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FINAL RCRA FACILITY INVESTIGATION FOR SOLID WASTE MANAGEMENT UNITS 5, 6, 12, 31 AND 61 VOLUME 1 OF 2 WITH ATTACHED RESPONSE TO COMMENTS NAS FORT WORTH TX

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NAVAL AIR STATION FORT WORTH JRB CARSWELL FIELD TEXAS

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FINAL

RCRA Facility Investigation Report

SWMUs 5, 6, 12, 31, and 61

Naval Air Station Fort Worth
Joint Reserve Base, TX

VOLUME 1 of 2

Prepared for
Air Force Center for Environmental Excellence
Brooks Air Force Base, TX

Contract No. F41624-00-D-8032

June 2002

DEPARTMENT OF THE AIR FORCE
HEADQUARTERS AIR FORCE CENTER FOR ENVIRONMENTAL EXCELLENCE
BROOKS AIR FORCE BASE TEXAS

20 June 2002

MEMORANDUM FOR RAY RISNER (TNRCC)

FROM: HQ AFCEE/ERD
P.O. Box 27008
Fort Worth, Texas 76127-0008

SUBJECT: Naval Air Station Joint Reserve Base
Formerly Carswell AFB
TNRCC Solid Waste Registration No. 65004
TNRCC Hazardous Waste Permit No. HW-50289
Final RCRA Facility Investigation Report,
Solid Waste Management Unit 5, 6, 12, 31, and 61

Dear Mr. Risner,

Two copies (one original and one copy) of the Final RCRA Facility Investigation Report for Solid Waste Management Units 5, 6, 12, 31 and 61 are enclosed for your review per the TNRCC RCRA permit No. HW50289 for NAS Fort Worth JRB. Additional copies of the Final Report are also being sent to the TNRCC Region 4 Office and to EPA Region 6. This RFI report summarizes historical and recent environmental investigations and interim remedial actions performed as part of the completed RFI. The report provides evidence for, and recommended closure of soil media under Risk Reduction Standards No. 2 of the TRNCC Risk Reduction Rules Program.

Should you have any questions regarding this submission, please contact me at (817) 782-7167.

Sincerely,

Michael R Dodyk

Michael R. Dodyk, P.E.
Restoration Team Chief
NAS Ft. Worth JRB

Printed on Recycled Paper

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Responses to Review Comments

Document Reviewed: Draft RCRA Facility Investigation Report (RFI), Solid Waste Management Units (SWMUs) 5, 6, 12, 31, and 61, Naval Air Station Fort Worth, Joint Reserve Base, Texas, Contract No. F4164-00-D-8032, Delivery Order No. 0009.

Responses to Mike Dodyk's Comments

Comment 1. It is requested that in Appendix H for the deed restrictions, Mike Dodyk's name replace Don Ficklen's name. Mike Dodyk has ready access to a notary on base so it would simplify matters.

Response 1. This change has been made as requested.

Responses to Booz-Allen Hamilton's Comments

General Comment

This document is clearly written and contains the necessary elements of an RFI report.

Specific Comments

Comment 1. Please add tabs to separate the sections of the report.

Response 1. This change has been made as requested.

Comment 2. Page 1-1, Section 1.0 1st paragraph, 1st sentence. Insert "and" between "JRB" and "was formerly known as."

Response 2. The first two sentences have been combined and modified as follows: "The Texas Natural Resource Conservation Commission (TNRCC) requested that the U. S. Air Force (USAF) investigate solid waste management units (SWMUs) located at Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), which was formerly known as Carswell Air Force Base (AFB), in Fort Worth, Texas."

Comment 3. Page 1-1, Section 1.0. 1st paragraph. The second half of the paragraph appears to be more of a results summary than an introduction and may not be appropriate here. Please consider revising the paragraph.

Response 3. The summary text included in the introduction has been presented in order to set the stage for the data discussed later in the report and supports subsequent conclusions. As a result, no changes have been made to the document.

Comment 4. Page 1-1, Section 1.0 1st paragraph, 2nd sentence. Change "an" to "a."

Response 4. This change has been made as requested.

Comment 5. Page 1-1, Section 1.1. 1st paragraph. The first sentence of the paragraph states that the land has been transferred from the Air Force to the Navy. The next sentence says, "Before complete property transfer can be accomplished, required environmental investigations...are to be completed and contaminated sites remediated." Please clarify.

Response 5. The text in this paragraph has been revised to state "Management responsibilities of a parcel of the former base, now known as NAS Fort Worth JRB have been transferred from the USAF to the Navy. However, before complete property transfer can be accomplished, required environmental investigations of potential contamination related to USAF activities occurring prior to September 30, 1993 on NAS Fort Worth JRB property are to be completed, and contaminated sites remediated. Once the previously identified environmental sites are officially closed, official property transfer can be completed."

Comment 6. Page 1-2, Section 1.1. After the first partial sentence on the page, insert "The IRAs were required in order to address surface soil contamination that exceeded RRS 2 cleanup levels " Also, please state at which of the Solid Waste Management Units (SWMUs) an Interim Remedial Action (IRA) was conducted

Response 6. The text was revised to state, "The IRAs were required in order to address soil contamination that exceeded RRS 2 levels at SWMUs 12, 31, and 61."

Comment 7. Page 1-3, Section 1.2.1. 4th paragraph on the page, 1st sentence. Delete "fractions of."

Response 7. This change has been made as requested.

Comment 8. Page 1-6, Section 1.3.2. The discussion of the Risk Reduction Standards (RRSs) is rather brief. Consider providing a more detailed description of the RRSs, including requirements for deed certification, and the relationship between RRS levels and planned future use.

Response 8. Section 1.3.2 has been revised to include the requested information and is included as "Attachment A" presented with these responses to comments.

Comment 9. Page 1-6, Section 1.3.2. 2nd paragraph, 1st sentence. Insert "in soil samples" between "analytes" and "were." Delete "at a site." Change "RRS 1 value" to "and RRS 2 values" and delete everything after "value."

Response 9. The sentence has been modified to read, "In some instances during the RFI, analytes in soil samples were detected above both the RRS 1 and 2 values "

Comment 10. Page 1-6, Section 1.3.2. 2nd paragraph, last sentence. Reword the sentence to indicate that the Media Specific Concentration (MSC) was set to the value of the highest detection for which the Synthetic Precipitation Leaching Procedure (SPLP) leachate was below the groundwater value. The fourth paragraph of Section 4.0 also uses better wording.

Response 10. The last sentence has been changed to read, "The site-specific MSC was set to the value of the highest soil detection for which the SPLP extract concentration was below the groundwater MSC."

Comment 11. Page 1-6, Section 1.4. 3rd paragraph, last sentence. Provide greater detail as to why intrusive sampling (below the floor) was not done.

Response 11. The following text was inserted at the end of the paragraph: "Intrusive sampling within or below the storage sheds was not conducted during Phase I of the RFI in order to avoid potentially damaging the integrity of the sheds." This rationale was presented in the RFI Work Plans and was agreed upon by the TNRCC before the start of intrusive RFI activities at each site (HydroGeoLogic, 1999). Had significant soil contamination been detected directly adjacent to a shed wall during the initial RFI effort, a more intrusive investigation below a storage shed would have been conducted during subsequent phases of the RFI.

Comment 12. Page 1-6, Section 1.4. 4th paragraph, 2nd sentence. The end of the sentence should be revised to conform to the verbiage used in the conclusions. Specifically, the text should state that contaminants of concern were delineated to RRS 1 or decreasing concentrations. Also, provide a brief discussion of the regulations that allow delineation to "decreasing concentrations."

Response 12. The third sentence was modified to state, "...delineate specific contaminants of concern (CoCs) to RRS 1 or decreasing concentrations." Although not specifically stated in the regulations,

delineating to decreasing concentrations was deemed acceptable by the TNRCC regulator during discussions at project meetings for NAS Fort Worth JRB providing that the deed certification boundary was placed at an approved distance beyond the point of the decreasing sample concentration.

Comment 13. Page 1-6, Section 1 4 4th paragraph, 4th sentence. Provide a discussion of the factors which would trigger an IRA.

Response 13. The following sentence was inserted into the paragraph to read: "If concentrations were confirmed above RRS 2, IRAs were performed to remove RRS 3 concentrations in order to obtain site closure under RRS 1 or RRS 2."

Comment 14. Page 1-6, Section 1.4. 5th paragraph, 1st sentence. Please state at which SWMUs the monitoring wells were installed.

Response 14. The first sentence was modified as follows: "Groundwater characterization activities were conducted at SWMUs 5, 6, 12, and 61 as follows." The second sentence was changed to "During Phase II of the RFI, one monitoring well was installed at SWMU 12 and two monitoring wells were installed at SWMU 61 using a hollow stem auger (HSA) "

Comment 15. Page 1-7, Section 1.4. 3rd sentence on the page. Please state the number of "additional rounds" of sampling that were conducted.

Response 15. This change has been made as follows "During Phase III of the RFI, two additional monitoring wells were installed at SWMU 12. Two additional rounds of groundwater sampling were conducted at SWMUs 12 and 61, and one additional round of groundwater sampling was conducted at SWMUs 5 and 6. Groundwater sampling activities conducted at each site are provided in detail in Section 3.0."

Comment 16. Page 3-1, Section 3.2. This section presents results from the current RFI along with those from previous investigations. Consider moving results from the current RFI to Section 4.0.

Response 16. Section 3.0 presents the results of previous investigations conducted nearby or in association with the sites presented in this RFI. Section 3 0 also includes a discussion of the activities conducted directly in association with this RFI. Only the results directly associated with specific RFI activities are presented in Section 4.0. As a result, this change was not made.

Comment 17. Page 3-3, Section 3.2 1.2. 5th paragraph, 1st sentence. If appropriate, state whether ENSR Corporation got state approval prior to using Oxygen Releasing Compound (ORC). Also, provide an explanation of the effectiveness of the ORC injection.

Response 17. The LPST site investigation and subsequent ORC injection was conducted under the direction of the U.S. Navy under the oversight of the TNRCC Petroleum Storage Tank (PST) division. Limited information about the LPST site is included in the RFI report for background purposes only, in order to inform the regulators of a documented release of petroleum compounds adjacent to, but not associated with, SWMUs 5 and 6. Effectiveness of the ORC injection at the adjacent site is not relevant to this RFI and was not included in the report.

Comment 18. Page 3-3, Section 3.2.1.2. Provide additional detail concerning the Leaking Petroleum Storage Tank (LPST), including any LPST related submittals, follow up work, etc.

Response 18. See response to Comment 17 above.

Comment 19. Page 3-8, Section 3.2.2.6 1st paragraph, 6th sentence. Change "RRS 1" to "RRS 2." Also, consider revising the paragraph to include a discussion of options available if floor or sidewall samples were found above RRS 2, as was done in section 3.2.4.6.

Response 19. RRS 1 was changed to RRS 2 in the sixth sentence as suggested. During excavation activities when samples results exceeded RRS 2 additional samples were collected in incremental steps outward until concentrations were detected below RRS 2. Therefore, the text in Section 3.2 2.6 is correct. However, the text in Section 3.2.4.6 will be revised to reflect this.

Comment 20. Page 3-16, Section 3.4. 6th paragraph, 1st sentence Describe when a Baseline Risk Assessment would be required.

Response 20. A Baseline Risk Assessment is not part of the RRS 2 process, therefore the sentence has been modified as follows: "A BLRA is not required by Chapter 335, Subchapter S of the TNRCC Risk Reduction Rules for closures under RRS 2, but is required for all closures under RRS 3."

Comment 21. Page 3-16, Section 3.4. 6th paragraph. Discuss the deed recordation requirement for RRS 2 and RRS 3 closures.

Response 21. A discussion of the deed recordation requirements has been added to Section 1.3.2, which has been revised per the response to Comment 8 and included with these responses to comments as "Attachment A". The following reference was added after the first sentence in the sixth paragraph of Section 3.4 to read: "The deed recordation requirements for closure under all RRS are discussed in detail in Section 1.3.2."

Comment 22. Page 4-1, Section 4.0. 3rd paragraph. Please provide more detail about SPLP, especially regarding "normal rainfall" and "acidic rain mixtures."

Response 22. The paragraph in Section 4.0 has been modified as follows:

"The SPLP extraction is used where the leaching potential from soil to groundwater due to the infiltration of rainfall is to be determined for a contaminant. Analytical results from SPLP extracts indicate the maximum leaching potential of a target analyte under laboratory conditions that simulate the effects of time and weather on the sample. SPLP is useful in those situations where a determination must be made whether or not a potentially contaminated material, if left in situ, will leach toxic substances when exposed to normal weathering. Instead of simulating landfill leachate using dilute acetic acid, as is used in the Toxicity Characteristic Leaching Procedure (TCLP), SPLP uses dilute nitric and sulfuric acids in an effort to simulate acidic rain mixtures resulting from airborne nitric and sulfuric oxides, which is more characteristic of the site conditions involved with these surface units. Note that due to instrumentation limitations, the SPLP leaching solution used for VOCs is reagent water; reagent water is also used for SPLP leaching of cyanide in order to prevent the evolution of hydrogen cyanide gas. To perform SPLP extraction, an aliquot of sample is mixed with the appropriate leaching fluid for 16–20 hours and then filtered. A special apparatus is used to minimize volatilization when VOCs are to be analyzed. Once a filtered leachate has been obtained, it is analyzed as a water sample by the appropriate method to determine the presence and concentration of specific contaminants."

Comment 23. Page 4-20, Section 4.3.6. Provide a more detailed explanation of the rationale behind not conducting a groundwater investigation.

Response 23. The text in Section 4.3.6 was modified as follows: "Based on the results of the Phase I soil investigation conducted at SWMU 31, evidence of a release at the site was limited to the surface soils only. No contamination attributed to SWMU 31 was identified in the samples collected from the 5-, 10-, or 15-foot intervals at the site. As a result, a groundwater investigation at SWMU 31 was not conducted."

Comment 24. Page 5-3, Section 5.1.3. Arsenic bullet, 5th sentence. Discuss whether the Texas Natural Resource Conservation Commission has accepted this chemistry explanation for this or any other location.

Response 24. The chemistry information presented as part of the discussion of sporadic arsenic concentrations in groundwater samples associated with SWMUs 5 and 6 has not been presented previously to TNRCC regarding sites at NAS Fort Worth JRB. This information was cited in a 1998 U.S. EPA publication entitled, "Monitored Natural Attenuation for Groundwater" and in a 1998 Technical Regulatory Guideline published by the Interstate Technology Regulatory Cooperation (IRTC) titled "Natural Attenuation of Chlorinated Solvents in Groundwater: Principles and Practices." Both of these documents are cited as references to this RFI Report. Similar chemistry discussions using these references are planned for RFI Reports currently being prepared for submittal to TNRCC in the near future.

Comment 25. Figures. Consider moving some or all of the figures into the body of the report.

Response 25. The figures will be moved to the end of their associated section, behind each section tab as suggested in Comment 1 above.

Attachment A (Response to Comment 8)

1.3.2 Risk Reduction Standards

In Subchapter S of the Risk Reduction Rules, the TNRCC has developed a series of three standards by which closure of RCRA sites may be obtained. General procedures for determining these standards have been based on scientific principals so that specific numeric cleanup levels can be generated. The cleanup levels are specified for different types of contaminated media such as air, surface water, groundwater, and soil, and for cross-media contamination pathways such as soil to groundwater and soil to air. The RRSs are designed to assure adequate protection of human health and the environment from potential exposure to contaminants associated with releases from permitted units.

A general overview of closure requirements under each of the three RRSs is provided below.

RRS 1: Closure/Remediation to Background – A RRS 1 closure is appropriate when it is established that the subject site is unaffected by past or present waste disposal practices. Attainment of a RRS 1 closure is demonstrated by sufficient sample collection and analysis to indicate that media contaminant concentrations are below the applicable RRS 1 values. In accordance with TNRCC Risk Reduction Rules, RRS 1 values are set at background concentrations for inorganic compounds or the method quantification limit (MQL) for organic compounds.

RRS 2: Closure/Remediation to Health-Based Standards and Criteria – A RRS 2 closure is appropriate when it is established that the subject site does not contain contaminant concentrations greater than RRS 2 Medium-Specific Concentrations (MSCs) or background values in any contaminated media of concern. In addition, contamination must be delineated to RRS 1 concentrations. Attainment of a RRS 2 closure is demonstrated by sufficient sample collection and analysis from the contaminated media of concern using the procedures outlined in Subchapter S of the TNRCC Risk Reduction Rules and the TNRCC Interoffice Memorandum. A document stating the responsible persons intention to fulfill deed certification requirements outlined in subsection 335.560 of the Risk Reduction Rules, Subchapter S must also be prepared and approved.

RRS 3: Closure/Remediation with Controls – If contaminant concentrations at a site exceed the RRS 2 values, a RRS 3 closure may be granted when the responsible party recommends a remedy to control contaminated media of concern that best achieves the requirements outlined in Subchapter S of the Risk Reduction Rules and the TNRCC Interoffice Memorandum. This remedy must be approved by the TNRCC executive director, and following approval the responsible party must subsequently complete the remedy, submit the final report, initiate post closure care, and complete the deed recordation requirements outlined in Subchapter S of the Risk Reduction Rules.

The primary emphasis of this investigation is to meet the requirements of Permit Provision VIII of the NAS Fort Worth HW-50289 permit. The NAS Fort Worth JRB is not a listed National Priority List (NPL) site. However, as the IRP, TNRCC RRS, and RCRA rely heavily on guidance documents prepared under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), this RFI has been performed and the report prepared using guidance documents from all four programs.

To determine if a release has occurred at any of the SWMUs, the results from samples collected from the sites were compared to predetermined RRS 1 values. For metals, the RRS 1 values were obtained from the base-specific background values for groundwater, surface soils, and subsurface soils as presented in the Final Basewide Background Study (Jacobs, 1998). For organic analytes, RRS 1 values were determined using compound-specific MQLs, as defined in the TNRCC Interoffice Consistency Memorandum (TNRCC, 1998a) and its Erratum Sheet (TNRCC, 1998b).

The Texas Risk Reduction Rules (30 TAC §335 Subchapter S) require that any analytes detected at concentrations above the applicable RRS 1 value be compared to available MSCs The MSCs presented in tabular form in 30 TAC §335.368 are used to determine if detected contaminants pose a threat to human health or to shallow groundwater Based on the anticipated future site uses and practices at SWMUs 5, 6, 12, 31, and 61, the RRS 2 values used for these SWMUs were the groundwater MSCs for industrial use and the soil MSCs for industrial use based on groundwater protection. Note that no MSC has been established for total petroleum hydrocarbons (TPH). The RRS 2 value used for TPH was derived from the TNRCC action level for coarse-grained soils from the Petroleum Storage Tank (PST) Division (TNRCC, 1996a).

In some instances during the RFI, analytes in soil samples were detected at a site above both the RRS 1 and RRS 2 values. In selected cases, the Synthetic Precipitation Leaching Procedure (SPLP) was performed on aliquots of the affected samples, and the resulting extracts were analyzed. If all results for SPLP extracts at a site were below the industrial groundwater MSC, a site-specific soil MSC for groundwater protection was developed for that analyte. The site-specific MSC was set to the value of the highest soil detection for which the SPLP extract was below the groundwater MSC.

FINAL

RCRA Facility Investigation Report

SWMUs 5, 6, 12, 31, and 61

Naval Air Station Fort Worth Joint Reserve Base, TX

Contract No. F41624-00-D-8032
Delivery Order No. 0009

Prepared for
Air Force Center for Environmental Excellence
Brooks Air Force Base, TX

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June 2002

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13 ABSTRACT (Maximum 200 words)

The Final RCRA Facility Investigation Report for SWMUs 5, 6, 12, 31, and 61 describes the investigations, activities, and/or interim removal actions as required for site closure under TNRCC RRS program.

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Preface

This document contains the Final Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) Report for solid waste management units (SWMUs) 5, 6, 12, 31, and 61 at the Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), Texas.

HydroGeoLogic, Inc (HydroGeoLogic) prepared this report for Ellis Environmental Group, LC (EEG), under contract to the U.S. Air Force (USAF) Center for Environmental Excellence (AFCEE), Contract No. F41624-00-D-8032, Delivery Order No. 0009, in support of the Air Force Installation Restoration Program (IRP).

Responsible key EEG personnel are as follows:
Rich Wheeler, P.E., Assistant Program Manager
Rick Levin, P.G., Project Manager

This contract will be administered by the Defense Contract Management Command (DCMC), 9549 Koger Blvd., Gadsen Bldg., Suite 200, St. Petersburg, FL 33702-2455. The Contracting Officer is Mr. Cliff Trimble. The Contracting Officer's Representative is Mr. Don Ficklen (210/536-5290), representing the AFCEE Environmental Restoration Division (ERD), located at Headquarters AFCEE, 3207 Sidney Brooks, Brooks Air Force Base (AFB), Texas 78235-5363.

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Abbreviations & Acronyms

°F	degrees Fahrenheit
1,1-DCE	1,1-Dichloroethene
AFB	Air Force Base
AFCEE	U.S. Air Force Center for Environmental Excellence
AFP 4	Air Force Plant 4
AGE	aerospace ground equipment
AOC	area of concern
ASTM	American Society for Testing and Materials
bgs	below ground surface
BLRA	baseline risk assessment
BTEX	benzene, toluene, ethylbenzene, and xylenes
CFR	Code of Federal Regulations
cis-1,2-DCE	*cis*-1,2-Dichloroethene
cm/sec	centimeters per second
CoC	contaminant of concern
CSM	conceptual site model
DCMC	Defense Contract Management Command
DPT	direct push technology
DQE	data quality evaluation
DQO	date quality objective
DRMO	Defense Reutilization and Marketing Office
EDD	electronic data deliverable
EDS	Environmental Data Services, Inc.
EEG	Ellis Environmental Group, LC
ERA	Environmental Restoration Account
ERD	Environmental Restoration Division
ERPIMS	Environmental Resources Program Information Management System
ESE	Environmental Science and Engineering, Inc.
ft/d	feet per day
gpd/ft^2	gallons per day per square foot
HSA	hollow-stem auger
HW	hazardous waste
IRA	Interim Remedial Action
IRP	Installation Restoration Program
IT	International Technologies Corporation
JP-4	jet propulsion (grade-4) fuel
JRB	Joint Reserve Base
LCS	laboratory control samples
LPST	leaking petroleum storage tank
LSA	Limited Site Assessment
MEK	methyl ethyl ketone
mg/kg	milligrams per kilogram
mg/L	milligrams per liter

MQL	method quantitation limit
MS/MSD	matrix spike/matrix spike duplicate
MSC	medium-specific concentration
MTBE	methyl tertiary butyl ether
NAS	Naval Air Station
NFA	no further action
NGVD	National Geodetic Vertical Datum
NPDES	National Pollution Discharge Elimination System
OVM	organic vapor monitor
OWS	oil/water separator
PAH	polynuclear aromatic hydrocarbon
PD-680	petroleum naphtha
PHC	petroleum hydrocarbons
PQL	practical quantitation limit
PST	petroleum storage tank
QA	quality assurance
QAPP	quality assurance project plan
QC	quality control
RCRA	Resource Conservation and Recovery Act
RFA	RCRA Facility Assessment
RFI	RCRA Facility Investigation
RRS	Risk Reduction Standard
SDG	sample delivery group
SPLP	Synthetic Precipitation Leaching Procedure
SVOC	semivolatile organic compound
SWMU	solid waste management unit
TCE	trichloroethene
TNRCC	Texas Natural Resource Conservation Commission
TPH	total petroleum hydrocarbons
trans-1,2-DCE	*trans*-1,2-Dichloroethene
TWC	Texas Water Commission
USAF	U.S. Air Force
USEPA	U.S. Environmental Protection Agency
UST	underground storage tank
VOC	volatile organic compound
VSI	visual site inspection
WAA	waste accumulation area
WP	work plan

TAB

SECTION 1.0

1.0 Introduction

The Texas Natural Resource Conservation Commission (TNRCC) requested that the U. S. Air Force (USAF) investigate solid waste management units (SWMUs) located at Naval Air Station (NAS) Fort Worth Joint Reserve Base (JRB), which was formerly known as Carswell Air Force Base (AFB), in Fort Worth, Texas. The TNRCC requested that a Resource Conservation and Recovery Act (RCRA) Facility Investigation (RFI) be conducted at SWMUs 5, 6, 12, 31, and 61 to determine whether any hazardous constituents listed in 40 Code of Federal Regulations (CFR) Part 264, Appendix IX have been released into the environment. RFI activities at the subject sites have been completed. Field observations and analytical results included in this RFI Report indicate that a release of hazardous constituents listed in 40 CFR Part 264, Appendix IX has occurred to the environment at SWMUs 5, 6, 12, 31, and 61. However, all contamination associated with SWMU 31 was removed during interim remedial action (IRA) activities As a result, SWMU 31 is recommended for no further action (NFA) and closure under Risk Reduction Standard (RRS) 1. There remains some evidence of release to soils at SWMUs 5, 6, 12, and 61; however, analytical results indicate that these releases pose no threat to human health or the environment. Based on this information, NFA is warranted, and SWMUs 5, 6, 12, and 61 are recommended for closure under RRS 2.

1.1 Project Background

Carswell AFB was officially closed on September 30, 1993. Management responsibilities of a parcel of the former base, now known as NAS Fort Worth JRB, have been transferred from the USAF to the Navy. However, before complete property transfer can be accomplished, required environmental investigations of potential contamination related to USAF activities occurring prior to September 30, 1993 on NAS Fort Worth JRB property are to be completed, and contaminated sites remediated. Once the previously identified environmental sites are officially closed, official property transfer can be completed.

On February 7, 1991, the former Carswell AFB (NAS Fort Worth JRB) was issued a RCRA hazardous waste (HW) permit (HW-50289) by the Texas Water Commission (TWC). This permit requires a RFI of all SWMUs and areas of concern (AOCs) listed in Permit Provision VIII, as well as those SWMUs and AOCs subsequently added to the list, in order to determine whether any of the hazardous constituents listed in 40 CFR Part 264, Appendix IX have been released into the environment.

In accordance with permit HW-50289, a RFI was conducted on a total of 14 SWMUs and 2 AOCs at NAS Fort Worth JRB, Texas (HydroGeoLogic, Inc. [HydroGeoLogic], 1999). The SWMUs and AOCs included in the RFI served mainly as waste accumulation areas (WAAs), which stored HW before it was either disposed of in landfills, reused on base, or processed through the Defense Reutilization and Marketing Office (DRMO) for off base recycling or disposal.

The initial phase of the RFI was conducted at the subject SWMUs during May and June of 1999 in an effort to obtain closure under the TNRCC RRS program. As a result of the initial field investigation, 9 of the 16 sites required further investigation and/or remediation before closure

could be requested. As a consequence, Phase II of the RFI was conducted at SWMUs 5, 6, 11, 12, 31, 32, 36, 51, and 61 in April, May, and October 2000. Following Phase II, five of these sites, SWMUs 5, 6, 12, 31, and 61, required a third round of investigation activities and/or IRAs before closure could be requested. The IRAs were required in order to address soil contamination that exceeded RRS 2 levels at SWMUs 12, 31, and 61. As a result, Phase III of the RFI was conducted in June 2001, and November 2001 through March 2002. SWMUs 5, 6, 12, 31, and 61 are the subject of this RFI Report.

This RFI Report demonstrates that SWMUs 5, 6, 12, 31, and 61 pose no significant risk to human health or the environment and provides justification for NFA and closure in accordance with RRS guidelines. SWMU 31 shows no evidence of a release to the environment after the IRA, and therefore is recommended for closure under RRS 1. Although there is some evidence of release to the soils at SWMUs 5, 6, 12, and 61, these releases have been delineated or removed in an IRA and pose no significant risk to human health or the environment. As a result, SWMUs 5, 6, 12, and 61 are recommended for closure under RRS 2.

This investigation was managed by the USAF under the Environmental Restoration Account (ERA) The primary regulatory programs that govern the RFI and closure of these sites are RCRA and the TNRCC RRS program. The TNRCC is the lead regulatory agency for activities conducted at the subject sites.

1.2 Site Identification and Description

The areas of interest for this RFI Report are five SWMUs located throughout the NAS Fort Worth JRB installation. The SWMUs listed below are identified as they appear on the TNRCC letter dated March 2, 1995. These SWMU identifications are based on the 1989 RCRA Facility Assessment (RFA) (A.T. Kearney, 1989) where each WAA was identified with the associated building number from which wastes were stored. These five SWMUs are identified as follows

- SWMU 5 (Building 1628 WAA)
- SWMU 6 (Building 1628 Washrack and Drain)
- SWMU 12 (Building 1602 WAA)
- SWMU 31 (Building 1050 WAA)
- SWMU 61 (Building 1320 Power Production Maintenance Facility WAA)

In 1990, new metal storage sheds designated as WAAs were built at SWMUs 5 and 61 in order to be in compliance with Permit HW-50289. Each storage shed was assigned a new, individual building number. These new WAA buildings are listed on Table 1.1. The new WAA buildings at SWMUs 5 and 61 are currently used for the storage of HW. Following the 1989 RFA, the washrack and drain were removed at SWMU 6, the wastes and concrete pad were removed at SWMU 12, and wastes were removed from SWMU 31 (A.T. Kearney, 1989). SWMUs 6, 12, and 31 no longer serve as active WAAs at NAS Fort Worth JRB.

The location of each SWMU in relation to the base is presented on Figure 1.1. Table 1.1 provides a summary description of the waste handled at each SWMU and lists the current status of each site.

1.2.1 SWMUs 5 and 6

SWMUs 5 and 6 are located very close to one another and managed similar types of waste. Therefore they have been investigated as one site. SWMU 5 is located within the Flight Line Area at the intersection of 1st street and E street. This SWMU, which operated from an unknown startup date until approximately 1989, served as the WAA for Building 1628. Building 1628 housed operations for Corrosion Control and the Aerospace Ground Equipment (AGE) Maintenance Shop. Corrosion Control personnel treated the F4-E aircraft and associated parts for corrosion by partial stripping and painting. Waste paints and thinners (10 gallons/month) generated by this shop were drummed and disposed of as HW. The AGE shop serviced, maintained, and dispatched flight line support equipment. Waste oils and fluids were collected in a 500-gallon bowser. Waste synthetic oil was collected in a designated 55-gallon drum Waste antifreeze (5 gallons/month) was drummed and stored at the accumulation site. Waste paints and thinners (1 gallon/month) were collected in a 10-gallon drum and stored at the shop's accumulation site.

SWMU 5 was described as an outdoor container storage area under a roofed metal shed constructed in November 1988. The concrete base of the shed measured approximately 15 by 10 feet. Waste was stored within this area in 55-gallon drums placed on wooden pallets. Recyclable oils were stored in a 500-gallon bowser and pumped out by a contractor. Lead acid batteries were stored on a wooden pallet located on bare ground outside the shed. New walls were added to the former storage shed in 1989 and the WAA was upgraded to store waste in compliance with the specifications of permit HW-50289. The WAA shed at SWMU 5 is currently used by the 301st Air Reserve for the storage of HW. Past and current photographs of SWMU 5 are shown in Figure 1.2.

SWMU 6 was located south of Building 1628 and northwest of SWMU 5. SWMU 6 began operating in 1979, and remained in use until approximately 1990 (A.T. Kearney, 1989). SWMU 6 served as the washrack and drain for Building 1628, mentioned above. SWMU 6 was described as an outdoor concrete pad where parts from aircraft engines were washed. The concrete pad was curbed and sloped so that runoff from the wash operations flowed into a drain. Wastewater from the washrack drain was piped to SWMU 7, a nearby oil/water separator (OWS), from which the oily fraction of the fluid flowed to SWMU 8, the sludge collection tank, and the wastewater fraction of the fluid flowed to SWMU 66, the sanitary sewer (International Technology Corporation (IT), 1998). The concrete pad and drain at SWMU 6 no longer exist, and the surface is currently covered with grass.

The wastewater at SWMU 6 may have contained aircraft soap, jet propulsion grade-4 fuel (JP-4), waste paints and thinners, aircraft engine hydraulic fluids, and aircraft engine oil. The primary cleaning agent used to wash aircraft parts at SWMU 6 was the petroleum naphtha solvent, PD680 (Type II). SWMU 6 may also have received surface water runoff from SWMU 5, described above. A current photograph depicting the former location of SWMU 6 is presented in Figure 1.2. No historic photos of SWMU 6 were located.

1.2.2 SWMU 12

SWMU 12 is located east of Building 1602 at the edge of the parking lot, along D Street, and operated from approximately 1982 until approximately 1990. Building 1602 housed the propulsion shop, which was responsible for the build-up and repair of jet engines. The tear down section of the shop generated waste JP-4 (84-gallons/year) and 7808 oil (84-gallons/year). Both of these wastes were collected in pans and drummed separately. The afterburner section of the shop used PD-680 (Type II) for parts cleaning. The waste PD-680 (60 gallons/year) was drummed and stored at the accumulation site (USAF, 1989).

At the time of the 1989 RFA, SWMU 12 consisted of seven 55-gallon drums of waste on top of wooden pallets, and two 5-gallon cans on a concrete pad. Drums of product were stored adjacent to drums of waste. This unit was not fenced or covered (A.T. Kearney, 1989). Past and current photographs of SWMU 12 are shown in Figure 1.3.

1.2.3 SWMU 31

SWMU 31 is located in the Flight Line Area, southeast of Building 1050 on Perimeter Road. Building 1050 housed the Pneudraulics Shop, which was responsible for aircraft hydraulic systems and component maintenance and operational checks. This shop was equipped with two PD-680 tanks for parts cleaning: one 15-gallon tank and one 50-gallon tank. The contents from each tank were emptied out and placed into 55-gallon drums every two months. These drums were then stored at SWMU 31. This unit managed approximately 25 gallons of hydraulic oil per year and 50 gallons of PD-680 per month.

SWMU 31, which operated from 1955 to 1990, consisted of an outdoor uncovered 6-inch thick concrete pad measuring 15 by 8 feet. This pad, which had no surrounding fence or secondary barricade, supported approximately ten 55-gallon drums along with several smaller containers. No waste is currently stored at this area. A roof has subsequently been erected over the concrete pad, which now serves as a base for a picnic table. SWMU 31 is located within the boundary of SWMU 29/Landfill 2. Past and current photographs of SWMU 31 are shown in Figure 1.4.

1.2.4 SWMU 61

SWMU 61 is located in the East Area near Rogner Drive. This SWMU, which operated from an unknown startup date until approximately 1990, served as an outdoor container storage area for waste generated inside Building 1320, the Power Production Maintenance Facility. The Power Production personnel were responsible for preventative maintenance of gasoline and diesel generators. This facility generated waste antifreeze (13 gallons/month), diesel fuel (9 gallons/month), and oil (13 gallons/month). These wastes were drummed and kept at SWMU 61 Waste oils were pumped out periodically by a contractor and other liquid wastes were sent to DRMO for disposal.

SWMU 61 consisted of a gravel-based outdoor container storage area that held 55-gallon drums placed on wooden pallets set on railroad ties. This unit was uncovered and lacked a berm or other form of secondary containment. During the 1989 visual site inspection (VSI), one of the drums stored at this unit was noted to have been more than 18 months old. Overall conditions at this unit

were described as poor. WAA 1319 was built at the western end of SWMU 61 in 1990. Waste is currently stored inside the WAA storage shed as well as in storage containers located alongside the WAA under Navy management. Past and current photographs of SWMU 61 are shown in Figure 1.5.

1.3 Regulatory Requirements

The overall objective of this project is to obtain closure of the subject SWMUs under the TNRCC RRS program. An overview of the RRS program is presented in Section 4.1 of the RFI Work Plans (WPs) (HydroGeoLogic, 1999). In addition, the SWMUs at NAS Fort Worth JRB are subject to the specific requirements of RCRA Permit HW-50289. These sites are typically very small and each SWMU only received wastes produced from the industrial practices conducted within the associated buildings As a result, a large soil boring network and the full suite of Appendix IX analyses were not justified at the majority of these sites. The Air Force has provided justification for a reduced list of soil and groundwater analytical requirements for this RFI in a letter to the TNRCC dated April 20, 1999 This letter is included as Appendix A. The RFI WPs and this RFI Report have been prepared using guidance documents from the Installation Restoration Program (IRP), RCRA, the U S. Environmental Protection Agency (USEPA), and the TNRCC RRS program.

