51	U	0.51		0.80		0.92	
Chromium	13		13		11		9.7		15	
Chromium VI	<0.098	U	<0.10	U	0.23		0.34		<0.10	U
Copper	11		7.8		5.9		4.6		8.6	
Iron	14000	N	11000	N	8600	N	8200	N	14000	N
Lead - Graphite Furnace	8.4	N	4.8	N	3.4	N	4.4	N	4.5	N
Mercury	<0.021	U	<0.027	U	<0.022	U	<0.022	U	<0.023	U
Nickel	20		15		9.0		11		16	
Silver	<0.96	U	<1.0	U	0.15		0.24		0.20	
Zinc	20		18		17		14		20	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

B = Analyte was also found in sample blank
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC limit
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QFR = Qualifier
Analytical data has not been validated.

Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-029		SB-030		SB-030		SB-030		SB-030	
Sample ID:	A1045		A1036		A1037		A1038		A1039	
Depth:	15.5 - 16		2.5 - 3		7 - 7.5		12 - 13		12 - 13	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	8800	N	15000	N	16000	N	10000	N	11000	N
Arsenic - Graphite Furnace	1.8	N	<1.0	UN	4.0	N	1.3	N	1.5	N
Barium	410	N	250	N	160	N	250	N	130	N
Beryllium	1.6		0.99		0.99		0.81		0.84	
Cadmium	0.68		0.81		0.77		<0.42	U	<0.51	U
Chromium	13		25		21		15		15	
Chromium VI	0.13		<0.10	U	<0.10	U	<0.50	U	<0.50	U
Copper	7.9		9.5		7.1		7.5		7.1	
Iron	12000	N	11000	N	16000	N	12000	N	12000	N
Lead - Graphite Furnace	6.6	N	5.2	N	5.7	N	4.4	N	3.9	N
Mercury	<0.022	U	<0.024	U	<0.027	U	<0.021	U	<0.025	U
Nickel	14		100		19		13		13	
Silver	0.098		<1.0	U	<1.1	U	<0.83	U	<1.0	U
Zinc	18		28		26		21		21	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-030		SB-031		SB-031		SB-031		SB-031	
Sample ID:	A1040		A1031		A1032		A1033		A1034	
Depth:	16.5 - 17		3 - 3.5		6.5 - 7		11 - 11.5		16 - 16.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	16000	N	14000	N	14000	N	13000	N	13000	N
Arsenic - Graphite Furnace	3.0	N	2.3	N	1.8	N	2.0	N	1.7	N
Barium	1000	N	590	N	68	N	450	N	440	N
Beryllium	0.99		0.98		0.71		0.96		0.84	
Cadmium	<0.47	U	<0.53	U	<0.54	U	0.57		<0.46	U
Chromium	21		14		15		16		17	
Chromium VI	<0.50	U	<0.10	U	<0.10	U	0.11		<0.50	U
Copper	7.8		8.3		7.2		12		8.0	
Iron	15000	N	11000	N	10000	N	14000	N	12000	N
Lead - Graphite Furnace	5.6	N	6.2	N	4.4	N	6.2	N	5.6	N
Mercury	<0.025	U	<0.025	U	<0.020	U	<0.025	U	<0.025	U
Nickel	16		10		12		15		14	
Silver	<0.94	U	<1.1	U	<1.1	U	<0.96	U	<0.93	U
Zinc	24		24		23		26		23	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-032		SB-032		SB-032		SB-032		SB-033	
Sample ID:	A1027		A1028		A1029		A1030		A1008	
Depth:	1 - 1.5		7 - 7.5		12 - 12.5		15.5 - 16		1 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	18000	N	15000	N	12000	N	13000	N	18000	
Arsenic - Graphite Furnace	4.8	N	5.4	N	1.9	N	2.1	N	2.6	
Barium	300	N	57	N	210	N	960	N	320	N
Beryllium	1.0		0.87		0.87		1.0		0.82	
Cadmium	0.97		<0.57	U	0.72		<0.57	U	0.60	
Chromium	21		20		15		22		16	
Chromium VI	<0.10	U	<0.10	U	<0.10	U	<0.10	U	<0.10	U
Copper	8.5		6.9		8.4		10		8.6	
Iron	15000	N	13000	N	14000	N	17000	N	14000	
Lead - Graphite Furnace	11	N	7.4	N	4.7	N	7.1	N	8.7	N
Mercury	<0.023	U	<0.024	U	<0.024	U	<0.024	U	<0.023	U
Nickel	15		18		14		21		13	
Silver	<1.1	U	<1.1	U	<1.1	U	<1.1	U	<0.92	U
Zinc	29		24		24		27		27	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-033		SB-033		SB-033		SB-034		SB-034	
Sample ID:	A1009		A1010		A1011		A1014		A1015	
Depth:	8 - 8.5		12 - 12.5		18.5 - 19		8.5 - 10		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	13000		11000		12000		8600	N	9500	N
Arsenic - Graphite Furnace	<1.1	U	1.2		3.7		2.4	N	<0.97	UN
Barium	1100	N	260	N	520	N	98	N	430	N
Beryllium	0.91		0.61		0.60		0.87		0.87	
Cadmium	<0.55	U	<0.55	U	0.53		<0.57	U	<0.48	U
Chromium	19		14		14		12		13	
Chromium VI	<0.10	U	<0.10	U	<0.10	U	<0.10	U	<0.10	U
Copper	9.6		7.3		8.3		7.1		6.7	
Iron	17000		10000		13000		11000	N	10000	N
Lead - Graphite Furnace	7.4	N	6.2	N	7.6	N	5.3	N	5.9	N
Mercury	<0.020	U	<0.023	U	<0.022	U	<0.020	U	<0.023	U
Nickel	20		14		14		12	N	12	N
Silver	<1.1	U	<1.1	U	<0.97	U	<1.1	U	<0.95	U
Zinc	23		22		21		19		18	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
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Tinker Air Force Base

Well/Boring:	SB-034		SB-035		SB-035		SB-035		SB-035	
Sample ID:	A1016		A1017		A1019		A1020		A1021	
Depth:	17 - 17.5		2 - 2.5		7.5 - 8		11.5 - 12		15 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	6200	N	13000	N	7400	N	5200	N	6700	N
Arsenic - Graphite Furnace	<0.97	UN	3.8	N	7.8	N	2.0	N	<1.0	UN
Barium	850	N	83	N	3400	N	80	N	630	N
Beryllium	0.61		1.1		1.1		0.58		0.72	
Cadmium	<0.58	U	<0.58	U	0.85		<0.44	U	<0.45	U
Chromium	9.8		12		11		6.5		10	
Chromium VI	<0.10	U	<0.10	U	<0.10	U	<0.10	U	<0.10	U
Copper	5.3		7.6		14		4.7		6.2	
Iron	9200	N	12000	N	16000	N	4700	N	10000	N
Lead - Graphite Furnace	6.0	N	9.5	N	18	N	5.8	N	5.4	N
Mercury	<0.022	U	<0.023	U	<0.024	U	<0.021	U	<0.022	U
Nickel	10	N	10	N	34	N	9.4	N	11	N
Silver	<1.2	U	<1.2	U	<1.2	U	<0.88	U	<0.90	U
Zinc	12		20		17		13		14	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-036		SB-036		SB-036		SB-036		SB-037	
Sample ID:	A1022		A1023		A1025		A1026		A1004	
Depth:	3 - 3.5		7 - 7.5		12 - 12.5		15 - 15.5		.5 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	17000	N	17000	N	11000	N	13000	N	16000	
Arsenic - Graphite Furnace	5.2	N	6.0	N	3.0	N	2.0	N	2.3	
Barium	230	N	310	N	430	N	510	N	100	N
Beryllium	0.89		0.95		0.72		0.77		0.74	
Cadmium	0.83		0.70		<0.51	U	<0.44	U	<0.54	U
Chromium	19		35		16		17		17	
Chromium VI	<0.10	U	<0.10	U	<0.10	U	<0.10	U	<0.10	U
Copper	7.4		9.4		7.6		8.5		7.3	
Iron	15000	N	17000	N	14000	N	14000	N	12000	
Lead - Graphite Furnace	7.7	N	6.1	N	5.9	N	5.7	N	6.0	N
Mercury	<0.022	U	<0.022	U	<0.024	U	<0.020	U	<0.021	U
Nickel	15		22		15		15		15	
Silver	<1.1	U	<1.1	U	<1.0	U	<0.88	U	<1.1	U
Zinc	24		26		20		21		24	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
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Tinker Air Force Base

Well/Boring:	SB-037		SB-037		SB-037		SB-038		SB-038	
Sample ID:	A1005		A1006		A1007		A1001		A1002	
Depth:	8 - 8.5		13 - 13.5		15.5 - 16		8.5 - 10.5		13.5 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Aluminum	11000		11000		8500		13000		12000	
Arsenic - Graphite Furnace	1.7		3.8		10		2.9		<1.1	U
Barium	68	N	510	N	790	N	59	N	160	N
Beryllium	0.66		0.60		<0.54	U	<0.55	U	<0.50	U
Cadmium	<0.48	U	<0.54	U	<0.54	U	<0.55	U	<0.50	U
Chromium	16		15		19		24		25	
Chromium VI	<0.10	U	<0.10	U	<0.10	U	<0.10	U	<0.10	U
Copper	7.6		7.9		6.9		7.3		7.7	
Iron	14000		13000		11000		13000		13000	
Lead - Graphite Furnace	5.1	N	6.0	N	6.9	N	5.1	N	4.9	N
Mercury	<0.023	U	<0.025	U	<0.022	U	<0.021	U	<0.026	U
Nickel	16		12		14		15		19	
Silver	<0.95	U	<1.1	U	<1.1	U	<1.1	U	<1.0	U
Zinc	22		19		16		22		21	
1,2,4-Trichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,2-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,3-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,4-Dichlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4,5-Trichlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4,6-Trichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dichlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dimethylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,4-Dinitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2,4-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2,6-Dinitrotoluene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chloronaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Chlorophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylnaphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
2-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
2-Nitrophenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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N = Sample is outside of Matrix Spike QC limit
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Analytical Results at the SDB
for SO
Tinker Air Force Base