1.3.1 Project Documents

This RFI was conducted in accordance with the RFI WPs prepared by HydroGeoLogic dated May 1999 (HydroGeoLogic, 1999), the WP Addendums dated April 2000 (HydroGeoLogic, 2000a) and February 2001 (HydroGeoLogic, 2001a), and the IRA WP dated October 2001 (Ellis Environmental Group, LC [EEG], 2001) The RFI WPs contain the Field Sampling Plan, which was followed during all sampling activities. The Final Basewide Quality Assurance Project Plan (QAPP), prepared by HydroGeoLogic dated February 1998 (HydroGeoLogic, 1998), was used as guidance for managing specific quality assurance (QA) and quality control (QC) procedures as well as analytical data generated from the original May/June 1999 RFI. The 1998 QAPP was revised and reissued in March 2000 as the Final 2000 Basewide QAPP (HydroGeoLogic, 2000b), and this was the QA/QC guidance document used for the follow-on RFI activities in 2000 and 2001. Project analytical data generation and assessment were designed to achieve data quality goals in accordance with the applicable edition of the Basewide QAPP. Data quality objectives are discussed in greater detail in Section 1.5.

1.3.2 Risk Reduction Standards

In Subchapter S of the Risk Reduction Rules, the TNRCC has developed a series of three standards by which closure of RCRA sites may be obtained. General procedures for determining these standards have been based on scientific principals so that specific numeric cleanup levels can be generated. The cleanup levels are specified for different types of contaminated media such as air, surface water, groundwater, and soil, and for cross-media contamination pathways such as soil to groundwater and soil to air. The RRSs are designed to assure adequate protection of human health and the environment from potential exposure to contaminants associated with releases from permitted units.

A general overview of closure requirements under each of the three RRSs is provided below.

RRS 1: Closure/Remediation to Background - A RRS 1 closure is appropriate when it is established that the subject site is unaffected by past or present waste disposal practices. Attainment of a RRS 1 closure is demonstrated by sufficient sample collection and analysis to indicate that media contaminant concentrations are below the applicable RRS 1 values. In accordance with TNRCC Risk Reduction Rules, RRS 1 values are set at background concentrations for inorganic compounds or the method quantification limit (MQL) for organic compounds.

RRS 2: Closure/Remediation to Health-Based Standards and Criteria - A RRS 2 closure is appropriate when it is established that the subject site does not contain contaminant concentrations greater than RRS 2 Medium-Specific Concentrations (MSCs) or background values in any contaminated media of concern. In addition, contamination must be delineated to RRS 1 concentrations. Attainment of a RRS 2 closure is demonstrated by sufficient sample collection and analysis from the contaminated media of concern using the procedures outlined in Subchapter S of the TNRCC Risk Reduction Rules and the TNRCC Interoffice Memorandum. A document stating the responsible persons intention to fulfill deed certification requirements outlined in subsection 335.560 of the Risk Reduction Rules, Subchapter S must also be prepared and approved.

RRS 3: Closure/Remediation with Controls - If contaminant concentrations at a site exceed the RRS 2 values, a RRS 3 closure may be granted when the responsible party recommends a remedy to control contaminated media of concern that best achieves the requirements outlined in Subchapter S of the Risk Reduction Rules and the TNRCC Interoffice Memorandum. This remedy must be approved by the TNRCC executive director, and following approval the responsible party must subsequently complete the remedy, submit the final report, initiate post closure care, and complete the deed recordation requirements outlined in Subchapter S of the Risk Reduction Rules.

The primary emphasis of this investigation is to meet the requirements of Permit Provision VIII of the NAS Fort Worth HW-50289 permit. The NAS Fort Worth JRB is not a listed National Priority List (NPL) site. However, as the IRP, TNRCC RRS, and RCRA rely heavily on guidance documents prepared under Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), this RFI has been performed and the report prepared using guidance documents from all four programs.

To determine if a release has occurred at any of the SWMUs, the results from samples collected from the sites were compared to predetermined RRS 1 values. For metals, the RRS 1 values were obtained from the base-specific background values for groundwater, surface soils, and subsurface soils as presented in the Final Basewide Background Study (Jacobs, 1998). For organic analytes, RRS 1 values were determined using compound-specific MQLs, as defined in the TNRCC Interoffice Consistency Memorandum (TNRCC, 1998a) and its Erratum Sheet (TNRCC, 1998b).

The Texas Risk Reduction Rules (30 TAC §335 Subchapter S) require that any analytes detected at concentrations above the applicable RRS 1 value be compared to available MSCs. The MSCs presented in tabular form in 30 TAC §335.368 are used to determine if detected contaminants pose a threat to human health or to shallow groundwater. Based on the anticipated future site uses and practices at SWMUs 5, 6, 12, 31, and 61, the RRS 2 values used for these SWMUs were the groundwater MSCs for industrial use and the soil MSCs for industrial use based on groundwater protection. Note that no MSC has been established for total petroleum hydrocarbons (TPH) The RRS 2 value used for TPH was derived from the TNRCC action level for coarse-grained soils from the Petroleum Storage Tank (PST) Division (TNRCC, 1996a).

In some instances during the RFI, analytes in soil samples were detected above both the RRS 1 and RRS 2 values. In selected cases, the Synthetic Precipitation Leaching Procedure (SPLP) was performed on aliquots of the affected samples, and the resulting extracts were analyzed. If all results for SPLP extracts at a site were below the industrial groundwater MSC, a site-specific soil MSC for groundwater protection was developed for that analyte. The site-specific MSC was set to the value of the highest soil detection for which the SPLP extract concentration was below the groundwater MSC.

1.4 Investigation Strategy

The RFI was designed and conducted to achieve the following objectives:

- Determine if a release from any of the SWMUs has occurred.
- Characterize the nature and extent of any contamination encountered, if necessary, additional rounds of sampling were performed to accomplish this objective.
- If necessary, utilize SPLP to provide site-specific MSCs.
- Perform IRAs to remove contaminated soil if needed

Prior to initiating the intrusive investigation at the subject sites, the structural integrity of each WAA storage shed's walls and floors was examined for cracks or gaps. As each shed's integrity appeared to be intact, intrusive activities did not take place within any of the WAA storage sheds.

Field tasks used to characterize each site included advancing continuous-core direct push technology (DPT) soil borings in order to collect soil samples. This soil sampling method was used to determine the lithology of native soils and the nature and extent of any surface and subsurface contamination Soil borings were placed in locations where waste was historically stored, along with areas where surface runoff was likely to collect. At sites where a WAA storage shed was built over a former SWMU, the soil borings were placed as close to the shed's walls as possible. Intrusive sampling within or below the storage sheds was not conducted during Phase I of the RFI in order to avoid potentially damaging the integrity of the sheds.

Soil characterization activities were conducted as follows. Phase I soil samples were collected from each soil boring in 5-foot intervals from the ground surface to the top of the water table in order to determine the nature and extent of any surface and subsurface contamination. During subsequent sampling events, additional soil samples were collected in order to confirm Phase I detections or to delineate specific contaminants of concern (CoCs) to RRS 1 or decreasing concentrations. Delineation and confirmation soil samples were collected at the depth intervals

associated with the corresponding Phase I detections. During Phase III, IRAs were conducted to remove contaminated soil as needed. If concentrations were confirmed above RRS 2, IRAs were performed to remove RRS 3 concentrations in order to obtain site closure under RRS 1 or RRS 2

Groundwater characterization activities were conducted at SWMUs 5, 6, 12, and 61 as follows. During Phase II of the RFI, one monitoring well was installed at SWMU 12 and two monitoring wells were installed at SWMU 61 using a hollow stem auger (HSA). Two rounds of groundwater samples were collected during Phase II from both new and existing wells at SWMUs 5, 6, 12, and 61. A groundwater investigation was not conducted at SWMU 31, as no subsurface soil contamination was encountered During Phase III of the RFI, two additional monitoring wells were installed at SWMU 12. Two additional rounds of groundwater sampling were conducted at SWMUs 12 and 61, and one additional round of groundwater sampling was conducted at SWMUs 5 and 6. Groundwater sampling activities conducted at each site are provided in detail in Section 3.0. Groundwater samples were analyzed for those CoCs identified in the Phase I soils

As previously noted, each SWMU received various types and amounts of HW throughout its respective period of operation. In order to determine if the subject SWMUs present a threat to human health or the environment, essential information regarding each site was obtained. This information includes:

- The nature of wastes stored at each SWMU.
- The lithology of soils to the top of the water table or refusal beneath each SWMU.
- An assessment of potential contaminant impacts on the quality of soil and groundwater within and around each SWMU.

1.5 Data Quality Objectives

The data generated by this project are of sufficient quality and quantity to meet the overall project objective to request closure of SWMUs 5, 6, 12, 31, and 61 under the TNRCC RRS program. Data from the following categories were required for this study:

Site Characterization - Data were used to evaluate physical and chemical properties of soil and groundwater The data were also used to characterize the nature and extent of any contaminants detected.

Health and Safety - Data were used to establish the level of protection needed for the sampling team and other site-related personnel. These data were gathered by the use of organic vapor monitors (OVMs) during intrusive activities.

A combination of screening level data and definitive level data was used during this RFI. Health and safety data were collected as screening data. All field samples were analyzed following USEPA SW846 protocols. The definitions of screening data and definitive data, as established by the *Data Quality Objectives Process for Superfund Interim Final Guidance* (USEPA/540/G-93/071, 1993) are described below:

- **Screening Data with Definitive Confirmation** – Screening data can be generated by rapid, less precise methods of analysis with less rigorous sample preparation. Sample preparation steps may be restricted to simple procedures such as dilution with a solvent,

instead of elaborate extraction/digestion and cleanup. Screening data provides analyte identification and quantification. Although the quantification may be determined using analytical methods with QA/QC procedures and criteria associated with definitive data, screening data without associated confirmation data are not considered to be data of known quality

- **Definitive Data** – Definitive data were generated using rigorous analytical methods, such as approved USEPA reference methods. Data are analyte-specific, with confirmation of analyte identity and concentration. These methods produce tangible raw data (e.g., chromatograms, spectra, digital values) in the form of paper printouts or computer-generated electronic files Data may be generated at the site or at an off-site location, as long as the QA/QC requirements are satisfied. For the data to be definitive, either analytical or total measurement error must be determined.

The methods of analysis selected for samples collected from NAS Fort Worth JRB produced screening as well as definitive data. The data generated by the laboratory analysis of samples were sufficiently sensitive to allow comparison of the results to the TNRCC RRS. The 1998 and 2000 Basewide QAPPs describe each analytical method that was performed as part of the investigation and outlines the QA measures followed by the contract laboratory. A data quality assessment of the analytical data collected during this RFI is presented as Appendix B.

1.6 Report Organization

The remainder of this document is divided into the following sections

Section 2.0 summarizes the installation and site-specific environmental settings for this RFI.

Section 3.0 summarizes any previous site investigations, as well as activities that were conducted during this RFI These activities included inspection of each WAA storage shed, the collection of soil and groundwater samples for analysis, and IRAs.

Section 4 0 presents the results of the RFI and assesses the potential releases to the environment.

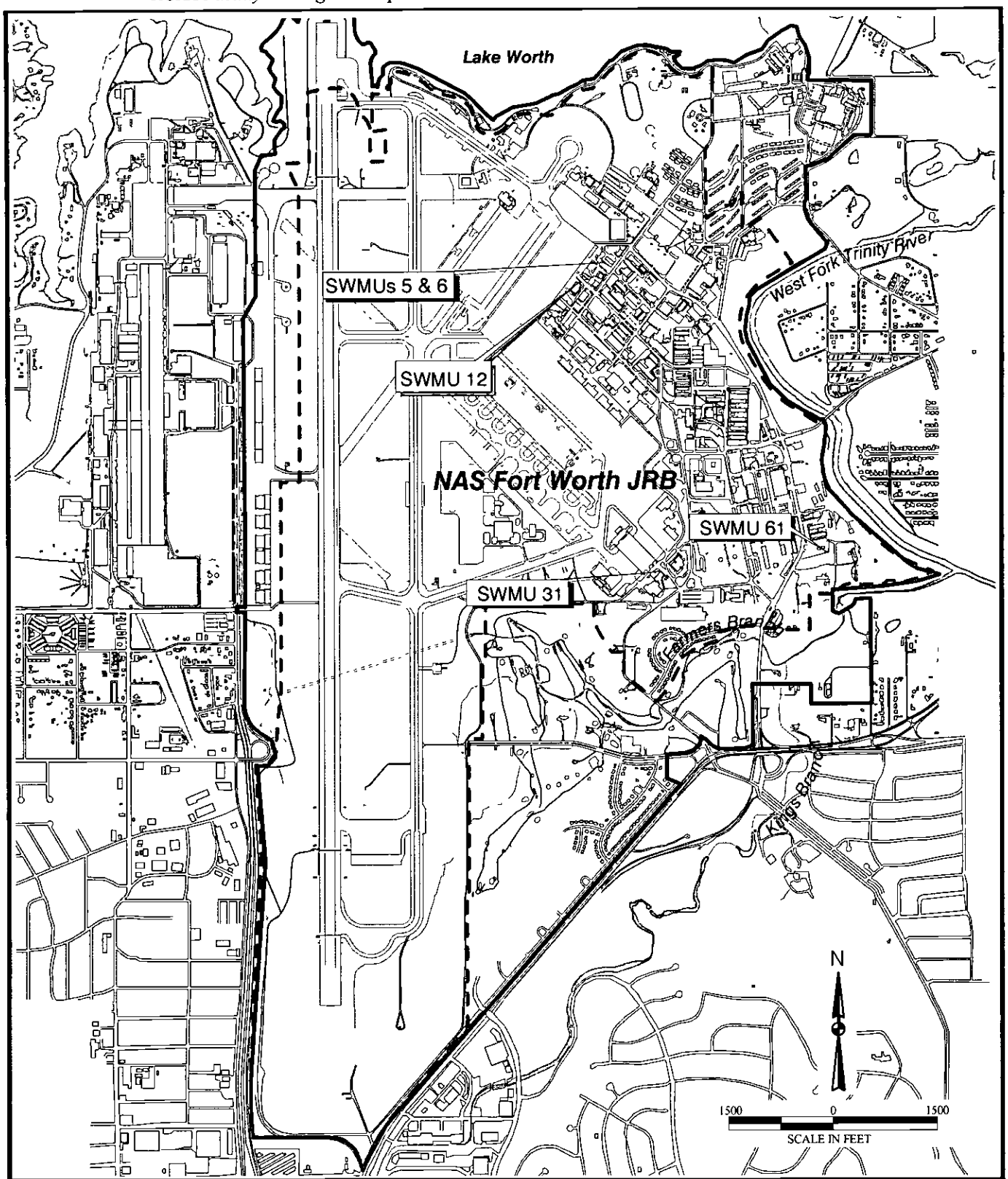
Section 5.0 presents a discussion and evaluation of the results presented in Section 4.0.

Section 6.0 presents the conclusions of the RFI and recommendations for closure based on the results presented in Section 4.0.

Section 7.0 presents the references associated with the preparation of this report.

Figures

Figure 1.1 SWMU Locations - NAS Fort Worth JRB, Texas
Figure 1 2 Photos and Location Map - SWMUs 5 and 6
Figure 1 3 Photos and Location Map – SWMU 12
Figure 1.4 Photos and Location Map - SWMU 31
Figure 1.5 Photos and Location Map - SWMU 61



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Revised 04/12/02 cf
Source HydroGeoLogic, Inc GIS Database

ELLIS ENVIRONMENTAL GROUP LC

HYDRO GeoLogic

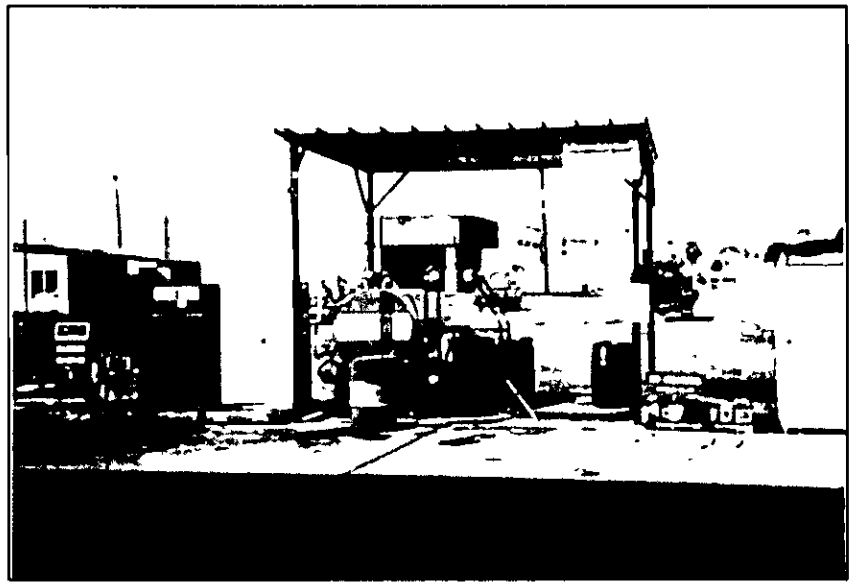
Legend

NAS Fort Worth JRB Boundary

Former Carswell AFB Boundary

Figure 1.1

SWMU Locations
NAS Fort Worth JRB, Texas



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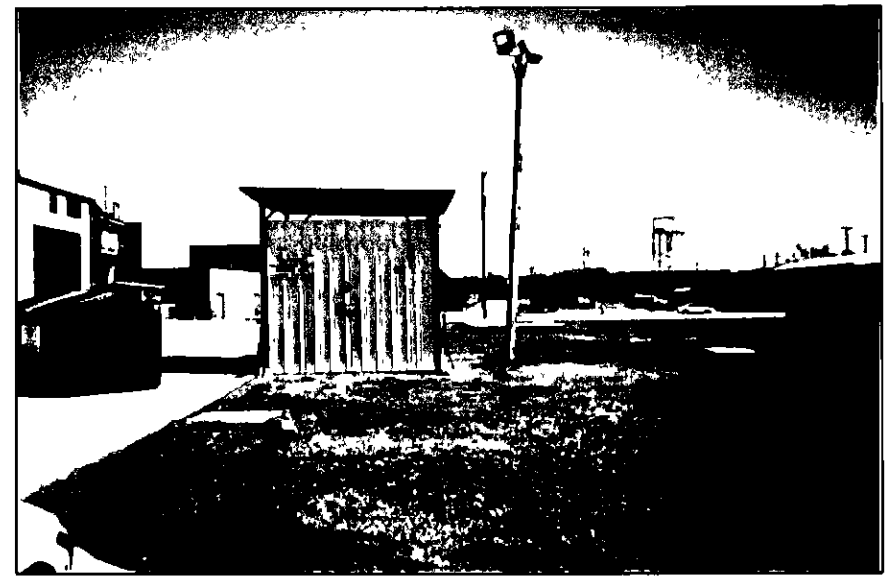

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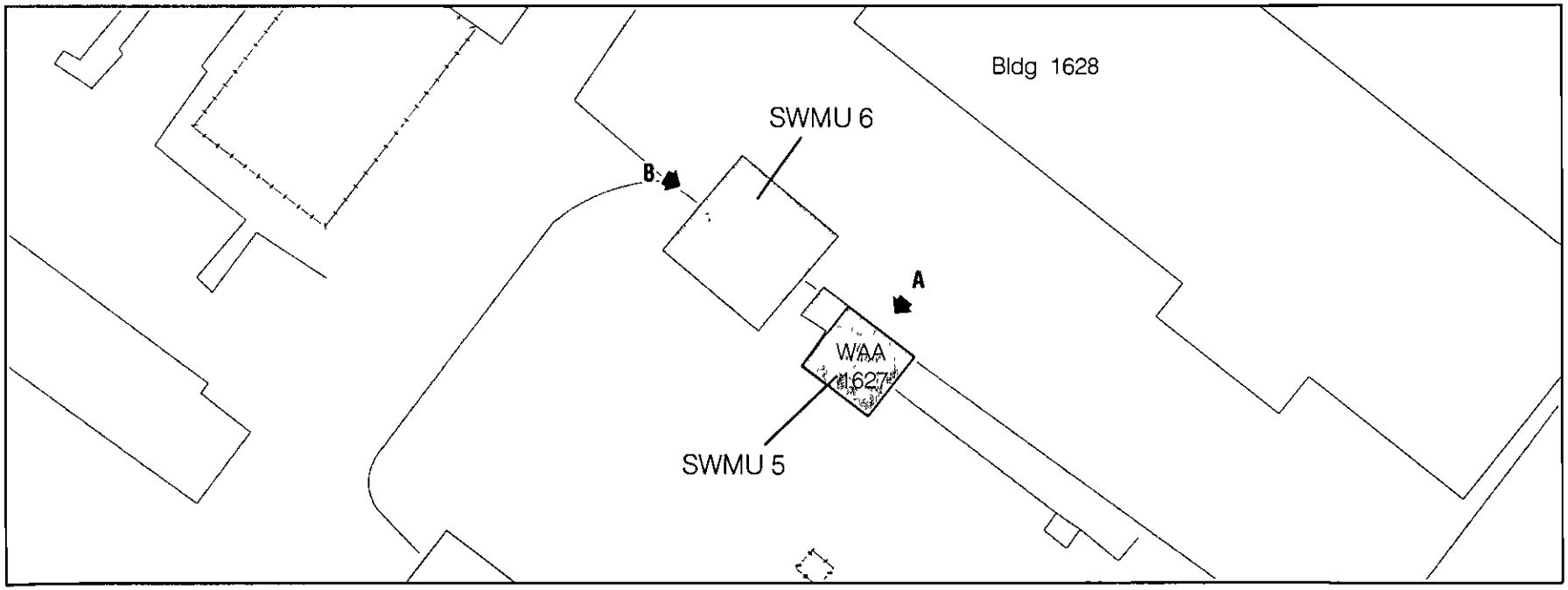

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Revised 03/20/02 tbraswell
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HYDRO GeoLogic

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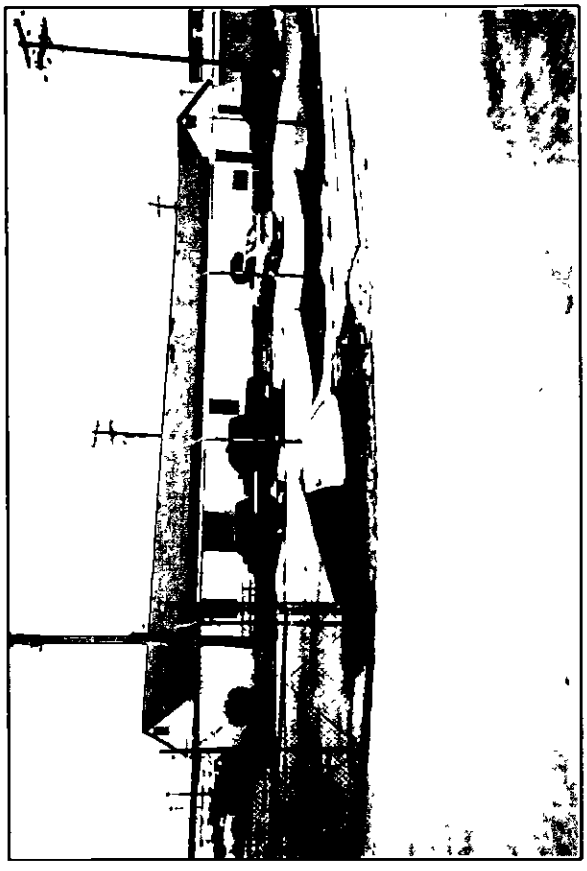
Figure 1.2
Photos and Location Map
SWMU 5 and SWMU 6



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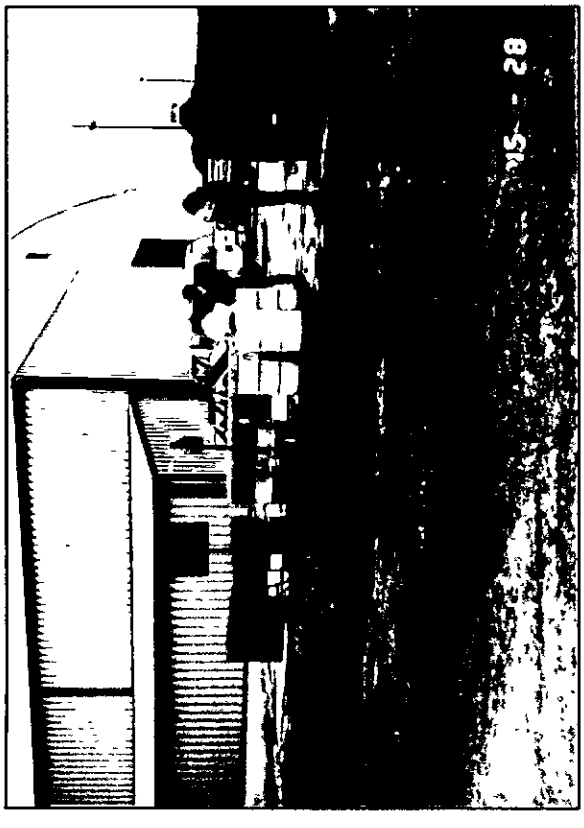

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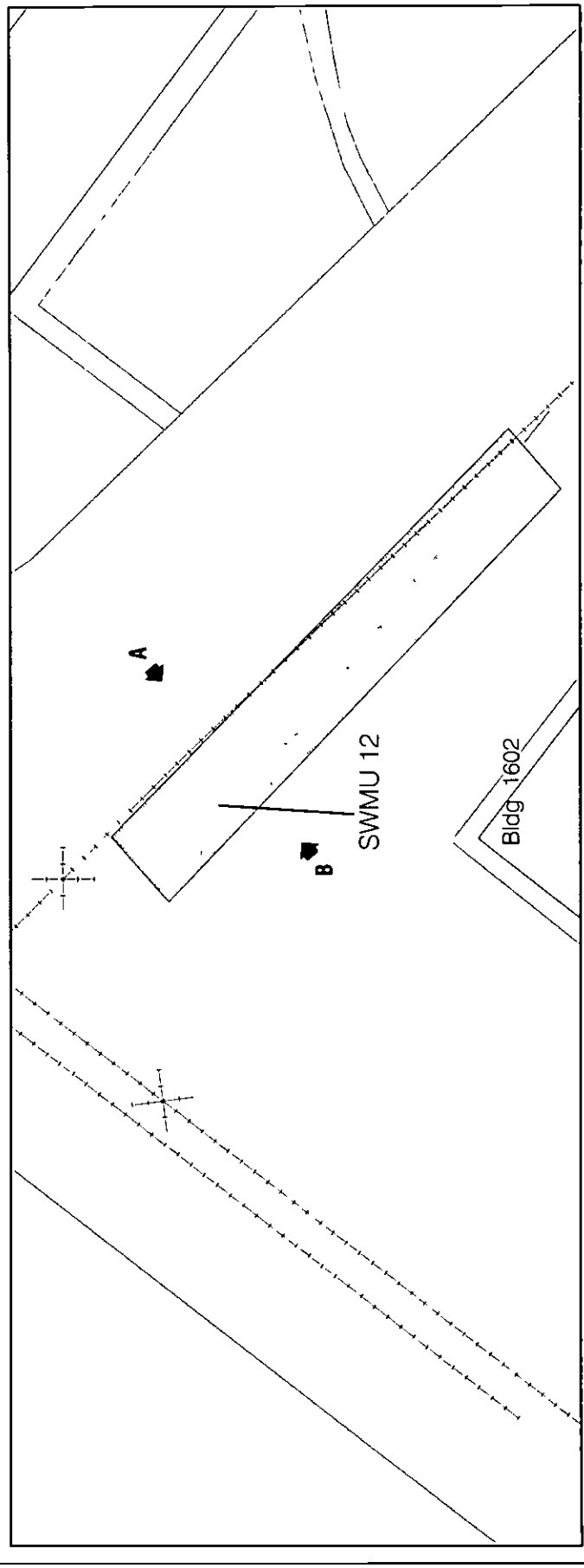

Figure 1.3
Photos and Location Map — SWMU 12

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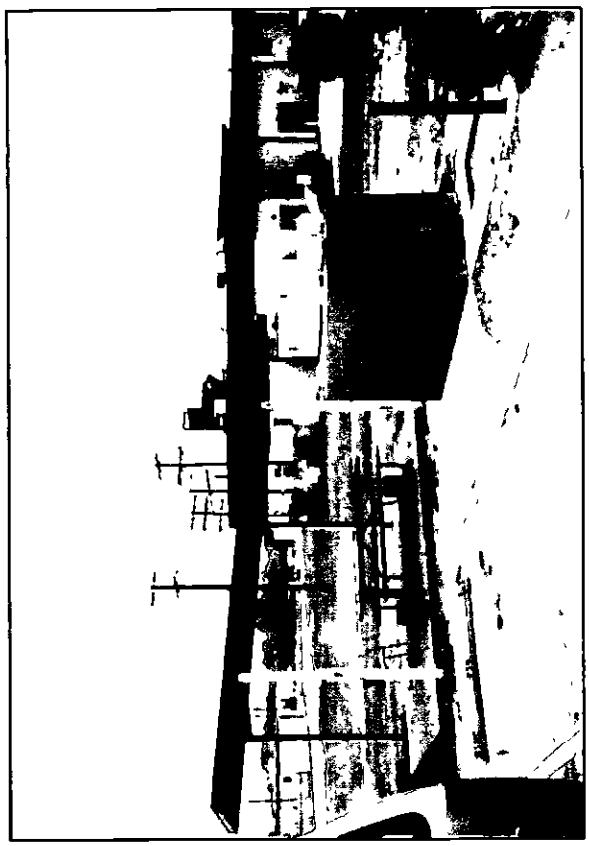

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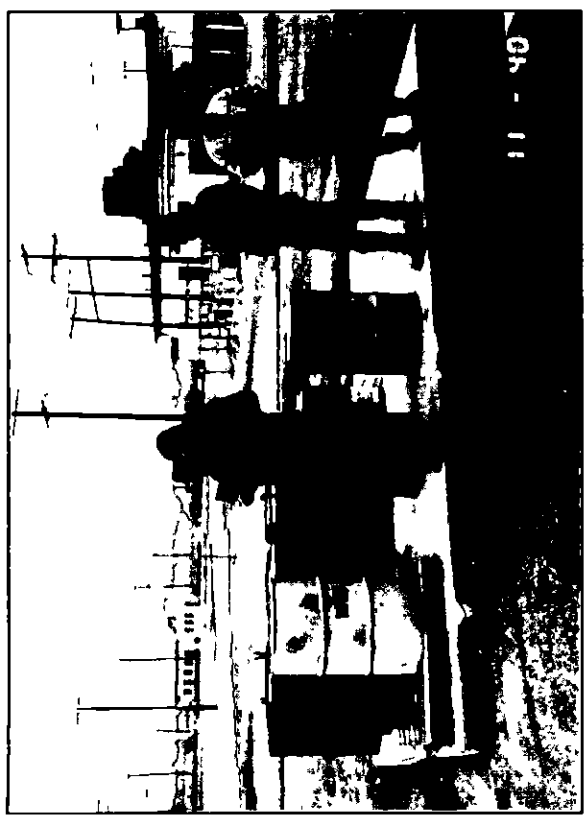

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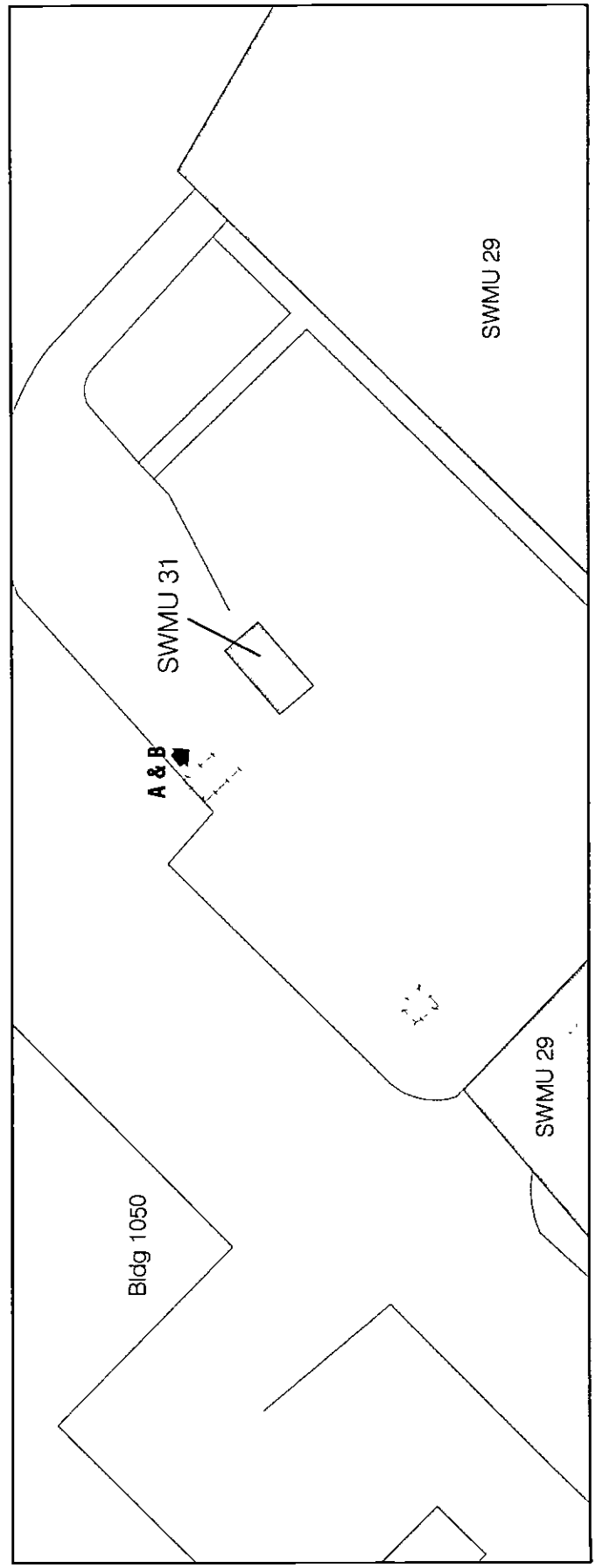

Figure 1.4
Photos and Location Map — SWMU 31

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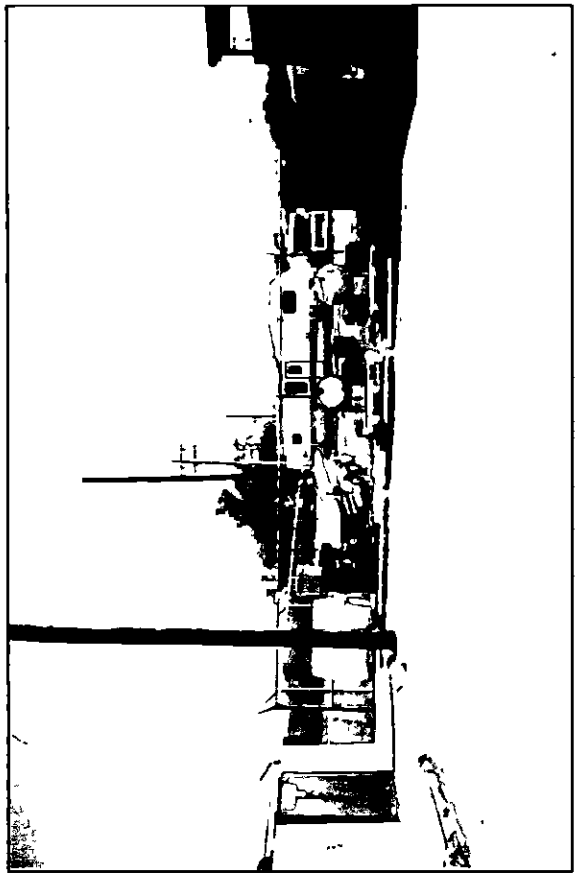
HYDRO GeoLogic



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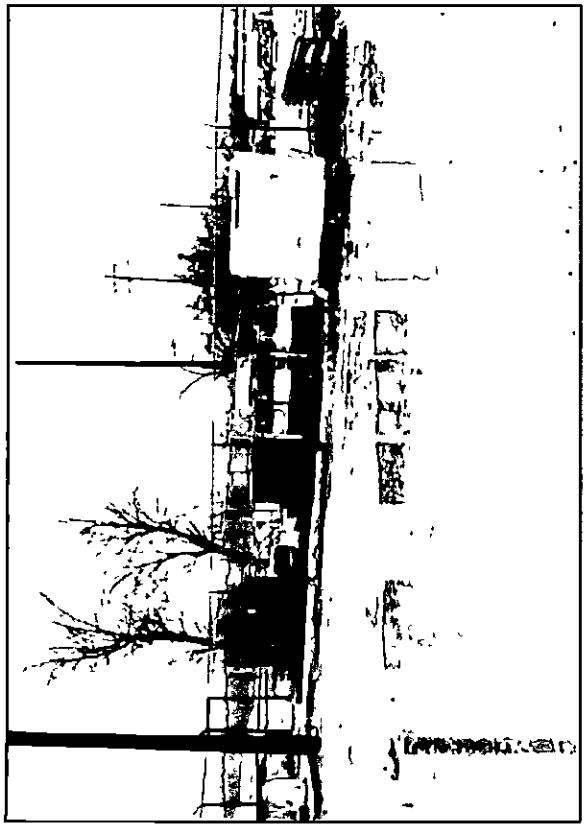

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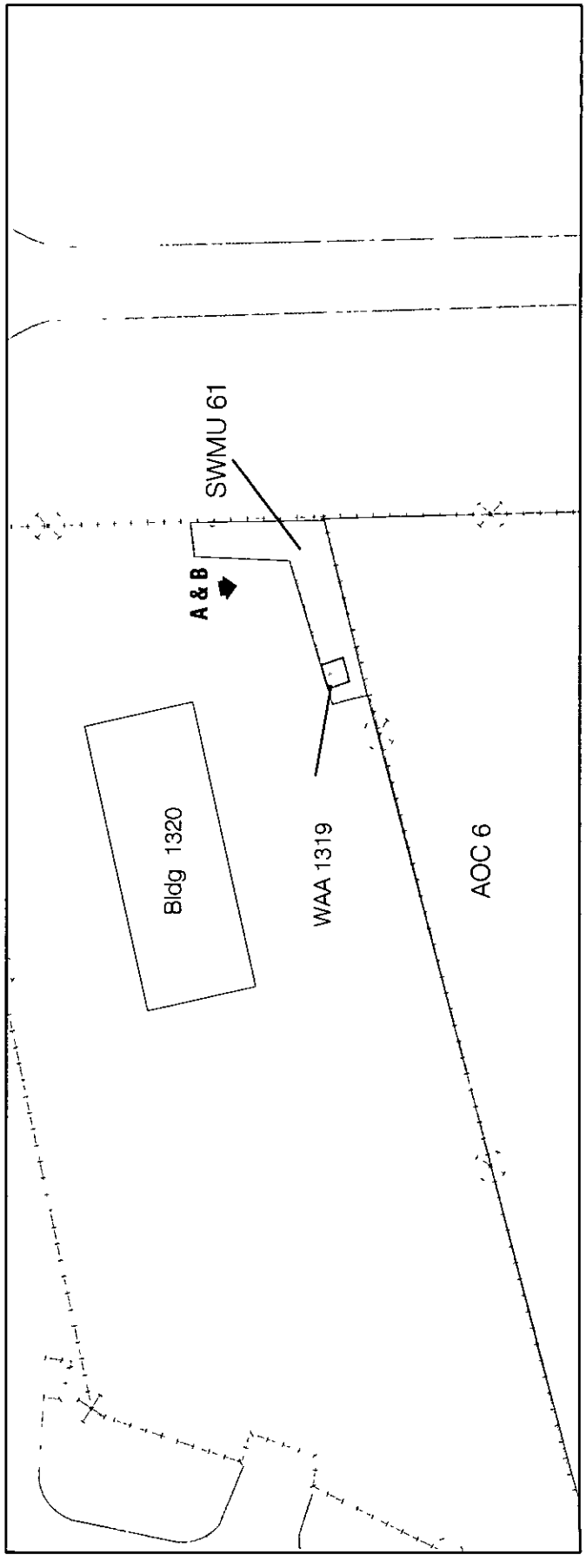

Figure 1.5
Photos and Location Map — SWMU 61

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Revised 04/04/02 cf
Source HGL GIS Database

TAB

SECTION 2.0

2.0 Summary of Existing Information

The climate, physiography, geology, hydrology, biology, and demographics of the NAS Fort Worth JRB area are described in the following sections.

2.1 Installation Environmental Setting

2.1.1 Physiographic Province

NAS Fort Worth JRB is located along the border zone between two physiographic provinces. The southeastern part of the base is situated within the Grand Prairie section of the Central Lowlands Physiographic Province. Most of NAS Fort Worth JRB is located within this province. This region is characterized by broad, eastward-sloping terrace surfaces that are interrupted by westward-facing escarpments. The land surface is typically grass covered and treeless except for isolated stands of upland timber. The northwestern part of the NAS Fort Worth JRB area is situated within the Western Cross Timbers Physiographic Province This area is characterized by rolling topography and a heavy growth of post and blackjack oaks (Radian, 1989a,b). Surface elevations for this region range from about 850 feet above National Geodetic Vertical Datum (NGVD) west of the base to approximately 550 feet above NGVD along the eastern side of the base. Figure 2.1 is a section of the Lake Worth, Texas, U.S Geological Survey topographic map showing the relief of the NAS Fort Worth JRB/Air Force Plant 4 (AFP 4) region.

2.1.2 Regional Geology

The geologic units of interest for the region, from youngest to oldest, are as follows: (1) the Quaternary Alluvium (including fill material and terrace deposits), (2) the Cretaceous Goodland Limestone, (3) the Cretaceous Walnut Formation, (4) the Cretaceous Paluxy Formation, (5) the Cretaceous Glen Rose Formation, and (6) the Cretaceous Twin Mountains Formation. A generalized cross section of the geology beneath NAS Fort Worth JRB is presented in Figure 2.2 (Radian, 1989a,b). The areal limits of surface exposure of these units at NAS Fort Worth JRB are shown in Figure 2.3. Cross section locations and individual cross sections at NAS Fort Worth JRB are presented in Figures 2.4 through 2.7 (CH2M HILL, 1996). The regional dip of the stratigraphic units beneath NAS Fort Worth JRB is between 35 and 40 feet per mile in an easterly to southeasterly direction. NAS Fort Worth JRB is located on the relatively stable Texas Craton, west of the faults that lie along the Ouachita Structural Belt. No major faults or fracture zones have been mapped near the base.

2.1.3 Groundwater

The water-bearing geologic formations located in the NAS Fort Worth JRB area may be divided into the following five hydrogeologic units, listed from the shallowest to the deepest: (1) an upper perched-water zone occurring in the alluvial terrace deposits associated with the Trinity River, (2) an aquitard of predominantly dry limestone of the Goodland and Walnut Formations, (3) an aquifer in the Paluxy Sand, (4) an aquitard of relatively impermeable limestone in the Glen Rose Formation, and (5) a major aquifer in the sandstone of the Twin Mountains Formation. Each of

these units is examined more explicitly in the following paragraphs The relationship between these hydrogeologic units and geologic units is illustrated in Figure 2 8 (Radian, 1989a,b).

2.1.3.1 Alluvial Terrace Deposits

The uppermost groundwater in the area occurs within the pore space of the grains of coarse sand and gravels deposited by the Trinity River. In some parts of Tarrant County, primarily in those areas adjacent to the Trinity River, groundwater from the terrace deposits is used for irrigation and residential use. Groundwater from the terrace deposits is rarely used as a source of potable water due to its limited distribution and susceptibility to surface/storm water pollution (CH2M HILL, 1984).

Recharge to the water-bearing deposits occurs through infiltration from precipitation and from surface water bodies. Extensive on-site pavement and construction restricts this recharge. Additional recharge, however, comes from leakage in water supply lines, sewer systems, storm drains, and cooling water systems. In 1991, this leakage was calculated to be in excess of approximately 115.5 million gallons for NAS Fort Worth JRB and AFP 4 (General Dynamics Facility Management, 1992). This inflow of water to the shallow aquifer effects local groundwater flow patterns and contamination transport, along with increasing hydraulic head, which acts as the force to potentially drive water into lower aquifer systems. The estimated hydraulic conductivity of the alluvial aquifer is 4.57 gallons per day per square foot (gpd/ft^2) (Radian, 1989a,b).

This flow between aquifers is restricted by the Goodland/Walnut Formations; therefore, the alluvial terrace groundwater is not hydraulically connected to the underlying aquifers at NAS Fort Worth JRB. The primary water flow in the terrace deposits is generally eastward toward the West Fork Trinity River, although localized variations exist across the entire site. The hydraulic gradient across the base is variable, reflecting variations in the flow direction and localized recharge. Discharge from the aquifer occurs into surface water on-site, specifically Farmers Branch Creek.

Potentiometric maps of NAS Fort Worth JRB and AFP 4 alluvial terrace groundwater are presented as Figure 2.9 and Figure 2 10. Both the April 2001 and October 2001 groundwater elevation data show an easterly trend in groundwater flow over the area of NAS Fort Worth JRB toward the West Fork Trinity River (HydroGeoLogic, 2001b).

2.1.3.2 Goodland / Walnut Aquitard

The groundwater within the terrace deposits is isolated from groundwater within the lower aquifers by the low permeability of the Goodland Limestone and Walnut Formations. The primary inhibitors to vertical groundwater movement within these units are the fine-grained clay and shale layers that are interbedded with layers of limestone. Some groundwater movement does occur between the individual bedding planes of both of these units, but the vertical hydraulic conductivity has been calculated to range between 1.2×10^{-9} centimeters per second (cm/sec) to 7.3×10^{-11} cm/sec for the NAS Fort Worth JRB and AFP 4 area. This corresponds to a vertical flow rate that ranges between 1.16×10^{-3} feet per day (ft/d) to 5.22×10^{-3} ft/d (Environmental Science and Engineering, Inc. [ESE], 1994).

At the AFP 4 "window area," the Goodland/Walnut aquitard is breached, and the alluvial terrace groundwater is in direct contact with the groundwater in the Paluxy aquifer. Several wells and borings have been advanced at NAS Fort Worth JRB to the Goodland/Walnut aquitard. There is no evidence that a similar window exists on the base property. All five monitoring wells that fully penetrate the Paluxy aquifer on NAS Fort Worth JRB property are represented in cross sections (Figures 2.5 through 2 7). These wells are USGS01P, USGS05P, USGS06P, USGS07P, and Paluxy 1 (P1).

2.1.3.3 Paluxy Aquifer

The Paluxy aquifer is an important source of potable groundwater for the Fort Worth area. Many of the surrounding communities, particularly White Settlement, obtain their municipal water supplies from the Paluxy aquifer Groundwater from the Paluxy is also used in some of the surrounding farms and ranches for agricultural purposes. Due to the extensive use of the Paluxy aquifer, water levels have declined significantly over the years. Water levels in the NAS Fort Worth JRB vicinity have not decreased as much as in the Fort Worth area due to its proximity to the Lake Worth recharge area and the fact that the base does not obtain water from the Paluxy aquifer. Drinking water at the base is supplied by the city of Fort Worth, which uses Lake Worth as its water source. The groundwater of the Paluxy aquifer is contained within the openings created by gaps between bedding planes, cracks, and fissures in the sandstones of the Paluxy Formation. Just as the Paluxy Formation is divided into upper and lower sand members, the aquifer is likewise divided into upper and lower aquifers. The upper sand is finer grained and contains a higher percentage of shale than the lower sand. Radian (1989) estimated hydraulic conductivities to range from 130 to 140 gpd/ft^2. Transmissivities range from 1,263 to 13,808 gallons per day per foot (gpd/ft), respectively (CH2MHill, 1984).

2.1.3.4 Glen Rose Aquitard

Below the Paluxy aquifer are the fine-grained limestone, shale, marl, and sandstone beds of the Glen Rose Formation. The thickness of the formation ranges from 250 to 450 feet. Although the sands in the Glen Rose Formation yield small quantities of groundwater in the area, the relatively impermeable limestone acts as an aquitard, restricting water movement between the Paluxy aquifer above and the Twin Mountains aquifer below.

2.1.3.5 Twin Mountains Aquifer

The Twin Mountains Formation is the oldest and deepest water supply source used in the NAS Fort Worth JRB area. The Twin Mountains Formation occurs approximately 600 feet below NAS Fort Worth JRB, with a thickness of between 250 to 430 feet. Recharge to the Twin Mountains aquifer occurs west of NAS Fort Worth JRB, where the formation out crops. Groundwater movement is eastward in the downdip direction. The Twin Mountains groundwater occurs under unconfined conditions in the recharge area and becomes confined as it moves downdip. Transmissivities in the Twin Mountains aquifer range from 1,950 to 29,700 gpd/ft^2 and average 8,450 gpd/ft^2 in Tarrant County. Permeabilities range from 8 to 165 gpd/ft^2 and average 68 gpd/ft^2 in Tarrant County (CH2M HILL, 1984)

2.1.3.6 Water Well Survey Results

An inventory of water supply wells within a one-mile radius of the NAS Fort Worth JRB boundary was conducted by HydroGeoLogic in 1997. Figure 2.11 illustrates the locations of 59 wells that were identified from TWC records. All of these wells were installed and completed in the Paluxy aquifer or the Twin Mountains aquifer. No active water wells are located on NAS Fort Worth JRB property. Water is supplied to the base by the city of Fort Worth, which obtains water from Lake Worth.

2.1.4 Surface Water

The topography of NAS Fort Worth JRB is fairly flat except for the lower lying areas along the tributaries of the Trinity River The land surface slopes gently northeastward toward Lake Worth and eastward toward the West Fork Trinity River. Surface elevations range from about 690 feet above NGVD at the southwest corner of the base to approximately 550 feet above NGVD, along the eastern side of the base.

NAS Fort Worth JRB is located within the Trinity River Basin, adjacent to Lake Worth. The lake is a man-made reservoir created by damming the Trinity River at a point just northeast of the base. The surface area of the lake is approximately 2,500 acres. Lake Worth receives a limited amount of storm water runoff from NAS Fort Worth JRB during and immediately after rainfall events. Elevation of the water surface is fairly consistent at approximately 594 feet above NGVD, the fixed elevation of the dam spillway. Part of the eastern boundary of NAS Fort Worth JRB is defined by the West Fork Trinity River. River flow is towards the southeast into the Gulf of Mexico. Because the Trinity River has been dammed, the 100- and 500-year flood plains do not extend more than 400 feet from the center of the river or any of its tributaries.

Surface drainage is mainly east towards the West Fork Trinity River. The base is partly drained by Farmers Branch Creek, a tributary of the West Fork Trinity River. Farmers Branch Creek begins within the community of White Settlement and flows eastward. Just south of AFP 4, Farmers Branch Creek flows under the runway within two large culverts identified as an aqueduct. Most of the base drainage is intercepted by a series of storm drains and culverts, directed to OWSs, and discharged to the West Fork Trinity River downstream of Lake Worth. A small portion of the north end of the base drains directly into Lake Worth.

NAS Fort Worth JRB currently has three storm water discharge points that are subject to National Pollution Discharge Elimination System (NPDES) requirements. Each discharge point is monitored weekly for chemical oxygen demand, oil and grease, and pH. The permit has been violated on numerous occasions. In 1979, these violations prompted the USEPA to formally demand a corrective action (CH2M HILL, 1984). Several additional sampling points were established to determine the flow of pollutants onto and off of the base. Samples were collected for a variety of parameters as circumstances (spills, fish kills, odors, and oil sheen) dictated (Radian, 1989a,b).

2.1.5 Climate

The climate in the Fort Worth area is classified as humid subtropical with hot summers and dry winters. Tropical maritime air masses control the weather during much of the year, but the passage of polar cold fronts and continental air masses can create large variations in winter temperatures (TNRCC, 1996b). In the Dallas-Fort Worth area, daily mean temperatures range from 43.4 degrees Fahrenheit (°F) in January to 85.3 °F in July. The highest recorded temperature is 113 °F, and the lowest temperature is 2 °F. Freezing temperatures occur on average of 25 days in the year (National Climatic Data Center (NCDC), 2000).

Average relative humidity (after noon) ranges from 51 percent (September and October) to 62 percent (January) (NCDC, 2000). Mean annual precipitation recorded at the base is approximately 32 inches. The wettest months are April and May, with a secondary maximum in September. The period from November to March is generally dry, with a secondary minimum in August. Snowfall accounts for a small percentage of the total precipitation between November and March. Thunderstorm activity occurs at the base an average of 45 days per year, with the majority of the activity between April and June. Hail may fall 2 to 3 days per year. The maximum precipitation ever recorded in a 24-hour period is 5.9 inches. On the average, measurable snowfall occurs 2 days per year (TNRCC, 1996b).

During 2000, the average annual temperature in the area was 65.6 °F, and monthly mean temperatures varied from 43.4 °F in January to 85.3 °F in July. The average daily minimum temperature in January was 32.7 °F, and the lowest recorded temperature was 32 °F. The average daily maximum temperature and highest temperature recorded at the base during 2000 were both in July was 96.5 °F, and the highest temperature ever recorded at the base was 98 °F in the month of July. Freezing temperatures occur at NAS Fort Worth JRB an average of 30 days per year. (National Weather Service, 2001).

Lake evaporation near NAS Fort Worth JRB is estimated to be approximately 57 inches per year. Evapotranspiration over land areas may be greater or less than lake evaporation depending on vegetative cover type and moisture availability. Average net precipitation is expected to be equal to the difference between average total precipitation and average lake evaporation, or approximately minus 25 inches per year. Mean cloud cover averages 50 percent at NAS Fort Worth JRB, with clear weather occurring frequently during the year. Some fog is present an average of 83 days per year. Wind speed averages 7 knots; however, a maximum of 80 knots has been recorded. Predominant wind direction is from the south-southwest throughout the year (TNRCC, 1996b).

2.1.6 Biology

Approximately 374 acres, or 14 percent, of NAS Fort Worth JRB is considered unimproved, indicating the presence of seminatural to natural biological/ecological conditions. The base lies in the Cross Timbers and Prairies Regions of Texas, where native vegetation is characterized by alternating bands of prairies and woodlands. The higher elevations on the base are covered by native and cultivated grasses such as little bluestem, Indian grass, big bluestem, side oats, grama, and buffalo grass. Forested areas occur primarily on the lower land and along the banks of

streams. Common wood species include oak, elm, pecan, hackberry, and sumac. Several non-native species such as catalpa and chinaberry are common (Radian, 1989a,b).

Typical wildlife on the base includes black-tailed jackrabbits in grassy areas along the runway. In addition, there are cottontail rabbits, gray squirrels, and opossums in the wooded areas. Common birds include morning doves, meadowlarks, grackles, and starlings. Hunting and trapping are not allowed on the base, but in the nearby rural areas they are a very popular form of recreation (Radian, 1989a,b).

Reported game fish include black bass, sunfish, and catfish, all of which can be found in Lake Worth, Farmers Branch Creek, and one small pond located on base near the golf course equipment shed. According to the Texas Department of Parks and Wildlife and the U.S. Fish and Wildlife Service, there are no threatened or endangered species known to occur on NAS Fort Worth JRB. None of the federally listed endangered plant species for Texas are known to occur within 100 miles of Tarrant County. Of the federally listed endangered animals species, only the peregrine falcon and the whooping crane are known to occasionally inhabit the area; however, none of these is suspected to reside in the vicinity of NAS Fort Worth JRB (Radian, 1989a,b).

2.1.7 Demographics

The following sections describe the regional and site-specific demographics as they relate to the Fort Worth, Texas area and NAS Fort Worth JRB.

2.1.7.1 Regional Demographics

Approximately 1,278,606 people reside within Tarrant County, Texas (U.S. Department of Commerce, 1996). Of this population, 485,650 reside within the city limits of Fort Worth. Several smaller cities and villages make up the remainder of the population. The communities of White Settlement, Lake Worth, Westworth Village, River Oaks, and Sansom Park lie within a 3-mile radius of NAS Fort Worth JRB. The following populations that reside in the cities and villages are based on 1994 census data: White Settlement (city) 16,502; Lake Worth (city) 4,694; Westworth Village (town) 2,502; River Oaks (city) 6,747; and Sansom Park (city) 4,136 (U.S. Department of Commerce, 1994). Six schools are within a 2-mile radius of NAS Fort Worth JRB; the closest is 0.5 miles south (Rust, 1995).

The area surrounding NAS Fort Worth JRB is highly urbanized due to its proximity to the city of Fort Worth. The area is composed of a combination of residential, commercial, and light industrial properties that employ the majority of local residents (Rust, 1995).

2.1.7.2 Site-Specific Demographics

The current full-time population at NAS Fort Worth JRB is approximately 3,600 people, comprising 400 officers, 1,400 civilians, and 1,800 active reservists. Part-time military reservists will increase this population to over 6,000 military personnel (CH2M HILL, 1996).

Approximately 86 percent of NAS Fort Worth JRB has been developed by way of buildings, roads, parking lots, runways, and housing and recreational areas. On-site activities include

various maintenance, inspection, and support activities for fuel systems, weapons, jet engines, AGE, and specialized ground equipment (HydroGeoLogic, 1999)

2.2 Site-Specific Environmental Setting

The following sections describe the site-specific environmental setting of NAS Fort Worth JRB.

2.2.1 Site-Specific Soils

The U.S Soil Conservation Service has identified four major soil associations in the area of NAS Fort Worth JRB. The first association is the surficial soils of the nearly level to gently sloping clayey soils of the Sanger-Purves-Slidell Association. Second is the Aledo-Bolar-Sanger Association, which is located within the southwestern portion of the Sanger-Purves-Slidell Association and is characterized as an increasingly loamy clayey soil of gentle to moderate slope. The third association, the Bastsil-Silawa Association separates the Sanger-Purves-Slidell Association from the Frio-Trinity Association. The Bastsil-Silawa Association is characterized as a sandy clay loam of nearly level slope (ESE, 1994). The clayey soils of the Frio-Trinity Association make up the fourth soil association and are located along the flood plain of the West Fork Trinity River. The areal limits of each of these soil associations and their occurrence on-site are shown in Figure 2.12.

2.2.2 Site-Specific Geology

The majority of NAS Fort Worth JRB is covered by alluvium deposited by the Trinity River during flood stages. The Quaternary Period alluvium (Holocene Epoch) occurs downstream from the Lake Worth Dam in the current flood plain of the West Fork Trinity River, on the east side of the facility. Older alluvial deposits and terrace deposits (Pleistocene Epoch) also occur on-site. The alluvium is composed of gravel, sand, silt, and clay of varying thicknesses and lateral extent. The thickness of these materials ranges from 0 to 60 feet. Fill material is also included within these deposits where landfills, waste pits, excavation sites, and other construction activities have altered the original land surface. This fill material is made up of clay, silt, sand, and gravel mixtures, but may also contain debris and other waste (Radian, 1989a,b).

Below the alluvial terrace deposits are the Cretaceous-age Goodland and Walnut Formations, which form the bedrock surface beneath NAS Fort Worth JRB. Both formations consist of interbedded, fossiliferous, hard limestone and calcareous shale. The upper formation, the Goodland Limestone, is exposed on the southern portion of the base, south of White Settlement Road. The Goodland is a chalky-white, fossiliferous limestone and marl. The thickness of the Goodland Limestone ranges from 20 to 25 feet. Below the Goodland Formation is the Walnut Formation (or Walnut Clay). The Walnut Formation is exposed in a small area along the shores of Lake Worth and Meandering Road Creek. This formation is a shell agglomerate limestone with varying amounts of clay and shale. It ranges in thickness from 25 to 35 feet throughout the site except where erosion has produced a few thinner areas. Subsurface investigations have located troughs and paleochannels that are eroded into the top of the bedrock at NAS Fort Worth JRB. These paleochannels are typical of an erosional surface modified by fluvial processes and are filled with sand and gravel deposits ranging in thickness from 15 to 35 feet (CH2M HILL, 1996).

Below the Walnut Formation is the Paluxy Formation (or Paluxy Sand). The Paluxy Formation underlies all of NAS Fort Worth JRB. The formation consists of several thick sandstone layers that are separated by thin, discontinuous shale and claystone layers. Sandstones in the formation are primarily a fine-to coarse-grained sand with minor amounts of clay, sandy clay, pyrite, lignite, and shale. The lower section of the Paluxy is generally coarser-grained than the upper section (CH2M HILL, 1996). Total formation thickness ranges from 130 to 175 feet, with variable thickness and occurrence of individual layers across the site. Only one unit in this formation, a shale/silty shale, can be extensively mapped across the base.

The older Glen Rose and Twin Mountains Formations are not exposed at NAS Fort Worth JRB The Glen Rose Formation consists primarily of calcareous sedimentary rock and some sands, clays, and anhydrite. The Glen Rose caps the Twin Mountain Formation, which is the oldest Cretaceous Formation in the NAS Fort Worth JRB area. The Twin Mountain Formation consists of a basal conglomerate of chert and quartz, grading upward into coarse- to fine-grained sand interspersed with varicolored shale.

Figures

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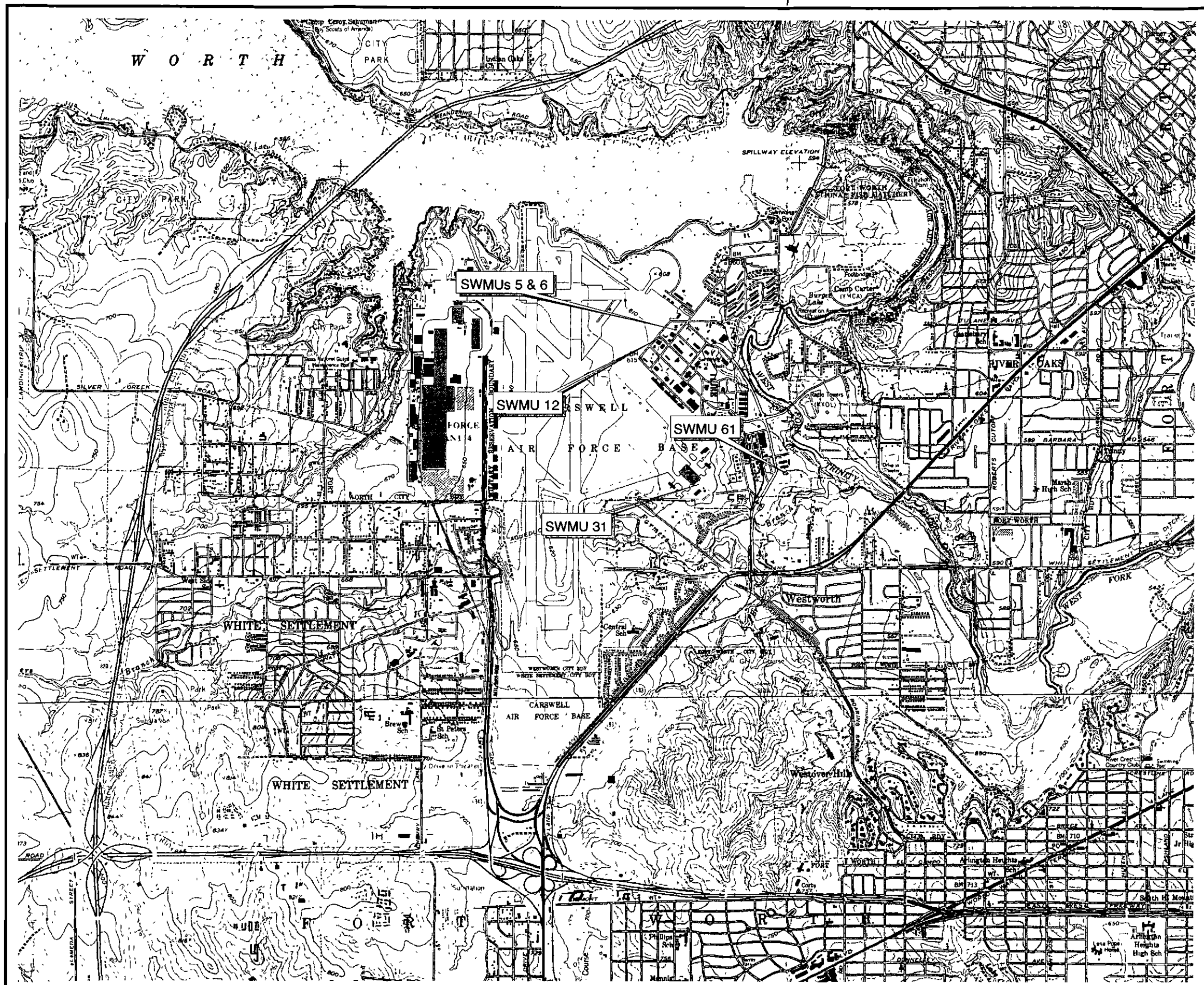
Figure 2.2 Generalized Geologic Cross Section of NAS Fort Worth JRB, Texas
Figure 2 3 Areal Distribution of Geologic Units of NAS Fort Worth JRB, Texas
Figure 2 4 Cross Section Location Map
Figure 2 5 Cross Sections A-A′, A′-A″, and A′-A‴
Figure 2.6 Cross Section B-B′
Figure 2.7 Cross Section B′-B″
Figure 2 8 Stratigraphic Column Correlating Hydrogeologic and Geologic Units
Figure 2 9 Water Level Elevations, Terrace Alluvium, April 2001
Figure 2 10 Water Level Elevations, Terrace Alluvium, October 2001
Figure 2 11 Water Well Receptor Survey Within 1 Mile of NAS Fort Worth JRB
Figure 2 12 Soil Association Map, NAS Fort Worth JRB, Texas



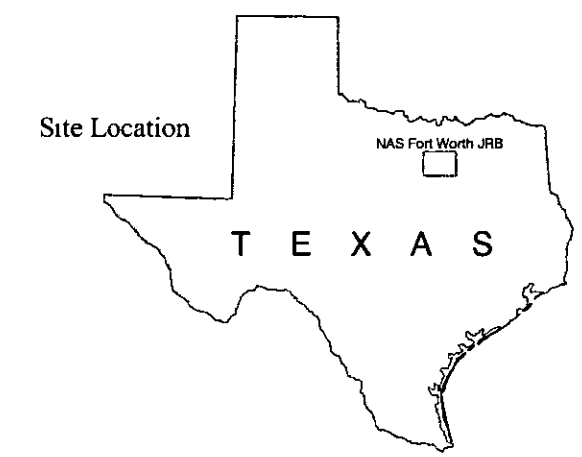
RCRA Facility Investigation Report - Waste Accumulated Areas
NAS Fort Worth JRB, Texas

Figure 2.1

Lake Worth Topographic Map

U.S. Air Force Center for Environmental Excellence

Legend



3000 0 3000 6000

SCALE IN FEET

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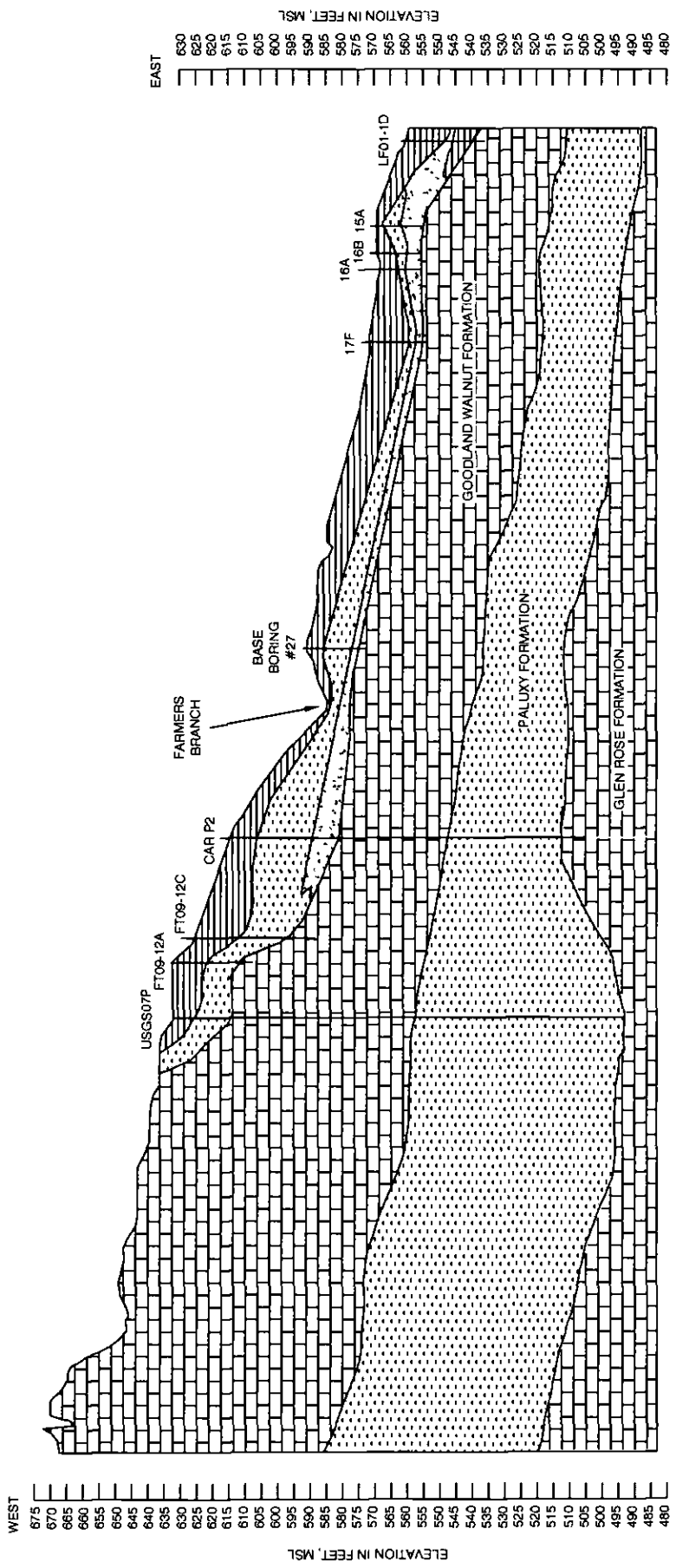
topo apr
Project EEG001-001-02-13
Created by. cfarmer 01/17/01
Revised 04/12/02 cf
Maps: Lake Worth and Benbrook TX
Dates Photorevised 1981, 1982

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO Geologic



NOTES

1 STRATIGRAPHIC CONDITIONS ARE KNOWN ONLY AT THE MONITORING WELLS AND BORINGS, CONTACTS ARE INTERPOLATED BETWEEN CONTROL POINTS

2 WITH THE EXCEPTION OF THE AREA BETWEEN USGS07P AND CAR-P2, THE CONTACT BETWEEN THE GOODLAND WALNUT AND PALUXY FORMATIONS DISPLAYS THE REGIONAL DIP OF 35-40 FEET PER MILE