Parameters	Well/Boring: SB-038 Sample ID: A1003 Depth: 17.5 - 18.5 Result	QFR
Aluminum	3000	
Arsenic - Graphite Furnace	1.0	
Barium	900	N
Beryllium	<0.45	U
Cadmium	0.54	
Chromium	8.1	
Chromium VI	<0.10	U
Copper	2.3	
Iron	6500	
Lead - Graphite Furnace	2.7	N
Mercury	<0.023	U
Nickel	6.6	
Silver	<0.89	U
Zinc	7.7	
1,2,4-Trichlorobenzene	<0.330	U
1,2-Dichlorobenzene	<0.330	U
1,3-Dichlorobenzene	<0.330	U
1,4-Dichlorobenzene	<0.330	U
2,4,5-Trichlorophenol	<0.825	U
2,4,6-Trichlorophenol	<0.330	U
2,4-Dichlorophenol	<0.330	U
2,4-Dimethylphenol	<0.330	U
2,4-Dinitrophenol	<0.825	U
2,4-Dinitrotoluene	<0.330	U
2,6-Dinitrotoluene	<0.330	U
2-Chloronaphthalene	<0.330	U
2-Chlorophenol	<0.330	U
2-Methylnaphthalene	<0.330	U
2-Methylphenol	<0.330	U
2-Nitroaniline	<0.825	U
2-Nitrophenol	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-67A		2-67A		2-67A		2-67A		2-68A	
Sample ID:	A1519		A1520		A1521		A1522		A1524	
Depth:	5 - 6		10 - 11		16.5 - 17.5		19 - 20		5 - 6	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	0.067	J
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	0.085	J	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-68A		2-68A		SB-029		SB-029		SB-029	
Sample ID:	A1525		A1526		A1042		A1043		A1044	
Depth:	10 - 11		17 - 18		4.5 - 5		9 - 9.5		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	0.25	J	0.18	J	<0.330	U	<0.330	U	<0.330	U
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-029		SB-030		SB-030		SB-030		SB-030	
Sample ID:	A1045		A1036		A1037		A1038		A1039	
Depth:	15.5 - 16		2.5 - 3		7 - 7.5		12 - 13		12 - 13	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	<0.330	U	0.041	JB	0.073	JB	0.089	JB	0.072	JB
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-030		SB-031		SB-031		SB-031		SB-031	
Sample ID:	A1040		A1031		A1032		A1033		A1034	
Depth:	16.5 - 17		3 - 3.5		6.5 - 7		11 - 11.5		16 - 16.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	0.11	JB	<0.330	U	<0.330	U	0.039	JB	0.10	JB
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-032		SB-032		SB-032		SB-032		SB-033	
Sample ID:	A1027		A1028		A1029		A1030		A1008	
Depth:	1 - 1.5		7 - 7.5		12 - 12.5		15.5 - 16		1 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	<0.330	U	0.053	JB	<0.330	U	<0.330	U	0.11	JB
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

B = Analyte was also found in sample blank
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC limit
< = Not detected
QFR = Qualifier
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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-033		SB-033		SB-033		SB-034		SB-034	
Sample ID:	A1009		A1010		A1011		A1014		A1015	
Depth:	8 - 8.5		12 - 12.5		18.5 - 19		8.5 - 10		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	<0.330	U	<0.330	U	0.11	JB	0.066	JB	0.12	JB
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

B = Analyte was also found in sample blank
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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-034		SB-035		SB-035		SB-035		SB-035	
Sample ID:	A1016		A1017		A1019		A1020		A1021	
Depth:	17 - 17.5		2 - 2.5		7.5 - 8		11.5 - 12		15 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	0.088	JB	0.27	JB	0.13	JB	0.20	JB	<0.330	U
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-036		SB-036		SB-036		SB-036		SB-037	
Sample ID:	A1022		A1023		A1025		A1026		A1004	
Depth:	3 - 3.5		7 - 7.5		12 - 12.5		15 - 15.5		.5 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	0.33	JB	0.12	JB	0.033	JB	<0.330	U	0.14	JB
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-037		SB-037		SB-037		SB-038		SB-038	
Sample ID:	A1005		A1006		A1007		A1001		A1002	
Depth:	8 - 8.5		13 - 13.5		15.5 - 16		8.5 - 10.5		13.5 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
3,3'-Dichlorobenzidine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
3-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Bromophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloro-3-methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chloroaniline	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Methylphenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
4-Nitroaniline	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
4-Nitrophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Acenaphthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Acenaphthylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(a)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(b)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(g,h,i)perylene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzo(k)fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzoic Acid	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Benzyl alcohol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Butylbenzylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Chrysene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-butylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Di-n-octylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzo(a,h)anthracene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dibenzofuran	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Diethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Dimethylphthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluoranthene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Fluorene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Parameters	Result	QFR
Well/Boring:	SB-038	
Sample ID:	A1003	
Depth:	17.5 - 18.5	
3,3'-Dichlorobenzidine	<0.330	U
3-Nitroaniline	<0.825	U
4,6-Dinitro-2-methylphenol	<0.825	U
4-Bromophenyl-phenylether	<0.330	U
4-Chloro-3-methylphenol	<0.330	U
4-Chloroaniline	<0.330	U
4-Chlorophenyl-phenylether	<0.330	U
4-Methylphenol	<0.330	U
4-Nitroaniline	<0.825	U
4-Nitrophenol	<0.825	U
Acenaphthene	<0.330	U
Acenaphthylene	<0.330	U
Anthracene	<0.330	U
Benzo(a)anthracene	<0.330	U
Benzo(a)pyrene	<0.330	U
Benzo(b)fluoranthene	<0.330	U
Benzo(g,h,i)perylene	<0.330	U
Benzo(k)fluoranthene	<0.330	U
Benzoic Acid	<0.330	U
Benzyl alcohol	<0.330	U
Butylbenzylphthalate	<0.330	U
Chrysene	<0.330	U
Di-n-butylphthalate	<0.330	U
Di-n-octylphthalate	<0.330	U
Dibenzo(a,h)anthracene	<0.330	U
Dibenzofuran	<0.330	U
Diethylphthalate	<0.330	U
Dimethylphthalate	<0.330	U
Fluoranthene	<0.330	U
Fluorene	<0.330	U
Hexachlorobenzene	<0.330	U

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E = Concentration exceeds instrument calibration range for that specific analysis
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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-67A		2-67A		2-67A		2-67A		2-68A	
Sample ID:	A1519		A1520		A1521		A1522		A1524	
Depth:	5 - 6		10 - 11		16.5 - 17.5		19 - 20		5 - 6	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	0.059	J	0.054	J	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	2.8	J	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	1.7	J	<5	U
1,1-Dichloroethene	<5	U	<5	U	<5	U	7.4		<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	3.4	J	14		<5	U
2-Butanone	3.5	JB	3.5	JB	4.4	JB	6.0	JB	4.1	JB
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	7.5	JB	2.5	JB	9.4	JB	16	JB	9.2	JB
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane										

B = Analyte was also found in sample blank
E = Concentration exceeds instrument calibration range for that specific analysis
J = Concentration is an estimated value
N = Sample is outside of Matrix Spike QC limit
< = Not detected
QFR = Qualifier
Analytical data has not been validated.

Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-68A		2-68A		SB-029		SB-029		SB-029	
Sample ID:	A1525		A1526		A1042		A1043		A1044	
Depth:	10 - 11		17 - 18		4.5 - 5		9 - 9.5		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethene	2.0	J	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	<5	U	4.6	J
2-Butanone	<100	U	<100	U	<100	U	5.7	J	<100	U
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	5.7	JB	6.0	JB	8.9	JB	9.9	J	7.7	JB
Benzene	2.0	J	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane										

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-029		SB-030		SB-030		SB-030		SB-030	
Sample ID:	A1045		A1036		A1037		A1038		A1039	
Depth:	15.5 - 16		2.5 - 3		7 - 7.5		12 - 13		12 - 13	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethene	2.6	J	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<8.5	U	<5	U	<5	U	0.6	J	<5	U
2-Butanone	<100	U	4.0	J	4.4	JB	<100	U	5.7	J
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	13	JB	5.4	JB	9.9	JB	5.1	JB	9.7	JB
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane										

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-030		SB-031		SB-031		SB-031		SB-031	
Sample ID:	A1040		A1031		A1032		A1033		A1034	
Depth:	16.5 - 17		3 - 3.5		6.5 - 7		11 - 11.5		16 - 16.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethene	1.5	J	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	<5	U	<5	U
2-Butanone	<100	U	<100	U	3.0	JB	<100	U	<100	U
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	<100	U	4.3	JB	<100	U	10	JB	4.9	JB
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane										

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-032		SB-032		SB-032		SB-032		SB-033	
Sample ID:	A1027		A1028		A1029		A1030		A1008	
Depth:	1 - 1.5		7 - 7.5		12 - 12.5		15.5 - 16		1 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	0.059	J	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	9.1		<5	U	1.4	J	6.1		<5	U
1,1-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	1.3	J	<5	U
2-Butanone	17	JB	4.1	JB	<100	U	<100	U	6.9	JB
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	9.5	J	<50	U	<50	U	<50	U	<50	U
Acetone	140	B	9.8	JB	7.7	JB	6.4	JB	32	J
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane									<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-033		SB-033		SB-033		SB-034		SB-034	
Sample ID:	A1009		A1010		A1011		A1014		A1015	
Depth:	8 - 8.5		12 - 12.5		18.5 - 19		8.5 - 10		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	<5	U	<5	U
2-Butanone	<100	U	<100	U	8.3	J	<100	U	4.6	JB
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	5.0	JB	6.0	JB	17	JB	7.1	JB	8.4	J
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane	<5	U	<5	U	<5	U				

B = Analyte was also found in sample blank
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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-034		SB-035		SB-035		SB-035		SB-035	
Sample ID:	A1016		A1017		A1019		A1020		A1021	
Depth:	17 - 17.5		2 - 2.5		7.5 - 8		11.5 - 12		15 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	3.7	J	<5	U	3.4	J	3.4	J
1,1-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	<5	U	<5	U
2-Butanone	3.8	JB	13	JB	4.0	JB	<100	U	4.2	JB
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	8.6	J	6.9	J	8.9	J	6.1	J	7.2	J
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane										

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-036		SB-036		SB-036		SB-036		SB-037	
Sample ID:	A1022		A1023		A1025		A1026		A1004	
Depth:	3 - 3.5		7 - 7.5		12 - 12.5		15 - 15.5		.5 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	0.033	J	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	15		<5	U
1,1-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	<5	U	<5	U
2-Butanone	6	JB	<100	U	3.7	JB	3.1	JB	7.6	J
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	14	JB	6.1	JB	8.9	JB	6.5	JB	30	JB
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane									<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-037		SB-037		SB-037		SB-038		SB-038	
Sample ID:	A1005		A1006		A1007		A1001		A1002	
Depth:	8 - 8.5		13 - 13.5		15.5 - 16		8.5 - 10.5		13.5 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Hexachlorobutadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachlorocyclopentadiene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Hexachloroethane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Isophorone	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
N-Nitrosodiphenylamine	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Naphthalene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Nitrobenzene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pentachlorophenol	<0.825	U	<0.825	U	<0.825	U	<0.825	U	<0.825	U
Phenanthrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Phenol	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
Pyrene	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U	<0.330	U	<0.330	U	<0.330	U	<0.330	U
1,1,1-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloroethane	<5	U	<5	U	<5	U	<5	U	<5	U
1,2-Dichloropropane	<5	U	<5	U	<5	U	<5	U	<5	U
2-Butanone	3	J	3.8	J	4.7	J	4.2	J	5.4	J
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U	<50	U
Acetone	7.0	JB	9.7	JB	12	JB	15	JB	21	JB
Benzene	<5	U	<5	U	<5	U	<5	U	<5	U
Bromodichloromethane	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Parameters	Result	QFR
Well/Boring:	SB-038	
Sample ID:	A1003	
Depth:	17.5 - 18.5	
Hexachlorobutadiene	<0.330	U
Hexachlorocyclopentadiene	<0.330	U
Hexachloroethane	<0.330	U
Indeno(1,2,3-cd)pyrene	<0.330	U
Isophorone	<0.330	U
N-Nitroso-di-n-propylamine	<0.330	U
N-Nitrosodiphenylamine	<0.330	U
Naphthalene	<0.330	U
Nitrobenzene	<0.330	U
Pentachlorophenol	<0.825	U
Phenanthrene	<0.330	U
Phenol	<0.330	U
Pyrene	<0.330	U
bis(2-Chloroethoxy)methane	<0.330	U
bis(2-Chloroethyl)ether	<0.330	U
bis(2-Chloroisopropyl)ethe	<0.330	U
bis(2-Ethylhexyl)phthalate	<0.330	U
1,1,1-Trichloroethane	<5	U
1,1,2,2-Tetrachloroethane	<5	U
1,1,2-Trichloroethane	<5	U
1,1-Dichloroethane	<5	U
1,1-Dichloroethene	<5	U
1,2-Dichloroethane	<5	U
1,2-Dichloropropane	<5	U
2-Butanone	3.3	J
2-Chloroethylvinyl ether	<10	U
2-Hexanone	<50	U
4-Methyl-2-Pentanone	<50	U
Acetone	9.4	JB
Benzene	<5	U
Bromodichloromethane	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-67A		2-67A		2-67A		2-67A		2-68A	
Sample ID:	A1519		A1520		A1521		A1522		A1524	
Depth:	5 - 6		10 - 11		16.5 - 17.5		19 - 20		5 - 6	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane										
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	5.6	JB	5.8	JB	5.5	JB	9.4	JB	5.1	JB
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	7.8		2.4	J	9.0		6.6		<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)										
Xylenes (total)	<5	U	<5	U	<5	U	<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	5.7		5.8		<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	2-68A		2-68A		SB-029		SB-029		SB-029	
Sample ID:	A1525		A1526		A1042		A1043		A1044	
Depth:	10 - 11		17 - 18		4.5 - 5		9 - 9.5		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	2.1	J	<5	U	<5	U	<5	U	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane										
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	3.4	JB	3.0	JB	2.5	J	1.6	JB	1.8	J
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Toluene	2.2	J	<5	U	<5	U	<5	U	<5	U
Trichloroethene	1.7	J	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)										
Xylenes (total)	<5	U	<5	U	<5	U	<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-029		SB-030		SB-030		SB-030		SB-030	
Sample ID:	A1045		A1036		A1037		A1038		A1039	
Depth:	15.5 - 16		2.5 - 3		7 - 7.5		12 - 13		12 - 13	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane										
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	<10	U	0.9	J	<10	U	0.6	J	<10	U
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<7.5	U	<5	U	<5	U	0.6	J	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)										
Xylenes (total)	<5	U	<5	U	<5	U	<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	4.1	J	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-030		SB-031		SB-031		SB-031		SB-031	
Sample ID:	A1040		A1031		A1032		A1033		A1034	
Depth:	16.5 - 17		3 - 3.5		6.5 - 7		11 - 11.5		16 - 16.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane										
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	1.7	JB	<10	U	<10	U	<10	U	<10	U
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)										
Xylenes (total)	<5	U	<5	U	<5	U	<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-032		SB-032		SB-032		SB-032		SB-033	
Sample ID:	A1027		A1028		A1029		A1030		A1008	
Depth:	1 - 1.5		7 - 7.5		12 - 12.5		15.5 - 16		1 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	2.8	J	<5	U	<5	U	0.5	J	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U		
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane									<5	U
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U		
Ethylbenzene	4.2	J	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	9.6	JB	1.3	JB	<10	U	<10	U	3.4	J
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)									<5	U
Xylenes (total)	22		<5	U	<5	U	<5	U		
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
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Tinker Air Force Base

Well/Boring:	SB-033		SB-033		SB-033		SB-034		SB-034	
Sample ID:	A1009		A1010		A1011		A1014		A1015	
Depth:	8 - 8.5		12 - 12.5		18.5 - 19		8.5 - 10		13.5 - 14	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorodibromomethane							<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane	<5	U	<5	U	<5	U				
Dichlorobromomethane							<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	6.0	JB	4.7	JB	4.7	JB	1.1	J	6.9	J
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)	<5	U	<5	U	<5	U				
Xylenes (total)							<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-034		SB-035		SB-035		SB-035		SB-035	
Sample ID:	A1016		A1017		A1019		A1020		A1021	
Depth:	17 - 17.5		2 - 2.5		7.5 - 8		11.5 - 12		15 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	2.3	J	<5	U	<5	U	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane										
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	6.9	J	7.0	J	4.8	J	3.7	J	3.0	J
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)										
Xylenes (total)	<5	U	<5	U	<5	U	<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-036		SB-036		SB-036		SB-036		SB-037	
Sample ID:	A1022		A1023		A1025		A1026		A1004	
Depth:	3 - 3.5		7 - 7.5		12 - 12.5		15 - 15.5		.5 - 1.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	<5	U	<5	U	<5	U	7.5	
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U		
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane									<5	U
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U		
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	<10	U	0.9	JB	<10	U	1.4	JB	7.5	JB
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)									<5	U
Xylenes (total)	<5	U	<5	U	<5	U	<5	U		
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	3.5	J	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Well/Boring:	SB-037		SB-037		SB-037		SB-038		SB-038	
Sample ID:	A1005		A1006		A1007		A1001		A1002	
Depth:	8 - 8.5		13 - 13.5		15.5 - 16		8.5 - 10.5		13.5 - 15.5	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Bromoform	<5	U	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	<5	U	<5	U
Chlorobenzene	<5	U	<5	U	0.7	J	<5	U	0.8	J
Chlorodibromomethane										
Chloroethane	<10	U	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	<5	U	<5	U	<5	U	<5	U
Chloromethane	<10	U	<10	U	<10	U	<10	U	<10	U
Dibromochloromethane	<5	U	<5	U	<5	U	<5	U	<5	U
Dichlorobromomethane										
Ethylbenzene	<5	U	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	9.6	JB	11	B	9.8	JB	13	B	17	B
Styrene	<5	U	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	1.2	J	<5	U	<5	U	<5	U
Toluene	<5	U	<5	U	<5	U	<5	U	<5	U
Trichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U	<10	U
Xylene (total)	<5	U	<5	U	<5	U	<5	U	<5	U
Xylenes (total)										
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U	<5	U

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Analytical Results at the SDB
for SO
Tinker Air Force Base

Parameters	Result	QFR
Well/Boring:	SB-038	
Sample ID:	A1003	
Depth:	17.5 - 18.5	
Bromoform	<5	U
Bromomethane	<10	U
Carbon Disulfide	<5	U
Carbon Tetrachloride	<5	U
Chlorobenzene	<5	U
Chlorodibromomethane		
Chloroethane	<10	U
Chloroform	<5	U
Chloromethane	<10	U
Dibromochloromethane	<5	U
Dichlorobromomethane		
Ethylbenzene	<5	U
Methylene Chloride	9.0	JB
Styrene	<5	U
Tetrachloroethene	<5	U
Toluene	<5	U
Trichloroethene	<5	U
Vinyl Acetate	<10	U
Vinyl Chloride	<10	U
Xylene (total)	<5	U
Xylenes (total)		
cis 1,3 Dichloropropene	<5	U
cis-1,2-Dichloroethene	<5	U
trans 1,3-Dichloropropene	<5	U
trans-1,2-Dichloroethene	<5	U

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ANALYTICAL RESULTS

GROUNDWATER

Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66A		2-67A		2-68A	
Sample ID:	A1592		A1595		A1597	
Depth:	0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR
Alkalinity, Titrimetric	410		400		400	
Chemical Oxygen Demand	<25	U	36		<25	U
Chloride by Ion Chrom.	52		89		72	
Nitrate and Nitrite	4.9		<0.050	U	3.0	
Phenolics	<0.010	U	0.042		<0.010	U
Silica	7.2		11		9.2	
Sulfate by Ion Chrom.	9.4		11		16	
Total Phosphorus	<0.10	U	<0.10	U	<0.10	U
Aluminum	1.1	N	<0.20	UN	0.72	N
Arsenic - Graphite Furnace	<0.010	U	0.016		<0.010	U
Barium	0.53	N	1.4	N	0.54	N
Cadmium	<0.0050	UN	<0.0050	UN	<0.0050	UN
Calcium	60	N	66	N	56	N
Chromium	0.018	N	<0.010	UN	<0.010	UN
Chromium VI	<0.010	U	0.014		<0.010	U
Copper	<0.025	UN	<0.025	UN	<0.025	UN
Iron	1.9	N	0.62	N	2.1	N
Lead - Graphite Furnace	<0.0030	U	<0.0030	U	<0.0030	U
Magnesium	34	N	36	N	35	N
Manganese	0.025	N	0.63	N	0.052	N
Mercury	<0.00020	U	<0.00020	U	<0.00020	U
Nickel	<0.040	UN	<0.040	UN	<0.040	UN
Potassium	<5.0	UN	<5.0	UN	7.6	N
Selenium	<0.10	UN	<0.10	UN	<0.10	UN
Silver	<0.010	UN	<0.010	UN	<0.010	UN
Sodium	43	N	48	N	49	N
Zinc	0.023	N	<0.020	UN	0.024	N
1,2,4-Trichlorobenzene	<10	U	<10	U	<10	U
1,2-Dichlorobenzene	<10	U	<10	U	<10	U
1,3-Dichlorobenzene	<10	U	<10	U	<10	U
1,4-Dichlorobenzene	<10	U	<10	U	<10	U