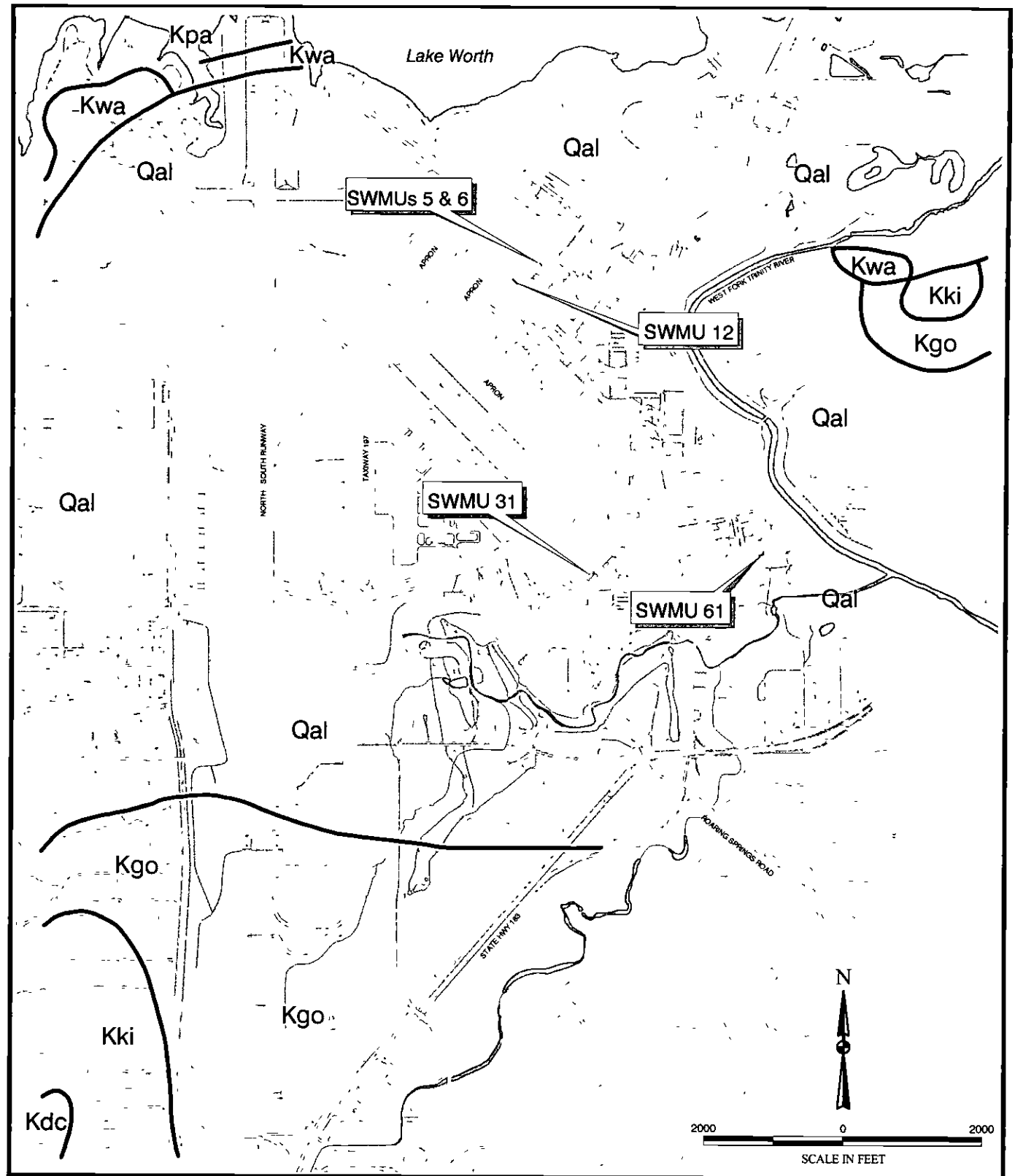
Legend

- Clay and Fill Material
- Gravel
- Sand
- Limestone and Shale

Figure 2.2
Generalized Geologic Cross Section of NAS Fort Worth JRB, Texas

ELLIS ENVIRONMENTAL GROUP, LC
HYDRO GEOLOGIC INC

Filename X EEG001 \DO1 \Maps\ rcra_ir_waa\Geo-x-section dwg
Created 06/02/99 jbelcher
Revised 04/12/02 apassarelli
Project EEG001-001-02-13
Source Radian, 1986, HGL, 1999



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Project EEG001-001-02-13
Created 03/06/02 tbraswell
Revised 04/12/02 cf
Source Radian, 1989

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO Geologic INC

Legend

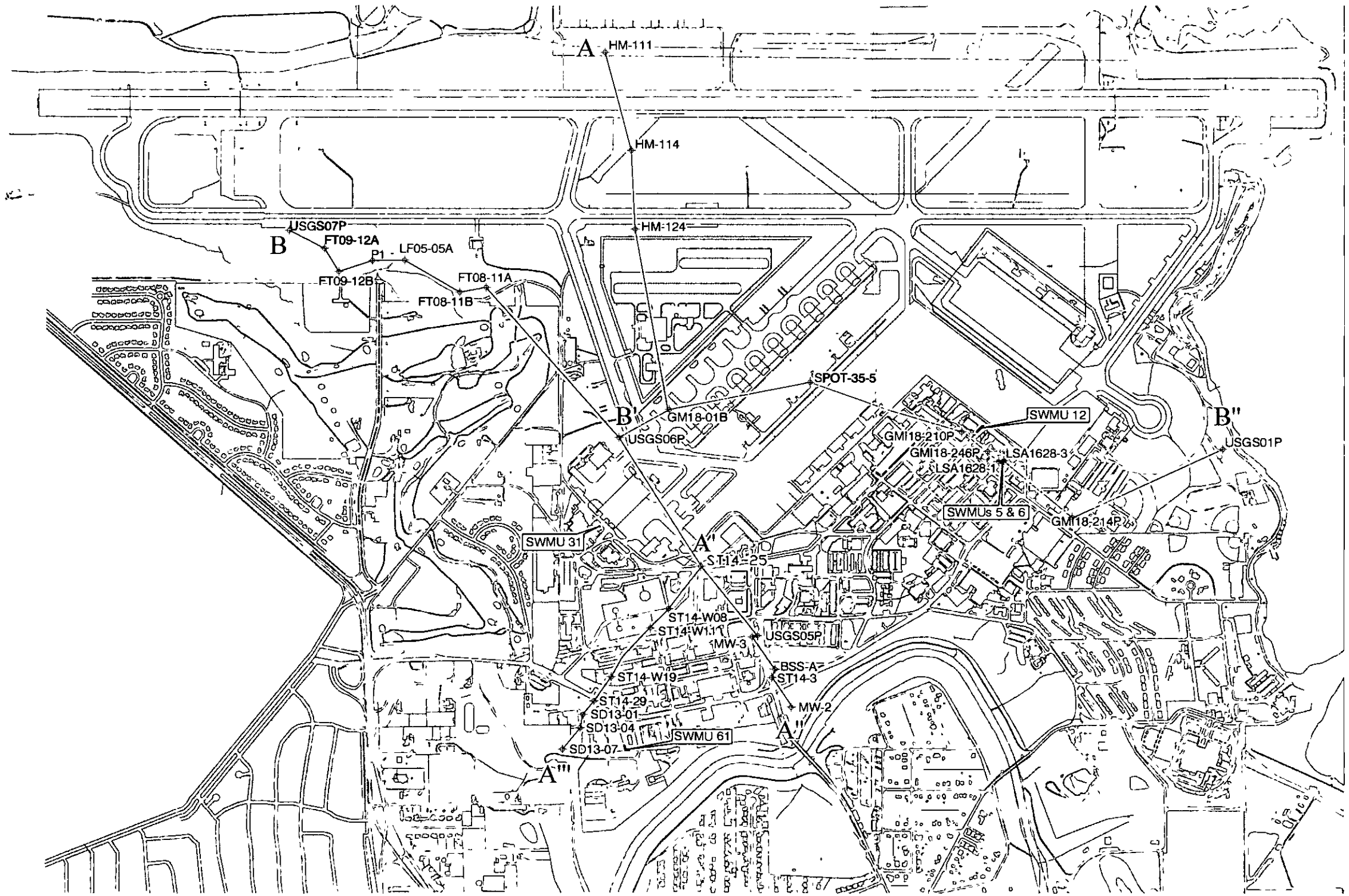
Symbol	Geologic Unit
Qal	Quaternary Alluvium
Kdc	Duck Creek Formation
Kki	Kiamichi Formation
Kgo	Goodland Limestone
Kwa	Walnut Formation
Kpa	Paluxy Formation

Figure 2.3
Areal Distribution of Geologic Units of NAS Fort Worth JRB, Texas

Figure 2.4

Cross Section Location Map

U. S. Air Force Center for Environmental Excellence



Legend

USGS01P — Boring Location

A——A' — Cross Section Line

N

0 625 1250 2500

SCALE IN FEET

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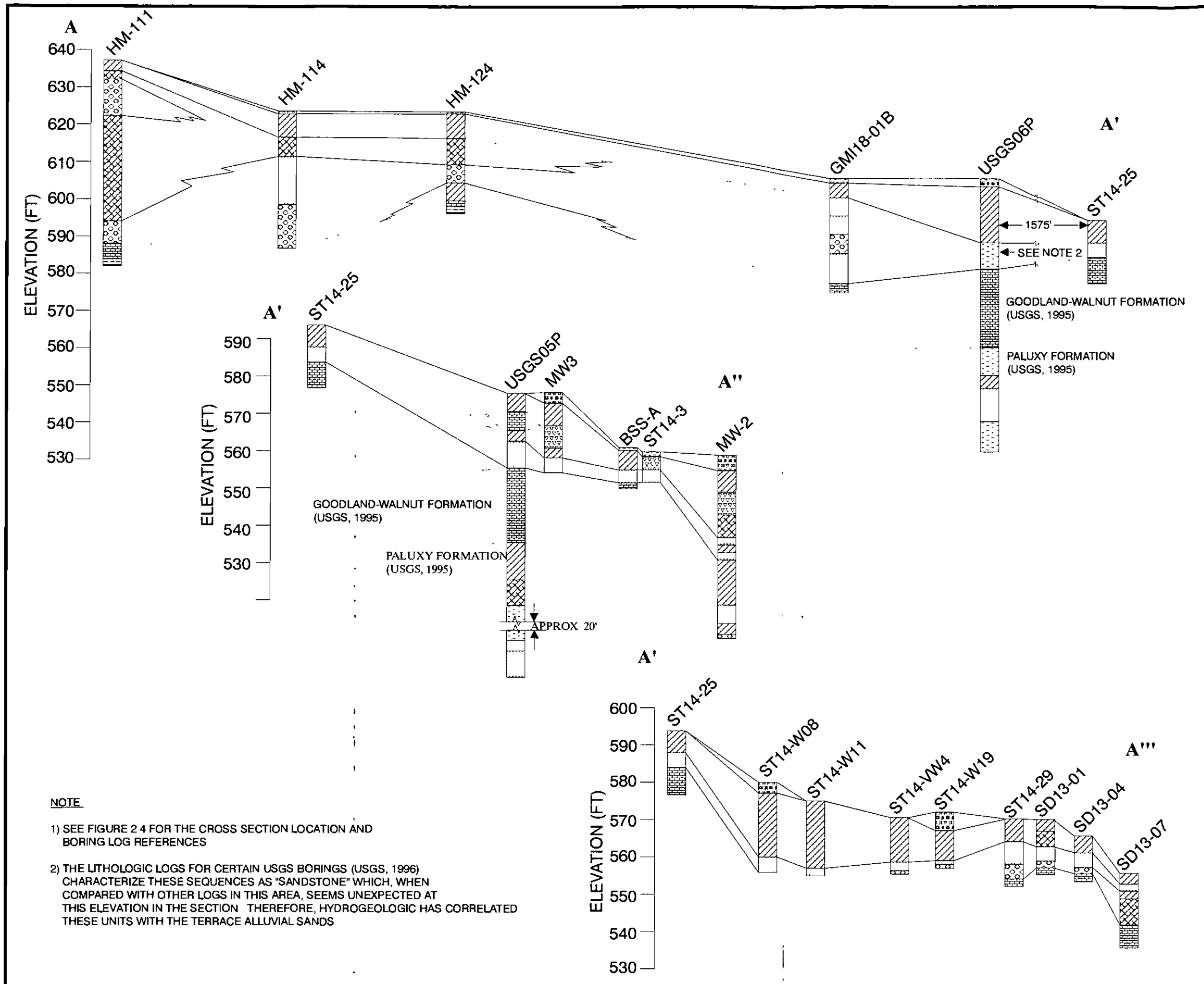
Project EEG001-001-02-13
Created by jbelcher 06/09/99
Revised 04/12/02 apassarelli
Map Source JACOBS, 1996

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC



NOTE

1) SEE FIGURE 2 4 FOR THE CROSS SECTION LOCATION AND BORING LOG REFERENCES

2) THE LITHOLOGIC LOGS FOR CERTAIN USGS BORINGS (USGS, 1996) CHARACTERIZE THESE SEQUENCES AS "SANDSTONE" WHICH, WHEN COMPARED WITH OTHER LOGS IN THIS AREA, SEEMS UNEXPECTED AT THIS ELEVATION IN THE SECTION THEREFORE, HYDROGEOLOGIC HAS CORRELATED THESE UNITS WITH THE TERRACE ALLUVIAL SANDS

RCRA Facility Investigation Report—Waste Accumulation Areas
NAS Fort Worth JRB, Texas

Figure 2.5

Cross Sections A-A', A'-A'', and A'-A'''

U.S. Air Force Center for Environmental Excellence

Legend

- Stratigraphic Contact
- Inferred Stratigraphic Contact
- Fine- to Coarse-Grained Sand, Clayey Sand, Silty Sand, Gravelly Sand
- Clay, Silty Clay, Sandy Clay
- Silt, Clayey Silt, Sandy Silt
- Gravelly Clay or Clay w/Limestone
- Fill, Soil, Gravel, Rock
- Coarse Gravel, Silty Gravel, Sandy Gravel
- Limestone
- Claystone/Mudstone/Shale
- Sandstone

0 600 1200
HORIZONTAL SCALE IN FEET

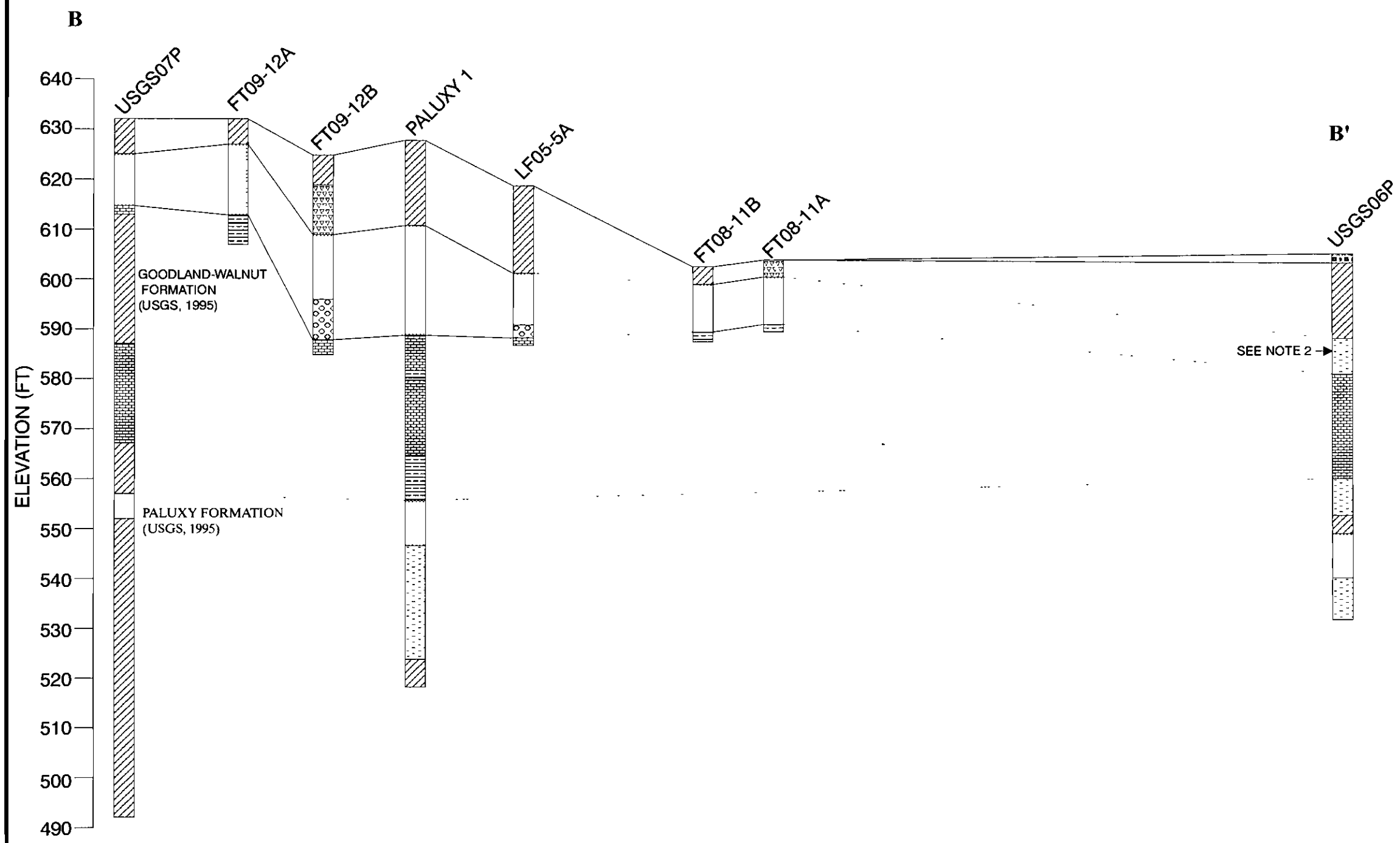
Filename X EEG\dol\maps\rcra_ir_waa\ A-A'' _x-sections cdr
Project EEG001-001-02-13
Revised 03/05/02 tbraswell
Source CH2M HILL 1996 b

ELLIS ENVIRONMENTAL GROUP, LC
HYDRO GeoLogic INC

Figure 2.6

Cross Section B-B'

U.S. Air Force Center for Environmental Excellence



NOTE

1) SEE FIGURE 2 4 FOR THE CROSS SECTION LOCATION AND BORING LOG REFERENCES

2) THE LITHOLOGIC LOGS FOR CERTAIN USGS BORINGS (USGS, 1996) CHARACTERIZE THESE SEQUENCES AS "SANDSTONE" WHICH, WHEN COMPARED WITH OTHER LOGS IN THIS AREA, SEEMS UNEXPECTED AT THIS ELEVATION IN THE SECTION THEREFORE, HYDROGEOLOGIC HAS CORRELATED THESE UNITS WITH THE TERRACE ALLUVIAL SANDS

Legend

- Stratigraphic Contact
- Inferred Stratigraphic Contact
- Fine- to Coarse-Grained Sand, Clayey Sand, Silty Sand, Gravelly Sand
- Clay, Silty Clay, Sandy Clay
- Silt, Clayey Silt, Sandy Silt
- Gravelly Clay or Clay w/Limestone
- Fill, Soil, Gravel, Rock
- Coarse Gravel, Silty Gravel, Sandy Gravel
- Limestone
- Claystone/Mudstone/Shale
- Sandstone

0 600 1200
HORIZONTAL SCALE IN FEET

Filename X EEG\do1\maps\rcra_ir_waa\ B-B _x-section cdr
Project EEG001-001-02-13
Revised 03/05/02 tbraswell
Source CH2M HILL, 1996 b

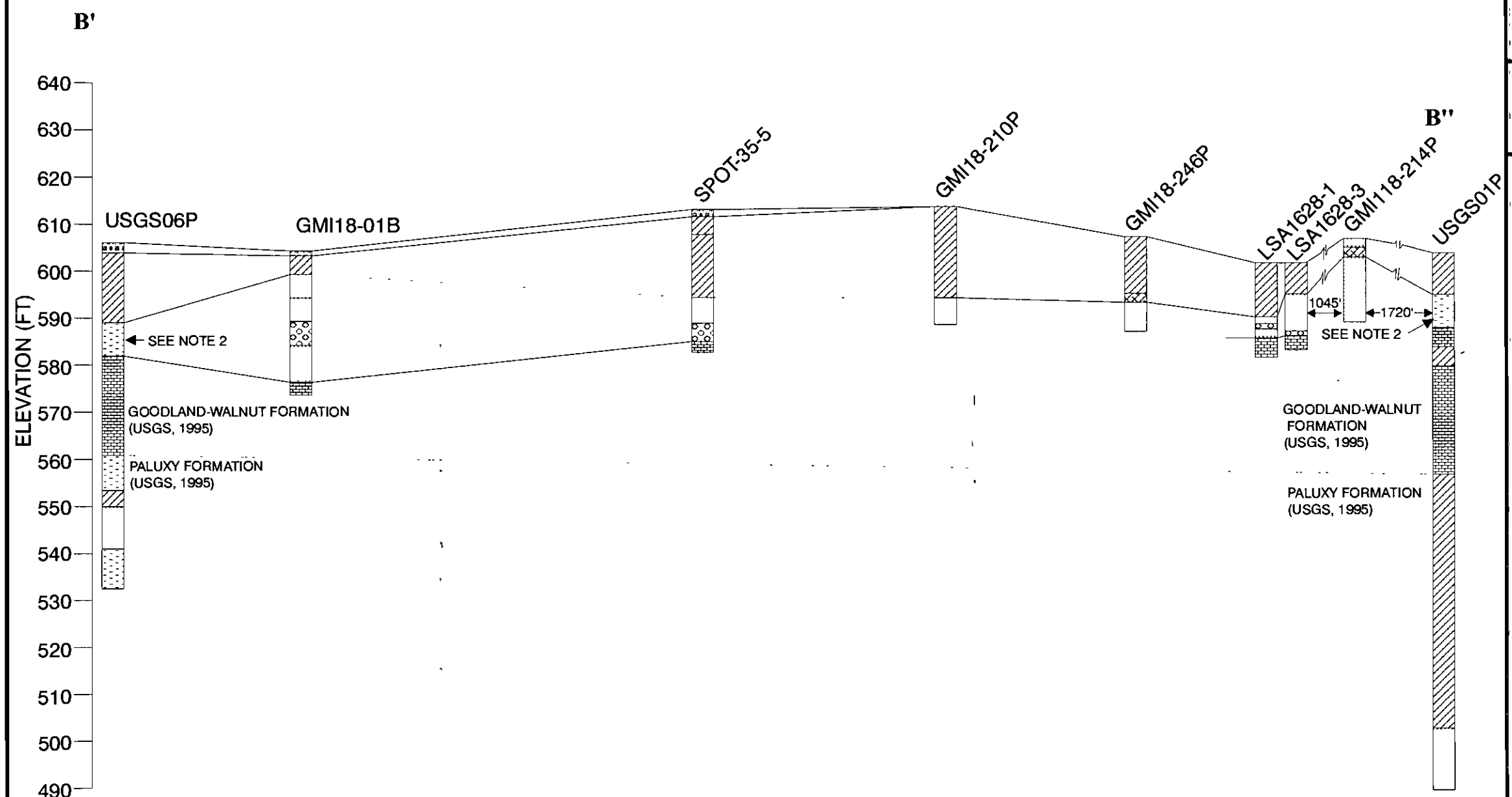
ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

Figure 2.7

Cross Section B'-B"

U.S. Air Force Center for Environmental Excellence



NOTE

1) SEE FIGURE 2 4 FOR THE CROSS SECTION LOCATION AND BORING LOG REFERENCES

2) THE LITHOLOGIC LOGS FOR CERTAIN USGS BORINGS (USGS, 1996) CHARACTERIZE THESE SEQUENCES AS "SANDSTONE" WHICH, WHEN COMPARED WITH OTHER LOGS IN THIS AREA, SEEMS UNEXPECTED AT THIS ELEVATION IN THE SECTION THEREFORE, HYDROGEOLOGIC HAS CORRELATED THESE UNITS WITH THE TERRACE ALLUVIAL SANDS

Legend

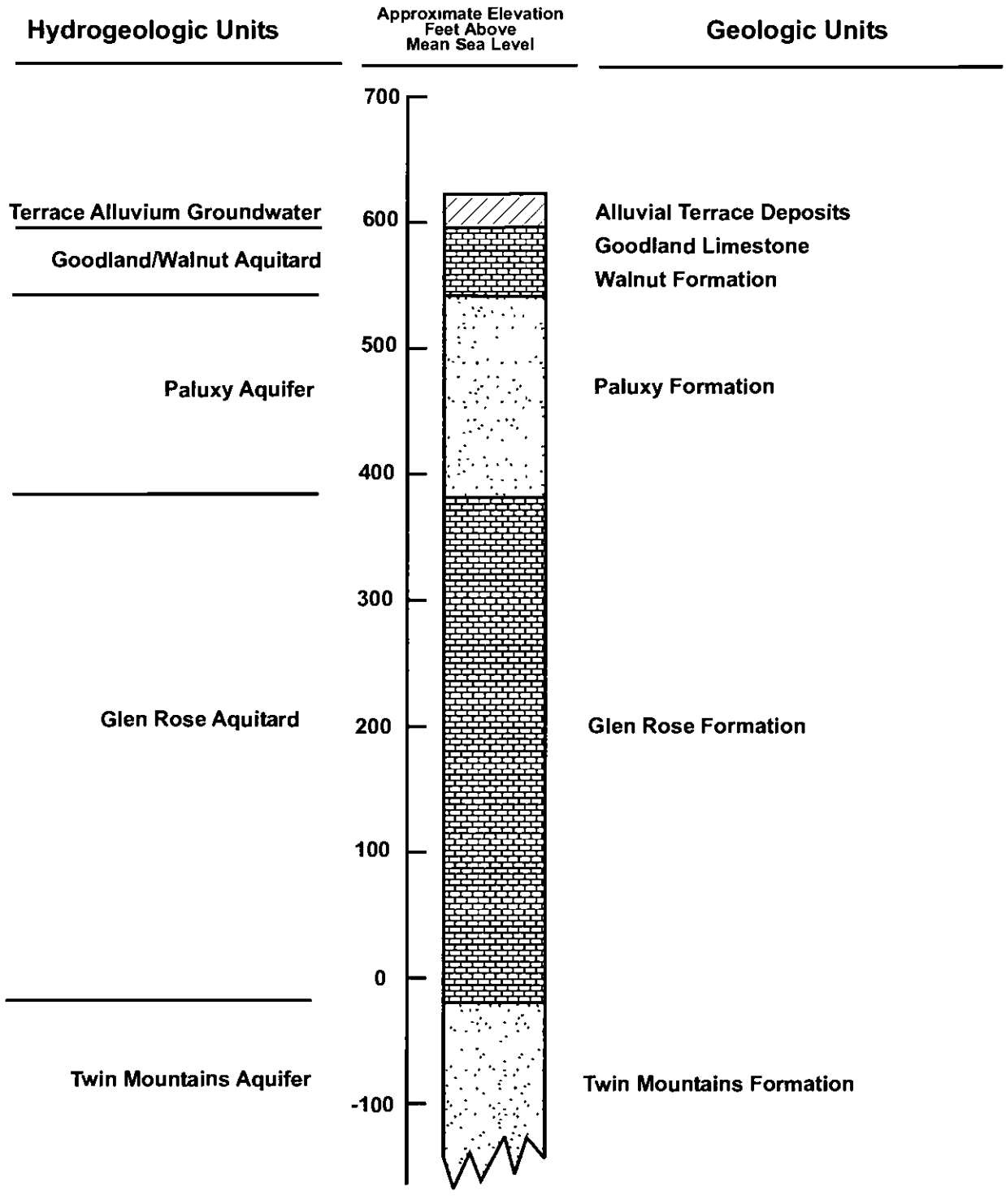
- Stratigraphic Contact
- Inferred Stratigraphic Contact
- Fine- to Coarse-Grained Sand, Clayey Sand, Silty Sand, Gravelly Sand
- Clay, Silty Clay, Sandy Clay
- Silt, Clayey Silt, Sandy Silt
- Gravelly Clay or Clay w/Limestone
- Fill, Soil, Gravel, Rock
- Coarse Gravel, Silty Gravel, Sandy Gravel
- Limestone
- Claystone/Mudstone/Shale
- Sandstone

0 600 1200
HORIZONTAL SCALE IN FEET

Filename X EEG\do1\maps\rcra_ir_waa\ B -B _x-section cdr
Project EEG001-001-02-13
Revised 03/05/02 tbraswell
Source CH2M HILL, 1996

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC



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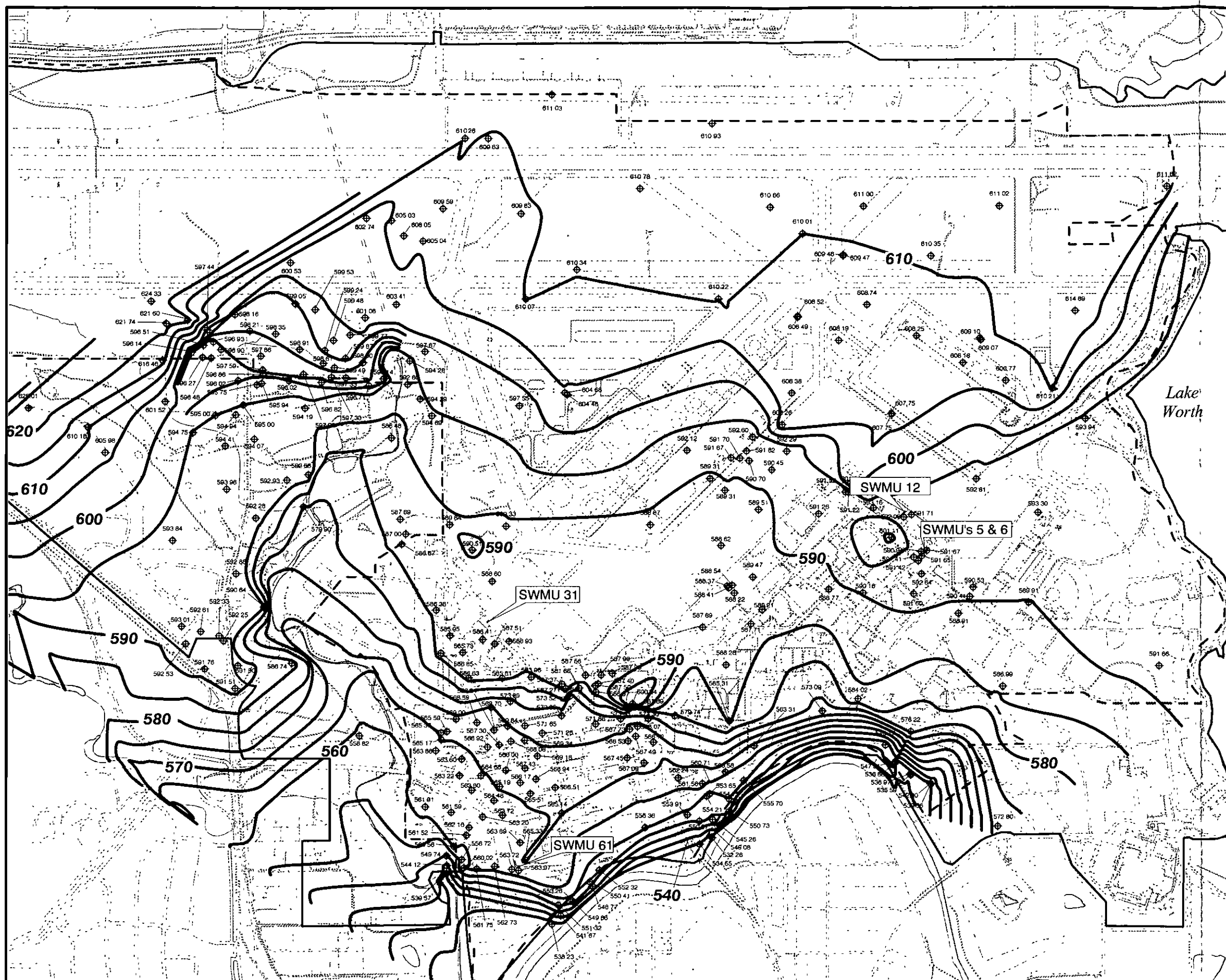
Project EEG001-001-02-13
Revised 03/05/02 tbraswell
Map Source Radian, 1989

ELLIS ENVIRONMENTAL GROUP LC
HYDRO GeoLogic INC

Legend

- Alluvium
- Limestone
- Sandstone

Figure 2.8
Stratigraphic Column Correlating Hydrogeologic and Geologic Units



RCRA Facility Investigation Report—Waste Accumulation Areas
NAS Fort Worth JRB, Texas

Figure 2.9

Water Level Elevations
Terrace Alluvium
April 2001

U.S. Air Force Center for Environmental Excellence

Legend

- - - - NAS Fort Worth JRB (Carswell Field)

——— Former Carswell Air Force Base

— 600 — Groundwater Elevation Contour (ft msl)

⊕ Monitoring Well
533 76 Groundwater Elevation (ft msl)

Solid Waste Managment Units (SWMU)

Building/Structure

N

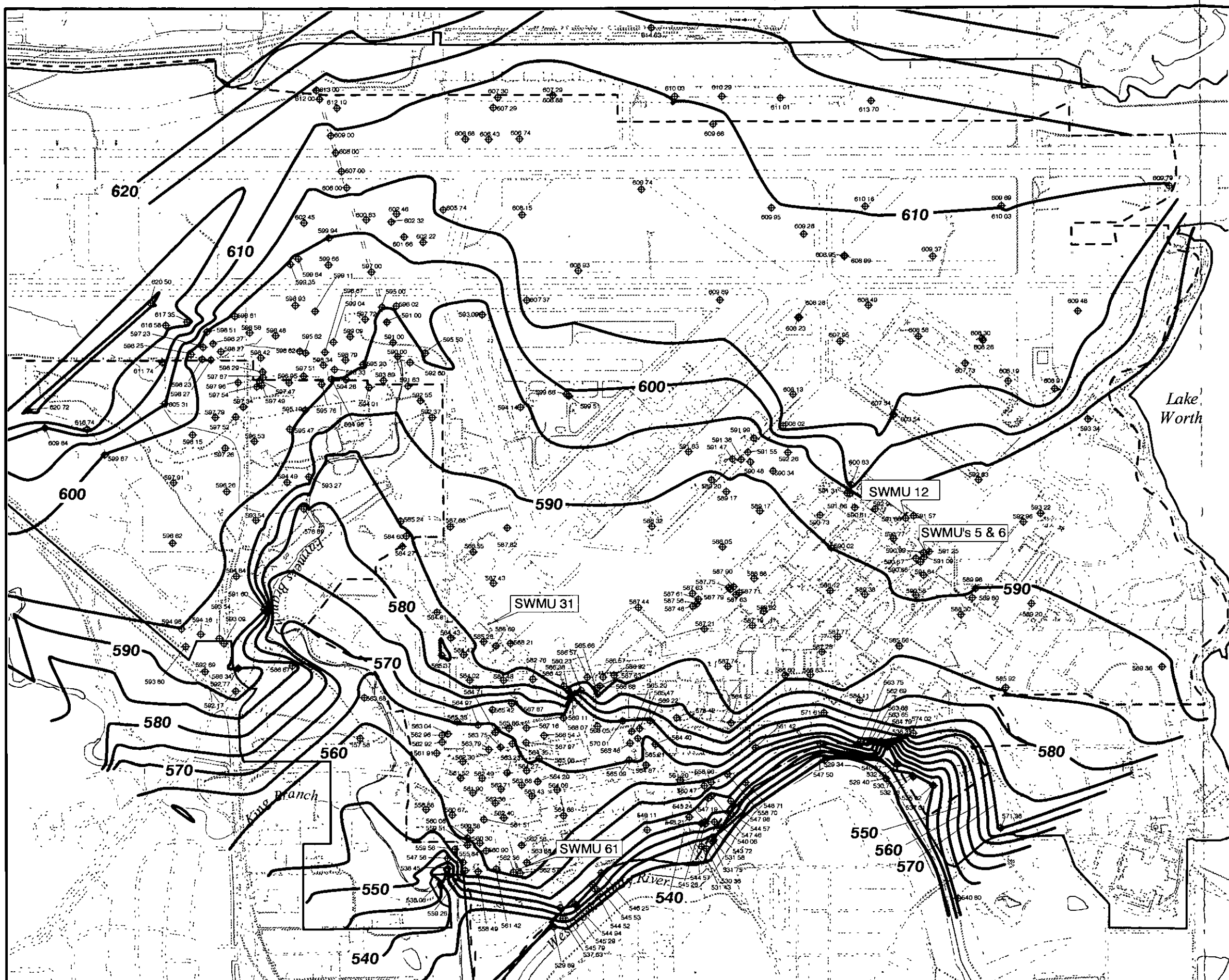
0 500 1000 2000

SCALE IN FEET

Filename X \EEG\do1\maps\rcra_ir_waa\ groundwater elev apr2001 apr
Project. EGG001-001-02-13
Created 07/05/01 jbelcher
Revised 04/04/02 cf
MapSource HydroGeoLogic, Inc GIS Database, 2001