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66A		2-67A		2-68A	
Sample ID:	A1592		A1595		A1597	
Depth:	0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR
2,4,5-Trichlorophenol	<10	U	<10	U	<10	U
2,4,6-Trichlorophenol	<10	U	<10	U	<10	U
2,4-Dichlorophenol	<10	U	<10	U	<10	U
2,4-Dimethylphenol	<10	U	<10	U	<10	U
2,4-Dinitrophenol	<25	U	<25	U	<25	U
2,4-Dinitrotoluene	<10	U	<10	U	<10	U
2,6-Dinitrotoluene	<10	U	<10	U	<10	U
2-Chloronaphthalene	<10	U	<10	U	<10	U
2-Chlorophenol	<10	U	<10	U	<10	U
2-Methylnaphthalene	<10	U	<10	U	<10	U
2-Methylphenol	<10	U	34		<10	U
2-Nitroaniline	<25	U	<25	U	<25	U
2-Nitrophenol	<10	U	<10	U	<10	U
3,3'-Dichlorobenzidine	<10	U	<10	U	<10	U
3-Nitroaniline	<25	U	<25	U	<25	U
4,6-Dinitro-2-methylphenol	<25	U	<25	U	<25	U
4-Bromophenyl-phenylether	<10	U	<10	U	<10	U
4-Chloro-3-methylphenol	<10	U	<10	U	<10	U
4-Chloroaniline	<10	U	<10	U	<10	U
4-Chlorophenyl-phenylether	<10	U	<10	U	<10	U
4-Methylphenol	<10	U	1.4	J	<10	U
4-Nitroaniline	<10	U	<10	U	<10	U
4-Nitrophenol	<25	U	<25	U	<25	U
Acenaphthene	<10	U	<10	U	<10	U
Acenaphthylene	<10	U	<10	U	<10	U
Anthracene	<10	U	<10	U	<10	U
Benzo(a)anthracene	<10	U	<10	U	<10	U
Benzo(a)pyrene	<10	U	<10	U	<10	U
Benzo(b)fluoranthene	<10	U	<10	U	<10	U
Benzo(g,h,i)perylene	<10	U	<10	U	<10	U
Benzo(k)fluoranthene	<10	U	<10	U	<10	U

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66A		2-67A		2-68A	
Sample ID:	A1592		A1595		A1597	
Depth:	0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR
Benzoic Acid	<10	U	<10	U	<10	U
Benzyl alcohol	<10	U	<10	U	<10	U
Butylbenzylphthalate	<10	U	<10	U	<10	U
Chrysene	<10	U	<10	U	<10	U
Di-n-butylphthalate	<10	U	<10	U	<10	U
Di-n-octylphthalate	<10	U	<10	U	<10	U
Dibenzo(a,h)anthracene	<10	U	<10	U	<10	U
Dibenzofuran	<10	U	<10	U	<10	U
Diethylphthalate	<10	U	<10	U	<10	U
Dimethylphthalate	<10	U	<10	U	<10	U
Fluoranthene	<10	U	<10	U	<10	U
Fluorene	<10	U	<10	U	<10	U
Hexachlorobenzene	<10	U	<10	U	<10	U
Hexachlorobutadiene	<10	U	<10	U	<10	U
Hexachlorocyclopentadiene	<10	U	<10	U	<10	U
Hexachloroethane	<10	U	<10	U	<10	U
Indeno(1,2,3-cd)pyrene	<10	U	<10	U	<10	U
Isophorone	<10	U	<10	U	<10	U
N-Nitroso-di-n-propylamine	<10	U	<10	U	<10	U
N-Nitrosodiphenylamine	<10	U	<10	U	<10	U
Naphthalene	<10	U	4.2	J	<10	U
Nitrobenzene	<10	U	<10	U	<10	U
Pentachlorophenol	<25	U	<25	U	<25	U
Phenanthrene	<10	U	<10	U	<10	U
Phenol	<10	U	<10	U	<10	U
Pyrene	<10	U	<10	U	<10	U
bis(2-Chloroethoxy)methane	<10	U	<10	U	<10	U
bis(2-Chloroethyl)ether	<10	U	<10	U	<10	U
bis(2-Chloroisopropyl)ethe	<10	U	<10	U	<10	U
bis(2-Ethylhexyl)phthalate	<10	U	<10	U	<10	U
Total Dissolved Solids	490		530		500	

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66A		2-67A		2-68A	
Sample ID:	A1592		A1595		A1597	
Depth:	0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR
Total Kjeldahl Nitrogen	<0.25	U	<0.25	U	<0.25	U
Total Organic Carbon	<1.0	U	4.8		1.4	
Total Suspended Solids	62		17		16	
TPH - IR	<1.1	U	<0.5	U	<1.3	U
1,1,1-Trichloroethane	<5	U	<50	U	<5	U
1,1,2,2-Tetrachloroethane	<5	U	<50	U	<5	U
1,1,2-Trichloroethane	<5	U	<50	U	<5	U
1,1-Dichloroethane	<5	U	<50	U	<5	U
1,1-Dichloroethene	<5	U	<50	U	<5	U
1,2-Dichloroethane	<5	U	13000	D	86	
1,2-Dichloropropane	<5	U	37	J	<5	U
2-Butanone	<100	U	<1000	U	<100	U
2-Chloroethylvinyl ether	<10	U	<100	U	<10	U
2-Hexanone	<50	U	<500	U	<50	U
4-Methyl-2-Pentanone	<50	U	<500	U	<50	U
Acetone	<100	U	<1000	U	<100	U
Benzene	<5	U	280		<5	U
Bromoform	<5	U	<50	U	<5	U
Bromomethane	<10	U	<100	U	<10	U
Carbon Disulfide	<5	U	<50	U	<5	U
Carbon Tetrachloride	49		<50	U	290	D
Chlorobenzene	<5	U	<50	U	<5	U
Chlorodibromomethane	<5	U	<50	U	<5	U
Chloroethane	<10	U	<100	U	<10	U
Chloroform	29		<50	U	510	D
Chloromethane	<10	U	<100	U	<10	U
Dichlorobromomethane	<5	U	<50	U	<5	U
Ethylbenzene	<5	U	25	J	<5	U
Methylene Chloride	<10	U	42	J	<10	U
Styrene	<5	U	<50	U	<5	U
Tetrachloroethene	<5	U	<50	U	<5	U

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66A		2-67A		2-68A	
Sample ID:	A1592		A1595		A1597	
Depth:	0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR
Toluene	<5	U	20	J	<5	U
Trichloroethene	1.8	J	48	J	36	
Vinyl Acetate	<10	U	<100	U	<10	U
Vinyl Chloride	<10	U	<100	U	<10	U
Xylenes (total)	<5	U	28	J	<5	U
cis 1,3 Dichloropropene	<5	U	<50	U	<5	U
cis-1,2-Dichloroethene	<5	U	120		3.2	J
trans 1,3-Dichloropropene	<5	U	<50	U	<5	U
trans-1,2-Dichloroethene	<5	U	<50	U	<5	U

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66B		2-67B		2-67B		2-68B	
Sample ID:	A1591		A1593		A1594		A1596	
Depth:	0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Alkalinity, Titrimetric	430		420		390		410	
Chemical Oxygen Demand	<25	U	<25	U	<25	U	<25	U
Chloride by Ion Chrom.	110		110		110		110	
Nitrate and Nitrite	0.067		7.4		7.4		3.1	
Phenolics	<0.010	U	<0.010	U	<0.010	U	<0.010	U
Silica	8.6		6.1		5.6		8.1	
Sulfate by Ion Chrom.	18		20		20		17	
Total Phosphorus	<0.10	U	<0.10	U	<0.10	U	0.13	
Aluminum	2.9	N	6.2	N	6.4	N	13	N
Arsenic - Graphite Furnace	<0.010	U	<0.010	U	<0.010	U	<0.010	U
Barium	0.70	N	0.75	N	0.78	N	3.5	N
Cadmium	<0.0050	UN	<0.0050	UN	<0.0050	UN	<0.0050	UN
Calcium	67	N	67	N	71	N	88	N
Chromium	<0.010	UN	0.012	N	0.012	N	0.030	N
Chromium VI	<0.010	U	<0.010	U	<0.010	U	<0.010	U
Copper	<0.025	UN	<0.025	UN	<0.025	UN	<0.025	UN
Iron	3.5	N	7.1	N	6.9	N	18	N
Lead - Graphite Furnace	<0.0030	U	<0.0030	U	<0.0030	U	0.0059	
Magnesium	27	N	35	N	37	N	45	N
Manganese	0.14	N	0.34	N	0.33	N	1.2	N
Mercury	<0.00020	U	<0.00020	U	<0.00020	U	<0.00020	U
Nickel	<0.040	UN	<0.040	UN	<0.040	UN	<0.040	UN
Potassium	<5.0	UN	<5.0	UN	<5.0	UN	<5.0	UN
Selenium	<0.10	UN	<0.10	UN	<0.10	UN	<0.10	UN
Silver	<0.010	UN	<0.010	UN	<0.010	UN	<0.010	UN
Sodium	98	N	76	N	81	N	74	N
Zinc	<0.020	UN	<0.020	UN	<0.020	UN	0.033	N
1,2,4-Trichlorobenzene	<10	U	<10	U	<10	U	<10	U
1,2-Dichlorobenzene	<10	U	1.8	J	1.9	J	<10	U
1,3-Dichlorobenzene	<10	U	<10	U	<10	U	<10	U
1,4-Dichlorobenzene	<10	U	<10	U	<10	U	<10	U

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66B		2-67B		2-67B		2-68B	
Sample ID:	A1591		A1593		A1594		A1596	
Depth:	0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR
2,4,5-Trichlorophenol	<10	U	<10	U	<10	U	<10	U
2,4,6-Trichlorophenol	<10	U	<10	U	<10	U	<10	U
2,4-Dichlorophenol	<10	U	<10	U	<10	U	<10	U
2,4-Dimethylphenol	<10	U	<10	U	<10	U	<10	U
2,4-Dinitrophenol	<25	U	<25	U	<25	U	<25	U
2,4-Dinitrotoluene	<10	U	<10	U	<10	U	<10	U
2,6-Dinitrotoluene	<10	U	<10	U	<10	U	<10	U
2-Chloronaphthalene	<10	U	<10	U	<10	U	<10	U
2-Chlorophenol	<10	U	<10	U	<10	U	<10	U
2-Methylnaphthalene	<10	U	<10	U	<10	U	<10	U
2-Methylphenol	<10	U	<10	U	<10	U	<10	U
2-Nitroaniline	<25	U	<25	U	<25	U	<25	U
2-Nitrophenol	<10	U	<10	U	<10	U	<10	U
3,3'-Dichlorobenzidine	<10	U	<10	U	<10	U	<10	U
3-Nitroaniline	<25	U	<25	U	<25	U	<25	U
4,6-Dinitro-2-methylphenol	<25	U	<25	U	<25	U	<25	U
4-Bromophenyl-phenylether	<10	U	<10	U	<10	U	<10	U
4-Chloro-3-methylphenol	<10	U	<10	U	<10	U	<10	U
4-Chloroaniline	<10	U	<10	U	<10	U	<10	U
4-Chlorophenyl-phenylether	<10	U	<10	U	<10	U	<10	U
4-Methylphenol	<10	U	<10	U	<10	U	<10	U
4-Nitroaniline	<10	U	<10	U	<10	U	<10	U
4-Nitrophenol	<25	U	<25	U	<25	U	<25	U
Acenaphthene	<10	U	<10	U	<10	U	<10	U
Acenaphthylene	<10	U	<10	U	<10	U	<10	U
Anthracene	<10	U	<10	U	<10	U	<10	U
Benzo(a)anthracene	<10	U	<10	U	<10	U	<10	U
Benzo(a)pyrene	<10	U	<10	U	<10	U	<10	U
Benzo(b)fluoranthene	<10	U	<10	U	<10	U	<10	U
Benzo(g,h,i)perylene	<10	U	<10	U	<10	U	<10	U
Benzo(k)fluoranthene	<10	U	<10	U	<10	U	<10	U