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC



RCRA Facility Investigation Report—Waste Accumulation Areas
NAS Fort Worth JRB, Texas

Figure 2.10

Water Level Elevations
Terrace Alluvium
October 2001

U.S. Air Force Center for Environmental Excellence

Legend

- - - - NAS Fort Worth JRB (Carswell Field)

——— Former Carswell Air Force Base

— 600 — Groundwater Elevation Contour (ft msl)

Monitoring Well

608 99 Groundwater Elevation (ft msl)

Solid Waste Managment Units (SWMU)

Building/Structure

Filename X:\EEG\dol\maps\rcra_ir_wad\ groundwater elev_oct2001.apr
Project EGG001-001-02-13
Created 07/05/01 jbelcher
Revised 04/04/02 cf
MapSource HydroGeoLogic, Inc GIS Database, 2002

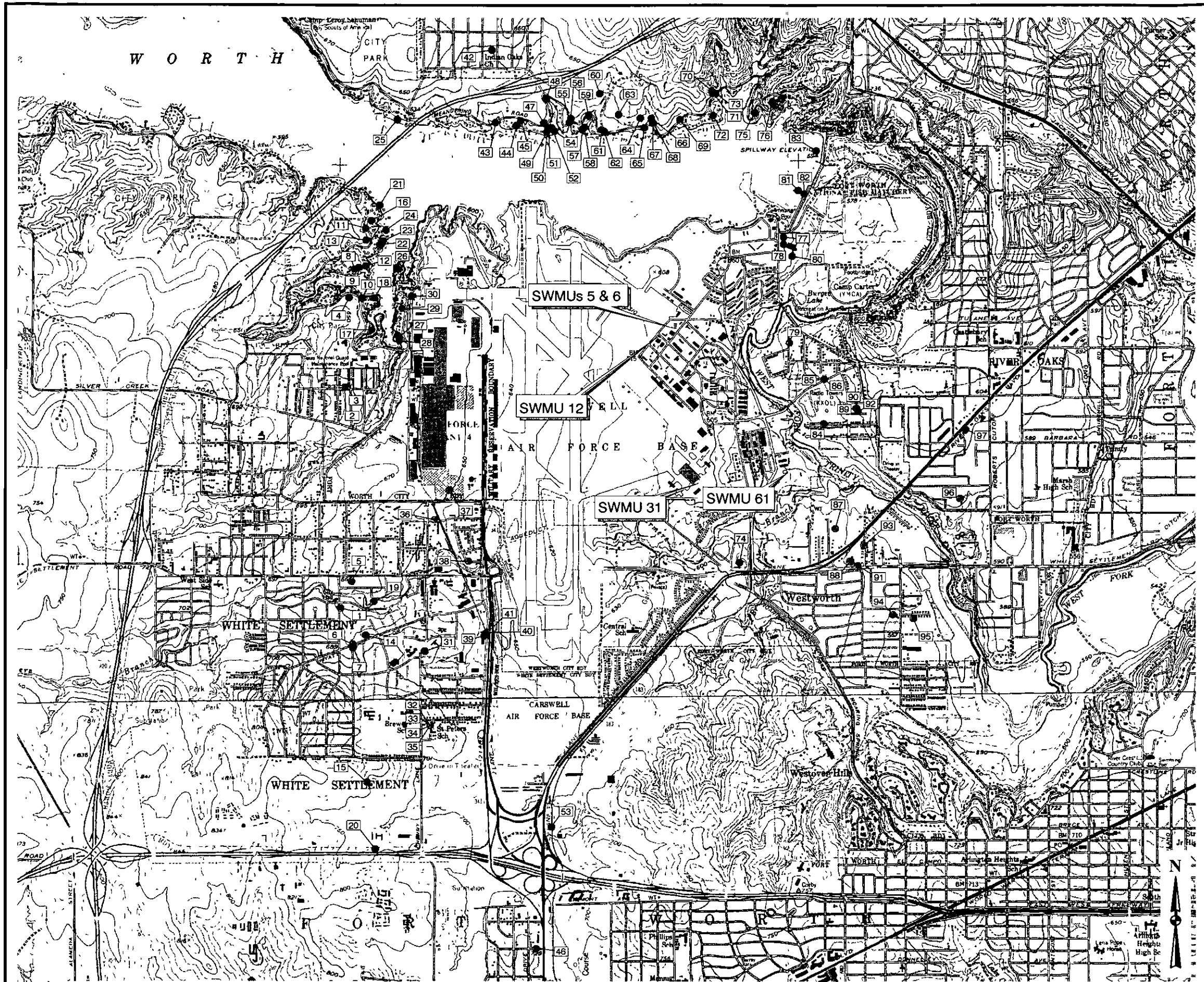
ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic Inc

Figure 2.11

Water Well Receptor Survey Within 1 Mile of NAS Fort Worth JRB

U.S. Air Force Center for Environmental Excellence



Legend

● Water Well Location

MAP ID	STATE WELL ID	WELL TYPE
1	Unnumbered	Domestic
2	32-13-811	Public Supply
3	32-13-808	Public Supply
4	32-13-08	Domestic
5	32-13-7k	Domestic
6	32-13-806	Unused
7	32-13-805	Unused
8	32-13-8	Domestic
9	32-13-4	Domestic
10	32-13-816	Domestic
11	32-13-7X	Domestic
12	32-13-8	Domestic
13	32-13-8	Domestic
14	Unnumbered	Domestic
15	32-21-2	Public Supply
16	32 13-8	Domestic
17	32-13-814	Domestic
18	32-13-819	Domestic
19	32-13-804	Public Supply
20	32 20-6	Domestic
21	32-13-822	Domestic
22	32-13-815	Domestic
23	32-13-820	Domestic
24	32-13-821	Domestic
25	32-13-5	Domestic
26	32-13-818	Domestic
27	32-13-813	Domestic
28	G2200324A	Public Supply
29	32-13-817	Domestic
30	32-13-8	Domestic
31	32-13-7g	Domestic
32	32-21-205	Unused
33	32-21-206	Unused
34	32-21-207	Unused
35	32-21-208	Unused
36	32-13-8c	Domestic
37	32-13-807	Unused
38	32-13-803	Public Supply
39	32-13-812	Public Supply
40	32-13-801	Public Supply
41	32-13-802	Public Supply
42	32-13-5C	Domestic
43	Unnumbered	NA
44	32-13-5	Domestic
45	32-13-7	Domestic
46	32-21-2B	Domestic
47	32-13-5	Domestic
48	32-13-5	Domestic
49	32-13-5	Domestic

MAP ID	STATE WELL ID	WELL TYPE
50	32-13-5	Domestic
51	32-13-5U	Domestic
52	32-24-4	Domestic
53	Unnumbered	Industrial
54	32-13-3	Domestic
55	Unnumbered	Domestic
56	32-13-5	Domestic
57	32-13-5K	Domestic
58	32-13-5K	Domestic
59	32-13-5	Domestic
60	32-13-5B	NA
61	32-13-5	Domestic
62	32-13-5	Domestic
63	32-13-9h	Domestic
64	32-13-5	Domestic
65	32-13-5	Domestic
66	32-13-5F	Domestic
67	32-13-5F	Domestic
68	32-13-5F	Domestic
69	32-13-5	Domestic
70	32-13-5S	Domestic
71	32-13 5S	Domestic
72	32-13-5	Domestic
73	32-13-5S	Domestic
74	32-12-9	Domestic
75	32-13-5	Domestic
76	32-13-5M	Domestic
77	32-13-810	Unused
78	32-13-809	Unused
79	32-13-8	Domestic
80	32-13-9	Domestic
81	S2200012A	Surface Water Intake
82	S2200012B	Surface Water Intake
83	S2200069A	Surface Water Intake
84	32-14-7	Domestic
85	32-13-911	Unused
86	32-13-912	Public Supply
87	32-13-9a	Domestic
88	32-13-917	Public Supply
89	32-13-9	Irrigation
90	32-14 7	Domestic
91	32-13-9	Domestic
92	32-14-7	Domestic
93	32-13-9	Domestic
94	32-13-9	Domestic
95	32-13-9a	Domestic
96	32-13-9	Irrigation
97	32-31-1N	Irrigation

3000 0 3000 6000

SCALE IN FEET

Filename X \EEG\do1\maps\rcra_ir_waa
water_well_receptor apr
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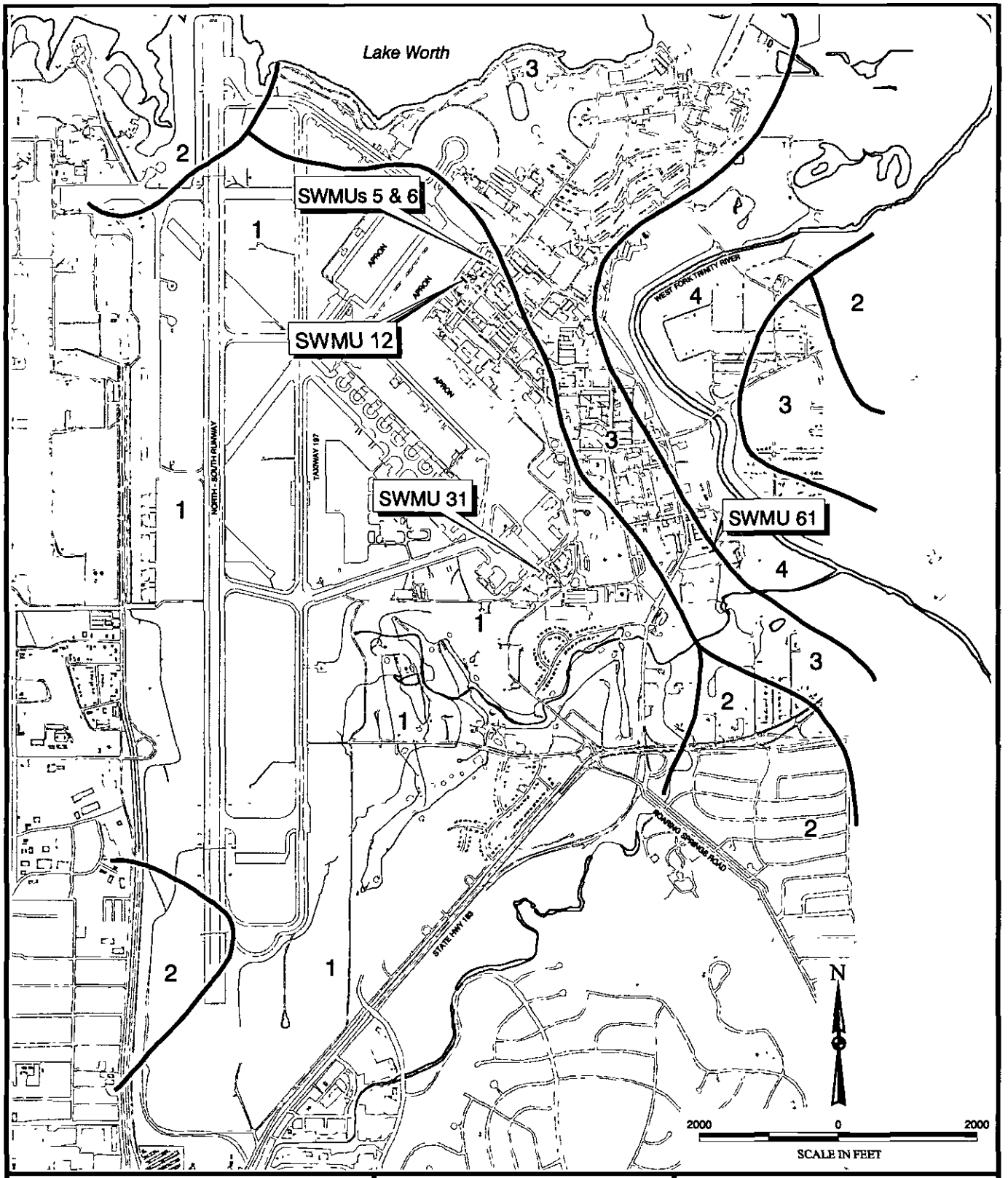
Created by cfarmer 01/17/01
Revised. 03412/02 cf
Maps Lake Worth and Benbrook TX
Dates Photorevised 1981, 1982

ELLIS ENVIRONMENTAL GROUP LC

HYDRO GeoLogic INC



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Project EEG001-001-02-13
Created 03/06/02 tbraswell
Revised 04/12/02 cf
Source Radian, 1989

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic

Legend

Soil Association.

1	Sanger-Purves-Slidell
2	Aledo-Bolar-Sanger
3	Bastsil-Silawa
4	Frio-Trinity

Figure 2.12
Soil Association Map
NAS Fort Worth JRB, Texas

TAB

SECTION 3.0

3.0 Summary of Investigation Activities

This section describes activities conducted as part of this investigation. Preliminary activities conducted for the site characterization included site reconnaissance, utility clearance, and inspections of each WAA storage shed. Chemical characterization activities included surface and subsurface soil sample collection and groundwater sampling intended to identify the nature and extent of contamination that may have resulted from past activities at each site. In addition, IRAs were performed at SWMUs 12, 31, and 61 in order to remove soil with contaminant concentrations exceeding RRS 2.

3.1 Site Reconnaissance and Utility Clearance

Prior to mobilizing to the field, HydroGeoLogic conducted site reconnaissance to select sample locations and to assess requirements for site preparation and clearance of underground utilities. Proposed drilling locations were determined and marked within and surrounding each SWMU based on accessibility and utility locations.

The Navy Public Works Office was notified regarding the intended field investigation and sampling. Local utility companies were contacted to mark and clear all subsurface utilities within the area of SWMUs 5, 6, 12, 31, and 61. For the Phase I soil investigation, the Navy Public Works office issued an individual dig permit for each SWMU under a master Permit No. 264 when utility clearance was completed at each site. Each individual dig permit was valid for 30 days, and field efforts for each site were conducted during the applicable 30-day window. Master Permit No. 264 expired before the Phase II soil investigation, and intrusive activities for Phase II and III were conducted under 30-day permits issued individually for each SWMU.

3.2 Site Investigation Activities

The following sections describe previous investigations conducted in association with the subject sites as well as activities conducted as part of this RFI. Investigation activities were conducted at SWMUs 5, 6, 12, 31, and 61 during May and June of 1999, April and May 2000, October 2000, June 2001, and November 2001 through March 2002. All sampling activities were conducted in accordance with the RFI WPs (HydroGeoLogic, 1999), the Phase II and III WP Addendums (HydroGeoLogic, 2000a and 2001a), and the IRA Final Work Plan (EEG, 2001).

As stated earlier in Section 1.3, the Air Force provided justification of a reduced list of soil and groundwater analytical requirements for this RFI in a letter to the TNRCC dated April 20, 1999. This letter is included as Appendix A.

3.2.1 SWMUs 5 and 6

3.2.1.1 WAA Storage Shed Inspection

In 1989, new walls were added to the former storage shed at SWMU 5, designated as WAA 1627 (A.T. Kearney, 1989). The 301st Air Reserve currently uses this building for the storage of HW. Prior to initiating the intrusive investigation at SWMU 5, the walls and floor of WAA 1627 were examined for cracks or gaps. The integrity of WAA 1627 appeared to be intact during the

inspection and as a result, intrusive activities did not take place within the storage shed. Photographs of the WAA storage shed at SWMU 5 are presented in Figure 3.1.

Shortly after 1990, the washrack and drain were removed at SWMU 6. This site has not served as an active washrack since that time.

3.2.1.2 Site Investigation History

Although there have been no soil or groundwater investigations directly associated with SWMUs 5 or 6 prior to this RFI, in 1993, the Fort Worth District Corps of Engineers conducted a limited site assessment (LSA) for leaking petroleum storage tank (LPST) site 106684 located adjacent to SWMUs 5 and 6 The site contained three leaking underground storage tanks (USTs) that were removed from the Building 1628 vehicle refueling area in October 1993 [U.S. Army Corps of Engineers (USACE), 1994]. These three USTs, 1628-1 (1,000 gallons gasoline), 1628-2 (1,000 gallons diesel), and 1628-3 (2,000 gallons JP-4), were located immediately to the east (downgradient) of SWMUs 5 and 6. After the tanks were exhumed, contaminated backfill was returned to the excavation and covered with a plastic liner. Clean soil was brought in to level the site. Three monitoring wells, LSA1628-1, LSA1628-2, and LSA1628-3, were subsequently installed in and around the former UST site (USACE, 1994). The locations of the former UST site and the associated monitoring wells are depicted in Figure 3.2.

Soil samples were collected during the installation of the three wells and analyzed using EPA Methods 8310 for polynuclear aromatic hydrocarbons (PAHs), 8020 for benzene, toluene, ethylbenzene, and xylenes (BTEX) and methyl tertiary butyl ether (MTBE), and 418.1 for TPH. Soil samples collected during the installation of LSA1628-3 indicated the area upgradient of the LPST site was not impacted by the leaking USTs. The soil samples during the installation of LSA1628-1 contained the highest levels of contamination, while the samples from LSA1628-2 contained moderate levels of petroleum contamination. A summary of the 1993 analytical results for soil is presented in Table 3.1. A more detailed discussion of these results is presented in the Revised-Final WPs (HydroGeoLogic, 1999).

Groundwater samples collected during the LSA were analyzed using EPA Methods 8310 for PAHs, 8240 for VOCs and MTBE, 418.1 for TPH, and 160.1 for Total Dissolved Solids (TDS). Groundwater samples collected during 1993, indicate the same distribution of petroleum contamination as was found in site soils. This distribution suggests the soil and groundwater surrounding the UST excavation, and immediately downgradient of SWMUs 5 and 6 was impacted by the leaking tanks. A summary of the 1993 analytical results for groundwater is presented in Table 3.2. A more detailed discussion of these results is presented in the Revised-Final WPs (HydroGeoLogic, 1999).

Following the 1993 LSA, groundwater samples were collected from the three LSA monitoring wells in 1995 (Law Engineering, 1996). Groundwater samples were analyzed for USEPA Methods 6010, 7060, and 7421 for metals; 8240 for VOCs; and 8270 for SVOCs. Sample results were compared to background levels for metals and the practical quantitation limits (PQLs) for organics. Concentrations of arsenic exceeded background levels in all three of the monitoring wells sampled and exceeded RRS 2 levels at a concentration of 0.0503 mg/L in monitoring well

LSA1628-2 (Figure 3.2). Lead exceeded both background and RRS 2 in monitoring wells LSA1628-1 and LSA1628-2. In addition, concentrations of petroleum related compounds, along with several SVOCs were detected in the groundwater samples collected at the site. As in the results of the 1993 LSA, higher concentrations of petroleum related compounds were detected in wells LSA1628-1 and LSA1628-2, with lower to no detections found in upgradient well LSA1628-3. A summary of the 1995 analytical results for groundwater is presented in Table 3.3. A more detailed discussion of these results is presented in the Revised-Final WPs (HydroGeoLogic, 1999).

In April 1998, the USACE began remediation activities of the groundwater beneath the former UST site. ENSR Corporation (ENSR) installed two additional monitoring wells, LSA1628-14 and LSA1628-15 downgradient of the site (Figure 3.2) and injected a slurry of an Oxygen Releasing Compound® to a depth of 17 feet below ground surface (bgs), to the north and east of LSA1628-3 (ENSR, 1998b). Groundwater samples were collected in June and September of 1998 from each of the five wells at the site, and analyzed for VOCs (8260), PAHs (8310), and TPH (TX1005). The 1998 groundwater sampling results are presented in Table 3.4. The distribution of contaminants in the groundwater samples collected from LSA1628-1, LSA1628-2, and LSA1628-3 was similar to the analytical results of the 1993 soil and groundwater investigation. Benzene was detected in the groundwater from LSA1628-14 slightly above the current TNRCC MSCs in June of 1998 and in September of 1998 (ENSR, 1998a). However, higher concentrations of benzene were detected in upgradient wells LSA1628-1 and LSA1628-2. Concentrations of TCE and associated VOCs were detected in all five wells and are attributed to the regional TCE plume.

As no significant petroleum-related VOCs were detected in the groundwater samples collected from well LSA1628-3 (Figure 3.2), these results are most likely to be indicative of a release from the tank excavation at LPST site 106684, and are not considered to be indicative of a release from SWMU 5 or 6.

3.2.1.3 Phase I Soil Sampling Activities

During Phase I of the RFI, three characterization soil borings were advanced around SWMU 5 and two characterization soil borings were advanced at SWMU 6 using DPT. Figure 3 2 illustrates the location of the SWMUs 5 and 6 Phase I borings, depicted as red circles. Soil samples were collected from each boring every 5 feet from the ground surface to the top of the water table. At SWMU 5, one boring (BHGLSWMU05001) was located where batteries were stored during the RFA, a second boring (BHGLSWMU05002) was located on the south side of the storage shed, and a third boring (BHGLSWMU05003) was located near the northeast corner of the SWMU. At SWMU 6, two borings (BHGLSWMU06001 and BHGLSWMU06002) were advanced within the former washrack area. A total of five surface soil and five subsurface soil samples were submitted for chemical analysis. Based on the types and quantities of wastes handled at SWMUs 5 and 6 (see Table 1.1), all samples were analyzed for the following list of analyses:

Screening:

- TX1005 – TPH
- SW9045C – soil pH
- SW8015 – ethylene glycol

Definitive (Appendix IX):

- SW8260B – volatile organic compounds (VOCs)
- SW8270C – semivolatile organic compounds (SVOCs)
- SW6010B/7000A – trace elements (metals)
- SW7471A – mercury

The analytical results obtained from samples collected from the soil borings were intended to determine whether a release has occurred from SWMUs 5 and 6. Results of the SWMUs 5 and 6 Phase I soil investigation are presented in Section 4.0.

3.2.1.4 Phase II Soil Sampling Activities

Five additional soil borings, BHGLSWMU05004 through BHGLSWMU05006, BHGLSWMU06003, and BHGLSWMU06004, were advanced at SWMUs 5 and 6 during Phase II. The Phase II soil borings are depicted as blue circles on Figure 3.2. Two of the soil borings, BHGLSWMU06003 and BHGLSWMU06004, were completed southwest and south of SWMU 6, respectively. The other three soil borings, BHGLSWMU05004, BHGLSWMU05005, and BHGLSWMU05006, were completed southeast, east, and northeast of SWMU 5, respectively. A total of 5 subsurface soil samples were submitted for chemical analysis during Phase II. Soil samples were collected to confirm the presence of specific CoCs at the depth intervals associated with the corresponding Phase I detections. Based on the results of the Phase I soil samples, the following methods were used to analyze Phase II soil samples:

Definitive:

- SW6010B – arsenic, barium, cobalt
- SW7421 – lead

All Phase II subsurface soil samples were analyzed for barium and cobalt. Samples collected from the 5-foot intervals of borings BHGLSWMU05005, BHGLSWMU05006, BHGLSWMU06003, and BHGLSWMU06004 were also analyzed for arsenic and lead. The analytical results obtained from samples collected from the Phase II soil borings were intended to confirm or delineate the presence of analytes detected slightly above both background and the MSCs at SWMUs 5 and 6 during the Phase I investigation. All Phase II soil analytical results at SWMUs 5 and 6 are discussed in Section 4.0.

3.2.1.5 Phase III Soil Sampling Activities

Although most CoCs were delineated during Phase II, additional sampling was necessary to achieve site closure under RRS 2. As a result, three additional borings, BEEGSWMU05007, BEEGSWMU06005, and BEEGSWMU06006, were advanced in June 2001 during Phase III. The Phase III soil borings locations are depicted as red squares on Figure 3.2. Soil boring BEEGSWMU05007 was advanced to the south of SWMU 5; BEEGSWMU06005 and

BEEGSWMU06006 were advanced to the northwest and southwest of SWMU 6, respectively. Soil samples were collected to confirm or delineate the presence of specific CoCs at the depth intervals associated with the corresponding Phase I and II detections. Based on the results of the Phase II soil samples, the following methods were used to analyze Phase III soil samples:

Definitive:

- SW6010B – cobalt
- SW7061 – arsenic

All Phase III subsurface soil samples were analyzed for cobalt. Samples collected from the 5-foot intervals of borings BEEGSWMU06005 and BEEGSWMU06006 were also analyzed for arsenic. All Phase III soil analytical results at SWMUs 5 and 6 are discussed in Section 4.0.

3.2.1.6 IRA Activities

An IRA was not conducted at SWMU 5 or SWMU 6

3.2.1.7 Groundwater Sampling Activities

Monitoring well installation at SWMUs 5 and 6 was not necessary due to existing monitoring wells LSA1628-2 and LSA1628-3. The monitoring well locations are depicted in Figure 3.2. Two rounds of groundwater sampling were conducted during Phase II. Based on the results of the Phase I soil samples, Phase II groundwater samples were analyzed for the following list of selected total metals·

Definitive:

- SW6010B – arsenic (Round 1)
- SW7060A – arsenic (Round 2)
- SW6010B – barium and cobalt (Rounds 1 and 2)
- SW7421 – lead (Rounds 1 and 2)

The method for arsenic analysis was changed to SW7060A in Round 2 due to a suspicion that low-level arsenic detections may be influenced by matrix effects. Method SW7060A is an arsenic-specific method and the data quality and analytical sensitivity produced by this method are of at least the same level as those produced by method SW6010B.

The analytical results from LSA1628-2 necessitated that an additional groundwater sample be collected from this monitoring well during Phase III in June 2001. No groundwater sample was collected from the upgradient monitoring well LSA1628-3 during Phase III. The Phase III groundwater sample was analyzed for arsenic only.

The analytical results obtained from samples collected from these monitoring wells are intended to determine if any analytes detected above the soil MSCs at SWMUs 5 and 6 are having an impact on groundwater quality. Results of the SWMUs 5 and 6 groundwater investigation are presented in Section 4.0.

3.2.2 SWMU 12

3.2.2.1 WAA Storage Shed Inspection

No WAA storage shed exists at SWMU 12. Shortly after 1990, all waste was removed from SWMU 12, and the site has not served as an active WAA since that time.

3.2.2.2 Site Investigation History

There have been no previous investigations associated with SWMU 12.

3.2.2.3 Phase I Soil Sampling Activities

Three soil borings, BHGLSWMU12001 through BHGLSWMU12003, were advanced within the area of former SWMU 12 during Phase I. Phase I soil boring locations are depicted as red circles on Figure 3.3. Soil samples were collected from each boring every 5 feet from the ground surface to the top of the water table. A total of three surface soil and six subsurface soil samples were submitted for chemical analysis. Based on the types and quantities of wastes handled at SWMU 12 (see Table 1.1), all samples were analyzed for the following list of analyses:

Screening:

- TX1005 – TPH

Definitive (Appendix IX):

- SW8260B – VOCs
- SW8270C – SVOCs
- SW6010B/7000A – trace elements (metals)
- SW7471A – mercury

The analytical results obtained from samples collected from the soil borings were intended to determine whether a release has occurred from SWMU 12. Results of the SWMU 12 Phase I soil investigation are presented in Section 4.0.

3.2.2.4 Phase II Soil Sampling Activities

Four DPT soil borings, BHGLSWMU12004 through BHGLSWMU12007, were advanced at SWMU 12 during Phase II. Phase II soil boring locations are depicted as blue circles on Figure 3.3. Boring BHGLSWMU12004 was completed northwest of boring BHGLSWMU12001. Boring BHGLSWMU12005 was completed southeast of boring BHGLSWMU12003. Borings BHGLSWMU12006 and BHGLSWMU12007 were completed west of boring BHGLSWMU12001 and southwest of boring BHGLSWMU12003, respectively. One additional HSA boring, WHGLTA028, was advanced east of SWMU 12 and completed as a monitoring well (Figure 3.3). Soil samples were collected from each boring to confirm and delineate specific CoCs at the depth intervals associated with the corresponding Phase I detections. A total of five surface soil samples (four samples and one duplicate) and nine subsurface soil samples were submitted for chemical analysis during Phase II. Based on the results of the Phase I soil samples, the following methods were used to analyze Phase II surface soil samples:

Definitive:

- SW6010B – arsenic, cadmium, lead
- SW8260B – benzene, vinyl chloride
- SW8270C – benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, indeno(1,2,3-c,d)pyrene
- TX1005 – TPH

Samples collected from borings BHGLSWMU12004, BHGLSWMU12006 through BHGLSWMU12007, and WHGLTA028 were analyzed for arsenic, benzene, and TPH. Soil samples collected from borings BHGLSWMU12006, BHGLSWMU12007, and WHGLTA028 were also analyzed for cadmium, lead, and vinyl chloride. Boring BHGLSWMU12005 was analyzed for cadmium, lead, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, and indeno(1,2,3-c,d)pyrene. The analytical results obtained from samples collected from the Phase II soil borings were intended to delineate analytes detected slightly above background and the MSCs at SWMU 12 during the Phase I investigation. Results of the SWMU 12 Phase II soil investigation are presented in Section 4.0.

3.2.2.5 Phase III Soil Sampling Activities

Although most CoCs were delineated during Phase II, additional sampling was necessary to achieve site closure under RRS 2. Four additional borings, BEEGSWMU12008, BEEGSWMU12009, BEEGSWMU12010, and BEEGSWMU12011, were advanced in June 2001 during Phase III. The Phase III soil borings locations are depicted as red squares on Figure 3.3. Soil boring BEEGSWMU12008 was advanced to the southwest of boring BHGLSWMU12006 Soil borings BEEGSWMU12009, BEEGSWMU12010, and BEEGSWMU12011 were advanced to the southwest, northwest, and northeast of boring BHGLSWMU12004, respectively. Soil samples were collected to delineate the presence of specific CoCs at the depth intervals associated with the corresponding Phase I and II detections. Based on the results of the Phase II soil samples, the following methods were used to analyze Phase III soil samples:

Definitive:

- SW6010B – arsenic
- SW8260 – BTEX
- SW8310 – PAHs
- TX1005 – TPH

All Phase III subsurface soil samples were analyzed for benzene. Samples collected from the 5-foot intervals of borings BEEGSWMU12009, BEEGSWMU12010, and the 5- and 10-foot intervals of BHGLSWMU12011, were also analyzed for BTEX, PAHs, and TPH. All Phase III soil analytical results at SWMU 12 are discussed in Section 4.0.

3.2.2.6 IRA Activities

An IRA consisting of four excavations was conducted at SWMU 12. Excavation locations are outlined in black on Figure 3.3. The excavations appeared to be the best interim remedy for attaining closure of SWMU 12 site soils. With the goal being to attain RRS 2 closure, confirmation samples collected from excavation floors and sidewalls had to indicate that CoCs

are at RRS 2 concentrations or lower. Pre-excavation confirmation sampling using DPT methods assured that the actual size of the excavation and volume of contaminated soils removed was known prior to the initiation of excavation activities. If concentrations above RRS 2 were identified on the floor or sidewalls of the excavation, the aerial extent and/or depth of the excavation was incrementally enlarged until confirmation sampling indicated that concentrations of CoCs below RRS 2 had been established on all faces of the excavation area. Specific details about each excavation are outlined in the paragraphs below.

Excavation SWMU12A, was initially planned to be centered on BHGLSWMU12004. The excavation would have interrupted the sensors of the gate to the Alert Apron, therefore a confirmation sample was for the CoC with an expedited turn around time before an excavation over BHGLSWMU12004 was begun. The CoC was not confirmed and proposed excavation 12A was not conducted. The result of the soil sampling is presented in Section 4.0 and Appendix C

Excavation SWMU12B was centered on BHGLSWMU12002 (Figure 3.3). The initial excavation extended to 5 feet long by 5 feet wide, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample was collected and analyzed directly below BHGLSWMU12002 at a depth of 2 feet bgs. Five additional samples were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA and excavation dimensions are presented in Section 4.0 and Appendix C.

Excavation SWMU12C was centered on BHGLSWMU12003 (Figure 3.3). The initial excavation extended to 5 feet long by 5 feet wide, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample was collected directly below BHGLSWMU12003 at a depth of 2 feet bgs. Four additional samples were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA and excavation dimensions are presented in Section 4.0 and Appendix C.

Excavation SWMU12D was centered on BHGLSWMU12001 (Figure 3.3). The initial excavation extended to 7 feet long by 7 feet wide, with an excavation depth of 7 feet (12.7 cubic yards). A confirmation sample was collected directly below BHGLSWMU12001 at a depth of 7 feet bgs. Four additional samples were collected at the 7-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA and excavation dimensions are presented in Section 4.0 and Appendix C.

3.2.2.7 Groundwater Sampling Activities

Monitoring well WHGLTA028 was installed downgradient from SWMU 12 in May 2000. The monitoring well location is depicted in Figure 3.3. A total of two rounds of groundwater samples were collected from WHGLTA028, and one round of groundwater samples was collected from existing cross-gradient monitoring well WCHMHTA012 during Phase II. Based on the results of the Phase I soil samples, the Phase II groundwater samples were analyzed for the following analytes:

Definitive:

- SW6010/7060A – arsenic
- SW6010B/7421 – lead
- SW8260B – benzene, vinyl chloride

The analytical results from Phase II necessitated the installation of an upgradient monitoring well, WEEGTA001, and an additional downgradient monitoring well, WEEGTA002 (Figure 3.3) Two additional rounds of groundwater samples were collected during Phase III in November 2001 and March 2002. Groundwater samples were collected from the newly installed monitoring wells, WEEGTA001 and WEEGTA002, and from existing monitoring well WHGLTA028 in November 2001. The November 2001 groundwater samples were analyzed for the following analytes:

Definitive:

- SW6010B/7000 – trace elements (metals)
- SW8260B – VOCs
- SW8270C – SVOCs

Groundwater samples were collected from WEEGTA001, WEEGTA002, WHGLTA028, and WCHMHTA012 in March 2002 for benzene only.

The analytical results obtained from samples collected from these monitoring wells was intended to determine if any analytes detected above the soil MSCs at SWMU 12 were having an impact on groundwater quality. Results of the SWMU 12 groundwater investigation are presented in Section 4.0.

3.2.3 SWMU 31

3.2.3.1 WAA Storage Shed Inspection

No WAA storage shed exists at SWMU 31. Shortly after 1990, all waste was removed from SWMU 31, and the site has not served as an active WAA since that time.

3.2.3.2 Site Investigation History

Although there have been no previous investigations directly associated with SWMU 31 prior to this RFI, SWMU 31 is located within the boundary of SWMU 29/Landfill 2 (Figure 1.4). A separate RFI of the SWMU 29 construction debris landfill has been ongoing since 1998. Information on various RFI activities at SWMU 29 has been reported in Technical Memorandums submitted to the Air Force in 1998 and 1999 (HydroGeoLogic, 1998 and HydroGeoLogic, 1999a). Site-specific MSCs for a variety of constituents have been established in the area of SWMU 29/Landfill 2 based on the results of RFI activities. These site-specific MSCs are presented in Table 3.5, and have been applied to analytes detected at SWMU 31 as needed since the two SWMU boundaries overlap. The Draft RFI report for SWMU 29 was scheduled for submittal to the Air Force in April 2002.