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66B		2-67B		2-67B		2-68B	
Sample ID:	A1591		A1593		A1594		A1596	
Depth:	0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Benzoic Acid	<10	U	<10	U	<10	U	<10	U
Benzyl alcohol	<10	U	<10	U	<10	U	<10	U
Butylbenzylphthalate	<10	U	<10	U	<10	U	<10	U
Chrysene	<10	U	<10	U	<10	U	<10	U
Di-n-butylphthalate	<10	U	<10	U	<10	U	<10	U
Di-n-octylphthalate	<10	U	<10	U	<10	U	<10	U
Dibenzo(a,h)anthracene	<10	U	<10	U	<10	U	<10	U
Dibenzofuran	<10	U	<10	U	<10	U	<10	U
Diethylphthalate	2.0	J	<10	U	<10	U	<10	U
Dimethylphthalate	<10	U	<10	U	<10	U	<10	U
Fluoranthene	<10	U	<10	U	<10	U	<10	U
Fluorene	<10	U	<10	U	<10	U	<10	U
Hexachlorobenzene	<10	U	<10	U	<10	U	<10	U
Hexachlorobutadiene	<10	U	<10	U	<10	U	<10	U
Hexachlorocyclopentadiene	<10	U	<10	U	<10	U	<10	U
Hexachloroethane	<10	U	<10	U	<10	U	<10	U
Indeno(1,2,3-cd)pyrene	<10	U	<10	U	<10	U	<10	U
Isophorone	<10	U	<10	U	<10	U	<10	U
N-Nitroso-di-n-propylamine	<10	U	<10	U	<10	U	<10	U
N-Nitrosodiphenylamine	<10	U	<10	U	<10	U	<10	U
Naphthalene	<10	U	<10	U	<10	U	<10	U
Nitrobenzene	<10	U	<10	U	<10	U	<10	U
Pentachlorophenol	<25	U	<25	U	<25	U	<25	U
Phenanthrene	<10	U	<10	U	<10	U	<10	U
Phenol	<10	U	<10	U	<10	U	<10	U
Pyrene	<10	U	<10	U	<10	U	<10	U
bis(2-Chloroethoxy)methane	<10	U	<10	U	<10	U	<10	U
bis(2-Chloroethyl)ether	<10	U	<10	U	<10	U	<10	U
bis(2-Chloroisopropyl)ethe	<10	U	<10	U	<10	U	<10	U
bis(2-Ethylhexyl)phthalate	13		<10	U	<10	U	<10	U
Total Dissolved Solids	690		690		670		630	

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66B		2-67B		2-67B		2-68B	
Sample ID:	A1591		A1593		A1594		A1596	
Depth:	0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Total Kjeldahl Nitrogen	<0.25	U	<0.25	U	<0.25	U	<0.25	U
Total Organic Carbon	2.5		2.8		3.4		1.4	
Total Suspended Solids	140		270		380		410	
TPH - IR	<1.1	U	<0.97	U	<0.96	U	<0.96	U
1,1,1-Trichloroethane	<5	U	16		17		9.8	
1,1,2,2-Tetrachloroethane	<5	U	<5	U	<5	U	<5	U
1,1,2-Trichloroethane	<5	U	<5	U	<5	U	<5	U
1,1-Dichloroethane	<5	U	21		21		<5	U
1,1-Dichloroethene	<5	U	99		100		26	
1,2-Dichloroethane	<5	U	45		45		<5	U
1,2-Dichloropropane	<5	U	46		47		<5	U
2-Butanone	<100	U	<100	U	2.1	J	<100	U
2-Chloroethylvinyl ether	<10	U	<10	U	<10	U	<10	U
2-Hexanone	<50	U	<50	U	<50	U	<50	U
4-Methyl-2-Pentanone	<50	U	<50	U	<50	U	<50	U
Acetone	<100	U	<100	U	<100	U	25	J
Benzene	<5	U	2.2	J	2.3	J	<5	U
Bromoform	<5	U	<5	U	<5	U	<5	U
Bromomethane	<10	U	<10	U	<10	U	<10	U
Carbon Disulfide	<5	U	<5	U	<5	U	<5	U
Carbon Tetrachloride	<5	U	<5	U	<5	U	2.3	J
Chlorobenzene	<5	U	<5	U	<5	U	<5	U
Chlorodibromomethane	<5	U	<5	U	<5	U	<5	U
Chloroethane	<10	U	<10	U	<10	U	<10	U
Chloroform	<5	U	6.2		6.4		6.2	
Chloromethane	<10	U	<10	U	<10	U	<10	U
Dichlorobromomethane	<5	U	<5	U	<5	U	<5	U
Ethylbenzene	<5	U	<5	U	<5	U	<5	U
Methylene Chloride	<10	U	<10	U	<10	U	<10	U
Styrene	<5	U	<5	U	<5	U	<5	U
Tetrachloroethene	<5	U	91		89		98	

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Analytical Results at the SDB
for WG
Tinker Air Force Base

Well/Boring:	2-66B		2-67B		2-67B		2-68B	
Sample ID:	A1591		A1593		A1594		A1596	
Depth:	0 - 0		0 - 0		0 - 0		0 - 0	
Parameters	Result	QFR	Result	QFR	Result	QFR	Result	QFR
Toluene	<5	U	<5	U	8.1		<5	U
Trichloroethene	<5	U	6.4		33		2.4	J
Vinyl Acetate	<10	U	<10	U	<10	U	<10	U
Vinyl Chloride	<10	U	<10	U	<10	U	<10	U
Xylenes (total)	<5	U	<5	U	<5	U	<5	U
cis 1,3 Dichloropropene	<5	U	<5	U	<5	U	<5	U
cis-1,2-Dichloroethene	<5	U	20		21		2.5	J
trans 1,3-Dichloropropene	<5	U	<5	U	<5	U	<5	U
trans-1,2-Dichloroethene	<5	U	<5	U	<5	U	<5	U

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ANALYTICAL RESULTS

QUALITY CONTROL - SOIL

Analytical QC results at the SDB
for SQ
Tinker Air Force Base

Well/Boring:	2-67A			2-67A			2-68A			2-68A			SB-032		
Sample ID:	A1522-MS			A1522-MSD			A1524-MS			A1524-MSD			A1028-MS		
Depth:	19 - 20			19 - 20			5 - 6			5 - 6			7 - 7.5		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Aluminum	312		%rec	341		%rec	1400		%rec	1360		%rec	820		%rec
Arsenic - Graphite Furnace	0		%rec	1.1		%rec	127		%rec	93.3		%rec	38		%rec
Barium	0		%rec	42		%rec	760		%rec	0		%rec	160		%rec
Beryllium	88		%rec	89		%rec	89		%rec	87		%rec	91		%rec
Cadmium	85		%rec	87		%rec	88		%rec	86		%rec	93		%rec
Chromium	85		%rec	85		%rec	97		%rec	97		%rec	94		%rec
Chromium VI	113		%rec	115		%rec	101		%rec	108		%rec	108		%rec
Copper	88		%rec	89		%rec	92		%rec	91		%rec	95		%rec
Iron	0		%rec	0		%rec	716		%rec	763		%rec	910		%rec
Lead - Graphite Furnace	0		%rec	0		%rec	240		%rec	0		%rec	19		%rec
Mercury	111		%rec	112		%rec	114		%rec	114		%rec	115		%rec
Nickel	83		%rec	82		%rec	91		%rec	92		%rec	91		%rec
Silver	86		%rec	87		%rec	87		%rec	85		%rec	90		%rec
Zinc	81		%rec	82		%rec	95		%rec	93		%rec	92		%rec
1,2,4-Trichlorobenzene	88		%rec	91		%rec	89		%rec	84		%rec	79		%rec
1,4-Dichlorobenzene	73		%rec	76		%rec	71		%rec	64		%rec	63		%rec
2,4,6-Tribromophenol	93		%rec	93		%rec	83		%rec	82		%rec	77		%rec
2,4-Dinitrotoluene	91		%rec	90		%rec	89		%rec				80		%rec
2-Chlorophenol	86		%rec	86		%rec	82		%rec	74		%rec	70		%rec
2-Fluorobiphenyl	88		%rec	95		%rec	87		%rec	84		%rec	98		%rec
2-Fluorophenol	58		%rec	60		%rec	57		%rec	52		%rec	61		%rec
4-Chloro-3-methylphenol	85		%rec	89		%rec	82		%rec	83		%rec	82		%rec
4-Nitrophenol	89		%rec	82		%rec	80		%rec	74		%rec	67		%rec
Acenaphthene	121		%rec	125		%rec	119		%rec	115		%rec	101		%rec
N-Nitroso-di-n-propylamine	96		%rec	96		%rec	92		%rec	85		%rec	82		%rec
Nitrobenzene-D5	81		%rec	85		%rec	76		%rec	73		%rec	78		%rec
Pentachlorophenol	86		%rec	85		%rec	81		%rec	76		%rec	72		%rec
Phenol	69		%rec	72		%rec	68		%rec	62		%rec	73		%rec
Phenol-D5	66		%rec	68		%rec	63		%rec	60		%rec	70		%rec
Pyrene	98		%rec	102		%rec	95		%rec	90		%rec	90		%rec
Terphenyl-D14	85		%rec	89		%rec	78		%rec	75		%rec	90		%rec

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Analytical QC results at the SDB
for SQ
Tinker Air Force Base

Well/Boring:	2-67A			2-67A			2-68A			2-68A			SB-032		
Sample ID:	A1522-MS			A1522-MSD			A1524-MS			A1524-MSD			A1028-MS		
Depth:	19 - 20			19 - 20			5 - 6			5 - 6			7 - 7.5		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
1,1-Dichloroethene	129		%rec	120		%rec	121		%rec	127		%rec	96		%rec
1,2-Dichloroethane-D4	108		%rec	103		%rec	104		%rec	105		%rec	105		%rec
Benzene	114		%rec	105		%rec	110		%rec	108		%rec	98		%rec
Bromofluorobenzene	98		%rec	97		%rec	94		%rec	98		%rec	95		%rec
Chlorobenzene	107		%rec	103		%rec	112		%rec	107		%rec	105		%rec
Toluene	108		%rec	105		%rec	111		%rec	112		%rec	105		%rec
Toluene-D8	99		%rec	99		%rec	102		%rec	104		%rec	101		%rec
Trichloroethene	95		%rec	86		%rec	91		%rec	87		%rec	84		%rec