3.2.3.3 Phase I Soil Sampling Activities

Two soil borings, BHGLSWMU31001 and BHGLSWMU31002, were advanced at SWMU 31 during Phase I. Phase I soil boring locations are depicted as red circles on Figure 3.4. As the roof over the picnic table did not allow DPT rig access to the concrete pad, soil borings BHGLSWMU31001 and BHGLSWMU31002 were advanced near the southeast and southwest corners of SWMU 31 where surface runoff was likely to have collected Soil samples were collected from each boring every 5 feet from the ground surface to the top of the water table. A total of two surface soil and six subsurface soil samples were submitted for chemical analysis. Based on the types and quantities of wastes handled at SWMU 31 (see Table 1.1), all samples were analyzed for the following list of analyses:

Screening:

- TX1005 – TPH

Definitive (Appendix IX):

- SW8260B – VOCs/Freon 113
- SW8270C – SVOCs
- SW6010B/7000A – trace elements (metals)
- SW7471A – mercury

The analytical results obtained from samples collected from the soil borings were intended to determine whether a release has occurred from SWMU 31 Results of the SWMU 31 Phase I soil investigation are presented in Section 4.0.

3.2.3.4 Phase II Soil Sampling Activities

Four soil borings, BHGLSWMU31003 through BHGLSWMU31006, were advanced at SWMU 31 during Phase II. Phase II soil boring locations are depicted as blue circles on Figure 3.4. Boring BHGLSWMU31003 was completed southwest of SWMU 31; BHGLSWMU31004 was completed south of SWMU 31; BHGLSWMU31005 was completed to the east of SWMU 31; and BHGLSWMU31006 was completed northeast of SWMU 31. Soil samples were collected to confirm and delineate specific CoCs at the depth intervals associated with the corresponding Phase I detections. A total of four surface soil samples were submitted for chemical analysis. Subsurface soil samples were not collected as no CoCs were identified in the subsurface during Phase I. Based on the results of the Phase I soil samples, the following methods were used to analyze Phase II surface soil samples:

Definitive:

- SW8260B – benzene and MEK
- SW6010B – barium, cadmium, chromium, lead
- SW7471 – mercury

All Phase II surface soil samples were analyzed for cadmium and lead. In addition, surface samples collected from borings BHGLSWMU31003 and BHGLSWMU31004 were analyzed for benzene and MEK. Surface soil samples collected from borings BHGLSWMU31005 and BHGLSWMU31006 were also analyzed for barium, chromium, and mercury. The analytical

results obtained from samples collected from the Phase II soil borings were intended to both confirm and delineate analytes detected slightly above background and the MSCs at SWMU 31 during the Phase I investigation Results of the SWMU 31 Phase II soil investigation are presented in Section 4.0.

3.2.3.5 Phase III Soil Sampling Activities

There were no CoCs identified in the soils at SWMU 31 following Phase II of the RFI investigation. Therefore no further soil sampling at this site was required during Phase III.

3.2.3.6 IRA Activities

An IRA consisting of two excavations was conducted at SWMU 31. Excavation locations are outlined in black on Figure 3.4. The excavations appeared to be the best interim remedy for attaining closure of SWMU 31 site soils. With the goal being to attain RRS 1 closure, confirmation samples collected from excavation floors and sidewalls had to indicate that CoCs are at RRS 1 concentrations or lower. Pre-excavation confirmation sampling using DPT methods assured that the actual size of the excavation and volume of contaminated soils removed was known prior to the initiation of excavation activities. If concentrations above RRS 1 were identified on the floor or sidewall of the excavation, the aerial extent and/or depth of the excavation was incrementally enlarged until confirmation sampling indicated that RRS 1 concentrations of CoCs had been established on all faces of the excavation area. Specific details about each excavation are outlined in the paragraphs below.

Excavation SWMU31A was centered on BHGLSWMU31002 (Figure 3.4) The initial excavation extended to 5 feet long by 5 feet wide, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample was collected directly below BHGLSWMU31002 at a depth of 2 feet bgs. Four additional samples were collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA and excavation dimensions are presented in Section 4.0 and Appendix C.

Excavation SWMU31B was centered on BHGLSWMU31001 (Figure 3.4). The initial excavation extended to 5 feet long by 5 feet wide, with an excavation depth of 2 feet (1.9 cubic yards). A confirmation sample was collected directly below BHGLSWMU31001 at a depth of 2 feet bgs. Four additional samples were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA and excavation dimensions are presented in Section 4.0 and Appendix C.

3.2.3.7 Groundwater Sampling Activities

All CoCs at SWMU 31 were identified in the surface soil samples only As a result, a groundwater investigation at SWMU 31 was not conducted.

3.2.4 SWMU 61

3.2.4.1 WAA Storage Shed Inspection

WAA 1319 was built near the west corner of SWMU 61 in 1990. Waste is currently stored inside this storage area as well as in containers located alongside the WAA shed. Prior to initiating the intrusive investigation at SWMU 61, the walls and floor of WAA 1319 were examined for cracks or gaps. The integrity of WAA 1319 appeared to be intact during the inspection and as a result, intrusive activities did not take place within the storage shed. Photographs of the WAA storage area at SWMU 61 are presented in Figure 3.5.

3.2.4.2 Site Investigation History

Although there have been no previous investigations directly associated with SWMU 61 prior to this RFI, AOC 6, the Recreational Vehicle (RV) Parking Area is located immediately south of SWMU 61. AOC 6 was included in the original 16 sites in this RFI and received site closure under RRS 1 following the Phase I investigation. During Phase I, soil boring BHGLAOC006003 was advanced in the area directly south of SWMU 61 (Figure 3.6). Soil samples were collected from boring BHGLAOC006003 at the surface and the 5-foot interval and analyzed for Appendix IX VOCs (SW8260), SVOCs (SW8270), metals/mercury (7470A/7471A), TPH (TX1005), and ethylene glycol (SW8015) All analytical results for the soil samples collected from boring BHGLAOC006003 were non-detect, or below RRS 1 (HydroGeoLogic, 2000). A more detailed discussion of the investigation of AOC 6, along with the complete set of analytical results, is presented in the Final RFI Report for SWMUs 16, 33, 34, 39, 42 and AOCs 6 and 15 (HydroGeoLogic, 2000c).

3.2.4.3 Phase I Soil Sampling Activities

Five soil borings, BHGLSWMU61001 through BHGLSWMU61005, were advanced at SWMU 61 during Phase I. Phase I soil boring locations are depicted as red circles in Figure 3.6. Boring BHGLSWMU61001 was advanced directly over an area of stained soil at the ground surface Borings BHGLSWMU61002 through BHGLSWMU61004 were advanced within the boundary of SWMU 61 in locations where waste was historically stored, and boring BHGLSWMU61005 was advanced to the north of SWMU 61 in front of the current WAA shed Soil samples were collected from each boring every 5 feet from the ground surface to the top of the water table. A total of five surface soil and five subsurface soil samples were submitted for chemical analysis. Based on the types and quantities of wastes handled at SWMU 61 (see Table 1.1), all samples were analyzed for the following list of analyses:

Screening:

- SW9045C – soil pH
- TX1005 – TPH
- SW8015 (modified) – ethylene glycol

Definitive (Appendix IX):

- SW8260B – VOCs
- SW8270C – SVOCs
- SW6010B/7000A – trace elements (metals)
- SW7471A – mercury

The analytical results obtained from samples collected from the soil borings were intended to determine whether a release occurred from SWMU 61. Results of the SWMU 61 Phase I soil investigation are presented in Section 4.0.

3.2.4.4 Phase II Soil Sampling Activities

A total of six additional DPT soil borings, BHGLSWMU61006 through BHGLSWMU61011, and two monitoring wells, WHGLTA034 and WHGLTA035, were advanced at SWMU 61 during Phase II. Phase II soil boring locations are depicted as blue circles, and the two new monitoring wells are located to the west of SWMU 61, on Figure 3.6. Borings BHGLSWMU61006, BHGLSWMU61007, and BHGLSWMU61008, were completed from southwest to northwest of SWMU 61, respectively, to delineate the western extent of SWMU 61. Soil borings BHGLSWMU61009, BHGLSWMU61010, WHGLTA034, BHGLSWMU61011, and WHGLTA035, were completed from the north to the southeast, respectively, to delineate the northern and eastern extent of SWMU 61. Borings WHGLTA034 and WHGLTA035 were advanced with a HSA and completed as monitoring wells to confirm subsurface lithology and to characterize the groundwater downgradient of the site. Soil samples were collected from each boring at the surface and 5-foot interval in order to delineate the CoCs identified during Phase I. A total of eight surface soil samples and ten subsurface soil samples were submitted for chemical analysis. Based on the results of the Phase I soil samples, the following method was used to analyze all Phase II soil samples:

Definitive:

- SW8260B – tetrachloroethene (PCE)

The analytical results obtained from samples collected from the Phase II soil borings were intended to confirm the presence of the analyte detected above RRS 1 and/or the MSC at SWMU 61 during the Phase I investigation. Results of the SWMU 61 Phase II soil investigation are presented in Section 4.0.

3.2.4.5 Phase III Soil Sampling Activities

A total of three additional borings were advanced during Phase III to provide additional delineation at SWMU 61. Phase III soil boring locations are depicted as red squares in Figure 3.6. Boring BEEGSWMU61012 was advanced south of the unit inside of the RV parking area (AOC 6). Boring BEEGSWMU61013 was collected northwest of the unit, and BEEGSWMU61014 was collected to the north. Soil samples were collected from each boring at the surface, and also from

the 5-foot interval at BHGLSWMU61012, in order to delineate the CoC identified during Phase I and II. Based on the results of the Phase II soil samples, the following method was used to analyze all Phase III soil samples:

Definitive:

- SW8260B – PCE

The analytical results obtained from samples collected from the Phase III soil borings were intended to delineate the presence of one analyte detected above RRS 1 and/or the MSC at SWMU 61 during the investigation. Results of the SWMU 61 Phase III soil investigation are presented in Section 4.0.

3.2.4.6 IRA Activities

An IRA was conducted in order to remove the elevated concentrations of CoCs from the surface interval of boring BHGLSWMU61001. This excavation appeared to be the best interim remedy for attaining RRS 2 closure for site soils at SWMU 61. With the goal being to attain RRS 2 closure, confirmation sampling on excavation floors and sidewalls needed to indicate that CoCs were at concentrations below RRS 2. This was determined by comparing the confirmation sampling result to the TNRCC established RRS 2 value. Pre-excavation confirmation sampling using DPT methods was performed in order to assure that the actual size of the excavation and volume of contaminated soils removed was known prior to the initiation of excavation activities. If concentrations above RRS 2 were identified on the floor or sidewalls of the excavation, the aerial extent and/or depth of the excavation was incrementally enlarged until confirmation sampling indicated that concentrations of CoCs below RRS 2 had been established on all faces of the excavation area.

Excavation SWMU61A was centered on the location of soil boring BHGLSWMU61001. The initial excavation was to extend to 10 feet long by 10 feet wide, with an excavation depth of 2 feet (7.4 cubic yards). A confirmation sample was collected directly below BHGLSWMU61001 at a depth of 2 feet bgs. Four additional samples were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA and actual excavation dimensions are presented in Section 4.0 and Appendix C

3.2.4.7 Groundwater Sampling Activities

Monitoring wells WHGLTA034 and WHGLTA035 were installed downgradient from SWMU 61 in May 2000. The monitoring well locations are depicted in Figure 3.6. A total of two rounds of groundwater samples were collected from WHGLTA034, WHGLTA035, and existing upgradient monitoring well WITCTA034 during Phase II. Based on the results of the Phase I soil samples, the Phase II groundwater samples were analyzed for the following analyte:

Definitive:

- SW8260B – PCE

The analytical results from Phase II necessitated the collection of additional groundwater samples from monitoring wells during Phase III in June and November 2001. Groundwater samples were

collected from WITCTA034, WHGLTA034, WHGLTA035, and SD13-05, another existing upgradient monitoring well. The Phase III groundwater samples were analyzed for the following analytes:

Definitive:

- SW8260B – PCE and trichloroethene (TCE)

The analytical results obtained from samples collected from these monitoring wells was intended to determine if any analytes detected above the soil MSCs at SWMU 61 were having an impact on groundwater quality. Results of the SWMU 61 groundwater investigation are presented in Section 4.0.

3.3 Elevation and Location Survey

Each DPT soil boring, monitoring well, and excavation location was surveyed by Baird, Hampton & Brown, Inc , of Fort Worth, Texas. Vertical and horizontal measurements were collected in accordance with the RFI WPs (HydroGeoLogic, 1999). Surveying data are provided in Appendix D.

3.4 Conceptual Site Model

The TNRCC approach to site closure/remediation consists of three RRSs. RRS 1 is based on background concentration levels and serves as the initial screen for a no release scenario closure. RRS 2 allows closure or remediation to health risk-based standards and criteria that are based on default assumptions concerning potential exposures. RRS 2 was used as a secondary screen for NFA site closures. If detected concentrations at the subject SWMUs exceed RRS 1 and RRS 2, site closure would proceed with a baseline risk assessment (BLRA), corrective measures study, and possible active remediation to attain risk-based standards.

The conceptual site model (CSM) provides a basis for identifying and evaluating the potential risks to human health in the BLRA. The CSM facilitates consistent and comprehensive evaluation of risks by creating a framework for identifying the paths by which humans and ecological receptors may be impacted by the subject SWMUs at NAS Fort Worth JRB.

The elements necessary to construct a complete exposure pathway and develop the CSM are:

- Sources and contaminants of concern
- Release mechanisms
- Transport pathways
- Exposure pathway scenarios
- Receptors

A generalized CSM for potential human and environmental exposures to air, soil, groundwater, and surface water/sediments are presented in Figures 3.7 and 3.8. Figure 3.7 shows the exposure and risks from contaminants contained in surface soil, while Figure 3.8 shows the exposure and risks from contaminants contained in subsurface soils.

The potential release and transport pathways for each of the SWMUs investigated in this study are similar. All of the sites are generally covered with pavement with adjacent or perimeter grass covered areas. All of the sites are also adjacent to a storm water drainage ditch. The release pathways include runoff to surface water and leaching to groundwater. As stated in previous sections, a Phase I soil investigation was conducted at each of the SWMUs in order to determine if a release had occurred from any of the subject sites Soil borings were placed in areas where wastes were historically stored and in areas where surface runoff from each site would have most likely collected. Evaluation of the initial RFI results against the above criteria indicated that a release of contaminants to soils might have occurred at the subject SWMUs. As a result, a Phase II and III soil investigation was performed, and groundwater investigations were conducted at SWMUs 5, 6, 12, and 61. Soils containing concentrations exceeding RRS 2 values were removed during IRAs at SWMUs 12, 31, and 61.

A BLRA is not required by Chapter 335, Subchapter S of the TNRCC Risk Reduction Rules for closures under RRS 2, but is required for all closures under RRS 3. The deed recordation requirements for closure under all RRS are discussed in detail in Section 1.3.2. Since all of the subject sites presented in this RFI Report will be requested for closure by the TNRCC under RRS 1 (SWMU 31) or RRS 2 (SWMUs 5, 6, 12, and 61), a CSM is deemed unnecessary for these sites and will not be developed; however, specific elements of the CSM are discussed in the summaries of each SWMU in Sections 4.0 and 5.0. The discussion of the impact on receptors concentrates on groundwater and groundwater protection MSCs, as these are the most conservative RRS 2 values available and the most likely route of exposure considering current site conditions and future use.

Figures

Figure 3.1 Photographs—WAA 1627—SWMUs 5 and 6
Figure 3.2 Sampling Locations—SWMUs 5 and 6
Figure 3 3 Sampling Locations—SWMU 12
Figure 3.4 Sampling Locations—SWMU 31
Figure 3 5 Photographs—WAA 1319—SWMU 61
Figure 3 6 Sampling Locations—SWMU 61
Figure 3.7 Conceptual Exposure Pathway Model for Surface Soil, NAS Fort Worth JRB, Texas
Figure 3.8 Conceptual Exposure Pathway Model for Subsurface Soil, NAS Fort Worth JRB, Texas

June 1999

June 1999

Filename X \EEG001\DO1\Maps\RCRA_IR_WAA \photo_location cdr
Project EEG001-001-02-13
Created 03/18/02 cfarmer
Revised 04/04/02 cf
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ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.

Figure 3.1
Photographs - WAA 1627
SWMU 5

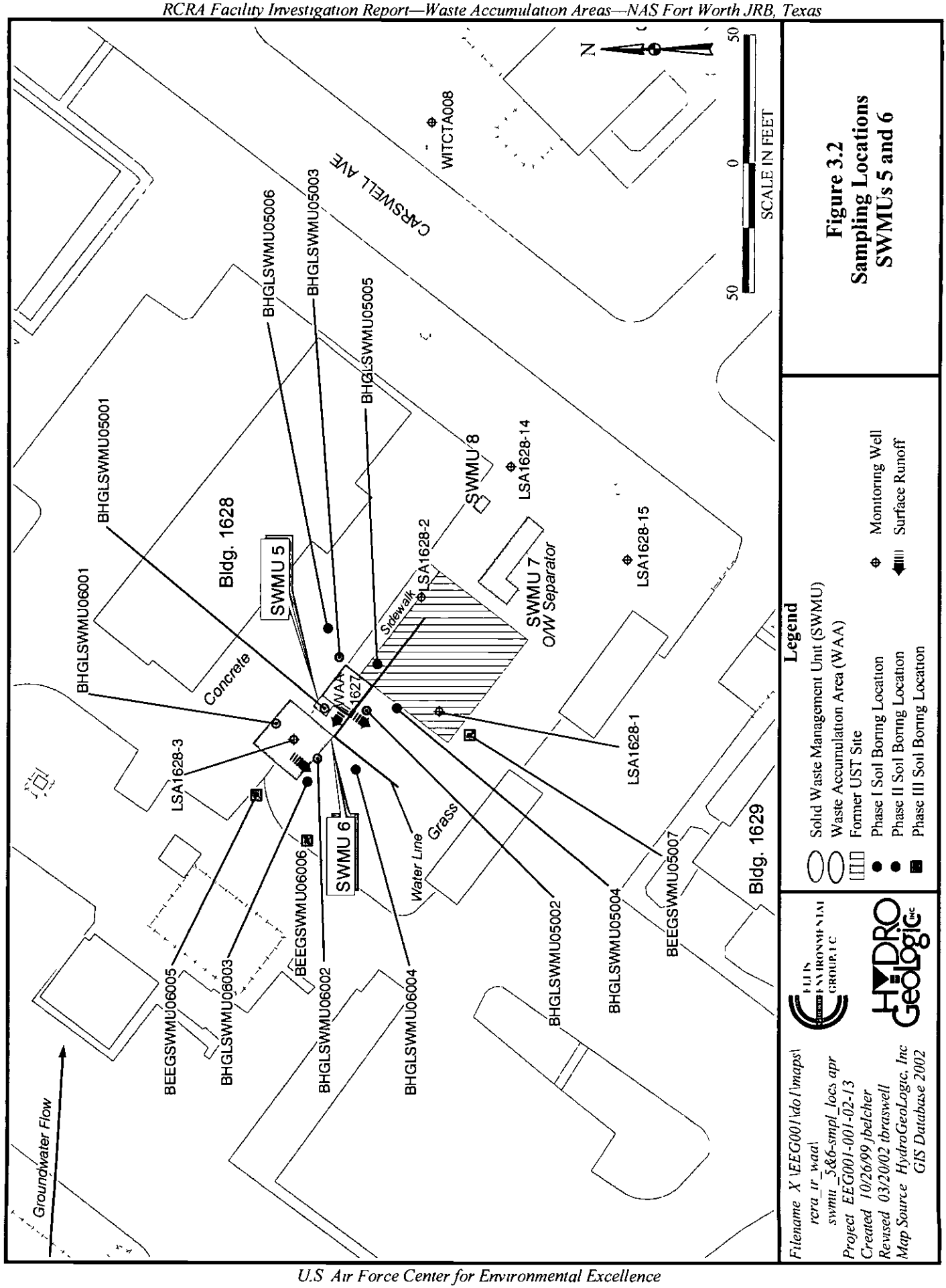


Figure 3.2
Sampling Locations
SWMUs 5 and 6

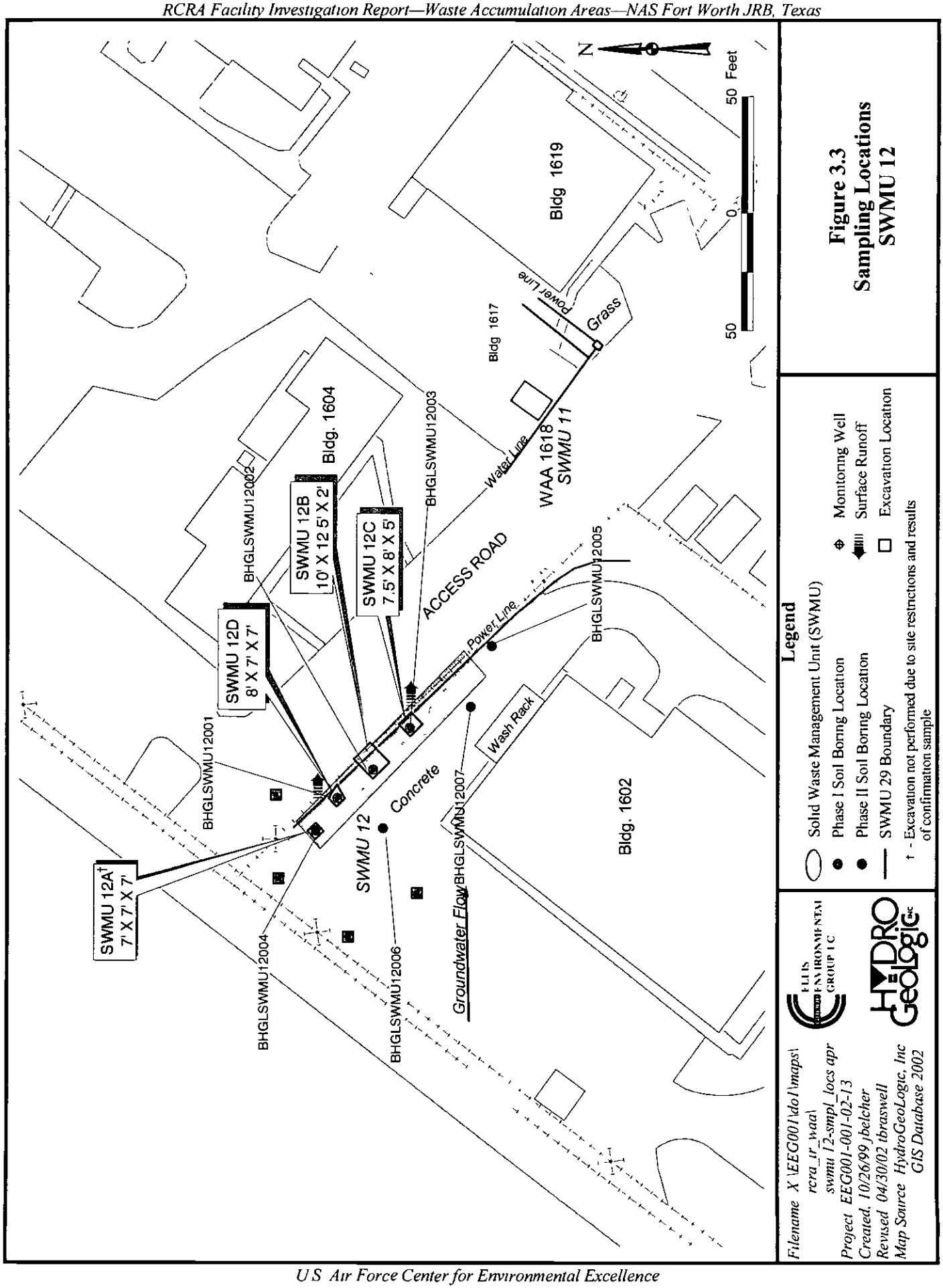


Figure 3.3
Sampling Locations
SWMU 12

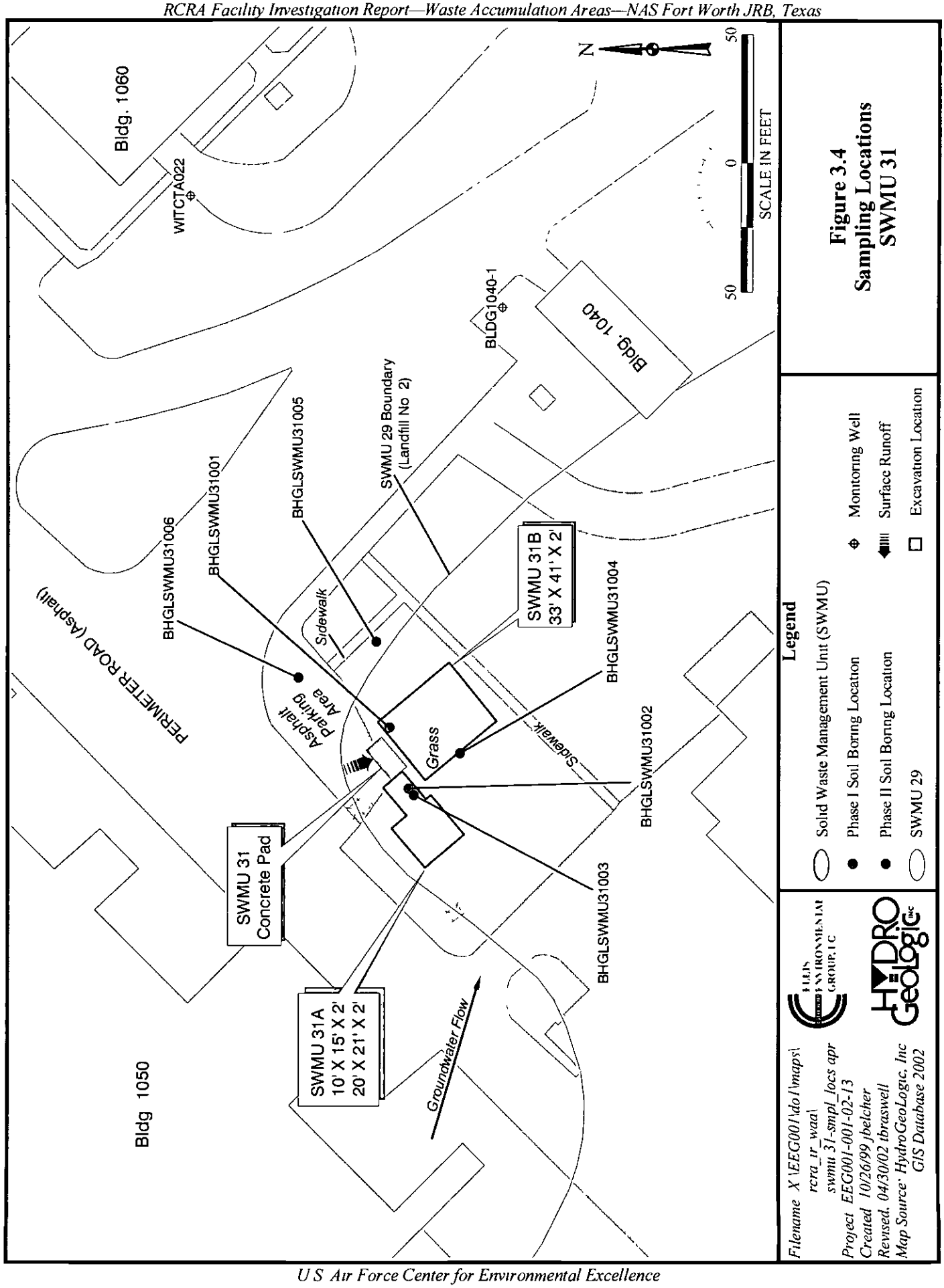
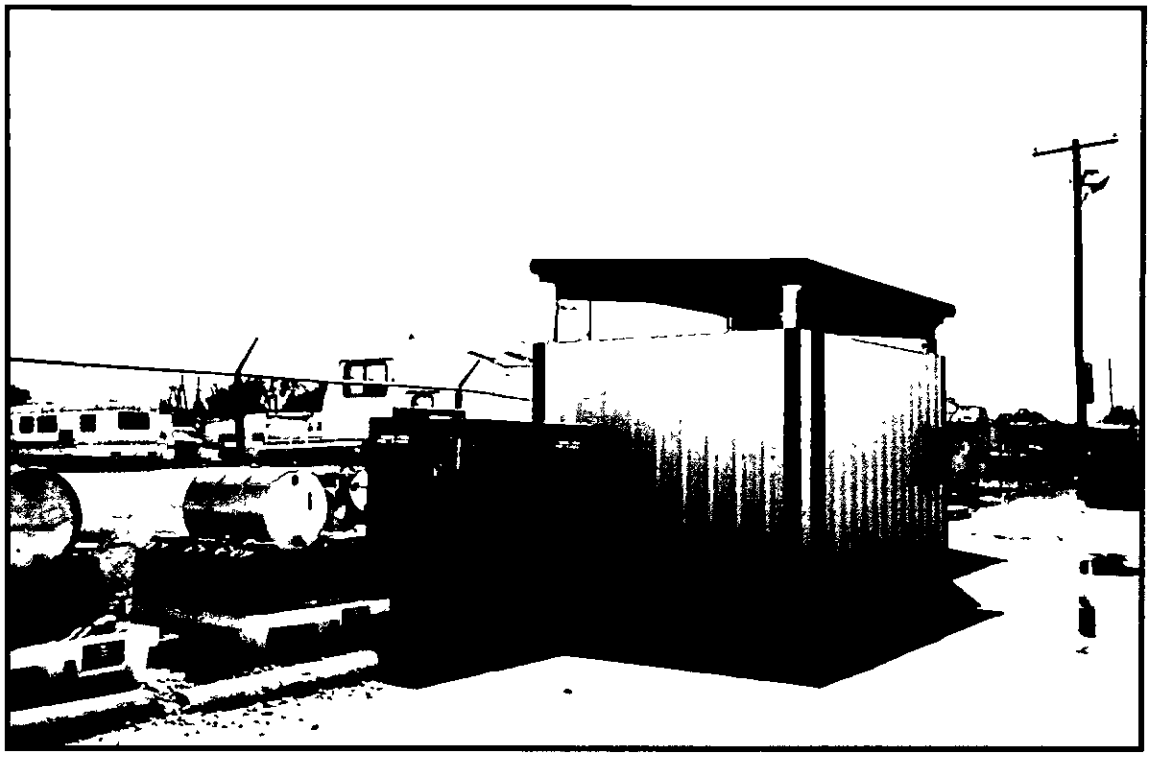
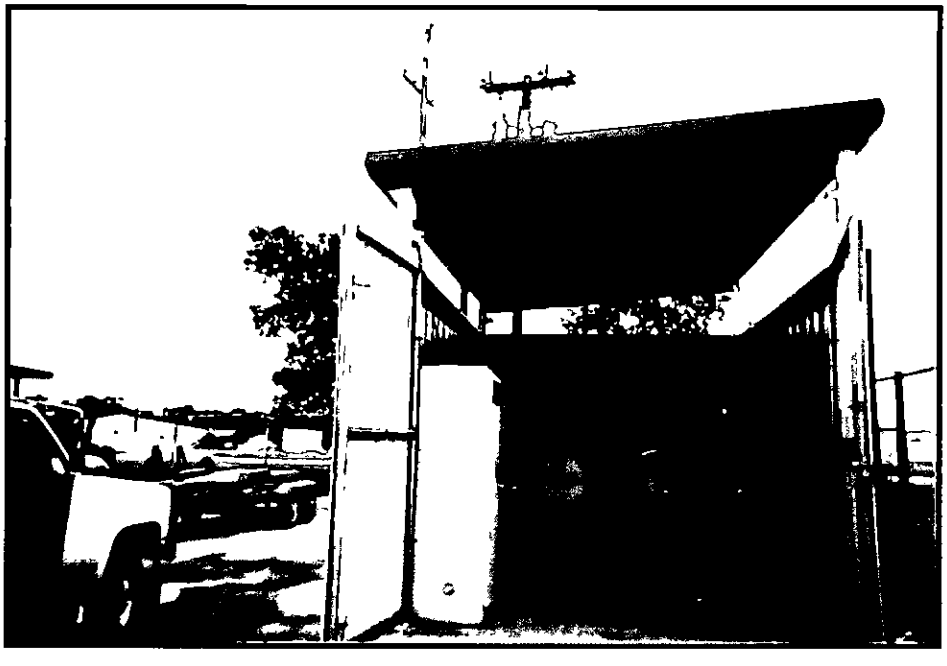


Figure 3.4
Sampling Locations
SWMU 31

June 1999



June 1999



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Created 03/18/02 cfarmer
Revised 04/04/02 cf
Source HGL GIS Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