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Analytical QC results at the SDB
for SQ
Tinker Air Force Base

Well/Boring:	SB-032			SB-035			SB-035			SB-037			SB-037		
Sample ID:	A1028-MSD			A1019-MS			A1019-MSD			A1006-MS			A1006-MSD		
Depth:	7 - 7.5			7.5 - 8			7.5 - 8			13 - 13.5			13 - 13.5		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Aluminum	720		%rec	973		mg/kg	808		mg/kg						
Arsenic - Graphite Furnace	64		%rec	139		%rec	141		%rec						
Barium	130		%rec	0		mg/kg	0		mg/kg						
Beryllium	89		%rec	85		mg/kg	85		mg/kg						
Cadmium	91		%rec	84		mg/kg	83		mg/kg						
Chromium	91		%rec	90		mg/kg	90		mg/kg						
Chromium VI	114		%rec	88		%rec	94		%rec						
Copper	91		%rec	82		mg/kg	82		mg/kg						
Iron	310		%rec	0		mg/kg	0		mg/kg						
Lead - Graphite Furnace	16		%rec	0		%rec	0		%rec						
Mercury	108		%rec	104		%rec	107		%rec						
Nickel	88		%rec	74		mg/kg	74		mg/kg						
Silver	87		%rec	85		mg/kg	85		mg/kg						
Zinc	89		%rec	86		mg/kg	85		mg/kg						
1,2,4-Trichlorobenzene	73		%rec	82		%rec	83		%rec						
1,4-Dichlorobenzene	57		%rec	68		%rec	72		%rec						
2,4,6-Tribromophenol	83		%rec	81		%rec	75		%rec						
2,4-Dinitrotoluene	77		%rec	80		%rec	79		%rec						
2-Chlorophenol	67		%rec	80		%rec	84		%rec						
2-Fluorobiphenyl	97		%rec	79		%rec	76		%rec						
2-Fluorophenol	61		%rec	70		%rec	70		%rec						
4-Chloro-3-methylphenol	78		%rec	85		%rec	86		%rec						
4-Nitrophenol	61		%rec	85		%rec	77		%rec						
Acenaphthene	94		%rec	96		%rec	95		%rec						
N-Nitroso-di-n-propylamine	74		%rec	86		%rec	85		%rec						
Nitrobenzene-D5	71		%rec	77		%rec	73		%rec						
Pentachlorophenol	67		%rec	79		%rec	73		%rec						
Phenol	68		%rec	70		%rec	74		%rec						
Phenol-D5	67		%rec	67		%rec	68		%rec						
Pyrene	96		%rec	92		%rec	96		%rec						
Terphenyl-D14	95		%rec	82		%rec	82		%rec						

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Analytical QC results at the SDB
for SQ
Tinker Air Force Base

Well/Boring:	SB-032			SB-035			SB-035			SB-037			SB-037		
Sample ID:	A1028-MSD			A1019-MS			A1019-MSD			A1006-MS			A1006-MSD		
Depth:	7 - 7.5			7.5 - 8			7.5 - 8			13 - 13.5			13 - 13.5		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
1,1-Dichloroethene	100		%rec	95		%rec	93		%rec	100		%rec	103		%rec
1,2-Dichloroethane-D4	108		%rec	108		%rec	103		%rec	104		%rec	106		%rec
Benzene	98		%rec	98		%rec	99		%rec	106		%rec	111		%rec
Bromofluorobenzene	93		%rec	96		%rec	99		%rec	96		%rec	97		%rec
Chlorobenzene	102		%rec	101		%rec	103		%rec	113		%rec	113		%rec
Toluene	104		%rec	99		%rec	100		%rec	113		%rec	116		%rec
Toluene-D8	102		%rec	100		%rec	102		%rec	107		%rec	108		%rec
Trichloroethene	85		%rec	81		%rec	82		%rec	94		%rec	93		%rec

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ANALYTICAL RESULTS

QUALITY CONTROL - WATER

Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	2-66B			2-66B			2-67A			2-67A			FIELDQC		
Sample ID:	A1591-MS			A1591-MSD			A1595-MS			A1595-MSD			A1012		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Alkalinity, Titrimetric							400		mg/l as	410		mg/l as			
Chemical Oxygen Demand							91		%rec	86		%rec			
Chloride by Ion Chrom.							108		%rec	115		%rec			
Nitrate and Nitrite							101		%rec	96		%rec			
Phenolics							78		%rec	88		%rec			
Silica							101		%rec	103		%rec			
Sulfate by Ion Chrom.							87		%rec	85		%rec			
Total Phosphorus							100		%rec	98		%rec			
Aluminum							79		%rec	87		%rec			
Arsenic - Graphite Furnace							108		%rec	105		%rec			
Barium							87		%rec	112		%rec			
Beryllium															
Cadmium							70		%rec	76		%rec			
Calcium							52		%rec	96		%rec			
Chromium							72		%rec	78		%rec			
Chromium VI							92		%rec	94		%rec			
Copper							69		%rec	76		%rec			
Iron							75		%rec	82		%rec			
Lead - Graphite Furnace							117		%rec	115		%rec			
Magnesium							65		%rec	92		%rec			
Manganese							64		%rec	77		%rec			
Mercury							109		%rec	111		%rec			
Nickel							68		%rec	74		%rec			
Potassium							77		%rec	85		%rec			
Selenium							72		%rec	74		%rec			
Silver							71		%rec	77		%rec			
Sodium							63		%rec	97		%rec			
Zinc							70		%rec	76		%rec			
1,2,4-Trichlorobenzene							84		%rec	89		%rec			
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	2-66B			2-66B			2-67A			2-67A			FIELDQC		
Sample ID:	A1591-MS			A1591-MSD			A1595-MS			A1595-MSD			A1012		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
1,4-Dichlorobenzene							78		%rec	78		%rec			
2,4,5-Trichlorophenol															
2,4,6-TRIBROMOPHENOL							94		%rec	97		%rec			
2,4,6-Tribromophenol															
2,4,6-Trichlorophenol															
2,4-Dichlorophenol															
2,4-Dimethylphenol															
2,4-Dinitrophenol															
2,4-Dinitrotoluene							77		%rec	84		%rec			
2,6-Dinitrotoluene															
2-Chloronaphthalene															
2-Chlorophenol							87		%rec	88		%rec			
2-FLUOROBIPHENYL							83		%rec	86		%rec			
2-FLUOROPHENOL							78		%rec	78		%rec			
2-Fluorobiphenyl															
2-Fluorophenol															
2-Methylnaphthalene															
2-Methylphenol															
2-Nitroaniline															
2-Nitrophenol															
3,3'-Dichlorobenzidine															
3-Nitroaniline															
4,6-Dinitro-2-methylphenol															
4-Bromophenyl-phenylether															
4-Chloro-3-methylphenol							91		%rec	95		%rec			
4-Chloroaniline															
4-Chlorophenyl-phenylether															
4-Methylphenol															
4-Nitroaniline															
4-Nitrophenol							78		%rec	82		%rec			
Acenaphthene							92		%rec	96		%rec			

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	2-66B			2-66B			2-67A			2-67A			FIELDQC		
Sample ID:	A1591-MS			A1591-MSD			A1595-MS			A1595-MSD			A1012		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Acenaphthylene															
Anthracene															
Benzo(a)anthracene															
Benzo(a)pyrene															
Benzo(b)fluoranthene															
Benzo(g,h,i)perylene															
Benzo(k)fluoranthene															
Benzoic Acid															
Benzyl alcohol															
Butylbenzylphthalate															
Chrysene															
Di-n-butylphthalate															
Di-n-octylphthalate															
Dibenzo(a,h)anthracene															
Dibenzofuran															
Diethylphthalate															
Dimethylphthalate															
Fluoranthene															
Fluorene															
Hexachlorobenzene															
Hexachlorobutadiene															
Hexachlorocyclopentadiene															
Hexachloroethane															
Indeno(1,2,3-cd)pyrene															
Isophorone															
N-Nitroso-di-n-propylamine							72		%rec	74		%rec			
N-Nitrosodiphenylamine															
NITROBENZENE-D5							88		%rec	91		%rec			
Naphthalene															
Nitrobenzene															
Nitrobenzene-D5															

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	2-66B			2-66B			2-67A			2-67A			FIELDQC		
Sample ID:	A1591-MS			A1591-MSD			A1595-MS			A1595-MSD			A1012		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
PHENOL-D5							79		%rec	82		%rec			
Pentachlorophenol							110		%rec	109		%rec			
Phenanthrene															
Phenol							81		%rec	81		%rec			
Phenol-D5															
Pyrene							99		%rec	102		%rec			
TERPHENYL-D14							87		%rec	88		%rec			
Terphenyl-D14															
bis(2-Chloroethoxy)methane															
bis(2-Chloroethyl)ether															
bis(2-Chloroisopropyl)ethe															
bis(2-Ethylhexyl)phthalate															
Total Dissolved Solids							530		mg/l	550		mg/l			
Total Kjeldahl Nitrogen							117		%rec	118		%rec			
Total Organic Carbon							108		%rec	105		%rec			
Total Suspended Solids							16		mg/l	14		mg/l			
TPH - IR							95		%rec	100		%rec			
1,1,1-Trichloroethane													<5	U	ug/l
1,1,2,2-Tetrachloroethane													<5	U	ug/l
1,1,2-Trichloroethane													<5	U	ug/l
1,1-Dichloroethane													<5	U	ug/l
1,1-Dichloroethene	91		%rec	87		%rec							<5	U	ug/l
1,2-Dichloroethane													<5	U	ug/l
1,2-Dichloroethane-D4	99		%rec	96		%rec							96		%rec
1,2-Dichloropropane													<5	U	ug/l
2-Butanone													<100	U	ug/l
2-Chloroethylvinyl ether													<10	U	ug/l
2-Hexanone													<50	U	ug/l
4-Methyl-2-Pentanone													<50	U	ug/l
Acetone													<100	U	ug/l
Benzene	92		%rec	90		%rec							<5	U	ug/l