Figure 3.5
Photographs - WAA 1319
SWMU 61

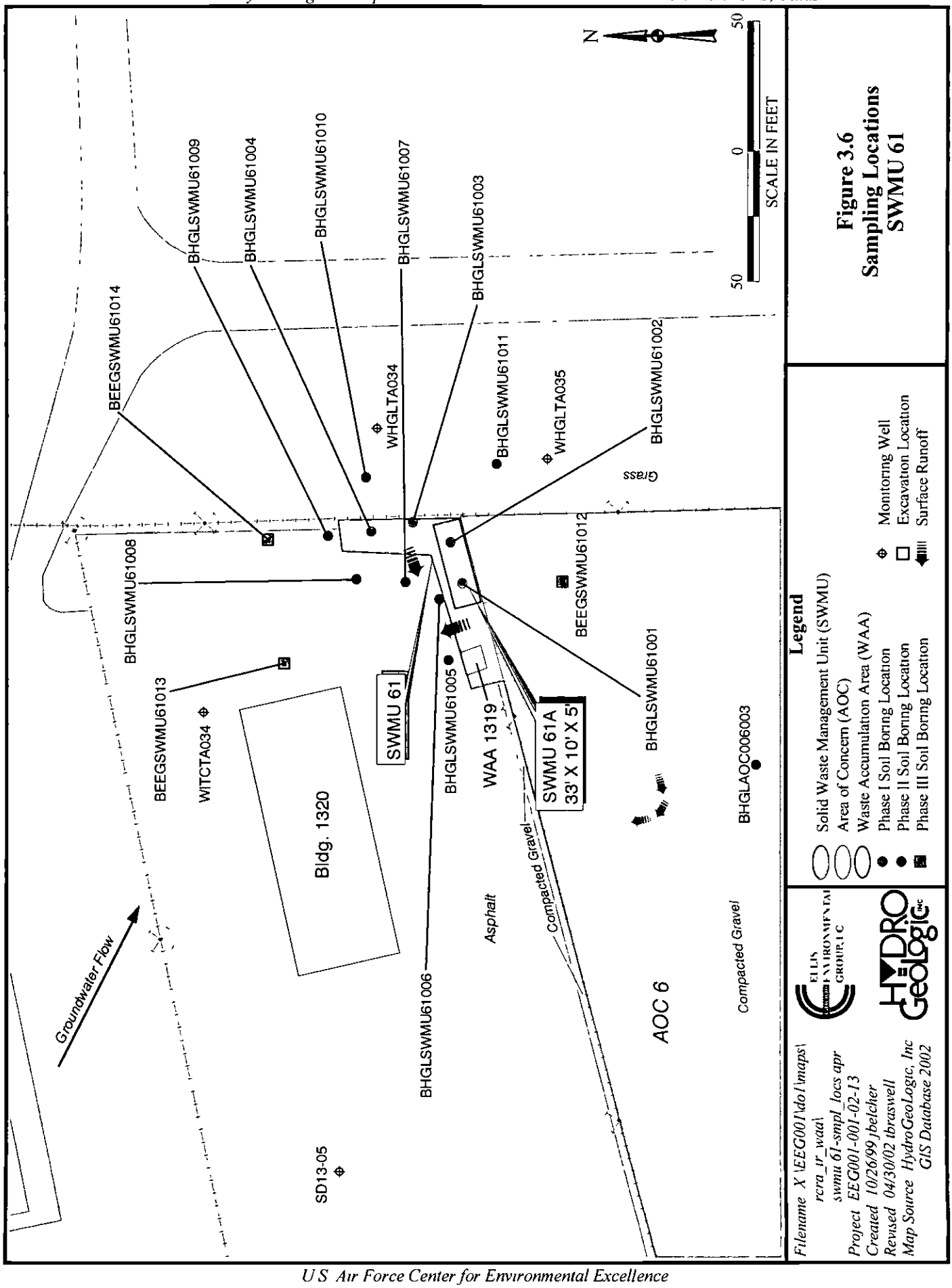

Figure 3.6
Sampling Locations
SWMU 61

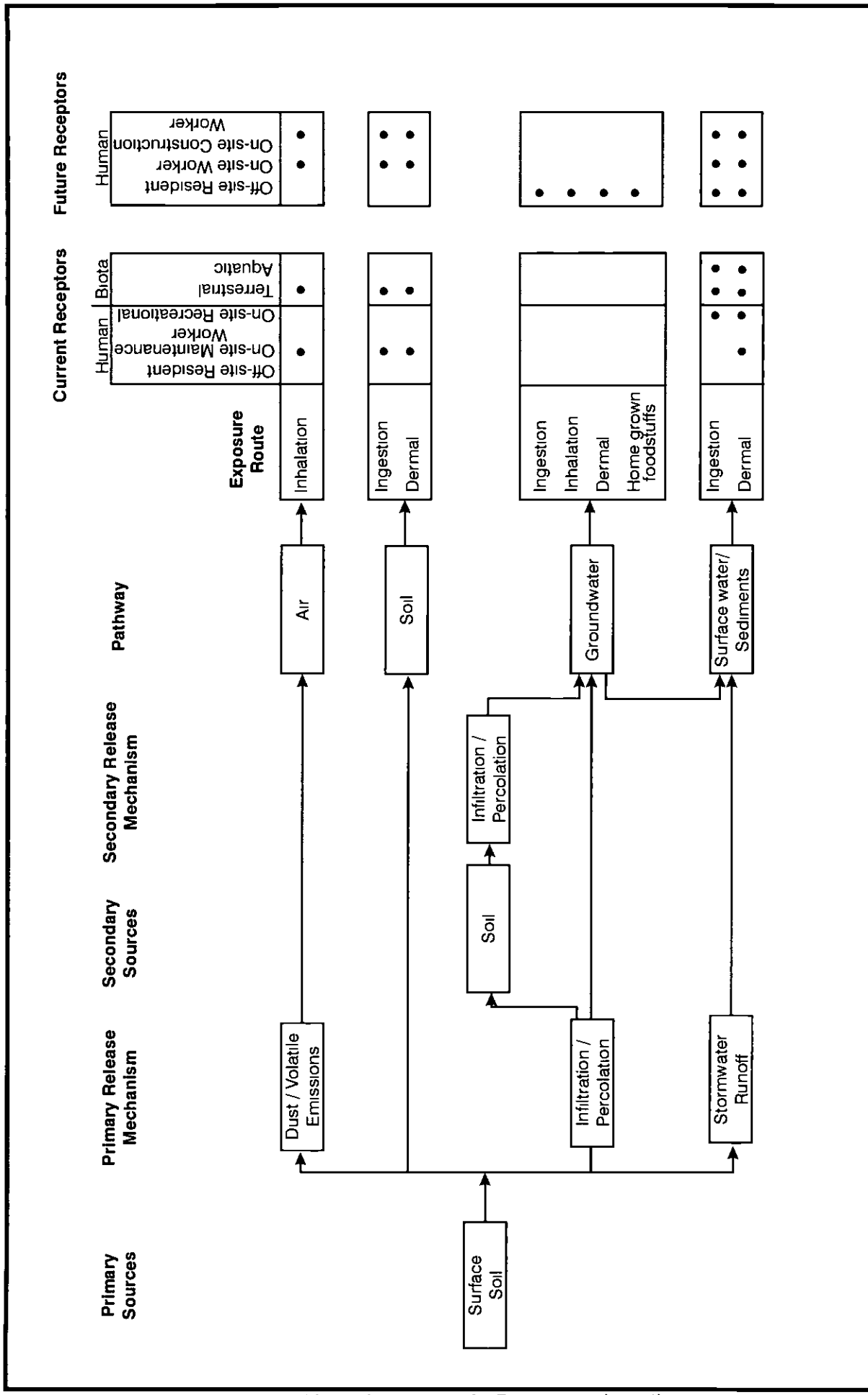

Figure 3.7
Conceptual Exposure Pathway Model for Surface Soil
NAS Fort Worth JRB, Texas

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Revised 04/29/02 tbraswell
Source HydroGeoLogic, Inc

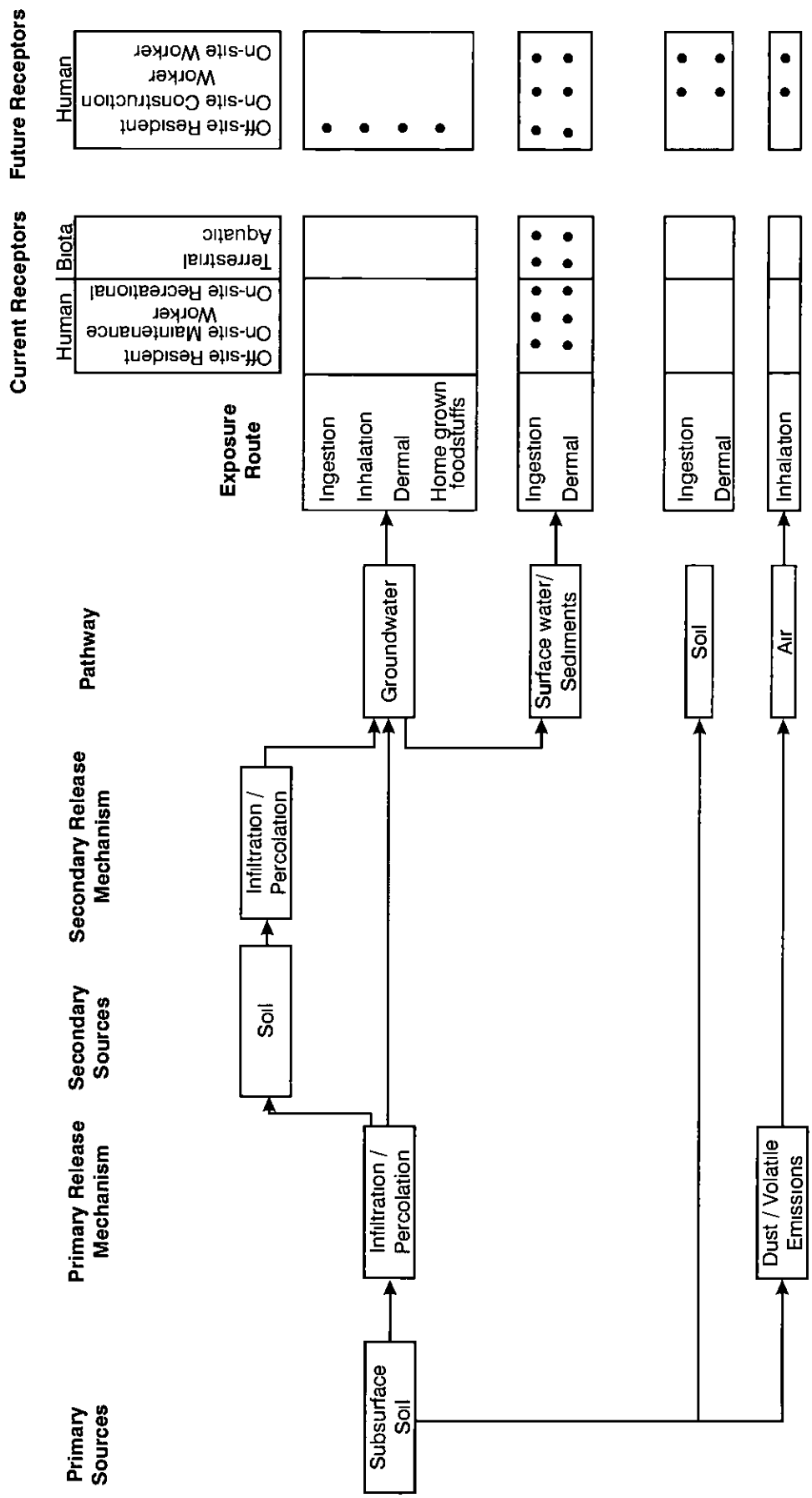

Figure 3.8
Conceptual Exposure Pathway Model for Subsurface Soil
NAS Fort Worth JRB, Texas

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Project AFC001-001-02-13
Created by 09/08/00 cfarmer
Revised 04/29/02 tbraswell
Source HydroGeoLogic, Inc

TAB

SECTION 4.0

4.0 Investigation Results

This section provides a discussion of analytical results of the soil samples collected at each SWMU. All soil and groundwater samples were analyzed in accordance with the rationale presented in the RFI WPs (HydroGeoLogic, 1999), the Phase II and III WP Addendums (HydroGeoLogic, 2000a and 2001a), and the IRA Work Plan (EEG, 2001).

To determine if a release has occurred at any of the SWMUs, the results from samples collected and analyzed for inorganic compounds were compared to the base-specific background values as presented in the Final Basewide Background Study (Jacobs, 1998). The results from samples collected and analyzed for organic compounds were compared to respective MQLs. In addition, all analytical results were compared to available MSCs to determine if detected contaminants posed a threat to shallow groundwater. All Phase I soil detections for each SWMU are presented in tabular form in this section. Complete analytical data summaries for Phase I soil samples are presented in Appendix E. As the complete analytical data for all Phase II and III soil and groundwater samples are presented in tables in this section, these data are not included in Appendix E

The SPLP extraction is used where the leaching potential from soil to groundwater due to the infiltration of rainfall is to be determined for a contaminant. Analytical results from SPLP extracts indicate the maximum leaching potential of a target analyte under laboratory conditions that simulate the effects of time and weather on the sample. SPLP is useful in those situations where a determination must be made whether or not a potentially contaminated material, if left in situ, will leach toxic substances when exposed to normal weathering. Instead of simulating landfill leachate using dilute acetic acid, as is used in the Toxicity Characteristic Leaching Procedure (TCLP), SPLP uses dilute nitric and sulfuric acids in an effort to simulate acidic rain mixtures resulting from airborne nitric and sulfuric oxides, which is more characteristic of the site conditions involved with these surface units. Note that due to instrumentation limitations, the SPLP leaching solution used for VOCs is reagent water; reagent water is also used for SPLP leaching of cyanide in order to prevent the evolution of hydrogen cyanide gas. To perform SPLP extraction, an aliquot of sample is mixed with the appropriate leaching fluid for 16-20 hours and then filtered. A special apparatus is used to minimize volatilization when VOCs are to be analyzed. Once a filtered leachate has been obtained, it is analyzed as a water sample by the appropriate method to determine the presence and concentration of specific contaminants.

During the Phase I field effort, a portion of the soil sample volume submitted for each metals analysis was held at the laboratory for SPLP extraction and analysis at a later date, if necessary. The SPLP extraction method was used in order to possibly provide a site specific adjusted MSC if analytes were detected above the applicable MSC in the original sample. When an SPLP extraction and analysis was performed, each analyte SPLP result was compared to the applicable industrial groundwater MSC; if the result in the extract was below this groundwater MSC, then the corresponding soil MSC was adjusted to the highest soil value that is associated with a "passing" SPLP result, provided that there is no soil result at the site with a lower detection for the same analyte that "failed" subsequent SPLP analysis. SPLP results and site-specific MSCs are presented in Table 4.1.

4.1 SWMUs 5 and 6

4.1.1 Lithologic Findings

A total of 13 soil borings (5 characteristic and 8 delineation) were advanced at SWMUs 5 and 6. Soil boring placement and rationale is discussed previously in Section 3.2.1. The majority of the soil borings were advanced in the grassy areas west and to the south of SWMUs 5 and 6 in the area of surface runoff. Three soil borings, BHGLSWMU05003, BHGLSWMU05006, and BHGLSWMU06001 were advanced through a layer of concrete approximately 1-foot thick. The only debris observed in any of the soil borings was wood encountered in the 1 to 3 foot interval of soil boring BHGLSWMU05006. The only odors observed were a slight petroleum odor detected around 9 feet bgs and a strong petroleum odor detected in the bottom 2 feet of boring BHGLSWMU05003.

The lithology at SWMUs 5 and 6 was analyzed using a north-south transect along borings BHGLSWMU05004, BHGLSWMU05002, BHGLSWMU05001, and BHGLSWMU06001. A lithologic cross section for SWMUs 5 and 6 is presented as Figure 4.1. Soil boring BHGLSWMU05004 exhibited approximately one foot of silty sand overlying a foot of sandy clay. A clayey sand layer was encountered between 2 and 6 feet bgs, where the boring was terminated. Soil boring BHGLSWMU05002 exhibited approximately 2 feet of clayey silt overlying a layer of clayey silt and sand to a depth of 6 feet bgs. A layer of silty sand was encountered from 6 to 7 feet bgs followed by a foot of fine sand between 8 and 10 feet bgs. The water table was reached at 9.5 ft bgs and the boring was terminated at 10 feet bgs. Soil boring BHGLSWMU05001 exhibited a similar lithology as BHGLSWMU05002, with the exception of a layer of sandy clay encountered from 6 to 7.5 feet bgs The water table was encountered at 10.2 feet bgs, and boring BHGLSWMU05001 was terminated at 12 feet bgs Soil boring BHGLSWMU06001 exhibited a layer of clay and silt from the ground surface to a depth of 3 feet bgs overlying silt, sand, and clay between 3 and 5 feet bgs. A one foot layer of silty sand was encountered from 5 to 6 feet bgs, followed by a layer of sand from 6 to 9 feet bgs. This layer is overlying sand and gravel from 9 to 14 feet bgs. The water table was reached at 10 feet bgs and the boring was terminated at 14 feet bgs. Boring logs are included in Appendix F.

Groundwater flow directions in the vicinity of SWMUs 5 and 6 trend generally to the east towards the West Fork Trinity River. Groundwater was encountered at approximately 9.5 to 10.2 feet bgs across the site.

4.1.2 Surface Soil Detections

A total of five surface soil samples were collected for analysis from borings BHGLSWMU05001 through BHGLSWMU05003, BHGLSWMU06001, and BHGLSWMU06002. All surface soil samples were analyzed for the list of analyses presented in Section 3.2.1.2. No CoCs were identified in the surface soils at SWMUs 5 and 6 following Phase I of the RFI.

4.1.2.1 Inorganic Constituents

There were no inorganic constituents detected above background in the surface soil samples collected at SWMUs 5 and 6.

4.1.2.2 Organic Constituents

One isolated concentration of ethylene glycol (10.03 mg/kg) was detected in the surface sample collected from boring BHGLSWMU05001. Analytical results are illustrated in Figure 4.2 and listed in Table 4.2.

4.1.3 Subsurface Soil Detections

A total of five subsurface soil samples were collected for characterization analysis from borings BHGLSWMU05001 through BHGLSWMU05003 and BHGLSWMU06001 through BHGLSWMU06002 during Phase I at SWMUs 5 and 6 (Figure 4 2). All subsurface soil samples were analyzed for the list of analyses presented in Section 3.2.1.2. Analytical results indicated low concentrations of metals above background concentrations in the subsurface soil samples collected during Phase I. Phase I subsurface soil results are presented in Table 4.3.

4.1.3.1 Inorganic Constituents

The following metals were detected in the subsurface soil samples collected at SWMUs 5 and 6:

- **Arsenic** was detected at a concentration of 11.4 milligrams per kilogram (mg/kg) in the soil sample collected from the 5-foot interval of boring BHGLSWMU05001 and at 12 mg/kg in the soil sample collected from the 5-foot interval of boring BHGLSWMU06002 during Phase I of the RFI. These concentrations of arsenic were above both the background value and the MSC. An SPLP extraction was performed on these samples and the results were below the MSC for arsenic in industrial groundwater. Based on the analysis of this SPLP extract, a revised soil MSC of 12 mg/kg was established for SWMUs 5 and 6. Four additional samples were collected for arsenic from the 5-foot intervals of borings BHGLSWMU05005, BHGLSWMU05006, BHGLSWMU06003, and BHGLSWMU06004 during Phase II of the RFI in order to delineate Phase I concentrations. Arsenic was detected below background in all of the Phase II samples except BHGLSWMU06003, where it was detected at a concentration of 13.2 mg/kg. An SPLP extraction was performed on this sample and the result was below the MSC, establishing a new site specific MSC of 13.2 mg/kg for arsenic. Three additional samples were collected for arsenic from the 5-foot intervals of BEEGSWMU06005 (one parent sample and one duplicate) and BEEGSWMU06006 during Phase III. Arsenic was detected below background in two of the three Phase III samples. A concentration of 9.2 mg/kg was detected in the duplicate of BHGLSWMU06005, however this detection was not confirmed by the parent sample.

- **Barium** was detected at concentrations of 179 mg/kg, 133 mg/kg, and 1280 mg/kg in the 5-foot intervals of BHGLSWMU05002, BHGLSWMU05003, and BHGLSWMU06002, respectively. An SPLP extraction was performed on the sample from BHGLSWMU06002 and the result was below the MSC for barium in industrial groundwater. Based on the analysis of this SPLP extract, a revised soil MSC of 1280 mg/kg was established for barium at SWMUs 5 and 6. Five additional samples were collected for barium from the 5-foot intervals of BHGLSWMU05004 through BHGLSWMU05006, BHGLSWMU06003, and BHGLSWMU06004 during Phase II in

order to delineate Phase I concentrations. Barium was detected below background in all five samples. No Phase III samples were collected for barium.

- **Cobalt** was detected during Phase I of the RFI at concentrations of 11.1 mg/kg, 22.1 mg/kg, and 41 mg/kg in the 5-foot interval of borings BHGLSWMU05002, BHGLSWMU05003, and BHGLSWMU06002, respectively. These concentrations were all above background, but well below the MSC of 613.2 mg/kg. During Phase II, seven additional samples, including two duplicates, were collected for cobalt from the 5-foot interval of soil borings BHGLSWMU05004 through BHGLSWMU05006, BHGLSWMU06003, and BHGLSWMU06004. Cobalt was detected above background but below the MSC in three of the seven Phase II samples. The Phase II concentrations above background ranged from 7.9 to 15.7 mg/kg. Four additional samples, including a duplicate, were collected at the 5-foot interval for cobalt from Phase III soil borings BEEGSWMU05007, BEEGSWMU06005, and BEEGSWMU06006. Cobalt was detected below background in all the Phase III samples with the exception of the sample collected from BEEGSWMU05007. Cobalt was detected slightly above background (6.19 mg/kg) at a concentration of 6.5 mg/kg in the 5-foot interval of BEEGSWMU05007.

- **Lead** was detected slightly above both background and the MSC in the subsurface soil samples collected from the 5-foot intervals of borings BHGLSWMU05003 and BHGLSWMU06002 at concentrations of 23.9 mg/kg and 14.8 mg/kg, respectively. SPLP extraction and analysis was performed on both of these Phase I subsurface soil samples, and the results were compared to the industrial groundwater MSC. The SPLP extract of lead from soil boring BHGLSWMU06002 (14.8 mg/kg) was below the MSC for industrial groundwater, but the extract from BHGLSWMU05003 (23.9 mg/kg) showed lead above the industrial groundwater MSC of 0 015 milligrams per liter (mg/L). Based on the analyses of these SPLP extracts, a revised soil MSC of 14.8 mg/kg for lead was established for this site. A total of five additional samples were collected and analyzed for lead from the 5-foot interval of borings BHGLSWMU05005, BHGLSWMU05006, BHGLSWMU06003, and BHGLSWMU06004 during Phase II of the RFI in order to delineate Phase I concentrations. Lead was detected below background in all of the Phase II samples collected at SWMUs 5 and 6.

- **Nickel** was detected at a concentration of 20.8 mg/kg in the 5-foot interval of BHGLSWMU06002 during Phase I. This detection of nickel was isolated, only slightly above the background level of 19.76 mg/kg, and well below the RRS 2 value of 204.4 mg/kg Nickel was not identified as a CoC at SWMUs 5 and 6 and no further sampling for this analyte was conducted.

4.1.3.2 Organic Constituents

No organic constituents were detected in the subsurface soils at SWMUs 5 and 6.

4.1.4 Soil pH

A visual inspection of SWMU 5 in 1989 noted the presence of a pallet holding lead-acid batteries placed on bare ground next to the southeast side of SWMU 5. As a result, all Phase I soil samples

collected at SWMUs 5 and 6 were analyzed for pH. Soil boring BHGLSWMU05001 was advanced in the location where the batteries were stored.

Soil pH levels at SWMUs 5 and 6 ranged from 8.1 to 8.6 in the surface soil samples and 8.2 to 8.4 in soil samples collected from the subsurface. Surface soil pH results are shown in Table 4.2, and subsurface soil pH results are shown in Table 4.3. Soil pH levels at SWMUs 5 and 6 are fairly alkaline, and are consistent with the native calcareous soils (Section 2 2) at NAS Fort Worth JRB.

4.1.5 Groundwater Detections

Two rounds of groundwater samples were collected from existing downgradient monitoring well LSA1628-2 and upgradient monitoring well LSA1628-3 during Phase II of the RFI. An additional groundwater sample was collected for arsenic from LSA1628-2 during Phase III Groundwater samples were analyzed for the constituents described in Section 3.2.1.5 and detections are depicted in Figure 4.3. Analytical results for groundwater are presented in Table 4.4.

4.1.5.1 Inorganic Constituents

The following inorganic analyte was detected in groundwater downgradient from SWMUs 5 and 6·

- **Arsenic** was detected at a concentration of 0.0115 F mg/L in the Round 1 sample collected from LSA1628-2. Although the result was flagged with "F" indicating that it was below the method reporting limit, this concentration of arsenic was above the background value (0.0049 mg/L), but below the MSC (0.05 mg/L) Arsenic was detected at a concentration of 0.031 mg/L in the groundwater sample collected from LSA1628-2 during Round 2 using the more analyte specific method SW7060A previously mentioned in Section 3.2.1.7. Based upon the first two rounds of groundwater sampling, a third groundwater sample and an associated duplicate sample were collected for arsenic from LSA1628-2 during Phase III of the RFI using method SW6010B. The duplicate result of the Phase III LSA1628-2 groundwater sample (0.0532 mg/L) was above both the background value and the MSC. However the parent sample had a concentration of 0.0433 F mg/L, which is below the MSC and does not confirm the detection in the duplicate sample.

4.1.5.2 Organic Constituents

Based on the results of the soil samples collected at SWMU 12, groundwater samples collected at SWMUs 5 and 6 during this RFI were not analyzed for organic analytes.

4.2 SWMU 12

4.2.1 Lithologic Findings

Three soil borings, BHGLSWMU12001 through BHGLSWMU12003, were advanced within the boundaries of SWMU 12 during Phase I. Four additional borings, BHGLSWMU12004 through

BHGLSWMU12007, and one HSA boring, WHGLTA028, were advanced during Phase II. Soil boring BHGLSWMU12004 was advanced northwest BHGLSWMU12001; BHGLSWMU12005 and BHGLSWMU12007 were advanced southeast and south of the site, respectively; and BHGLSWMU12006 was advanced to the west of the site. Four soil borings, BEEGSWMU12008 through BEEGSWMU12011, were advanced during Phase III Soil borings BEEGSWMU12008 and BEEGSWMU12009 were advanced to the southwest and west of BHGLSWMU12006, respectively. BEEGSWMU12010 and BEEGSWMU12011 were advanced to the northwest and northeast of the site, respectively. Rationale for soil boring placement is discussed previously in Section 3.2 2.

Soil borings BHGLSWMU12001 through BHGLSWMU12003 were advanced in the grassy area at SWMU 12. Soil borings BHGLSWMU12004 through BHGLSWMU12007 and BEEGSWMU12008 through BEEGSWMU12011 were advanced in the concrete area. Concrete and gravel was encountered in the top 10 inches of borings BHGLSWMU12004 through BHGLSWMU12005, BHGLSWMU12007, and BEEGSWMU12008 through BEEGSWMU12011. Wood debris was found in borings BHGLSWMU12001 and BHGLSWMU12007. Petroleum odors were observed in borings BHGLSWMU12001, BHGLSWMU12004, BEEGSWMU12009, BEEGSWMU12010, and BEEGSWMU12011.

Lithology was analyzed using a northwest-southeast transect along borings BEEGSWMU12010, BHGLSWMU12004, BHGLSWMU12001, BHGLSWMU12002, BHGLSWMU12003, BHGLSWMU12007, and BHGLSWMU12005. The lithologic cross section for SWMU 12 is presented in Figure 4.4. Soil boring BEEGSWMU12010 exhibited a layer of concrete underlain by 2" of gravel fill from the ground surface to a depth of 1 foot bgs. This layer overlies clay from 1 to 4 feet bgs, followed by a layer of sandy clay from 4 and 6 feet bgs. Delineation boring BEEGSWMU12010 was terminated at 6 feet bgs Soil boring BHGLSWMU12004 exhibited a layer of concrete from the ground surface to a depth of 1 foot bgs. A layer silty clay is encountered from 1 to 11 feet bgs, with a 2-foot layer of silty sand from 5 to 7 feet bgs. Delineation boring BHGLSWMU12004 was terminated at 11 feet bgs. Soil boring BHGLSWMU12001 exhibited silty clay from the ground surface to a depth of 6 feet bgs. This overlies sandy silt from 6 to 12 feet bgs, transitioning to sand and gravel from 12 to 16 feet bgs, with the water table at 14 5 feet bgs. The boring was terminated at 16 feet bgs. Boring BHGLSWMU12002 exhibited a layer of silty clay from the ground surface to a depth of 6 feet, with a layer of sandy silt from 6 to 12 feet bgs. This overlies a layer of sand from 12 to 16 feet bgs, with the water table at 14.5 feet bgs and the boring terminated at 16 feet bgs. Boring BHGLSWMU12003 exhibited a similar lithology to BHGLSWMU12002. Soil boring BHGLSWMU12007 exhibited a layer of concrete from the ground surface to a depth of 1 foot bgs. A layer of sand is encountered from 1 to 3 feet bgs, with a layer of silty clay from 3 to 7 feet bgs. This overlies a layer of sandy silt from 7 to 11 feet. Delineation boring BHGLSWMU12007 was terminated at 11 feet bgs. Delineation soil boring BHGLSWMU12005 exhibited a similar lithology to BHGLSWMU12007, with the boring terminated at 6 feet bgs. Boring logs are presented in Appendix F.

Groundwater flow direction in the vicinity of SWMU 12 trends generally to the east. Groundwater was encountered at approximately 14.5 feet bgs across the site.

4.2.2 Surface Soil Detections

A total of three Phase I surface soil samples were collected for analysis at SWMU 12: one surface sample each from borings BHGLSWMU12001 and BHGLSWMU12003. Based on the results of the Phase I soil investigation, additional surface soil samples were collected from borings BHGLSWMU12005, BHGLSWMU12007, and WHGLTA028 to delineate CoCs identified at the site Soil sampling locations are depicted in Figure 4 5. All Phase I surface soil samples were analyzed for the list of analyses presented in Section 3.2.2. Analytical detections in SWMU 12 Phase I and II surface soils are presented in Table 4.5. Results from SPLP extraction performed on Phase I surface soil and Phase I subsurface soil samples from SWMU 12 are presented in Table 4.1.

4.2.2.1 Inorganic Constituents

The following metals were detected in the surface soil samples collected at SWMU 12·

- **Cadmium** was detected at 0.98 mg/kg and 0 74 mg/kg in the surface soil samples collected from borings BHGLSWMU12002 and BHGLSWMU12003, respectively. These detections of cadmium were above both background and the MSC. An SPLP extraction was performed on these samples, and the cadmium results were below the industrial water MSC. Based on this SPLP analysis, a site-specific soil MSC of 0.98 mg/kg was established for cadmium during Phase I (a new site-specific MSC was established at 4.2 mg/kg during Phase III). Four additional surface samples were collected from borings BHGLSWMU12005, BHGLSWMU12006, BHGLSWMU12007, and WHGLTA028 for delineation purposes during Phase II. Cadmium was detected below background in all of the Phase II delineation surface soil samples. Cadmium was detected slightly above background (0.556 mg/kg) at a concentration of 0.7 F mg/kg in the duplicate sample collected from BHGLSWMU12006-01. This detection was not confirmed by the parent sample.

- **Lead** was detected at 89.4 mg/kg in the surface soil sample collected from boring BHGLSWMU12002 and 57.8 mg/kg in the surface soil collected from boring BHGLSWMU12003 These detections of lead were above both background and the MSC. An SPLP extraction was performed on these samples, and the lead results were both above the industrial water MSC of 0.0150 mg/L. Based on these SPLP analyses, no site-specific soil MSC was established for lead at SWMU 12 during Phase II; however a site-specific MSC of 64.8 mg/kg was established for SWMU 12 during the IRA confirmation and delineation sampling (Appendix C). Four additional surface samples were collected for lead from borings BHGLSWMU12005, BHGLSWMU12006, BHGLSWMU12007, and WHGLTA028 during Phase II. These Phase II soil borings were advanced for delineation purposes. Lead was detected below background in all of the Phase II soil samples.

- **Zinc** was detected at 84.8 mg/kg in the surface soil sample collected from boring BHGLSWMU12002 and 97.9 mg/kg in the surface soil sample collected from boring

BHGLSWMU12003. These detections of zinc were above the background, but well below the MSC. No additional surface samples were collected for zinc during Phase II.

4.2.2.2 Organic Constituents

The following organic constituents were detected in the surface soil samples collected at SWMU 12:

- **Benzo(a)anthracene** was detected at 1.7 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of benzo(a)anthracene was above both the RRS 1 and RRS 2 for method SW8270C (0.33 mg/kg) One additional surface soil sample was collected for benzo(a)anthracene from boring BHGLSWMU12005 during Phase II for delineation purposes. Benzo(a)anthracene was detected below RRS 1 in the Phase II surface soil sample.

- **Benzo(a)pyrene** was detected at 1.4 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of benzo(a)pyrene was above both the RRS 1 and RRS 2 for method SW8270C (0.33 mg/kg). One additional surface soil sample was collected for benzo(a)pyrene from boring BHGLSWMU12005 during Phase II for delineation purposes. Benzo(a)pyrene was detected below RRS 1 in the Phase II surface soil sample.

- **Benzo(b)fluoranthene** was detected at 2.0 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of benzo(b)fluoranthene was above the RRS 1 and MSC (0.33 mg/kg). One additional surface soil sample was collected for benzo(b)fluoranthene from boring BHGLSWMU12005 during Phase II for delineation purposes. Benzo(b)fluoranthene was detected below RRS 1 in the Phase II surface soil sample.

- **Benzo(g,h,i)perylene** was detected at 0.75 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of benzo(g,h,i)perylene was above the RRS 1 (0 33 mg/kg), but well below the MSC (306.6 mg/kg). No further sampling for this analyte in the surface soil was conducted.

- **Benzo(k)fluoranthene** was detected at 0.76 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of benzo(k)fluoranthene was above the RRS 1 (0.33 mg/kg) and MSC (0.392 mg/kg). One additional surface soil sample was collected for benzo(k)fluoranthene from boring BHGLSWMU12005 during Phase II for delineation purposes. Benzo(k)fluoranthene was detected below RRS 1 in the Phase II surface soil sample.

- **Bis(2-Ethylhexyl)phthalate** was detected at 0.42 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of bis(2-Ethylhexyl)phthalate was above the RRS 1 (0.33 mg/kg), but below the MSC (0.6 mg/kg). No further sampling for this analyte in the surface soil was conducted.

- **Chrysene** was detected at 1.8 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12005. This detection of chrysene was above the RRS 1 (0.33 mg/kg), but well below the MSC (3.92 mg/kg). No further sampling for this analyte in the surface soil was conducted.

- **Fluoranthene** was detected at 0 37 F mg/kg and 3.3 mg/kg in the surface soil samples collected from Phase I borings BHGLSWMU12002 and BHGLSWMU12003, respectively. These detections of fluoranthene were above the RRS 1 (0.33 mg/kg), but well below the MSC (408.8 mg/kg). No further sampling for this analyte in the surface soil was conducted

- **Indeno(1,2,3-c,d)pyrene** was detected at 0 96 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of indeno(1,2,3-c,d)pyrene was above the RRS 1 and MSC (0.33 mg/kg) One additional surface soil sample was collected for indeno(1,2,3-c,d)pyrene from boring BHGLSWMU12005 during Phase II for delineation purposes. Indeno(1,2,3-c,d)pyrene was detected below RRS 1 in the Phase II surface soil sample.

- **Phenanthrene** was detected at 1 6 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This detection of phenanthrene was above the RRS 1 (0.33 mg/kg), but well below the MSC (306.6 mg/kg). No further sampling for this analyte in the surface soil was conducted

- **Pyrene** was detected at 0.42 mg/kg and 3.3 mg/kg in the surface soil samples collected from Phase I borings BHGLSWMU12002 and BHGLSWMU12003, respectively. These detections of pyrene were above the RRS 1 (0.33 mg/kg), but well below the MSC (306.6 mg/kg). No further sampling for this analyte in the surface soil was conducted.

4.2.3 Subsurface Soil Detections

A total of six subsurface soil samples were collected for characterization analysis from borings BHGLSWMU12001 through BHGLSWMU12003 during Phase I at SWMU 12 (Figure 4.5). All subsurface soil samples were analyzed for the list of analyses presented in Section 3.2.2. Phase I subsurface soil results are presented in Table 4.6. Based on the results of the Phase I soil investigation, additional subsurface soil samples were collected from borings BHGLSWMU12004 through BHGLSWMU12007, WHGLTA028, and BEEGSWMU12008 through BEEGSWMU12011 in order to delineate CoCs identified at the site. Soil sampling locations are depicted in Figure 4.5. Analytical detections in SWMU 12 subsurface soils are presented in Table 4.6. Results from SPLP extraction performed on Phase I surface soil and Phase I subsurface soil samples from SWMU 12 are presented in Table 4.1.

4.2.3.1 Inorganic Constituents

The following metals were detected in the subsurface soil samples collected at SWMU 12:

- **Arsenic** was detected at 10.5 J mg/kg in the subsurface soil sample collected from the 10-foot interval of boring BHGLSWMU12001. This detection of arsenic was above both

background and the MSC. An SPLP extraction was performed on this sample, and the arsenic result was below the industrial water MSC Based on this SPLP analysis, a site-specific soil MSC of 10.5 mg/kg was established for arsenic. Three subsurface delineation samples, BHGLSWMU12006, BHGLSWMU12007, and WHGLTA028, were collected for arsenic at SWMU 12 during Phase II. Arsenic was detected below background in one of the Phase II delineation surface soil samples Arsenic was detected below the site-specific MSC (10 5 mg/kg) at concentrations of 6.8 F mg/kg and 8.4 F mg/kg in BHGLSWMU12006 and BHGLSWMU12007, respectively. An additional delineation boring for arsenic, BEEGSWMU12011, was advanced during Phase III. Arsenic was detected below background in the Phase III delineation boring.

- **Cobalt** was detected at 7.5 mg/kg and 7.7 mg/kg in the 5-foot intervals collected from borings BHGLSWMU12001 and BHGLSWMU12003, respectively. These detections of cobalt were above background, but well below the MSC (613.2 mg/kg). No additional subsurface samples were collected for cobalt during Phase II.