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	2-66B			2-66B			2-67A			2-67A			FIELDQC		
Sample ID:	A1591-MS			A1591-MSD			A1595-MS			A1595-MSD			A1012		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Bromodichloromethane													<5	U	ug/l
Bromofluorobenzene	99		%rec	99		%rec							90		%rec
Bromoform													<5	U	ug/l
Bromomethane													<10	U	ug/l
Carbon Disulfide													<5	U	ug/l
Carbon Tetrachloride													<5	U	ug/l
Chlorobenzene	100		%rec	99		%rec							<5	U	ug/l
Chlorodibromomethane															
Chloroethane													<10	U	ug/l
Chloroform													<5	U	ug/l
Chloromethane													<10	U	ug/l
Dibromochloromethane													<5	U	ug/l
Dichlorobromomethane															
Ethylbenzene													<5	U	ug/l
Methylene Chloride													7.0	JB	ug/l
Styrene													<5	U	ug/l
Tetrachloroethene													<5	U	ug/l
Toluene	98		%rec	95		%rec							<5	U	ug/l
Toluene-D8	107		%rec	107		%rec							91		%rec
Trichloroethene	90		%rec	86		%rec							<5	U	ug/l
Vinyl Acetate													<10	U	ug/l
Vinyl Chloride													<10	U	ug/l
Xylene (total)													<5	U	ug/l
Xylenes (total)															
cis 1,3 Dichloropropene													<5	U	ug/l
cis-1,2-Dichloroethene													<5	U	ug/l
trans 1,3-Dichloropropene													<5	U	ug/l
trans-1,2-Dichloroethene													<5	U	ug/l

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1013			A1018			A1024			A1035			A1041		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Alkalinity, Titrimetric															
Chemical Oxygen Demand															
Chloride by Ion Chrom.															
Nitrate and Nitrite															
Phenolics															
Silica															
Sulfate by Ion Chrom.															
Total Phosphorus															
Aluminum				<0.20	U	mg/l									
Arsenic - Graphite Furnace				<0.010	U	mg/l									
Barium				<0.20	U	mg/l									
Beryllium				<0.0050	U	mg/l									
Cadmium				<0.0050	U	mg/l									
Calcium															
Chromium				0.091		mg/l									
Chromium VI															
Copper				<0.025	U	mg/l									
Iron				2.1		mg/l									
Lead - Graphite Furnace				0.0077		mg/l									
Magnesium															
Manganese															
Mercury				<0.00020	U	mg/l									
Nickel				<0.040	U	mg/l									
Potassium															
Selenium															
Silver				<0.010	U	mg/l									
Sodium															
Zinc				<0.020	U	mg/l									
1,2,4-Trichlorobenzene															
1,2-Dichlorobenzene															
1,3-Dichlorobenzene															

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1013			A1018			A1024			A1035			A1041		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
1,4-Dichlorobenzene															
2,4,5-Trichlorophenol															
2,4,6-TRIBROMOPHENOL															
2,4,6-Tribromophenol															
2,4,6-Trichlorophenol															
2,4-Dichlorophenol															
2,4-Dimethylphenol															
2,4-Dinitrophenol															
2,4-Dinitrotoluene															
2,6-Dinitrotoluene															
2-Chloronaphthalene															
2-Chlorophenol															
2-FLUOROBIPHENYL															
2-FLUOROPHENOL															
2-Fluorobiphenyl															
2-Fluorophenol															
2-Methylnaphthalene															
2-Methylphenol															
2-Nitroaniline															
2-Nitrophenol															
3,3'-Dichlorobenzidine															
3-Nitroaniline															
4,6-Dinitro-2-methylphenol															
4-Bromophenyl-phenylether															
4-Chloro-3-methylphenol															
4-Chloroaniline															
4-Chlorophenyl-phenylether															
4-Methylphenol															
4-Nitroaniline															
4-Nitrophenol															
Acenaphthene															

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Analytical qc results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1013			A1018			A1024			A1035			A1041		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Acenaphthylene															
Anthracene															
Benzo(a)anthracene															
Benzo(a)pyrene															
Benzo(b)fluoranthene															
Benzo(g,h,i)perylene															
Benzo(k)fluoranthene															
Benzoic Acid															
Benzyl alcohol															
Butylbenzylphthalate															
Chrysene															
Di-n-butylphthalate															
Di-n-octylphthalate															
Dibenzo(a,h)anthracene															
Dibenzofuran															
Diethylphthalate															
Dimethylphthalate															
Fluoranthene															
Fluorene															
Hexachlorobenzene															
Hexachlorobutadiene															
Hexachlorocyclopentadiene															
Hexachloroethane															
Indeno(1,2,3-cd)pyrene															
Isophorone															
N-Nitroso-di-n-propylamine															
N-Nitrosodiphenylamine															
NITROBENZENE-D5															
Naphthalene															
Nitrobenzene															
Nitrobenzene-D5															

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1013			A1018			A1024			A1035			A1041		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
PHENOL-D5															
Pentachlorophenol															
Phenanthrene															
Phenol															
Phenol-D5															
Pyrene															
TERPHENYL-D14															
Terphenyl-D14															
bis(2-Chloroethoxy)methane															
bis(2-Chloroethyl)ether															
bis(2-Chloroisopropyl)ethe															
bis(2-Ethylhexyl)phthalate															
Total Dissolved Solids															
Total Kjeldahl Nitrogen															
Total Organic Carbon															
Total Suspended Solids															
TPH - IR				<1.0	U	mg/l									
1,1,1-Trichloroethane	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
1,1,2,2-Tetrachloroethane	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
1,1,2-Trichloroethane	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
1,1-Dichloroethane	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
1,1-Dichloroethene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
1,2-Dichloroethane	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
1,2-Dichloroethane-D4	102		%rec	101		%rec	96		%rec	102		%rec	103		%rec
1,2-Dichloropropane	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
2-Butanone	<100	U	ug/l	<100	U	ug/l	<100	U	ug/l	3.0	J	ug/l	<100	U	ug/l
2-Chloroethylvinyl ether	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l
2-Hexanone	<50	U	ug/l	<50	U	ug/l	<50	U	ug/l	<50	U	ug/l	<50	U	ug/l
4-Methyl-2-Pentanone	<50	U	ug/l	<50	U	ug/l	<50	U	ug/l	<50	U	ug/l	<50	U	ug/l
Acetone	<100	U	ug/l	<100	U	ug/l	<100	U	ug/l	<100	U	ug/l	<100	U	ug/l
Benzene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1013			A1018			A1024			A1035			A1041		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Bromodichloromethane															
Bromofluorobenzene	95		%rec	97		%rec	97		%rec	95		%rec	100		%rec
Bromoform	<5	U	ug/l	2.6	J	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Bromomethane	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l
Carbon Disulfide	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Carbon Tetrachloride	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Chlorobenzene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Chlorodibromomethane	<5	U	ug/l	9.3		ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Chloroethane	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l
Chloroform	<5	U	ug/l	3.2	J	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Chloromethane	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l
Dibromochloromethane															
Dichlorobromomethane	<5	U	ug/l	6.6		ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Ethylbenzene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Methylene Chloride	<10	U	ug/l	7.7	JB	ug/l	6.7	JB	ug/l	7.0	JB	ug/l	<10	U	ug/l
Styrene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Tetrachloroethene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Toluene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Toluene-D8	94		%rec	93		%rec	93		%rec	91		%rec	94		%rec
Trichloroethene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
Vinyl Acetate	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l
Vinyl Chloride	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l	<10	U	ug/l
Xylene (total)															
Xylenes (total)	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
cis 1,3 Dichloropropene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
cis-1,2-Dichloroethene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
trans 1,3-Dichloropropene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l
trans-1,2-Dichloroethene	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l	<5	U	ug/l

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1517			A1518			A1518-MS			A1518-MSD			A1523		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Alkalinity, Titrimetric															
Chemical Oxygen Demand															
Chloride by Ion Chrom.															
Nitrate and Nitrite															
Phenolics															
Silica															
Sulfate by Ion Chrom.															
Total Phosphorus															
Aluminum				<0.20	U	mg/l									
Arsenic - Graphite Furnace				<0.010	U	mg/l									
Barium				<0.20	U	mg/l									
Beryllium				<0.0050	U	mg/l									
Cadmium				<0.0050	U	mg/l									
Calcium															
Chromium				<0.010	U	mg/l									
Chromium VI				<0.010	U	mg/l									
Copper				<0.025	U	mg/l									
Iron				<0.10	U	mg/l									
Lead - Graphite Furnace				<0.0030	U	mg/l									
Magnesium															
Manganese															
Mercury				<0.00020	U	mg/l									
Nickel				<0.040	U	mg/l									
Potassium															
Selenium															
Silver				<0.010	U	mg/l									
Sodium															
Zinc				<0.020	U	mg/l									
1,2,4-Trichlorobenzene				<10	U	ug/l									
1,2-Dichlorobenzene				<10	U	ug/l									
1,3-Dichlorobenzene				<10	U	ug/l									

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Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1517			A1518			A1518-MS			A1518-MSD			A1523		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
1,4-Dichlorobenzene				1.7	JB	ug/l									
2,4,5-Trichlorophenol				<10	U	ug/l									
2,4,6-TRIBROMOPHENOL															
2,4,6-Tribromophenol				65		%rec									
2,4,6-Trichlorophenol				<10	U	ug/l									
2,4-Dichlorophenol				<10	U	ug/l									
2,4-Dimethylphenol				<10	U	ug/l									
2,4-Dinitrophenol				<25	U	ug/l									
2,4-Dinitrotoluene				<10	U	ug/l									
2,6-Dinitrotoluene				<10	U	ug/l									
2-Chloronaphthalene				<10	U	ug/l									
2-Chlorophenol				<10	U	ug/l									
2-FLUOROBIPHENYL															
2-FLUOROPHENOL															
2-Fluorobiphenyl				48		%rec									
2-Fluorophenol				48		%rec									
2-Methylnaphthalene				<10	U	ug/l									
2-Methylphenol				<10	U	ug/l									
2-Nitroaniline				<25	U	ug/l									
2-Nitrophenol				<10	U	ug/l									
3,3'-Dichlorobenzidine				<10	U	ug/l									
3-Nitroaniline				<25	U	ug/l									
4,6-Dinitro-2-methylphenol				<25	U	ug/l									
4-Bromophenyl-phenylether				<10	U	ug/l									
4-Chloro-3-methylphenol				<10	U	ug/l									
4-Chloroaniline				<10	U	ug/l									
4-Chlorophenyl-phenylether				<10	U	ug/l									
4-Methylphenol				<10	U	ug/l									
4-Nitroaniline				<10	U	ug/l									
4-Nitrophenol				<25	U	ug/l									
Acenaphthene				<10	U	ug/l									

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Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1517			A1518			A1518-MS			A1518-MSD			A1523		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Acenaphthylene				<10	U	ug/l									
Anthracene				<10	U	ug/l									
Benzo(a)anthracene				<10	U	ug/l									
Benzo(a)pyrene				<10	U	ug/l									
Benzo(b)fluoranthene				<10	U	ug/l									
Benzo(g,h,i)perylene				<10	U	ug/l									
Benzo(k)fluoranthene				<10	U	ug/l									
Benzoic Acid				<10	U	ug/l									
Benzyl alcohol				<10	U	ug/l									
Butylbenzylphthalate				<10	U	ug/l									
Chrysene				<10	U	ug/l									
Di-n-butylphthalate				<10	U	ug/l									
Di-n-octylphthalate				<10	U	ug/l									
Dibenzo(a,h)anthracene				<10	U	ug/l									
Dibenzofuran				<10	U	ug/l									
Diethylphthalate				<10	U	ug/l									
Dimethylphthalate				<10	U	ug/l									
Fluoranthene				<10	U	ug/l									
Fluorene				<10	U	ug/l									
Hexachlorobenzene				<10	U	ug/l									
Hexachlorobutadiene				<10	U	ug/l									
Hexachlorocyclopentadiene				<10	U	ug/l									
Hexachloroethane				<10	U	ug/l									
Indeno(1,2,3-cd)pyrene				<10	U	ug/l									
Isophorone				<10	U	ug/l									
N-Nitroso-di-n-propylamine				<10	U	ug/l									
N-Nitrosodiphenylamine				<10	U	ug/l									
NITROBENZENE-D5															
Naphthalene				<10	U	ug/l									
Nitrobenzene				<10	U	ug/l									
Nitrobenzene-D5				36		%rec									

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Analytical QC results at the SDB
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Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1517			A1518			A1518-MS			A1518-MSD			A1523		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
PHENOL-D5															
Pentachlorophenol				<25	U	ug/l									
Phenanthrene				<10	U	ug/l									
Phenol				<10	U	ug/l									
Phenol-D5				42		%rec									
Pyrene				<10	U	ug/l									
TERPHENYL-D14															
Terphenyl-D14				87		%rec									
bis(2-Chloroethoxy)methane				<10	U	ug/l									
bis(2-Chloroethyl)ether				<10	U	ug/l									
bis(2-Chloroisopropyl)ethe				<10	U	ug/l									
bis(2-Ethylhexyl)phthalate				5.4	JB	ug/l									
Total Dissolved Solids															
Total Kjeldahl Nitrogen															
Total Organic Carbon															
Total Suspended Solids															
TPH - IR															
1,1,1-Trichloroethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
1,1,2,2-Tetrachloroethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
1,1,2-Trichloroethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
1,1-Dichloroethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
1,1-Dichloroethene	<5	U	ug/l	<5	U	ug/l	119		ug/kg	117		rec	<5	U	ug/l
1,2-Dichloroethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
1,2-Dichloroethane-D4	103		%rec	100		%rec	101		%rec	100		%rec	98		%rec
1,2-Dichloropropane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
2-Butanone	<100	U	ug/l	<100	U	ug/l							<100	U	ug/l
2-Chloroethylvinyl ether	<10	U	ug/l	<10	U	ug/l							<10	U	ug/l
2-Hexanone	<50	U	ug/l	<50	U	ug/l							<50	U	ug/l
4-Methyl-2-Pentanone	<50	U	ug/l	<50	U	ug/l							<50	U	ug/l
Acetone	<100	U	ug/l	<100	U	ug/l							<100	U	ug/l
Benzene	<5	U	ug/l	<5	U	ug/l	109		ug/kg	109		rec	<5	U	ug/l

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Analytical QC results at the SDB
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Tinker Air Force Base

Well/Boring:	FIELDQC			FIELDQC			FIELDQC			FIELDQC			FIELDQC		
Sample ID:	A1517			A1518			A1518-MS			A1518-MSD			A1523		
Depth:	0 - 0			0 - 0			0 - 0			0 - 0			0 - 0		
Parameters	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units	Result	QFR	Units
Bromodichloromethane															
Bromofluorobenzene	96		%rec	103		%rec	105		%rec	105		%rec	104		%rec
Bromoform	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Bromomethane	<10	U	ug/l	<10	U	ug/l							<10	U	ug/l
Carbon Disulfide	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Carbon Tetrachloride	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Chlorobenzene	<5	U	ug/l	<5	U	ug/l	102		ug/kg	104		rec	<5	U	ug/l
Chlorodibromomethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Chloroethane	<10	U	ug/l	<10	U	ug/l							<10	U	ug/l
Chloroform	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Chloromethane	<10	U	ug/l	<10	U	ug/l							<10	U	ug/l
Dibromochloromethane															
Dichlorobromomethane	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Ethylbenzene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Methylene Chloride	<10	U	ug/l	3.9	J	ug/l							<10	U	ug/l
Styrene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Tetrachloroethene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
Toluene	<5	U	ug/l	<5	U	ug/l	100		ug/kg	102		rec	<5	U	ug/l
Toluene-D8	93		%rec	93		%rec	95		%rec	95		%rec	94		%rec
Trichloroethene	<5	U	ug/l	<5	U	ug/l	105		ug/kg	107		rec	<5	U	ug/l
Vinyl Acetate	<10	U	ug/l	<10	U	ug/l							<10	U	ug/l
Vinyl Chloride	<10	U	ug/l	<10	U	ug/l							<10	U	ug/l
Xylene (total)															
Xylenes (total)	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
cis 1,3 Dichloropropene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
cis-1,2-Dichloroethene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
trans 1,3-Dichloropropene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l
trans-1,2-Dichloroethene	<5	U	ug/l	<5	U	ug/l							<5	U	ug/l

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Analytical QC results at the SDB
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Well/Boring:	FIELDQC		
Sample ID:	A1598		
Depth:	0 - 0		
Parameters	Result	QFR	Units
Alkalinity, Titrimetric			
Chemical Oxygen Demand			
Chloride by Ion Chrom.			
Nitrate and Nitrite			
Phenolics			
Silica			
Sulfate by Ion Chrom.			
Total Phosphorus			
Aluminum			
Arsenic - Graphite Furnace			
Barium			
Beryllium			
Cadmium			
Calcium			
Chromium			
Chromium VI			
Copper			
Iron			
Lead - Graphite Furnace			
Magnesium			
Manganese			
Mercury			
Nickel			
Potassium			
Selenium			
Silver			
Sodium			
Zinc			
1,2,4-Trichlorobenzene			
1,2-Dichlorobenzene			
1,3-Dichlorobenzene			

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Well/Boring:	FIELDQC		
Sample ID:	A1598		
Depth:	0 - 0		
Parameters	Result	QFR	Units
1,4-Dichlorobenzene			
2,4,5-Trichlorophenol			
2,4,6-TRIBROMOPHENOL			
2,4,6-Tribromophenol			
2,4,6-Trichlorophenol			
2,4-Dichlorophenol			
2,4-Dimethylphenol			
2,4-Dinitrophenol			
2,4-Dinitrotoluene			
2,6-Dinitrotoluene			
2-Chloronaphthalene			
2-Chlorophenol			
2-FLUOROBIPHENYL			
2-FLUOROPHENOL			
2-Fluorobiphenyl			
2-Fluorophenol			
2-Methylnaphthalene			
2-Methylphenol			
2-Nitroaniline			
2-Nitrophenol			
3,3'-Dichlorobenzidine			
3-Nitroaniline			
4,6-Dinitro-2-methylphenol			
4-Bromophenyl-phenylether			
4-Chloro-3-methylphenol			
4-Chloroaniline			
4-Chlorophenyl-phenylether			
4-Methylphenol			
4-Nitroaniline			
4-Nitrophenol			
Acenaphthene			

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Analytical data has not been validated.

Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Well/Boring:	FIELDQC		
Sample ID:	A1598		
Depth:	0 - 0		
Parameters	Result	QFR	Units
Acenaphthylene			
Anthracene			
Benzo(a)anthracene			
Benzo(a)pyrene			
Benzo(b)fluoranthene			
Benzo(g,h,i)perylene			
Benzo(k)fluoranthene			
Benzoic Acid			
Benzyl alcohol			
Butylbenzylphthalate			
Chrysene			
Di-n-butylphthalate			
Di-n-octylphthalate			
Dibenzo(a,h)anthracene			
Dibenzofuran			
Diethylphthalate			
Dimethylphthalate			
Fluoranthene			
Fluorene			
Hexachlorobenzene			
Hexachlorobutadiene			
Hexachlorocyclopentadiene			
Hexachloroethane			
Indeno(1,2,3-cd)pyrene			
Isophorone			
N-Nitroso-di-n-propylamine			
N-Nitrosodiphenylamine			
NITROBENZENE-D5			
Naphthalene			
Nitrobenzene			
Nitrobenzene-D5			

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Parameters	Result	QFR	Units
Well/Boring:	FIELDQC		
Sample ID:	A1598		
Depth:	0 - 0		
PHENOL-D5			
Pentachlorophenol			
Phenanthrene			
Phenol			
Phenol-D5			
Pyrene			
TERPHENYL-D14			
Terphenyl-D14			
bis(2-Chloroethoxy)methane			
bis(2-Chloroethyl)ether			
bis(2-Chloroisopropyl)ethe			
bis(2-Ethylhexyl)phthalate			
Total Dissolved Solids			
Total Kjeldahl Nitrogen			
Total Organic Carbon			
Total Suspended Solids			
TPH - IR			
1,1,1-Trichloroethane	<5	U	ug/l
1,1,2,2-Tetrachloroethane	<5	U	ug/l
1,1,2-Trichloroethane	<5	U	ug/l
1,1-Dichloroethane	<5	U	ug/l
1,1-Dichloroethene	<5	U	ug/l
1,2-Dichloroethane	<5	U	ug/l
1,2-Dichloroethane-D4	106		%rec
1,2-Dichloropropane	<5	U	ug/l
2-Butanone	<100	U	ug/l
2-Chloroethylvinyl ether	<10	U	ug/l
2-Hexanone	<50	U	ug/l
4-Methyl-2-Pentanone	<50	U	ug/l
Acetone	<100	U	ug/l
Benzene	<5	U	ug/l

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Analytical QC results at the SDB
for WQ
Tinker Air Force Base

Parameters	Result	QFR	Units
Well/Boring:	FIELDQC		
Sample ID:	A1598		
Depth:	0 - 0		
Bromodichloromethane			
Bromofluorobenzene	99		%rec
Bromoform	<5	U	ug/l
Bromomethane	<10	U	ug/l
Carbon Disulfide	<5	U	ug/l
Carbon Tetrachloride	<5	U	ug/l
Chlorobenzene	<5	U	ug/l
Chlorodibromomethane	<5	U	ug/l
Chloroethane	<10	U	ug/l
Chloroform	<5	U	ug/l
Chloromethane	<10	U	ug/l
Dibromochloromethane			
Dichlorobromomethane	<5	U	ug/l
Ethylbenzene	<5	U	ug/l
Methylene Chloride	<10	U	ug/l
Styrene	<5	U	ug/l
Tetrachloroethene	<5	U	ug/l
Toluene	<5	U	ug/l
Toluene-D8	97		%rec
Trichloroethene	<5	U	ug/l
Vinyl Acetate	<10	U	ug/l
Vinyl Chloride	<10	U	ug/l
Xylene (total)			
Xylenes (total)	<5	U	ug/l
cis 1,3 Dichloropropene	<5	U	ug/l
cis-1,2-Dichloroethene	<5	U	ug/l
trans 1,3-Dichloropropene	<5	U	ug/l
trans-1,2-Dichloroethene	<5	U	ug/l

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