- **Copper** was detected at 15.8 J mg/kg in the 5-foot interval collected from boring BHGLSWMU12003. This detection of copper was slightly above the background (13.72 mg/kg), but well below the MSC (130 mg/kg). No additional subsurface samples were collected for copper during Phase II.

4.2.3.2 Organic Constituents

The following organic constituents were detected in the subsurface soil samples collected at SWMU 12:

- **Acetone** was detected at a concentration of 0.012 mg/kg in the 10-foot interval of Phase I boring BHGLSWMU12003. This detection was above RRS 1(0.005 mg/kg), but well below MSC (1022 mg/kg). No additional subsurface samples were collected during Phase II.

- **Benzene** was detected at 0.1 J mg/kg (5-foot interval) and 0.003 mg/kg (10-foot interval) in the subsurface soil samples collected from Phase I boring BHGLSWMU12001. Benzene was similarly detected at concentrations of 0.003 mg/kg (5-foot interval) and 0.006 mg/kg (10-foot interval) in Phase I boring BHGLSWMU12002. These detections of benzene were above the RRS 1 (0.002), but well below the MSC (0.5 mg/kg). Eight additional subsurface soil samples were collected for benzene from borings BHGLSWMU12004, BHGLSWMU12006, BHGLSWMU12007, and WHGLTA028 during Phase II. These Phase II soil borings were advanced for delineation purposes. Benzene was detected below RRS 1 in both the 5- and 10-foot intervals of borings BHGLSWMU12007 and WHGLTA028. Benzene was detected at concentrations of 1.3 J mg/kg and 0.015 mg/kg in the 5-foot intervals of BHGLSWMU12004 and BHGLSWMU12006, respectively. Both Phase II detections were above RRS 1, but only the detection in BHGLSWMU12004 was above the MSC of 0.5 mg/kg. Benzene was detected below RRS 1 in the 10-foot intervals of both BHGLSWMU12004 and BHGLSWMU12006. Four additional borings, BEEGSWMU12008 through

BEEGSWMU12011, were advanced to delineate benzene in the 5-foot interval during Phase III Benzene was not detected or detected below RRS 1 in all Phase III soil samples.

- **Ethylbenzene** was detected at a concentration of 0.006 J mg/kg in the 5-foot interval of Phase I boring BHGLSWMU12001. This detection is above the RRS 1 (0.003 mg/kg), but well below the MSC (70 mg/kg) Three additional Phase III borings were advanced to delineate ethylbenzene in the subsurface soil. All Phase III detections were below RRS 1.

- **Vinyl Chloride** was detected at a concentration of 0 007 mg/kg in the 10-foot interval of Phase I boring BHGLSWMU12002. This detection is above the RRS 1 (0.005 mg/kg), but below the MSC (0.0657 mg/kg) Three additional Phase II borings were advanced to delineate vinyl chloride in the subsurface soil. All Phase II detections were below RRS 1.

- **2-methylnaphthalene** was detected during Phase I at 0 47 mg/kg in the 5-foot interval of BHGLSWMU12001. This detection of 2-methylnaphthalene was above the RRS 1 (0.33 mg/kg), but well below MSC (204.4 mg/kg). No additional sampling was conducted for 2-methylnaphthalene during Phase II or III

- **Benzo(a)anthracene** was detected during Phase III at 0.0077 J mg/kg and 0.0093 J mg/kg in the 5-foot interval of BEEGSWMU12010 and in the 10-foot interval of BEEGSWMU12011, respectively. These detections of benzo(a)anthracene were above the RRS 1 (0.0042 mg/kg) for method SW8310, but below MSC (0.0392 mg/kg)

- **Benzo(b)fluoranthene** was detected at 0.019 mg/kg in the 5-foot interval of BEEGSWMU12010, and at 0.032 in the 5-foot interval and 0.0039 mg/kg in the 10-foot interval of BEEGSWMU12011, during Phase III. These detections of benzo(b)fluoranthene were above the RRS 1 (0.0017 mg/kg) for method SW8310, but below the MSC (0.0392 mg/kg).

- **Fluoranthene** was detected at 0 086 mg/kg in the 5-foot interval collected from Phase III boring BEEGSWMU12010. This detection of fluoranthene was above the RRS 1 (0.0042 mg/kg) for method SW8310, but well below the MSC (408.8 mg/kg).

- **Fluorene** was detected at 0.61 mg/kg in the 5-foot interval collected from Phase I boring BHGLSWMU12001. This detection of fluorene was above the RRS 1 (0.33 mg/kg), but well below the MSC (408.8 mg/kg). Four additional subsurface soil samples were collected for fluorene from borings BEEGSWMU12009 through BEEGSWMU12011 during Phase III. These Phase III soil borings were advanced for delineation purposes. Fluorene was detected below RRS 1 in all of the Phase III subsurface soil samples, except for at a concentration of 0.072 mg/kg in the 5-foot interval of BEEGSWMU12010. This concentration is above the RRS 1 (0 0083 mg/kg) for method SW8310, but well below the MSC (408.8 mg/kg).

- **Naphthalene** was detected at 0 85 mg/kg in the 5-foot interval of Phase I boring BHGLSWMU12001. This detection of naphthalene was above the RRS 1 (0.33 mg/kg),

but well below the MSC (204.4 mg/kg). No further sampling for this analyte in the subsurface soil was conducted.

- **Phenanthrene** was detected at 0.57 mg/kg in the 5-foot interval of Phase I boring BHGLSWMU12001. This detection of phenanthrene was above the RRS 1 (0.33 mg/kg), but well below the MSC (306.6 mg/kg). Three additional soil borings were advanced during Phase III to delineate PAHs Phenanthrene was detected at a concentration of 0.017 mg/kg in the 5-foot interval of BEEGSWMU12010, and 0.0061 mg/kg in the 10-foot interval of BEEGSWMU12011. These detections were above the RRS 1 (0.0033 mg/kg) for method SW8310, but well below the MSC (306.6 mg/kg).

- **Pyrene** was detected at 0 013 mg/kg in the 5-foot interval of Phase III boring BEEGSWMU12010. This detection of pyrene was above the RRS 1 (0.0083 mg/kg) for method SW8310, but well below the MSC (306 6 mg/kg). Pyrene was detected below the RRS 1 in Phase III borings BEEGSWMU12009 and BEEGSWMU12011.

- **TPH** was detected at 770 mg/kg in the 5-foot interval of Phase I boring BHGLSWMU12001. This detection of TPH was above the RRS 1 (50 mg/kg), as well as the TNRCC action level for coarse-grained soils (500 mg/kg) Four additional subsurface soil samples were collected for TPH from borings BHGLSWMU12004, BHGLSWMU12006, BHGLSWMU12007, and WHGLTA028 during Phase II for delineation purposes. TPH was detected below RRS 1 in all of the Phase II surface soil samples, with the exception of one concentration of 1,100 mg/kg in the 5-foot interval of the sample collected from delineation boring BHGLSWMU12004. An SPLP extraction was performed on this sample, and the TPH result was below RRS 1. Based on this SPLP analysis, a site-specific soil MSC of 1,100 mg/kg was established for TPH.

4.2.4 Soil pH

Soil pH levels were not analyzed for at SWMU 12 based on the wastes handled at this SWMU (Table 1.1).

4.2.5 IRA Detections

As depicted in Figures 4.6 through 4.9, four excavations were planned and three were completed at SWMU 12 as part of an IRA to remove soil contaminated with concentrations of lead, benzene, and various PAHs above RRS 2. Excavation confirmation samples were collected from each sidewall and multiple floor samples were collected. The results of IRA excavation confirmation samples show that all target CoCs were removed in the excavations. The IRA results are presented in Appendix C.

Excavation SWMU 12A (Figure 4.6), centered on BHGLSWMU12004, was intended to achieve the removal of soils contaminated with concentrations of benzene and TPH above the RRS 2 values (Figure 4.5). The initial excavation was proposed to extend to 7 feet long by 7 feet wide, with an excavation depth of 7 feet (12.7 cubic yards). The location of this excavation would have interrupted the gate sensors leading to the Alert Apron on the flightline. Therefore a confirmation sample was collected and analyzed with an expedited laboratory turn around time. The benzene

concentration at the 5-foot interval of BHGLSWMU12004 (1.3 J mg/kg) was not confirmed by the October 2001 sample BEEGSWMU12001 (0.035 mg/kg) and excavation 12A was not performed. The result of the soil sampling is presented in Appendix C.

Excavation SWMU 12B (Figure 4.7) was initially centered on BHGLSWMU12002. The excavation eventually took the shape of a large rectangle that measured 10 feet long by 12 5 feet wide and 2 feet deep. A total of 10 cubic yards were removed from excavation SWMU 12B. Excavation SWMU12B was intended for the removal of soils contaminated with concentrations of lead above RRS 2 and other compounds detected at concentrations above RRS 1 (Figure 4.5). A confirmation sample was collected and analyzed for lead, cadmium, and zinc directly below BHGLSWMU12002 at a depth of 2 feet bgs. Five additional samples, analyzed for lead, cadmium, and zinc only, were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA sampling are presented in Appendix C

Excavation SWMU 12C (Figure 4.8) was initially centered on BHGLSWMU12003. The excavation eventually took the shape of a large rectangle that measured 7.5 feet long by 8 feet wide by 5 feet deep. A total of 11 cubic yards were removed from excavation SWMU 12C. Excavation SWMU12C was intended for the removal of soils contaminated with concentrations of lead and select PAHs above RRS 2, as well as other compounds detected at concentrations above RRS 1 (Figure 4.5). A confirmation sample was collected and analyzed for lead and PAHs directly below BHGLSWMU12003 at a depth of 2 feet bgs. Four additional samples, analyzed for lead and PAHs only, were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA sampling are presented in Appendix C.

Excavation SWMU 12D (Figure 4.9) was initially centered on BHGLSWMU12001. The excavation eventually took the shape of a rectangle that measured approximately 8 feet long by 7 feet wide by 7 feet deep. A total of 15 cubic yards were removed from excavation SWMU 12D Excavation SWMU12D was intended for the removal of soils contaminated with concentrations of TPH above RRS 2 (Figure 4.5). A confirmation sample was collected and analyzed for TPH directly below BHGLSWMU12001 at a depth of 7 feet bgs. Four additional samples, analyzed for TPH only, were collected at the 7-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA sampling are presented in Appendix C.

4.2.6 Groundwater Detections

One round of groundwater samples was collected from existing cross-gradient monitoring well WCHMHTA012, and two rounds of groundwater samples were collected from newly installed downgradient monitoring well WHGLTA028, during Phase II of the RFI. An upgradient monitoring well, WEEGTA001, and an additional downgradient monitoring well, WEEGTA002, were installed during Phase III. The third round of groundwater samples was collected for metals (SW6010B), VOCs (SW8260B), and SVOCS (SW8270C) from WEEGTA001, WEEGTA002, and WHGLTA028. A fourth round of groundwater samples was collected for benzene from WEEGTA001, WEEGTA002, WHGLTA028, and WCHMHTA012 during Phase III.

Groundwater samples were analyzed for the constituents described in Section 3.2.1.5. Groundwater results are depicted in Figure 4.10 and presented in Table 4.7.

4.2.6.1 *Inorganic Constituents*

The following metals were detected in the groundwater samples collected at SWMU 12:

- **Arsenic** was detected at a concentration of 0.035 F mg/L in WCHMHTA012 (October 2000) Arsenic was detected at concentrations of 0.0165 (October 2000), 0.0201 mg/L (October 2000 duplicate), and 0.0166 F mg/L (November 2001) in WHGLTA028. Arsenic was also detected at concentrations of 0 0145 F mg/L in WEEGTA001 (November 2001) and 0.0206 F mg/L in WEEGTA002 (November 2001). These detections of arsenic were above the RRS 1, but below the MSC.

- **Copper** was detected at concentrations of 0.0044 F mg/L in WEEGTA001 and 0.0066 F mg/L in WEEGTA002 during the November 2001 round of groundwater sampling. These detections of copper were above the RRS 1, but below the MSC.

- **Iron** was detected at concentrations of 2.4 mg/L in WHGLTA028; 1.36 mg/L in WEEGTA001; and 4.97 mg/L in WEEGTA002 during the November 2001 round of groundwater sampling. These detections of iron were above the RRS 1 value. There is no MSC for iron.

- **Manganese** was detected at concentrations of 0.348 mg/L in WHGLTA028; 0.98 mg/L in WEEGTA001; and 0.205 mg/L in WEEGTA002 during the November 2001 round of groundwater sampling. These detections of manganese were above the RRS 1, but well below the MSC.

- **Silver** was detected at a concentration of 0 0019 F mg/L in WEEGTA002 (November 2001). This detection of silver was above the RRS 1, but well below the MSC.

- **Antimony** was detected at a concentration of 0.003 F mg/L in WEEGTA001 (November 2001). This detection of antimony was slightly above the RRS 1 and well below the MSC.

4.2.6.2 Organic Constituents

The following organic constituents were detected in the groundwater samples collected at SWMU 12:

- **1,1-Dichloroethene (1,1-DCE)** was detected at a concentration of 0.001 mg/L during the November 2001 groundwater sampling round in monitoring wells WHGLTA028, WEEGTA001, and WEEGTA002. These concentrations of 1,1-Dichloroethene were above RRS 1 (0.0005 mg/L), but below the MSC (0.007 mg/L).

- **1,2,4-Trimethylbenzene** was detected at a concentration of 0.002 mg/L in the groundwater sample collected from downgradient monitoring well WHGLTA028 in

November 2001. This concentration of 1,2,4-Trimethylbenzene was above RRS 1 (0.0005 mg/L), but well below the MSC (5.11 mg/L)

- **Benzene** was detected at concentrations of 0.001 mg/L, 0.002 mg/L, 0.0009 mg/L, and 0.00086 mg/L in the groundwater samples collected from downgradient monitoring well WHGLTA028 in May 2000, October 2000, November 2001, and March 2002, respectively. Benzene was also detected at concentrations of 0 00053 mg/L in WCHMHTA012 (March 2002); 0.0007 mg/L (November 2001) and 0.00068 mg/L (March 2002) in WEEGTA001; and 0.0006 mg/L (November 2001) and 0.00079 mg/L (March 2002) in WEEGTA002. These concentrations of benzene were above RRS 1 (0.0004 mg/L), but below the MSC (0.005 mg/L).

- ***cis*-1,2-Dichloroethene (*cis*-1,2-DCE)** was detected at concentrations of 0.22 mg/L in WEEGTA001, 0.19 mg/L in WHGLTA028, and 0.2 mg/L in WEEGTA002 during the November 2001 groundwater sampling round. These concentrations of cis-1,2-DCE were above both RRS 1 (0.0005 mg/L) and the MSC (0.07 mg/L).

- **Ethylbenzene** was detected at a concentration of 0.001 mg/L in WHGLTA028 during the November 2001 groundwater sampling round. This concentration of ethylbenzene was above RRS 1 (0.0005 mg/L), but below the MSC (0.7 mg/L).

- **m,p-Xylene** was detected at a concentration of 0.002 mg/L in WHGLTA028 during the November 2001 groundwater sampling round. This concentration of m,p-Xylene was slightly above RRS 1 (0.001 mg/L) and well below the MSC (10 mg/L).

- **PCE** was detected at concentrations of 0.002 mg/L in WEEGTA001, 0.001 mg/L in WHGLTA028, and 0.0006 mg/L in WEEGTA002 during the November 2001 groundwater sampling round. These concentrations of PCE were above RRS 1 (0.0005 mg/L), but below the MSC (0.005 mg/L).

- **trans-1,2-Dichloroethene (trans-1,2-DCE)** was detected at concentrations of 0.018 mg/L in WEEGTA001, 0.025 mg/L in WHGLTA028, and 0 005 mg/L in WEEGTA002 during the November 2001 groundwater sampling round. These concentrations of trans-1,2-Dichloroethene were above RRS 1 (0.0005 mg/L), but below the MSC (0.1 mg/L).

- **TCE** was detected at concentrations of 0.42 mg/L in WEEGTA001, 0.4 mg/L in WHGLTA028, and 0.29 mg/L in WEEGTA002 during the November 2001 groundwater sampling round. These concentrations of TCE were above both RRS 1 (0.0005 mg/L) and below the MSC (0.005 mg/L).

- **Vinyl Chloride** was detected at concentrations of 0.009 mg/L, 0.012 J mg/L, 0.015 J mg/L, and 0 007 mg/L in the groundwater samples collected from downgradient monitoring well WHGLTA028 in May 2000, October 2000 (including duplicate sample), and November 2001, respectively. Vinyl chloride was also detected at concentrations of 0.006 mg/L in WEEGTA001 and 0.008 mg/L in WEEGTA002 during the November 2001 groundwater sampling round. These concentrations of vinyl chloride were above both RRS 1 (0.0005 mg/L) and below the MSC (0.002 mg/L).

4.3 SWMU 31

4.3.1 Lithologic Findings

Two soil borings, BHGLSWMU31001 and BHGLSWMU31002, were advanced to the southwest and north east of the concrete pad at SWMU 31 during Phase I. Four additional borings, BHGLSWMU31003 through BHGLSWMU31006, were advanced during Phase II. Soil boring BHGLSWMU31003 was a confirmation boring of BHGLSWMU31002. Soil boring BHGLSWMU31004 was advanced south of the concrete pad and SWMU 31, and BHGLSWMU31005 and BHGLSWMU31006 were advanced to the east and northeast of the site, respectively. Rationale for soil boring placement is discussed previously in Section 3.2 2.

Soil borings BHGLSWMU31001 through BHGLSWMU31005 were advanced in the grassy area surrounding the concrete pad at SWMU 31 Soil boring BHGLSWMU31006 was advanced in the asphalt parking area. As stated previously, SWMU 31 is located within the boundary of SWMU 29/Landfill 2. Landfill debris was encountered in the Phase I borings BHGLSWMU31001 and BHGLSWMU31002. Fill material and landfill debris was observed from 4 feet to 13 feet bgs in soil boring BHGLSWMU31001, and from 2 feet to 10 feet bgs in soil boring BHGLSWMU31002. Gravel and asphalt was encountered in the top 6 inches of all four Phase II borings, BHGLSWMU31003 through BHGLSWMU31006 No petroleum odors were observed in any of the soil borings at SWMU 31.

Lithology was analyzed using a west-east transect along borings BHGLSWMU31002, BHGLSWMU31001, and BHGLSWMU31005. The lithologic cross section for SWMU 31 is presented in Figure 4.11. Soil boring BHGLSWMU31002 exhibited gravel and topsoil then silty sand with gravel from the ground surface to a depth of 2 feet bgs. This layer overlies fill material and landfill debris from 2 to 10 feet bgs, followed by a layer of silty sand between 10 and 12.5 feet bgs, transitioning to silty sand with gravel to 17 feet bgs. A layer of sand and gravel is encountered from 17 to 20 feet bgs, with the water table at 18 feet bgs and the boring terminated at 20 feet bgs. Soil boring BHGLSWMU31001 exhibited gravel and topsoil then silty sand with gravel from the ground surface to a depth of 2.5 feet bgs, overlying sandy clay from 2.5 to 4 feet bgs. Fill material and landfill debris was encountered from 4 to 13 feet bgs. This overlies a layer of silty sand from 13 to 15 feet bgs, transitioning to silt, sand, and gravel from 15 to 16.25 feet bgs. A layer of sand and gravel is encountered from 16.25 to 22 feet bgs, with the water table at 20 feet bgs and the boring terminated at 22 feet bgs. Boring BHGLSWMU31005 was advanced through six inches of grass, gravel, and asphalt, overlying silty clay to a depth of 2 feet bgs. Soil boring BHGLSWMU31005 was a delineation boring for surface soil and therefore terminated at 2 feet bgs. Boring logs are presented in Appendix F.

Groundwater flow directions in the vicinity of SWMU 31 trend generally to the southeast. Groundwater was encountered at approximately 18 to 20 feet bgs across the site.

4.3.2 Surface Soil Detections

A total of two Phase I surface soil samples were collected for analysis at SWMU 31: one surface sample each from borings BHGLSWMU31001 and BHGLSWMU31002. Based on the results of

the Phase I soil investigation, additional surface soil samples were collected from borings BHGLSWMU31004 through BHGLSWMU31006 to delineate CoCs identified at the site, and from BHGLSWMU31004 to confirm CoCs detected in BHGLSWMU31002. Soil sampling locations are depicted in Figure 4.12. All Phase I surface soil samples were analyzed for the list of analyses presented in Section 3.2.2.2. Analytical detections in SWMU 31 Phase I and II surface soils are presented in Table 4.8. Results from SPLP extraction performed on Phase I surface soil and Phase I subsurface soil samples from SWMU 31 are presented in Table 4.1.

4.3.2.1 Inorganic Constituents

The following metals were detected in the surface soil samples collected at SWMU 31:

- **Barium** was detected at 506 mg/kg in the surface soil sample collected from boring BHGLSWMU31001. This detection of barium was above both background and the MSC. An SPLP extraction was performed on this sample, and the barium result was below the industrial groundwater MSC. Based on this SPLP analysis, a site-specific soil MSC of 506 mg/kg was established for barium at SWMU 31. Two additional surface samples were collected for barium from borings BHGLSWMU31005 and BHGLSWMU31006 during Phase II for delineation purposes. Barium was detected below background in both of the Phase II delineation samples.

- **Cadmium** was detected at 1.5 mg/kg and 0.99 mg/kg in the surface soil samples collected from borings BHGLSWMU31001 and BHGLSWMU31002, respectively. These detections of cadmium were above both background and the MSC. An SPLP extraction was performed on these samples, and the cadmium results were below the industrial groundwater MSC. Based on this SPLP analysis, a site-specific soil MSC of 1.5 mg/kg was established for cadmium. Four additional surface samples were collected for cadmium at SWMU 31 during Phase II. The samples collected from borings BHGLSWMU31004 through BHGLSWMU31006 were collected for delineation purposes, and the sample collected from BHGLSWMU31003 was for confirmation of the detection in BHGLSMWU31002 Cadmium was detected below background in the Phase II delineation and confirmation samples with the exception of the sample collected from BHGLSWMU31006, which was detected slightly above background (0.556 mg/kg) at a concentration of 0.6 mg/kg.

- **Chromium** was detected at 40.6 mg/kg in the surface soil sample collected from boring BHGLSWMU31001. This detection of chromium was above both background and the MSC. An SPLP extraction was performed on this sample, and the chromium result was below the industrial groundwater MSC. Based on this SPLP analysis, a site-specific soil MSC of 40.6 mg/kg was established for chromium. Two additional surface samples were collected for chromium from borings BHGLSWMU31005 and BHGLSWMU31006 during Phase II for delineation purposes. Chromium was detected below background in both of the Phase II delineation samples.

- **Copper** was detected at 23.3 mg/kg in the surface soil sample collected from boring BHGLSWMU31001. This detection of copper was slightly above the background value,

but well below the MSC. No additional surface samples were collected for copper during Phase II

- **Lead** was detected at 159 mg/kg and 58.5 mg/kg in the surface soil samples collected from borings BHGLSWMU31001 and BHGLSWMU31002, respectively. These detections of lead were above both background and the MSC. An SPLP extraction was performed on these samples, and the lead results were both above the industrial groundwater MSC of 0 0150 mg/L. Based on these SPLP analyses, no site-specific soil MSC was established for lead at SWMU 31. Four additional surface samples were collected for lead from borings BHGLSWMU31003 through BHGLSWMU31006 during Phase II. Soil borings BHGLSWMU31004 through BHGLSWMU31006 were advanced for delineation purposes, and BHGLSWMU31003 was advanced as a confirmation sample of BHGLSWMU31002. Lead was detected below background in all of the Phase II soil samples.

- **Zinc** was detected at 123 mg/kg in the surface soil sample collected from boring BHGLSWMU31001. This detection of zinc was above the background, but well below the MSC. No additional surface samples were collected for zinc during Phase II.

- **Mercury** was detected at 0 57 mg/kg in the surface soil sample collected from boring BHGLSWMU31001. This detection of mercury was above both the background value and the MSC. An SPLP extraction was performed on this sample, and the mercury result was below the industrial groundwater MSC. Based on this SPLP analysis, a site-specific soil MSC of 0.57 mg/kg was established for mercury. Two additional surface samples were collected for mercury from borings BHGLSWMU31005 and BHGLSWMU31006 during Phase II for delineation purposes. Mercury was not detected in either of the Phase II delineation samples.

4.3.2.2 Organic Constituents

The following organic constituents were detected in the surface soil samples collected at SWMU 31:

- **Acetone** was detected at 0.15 mg/kg in the surface soil sample collected from boring BHGLSWMU31002. This detection of acetone was above the RRS 1 (0.005 mg/kg), but well below the MSC (1,022 mg/kg). Acetone was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **MEK** was detected at 0.019 mg/kg in the surface soil sample collected from boring BHGLSWMU31002. This detection of MEK was above the RRS 1 (0.005 mg/kg), but well below the MSC (6,132 mg/kg). MEK was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **Benzo(b)fluoranthene** was detected at 0.51 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU3001. This detection of benzo(b)fluoranthene was above the RRS 1 and MSC (0.33 mg/kg). Benzo(b)fluoranthene was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **Benzo(g,h,i)perylene** was detected at 0.44 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU31001. This detection of benzo(g,h,i)perylene was above the RRS 1 (0.33 mg/kg), but well below the MSC (306.6 mg/kg). Benzo(g,h,i)perylene was not identified as a CoC at the site and no further sampling for this analyte was conducted

- **Chrysene** was detected at 0.38 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU31001. This detection of chrysene was above the RRS 1 (0.33 mg/kg), but well below the MSC (3.92 mg/kg). Chrysene was not identified as a CoC at the site and no further sampling for this analyte was conducted

- **Fluoranthene** was detected at 0.79 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU31001 and at 0 34 F mg/kg in BHGLSWMU31002 These detections of fluoranthene were above the RRS 1 (0.33 mg/kg), but well below the MSC (408.8 mg/kg). Fluoranthene was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **Indeno(1,2,3-c,d)pyrene** was detected at 0.42 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU31001. This detection of indeno(1,2,3-c,d)pyrene was above the RRS 1 and MSC (0.33 mg/kg).

- Indeno(1,2,3-c,d)pyrene was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **Phenanthrene** was detected at 0.5 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU31001. This detection of phenanthrene was above the RRS 1 (0 33 mg/kg), but well below the MSC (306.6 mg/kg). Phenanthrene was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **Pyrene** was detected at 0.64 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU31001. This detection of pyrene was above the RRS 1 (0.33 mg/kg), but well below the MSC (306.6 mg/kg) Pyrene was not identified as a CoC at the site and no further sampling for this analyte was conducted

4.3.3 Subsurface Soil Detections

During Phase I soil sampling activities, a total of seven subsurface soil samples were collected for analysis at SWMU 31 (Figure 4.12). Soil samples were collected at 5-foot intervals until the water table was encountered. All subsurface soil samples were analyzed for the list of analyses presented in Section 3.2.2.2. Based on the results from the Phase I soil investigation, no subsurface soil samples were collected during Phase II. Analytical results of subsurface soil samples are presented in Table 4.9 and depicted in Figure 4.12.

4.3.3.1 Inorganic Constituents

The following metal was detected in a subsurface soil sample collected at SWMU 31

- **Mercury** (0.2 mg/kg) was detected above background in the 15-foot interval of the soil sample collected at boring BHGLSWMU31002. This concentration of mercury is equal to the MSC of 0.2 mg/kg An SPLP extraction and analysis was not performed on this sample because the surface soil sample collected from BHGLSWMU31001 established a site-specific MSC of 0.57 mg/kg for mercury at SWMU 31 No additional samples were collected during Phase II in the subsurface.

4.3.3.2 Organic Constituents

No organic constituents were detected above the RRS 1 value or MSCs in the subsurface soil samples collected at SWMU 31.

4.3.4 Soil pH

Soil pH levels were not analyzed for at SWMU 31 based on the wastes handled and the site (Table 1.1).

4.3.5 IRA Detections

As depicted in Figures 4.13 and 4.14, two excavations were completed at SWMU 31 as part of an IRA to remove soil contaminated with concentrations of lead above RRS 2. Excavation confirmation samples were collected from each sidewall and multiple floor samples were collected. The results of IRA excavation confirmation samples show that all target CoCs were removed in the excavations. The IRA results are presented in Appendix C.

Excavation SWMU 31A (Figure 4 13) was initially centered on BHGLSWMU31001. The excavation eventually took the form of two rectangles that measured 150 square feet by 2 feet deep and 420 square feet by 2 feet deep. A total of 42 cubic yards were removed from excavation 31A. Excavation SWMU31A was intended to achieve the removal of soils contaminated with concentrations of lead above the RRS 2 value and other compounds detected above RRS 1 values (Figure 4.12). A confirmation sample was collected and analyzed for lead, cadmium, and MEK directly below BHGLSWMU31002 at a depth of 2 feet bgs. Four additional samples, analyzed for lead and cadmium only, were collected at the 5-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA sampling are presented in Appendix C.

Excavation SWMU 31B (Figure 4.14) was initially centered on BHGLSWMU31002. The excavation eventually took the shape of a large rectangle that measured 1353 square feet by 2 feet deep. A total of 100 cubic yards were removed from excavation SWMU 31B. Excavation SWMU31B was intended for the removal of soils contaminated with concentrations of lead above RRS 2 and other compounds detected at concentrations above RRS 1 (Figure 4.12). A confirmation sample was collected and analyzed for lead, barium, cadmium, chromium, mercury, and zinc directly below BHGLSWMU31001 at a depth of 2 feet bgs. Four additional samples,

analyzed for lead, barium, cadmium, chromium, mercury, and zinc only, were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of the IRA sampling are presented in Appendix C.

4.3.6 Groundwater Detections

Based on the results of the Phase I soil investigation conducted at SWMU 31, evidence of a release at the site was limited to the surface soils only. No contamination attributed to SWMU 31 was identified in the samples collected from the 5-, 10-, or 15-foot intervals at the site. As a result, a groundwater investigation at SWMU 31 was not conducted.

4.4 SWMU 61

4.4.1 Lithologic Findings

A total of sixteen soil borings (five characterization, nine delineation, and two completed as monitoring wells), BHGLSWMU61001 through BHGLSWMU61011; BEEGSWMU61012 through BEEGSWMU61014; WHGLTA034 and WHGLTA035, were advanced during RFI activities at SWMU 61. Soil boring placement and rationale is discussed previously in Section 3.2.3

Soil borings BHGLSWMU61001 through BHGLSWMU61009, BEEGSWMU61013, and BEEGSWMU61014 were advanced through the asphalt parking lot Additionally, soil boring BHGLSWMU61001 was advanced over an area of stained gravel. BHGLSWMU61010 through BHGLSWMU61011, WHGLTA034, and WHGLTA035 were advanced through the adjacent grassy areas to the east of SWMU 61. BEEGSWMU61012 was advanced through the compacted gravel within AOC 6. Strong fuel-like odors were observed in the 1 to 3-foot interval of soil boring BHGLSWMU61012. No debris was encountered at any of the SWMU 61 soil borings.

Lithology was analyzed on southwest-north transect along borings BHGLSWMU61005, BHGLSWMU61001, BHGLSWMU61002, BHGLSWMU61003, BHGLSWMU61004, and BHGLSWMU61009. A lithologic cross section for SWMU 61 is presented in Figure 4.15. Soil boring BHGLSWMU61005 exhibited approximately 6 inches of surficial asphalt and gravel fill overlying a thin clayey silt layer between 0.5 and 1 foot bgs, followed by a sandy silt layer between 1 and 6 feet bgs. This layer overlaid sand from 6 to 9.5 feet bgs, transitioning to sand and gravel between 9.5 and 12 feet bgs. The water table was encountered at 10 feet bgs and the boring was terminated at 12 feet bgs. Soil boring BHGLSWMU61001 exhibited approximately 6 inches of surficial asphalt and gravel fill overlying silty clay from 1 to 4 feet bgs, followed by silty sand from 4 to 7 feet bgs. This overlaid a thin layer of silt sand and gravel from 7 to 8 feet bgs and a layer of sand from 8 to 12 feet bgs The water table was encountered at 10 feet bgs and the boring was terminated at 12 feet bgs. Boring BHGLSWMU61002 displayed a similar lithology as that encountered in BHGLSWMU61001, with the water table and boring terminated at 10 feet bgs. Soil boring BHGLSWMU61003 was also advanced through approximately 6 inches of surficial asphalt and gravel fill, overlying a layer of silty sand between 1 and 7 feet bgs. A layer of sand was exhibited from 7 to 9.25 feet bgs which overlaid sand and gravel from 9.25 to 10 feet bgs. The water table was encountered at 9 feet bgs and the boring was terminated at 10 feet bgs.

Boring BHGLSWMU61004 was advanced through 6 inches of asphalt and gravel fill with silty sand from 1 to 5.25 feet bgs. This layer overlaid silty sand and gravel from 5.25 to 9 feet bgs, transitioning to sand and gravel from 9 feet to the end of the boring at 10 feet bgs. The water table was also encountered at 10 feet bgs. Soil boring BHGLSWMU61009 exhibited a layer of asphalt and gravel from the ground surface to a depth of 1-foot bgs. This was overlying a layer of sand from 1 to 2 feet bgs and then a layer of silty sand from 2 to 6 feet bgs. Boring BHGLSWMU61009 was a delineation boring for the 5-foot interval and terminated at 6 feet bgs.

Groundwater flow directions in the vicinity of SWMU 61 trend generally to the southeast towards the West Fork Trinity River. Groundwater was encountered at approximately 9 to 10 feet bgs across the site.

4.4.2 Surface Soil Detections

A total of five Phase I surface soil samples were collected for analysis at SWMU 61: one surface sample each from borings BHGLSWMU61001 through BHGLSWMU61005. Soil sampling locations are depicted in Figure 4.16. All Phase I surface soil samples were analyzed for the list of analyses presented in Section 3.2.3.2. All analytes detected in surface soil samples are presented in Table 4.10. Analytes detected above RRS 1 concentrations are depicted in Figure 4.16.

4.4.2.1 Inorganic Constituents

The following metal was detected above background in the surface soil samples collected at SWMU 61:

- **Nickel** was detected at a concentration of 14 7 mg/kg in the surface soil sample collected from soil boring BHGLSWMU61005. This concentration is slightly above the background concentration of 14.6 mg/kg, and well below the MSC of 204.4 mg/kg

4.4.2.2 Organic Constituents

The following VOCs were detected above background in the surface soil samples collected at SWMU 61:

- **Ethylene Glycol** was detected in the surface soil sample collected from boring BHGLSWMU61005 (17 mg/kg). This detection of ethylene glycol was above RRS 1 (5 mg/kg), but well below the MSC (20,440 mg/kg). Based on the Phase I investigation results, ethylene glycol was not identified as a CoC at the site and no further sampling for this analyte was conducted.

- **Benzene** was detected in the surface soil sample collected from boring BHGLSWMU61001 (0.005 J mg/kg). This detection of benzene was above RRS 1 (0.002 mg/kg), but well below the MSC (0.5 mg/kg).

- ***cis*-1,2-DCE** was detected in the surface soil sample collected from boring BHGLSWMU61001 (0.073 J mg/kg). This detection of cis-1,2-DCE was above the RRS 1 (0.005 mg/kg), but well below the MSC (7 mg/kg).

- **Ethylbenzene** was detected in the surface soil sample collected from boring BHGLSWMU61001 (0.024 J mg/kg). This detection of ethylbenzene was above the RRS 1 (0 003 mg/kg), but well below the MSC (70 mg/kg)

- **m,p-Xylene** was detected in the surface soil sample collected from boring BHGLSWMU61001 (0.054 J mg/kg). This detection of m,p-xylene was above the RRS 1 (0.005 mg/kg), but well below the MSC (1000 mg/kg).

- **o-Xylene** was detected in the surface soil sample collected from boring BHGLSWMU61001 (0 028 J mg/kg). This detection of o-xylene was above the RRS 1 (0.005 mg/kg), but well below the MSC (1000 mg/kg).

- **Tetrachloroethene (PCE)** was detected in four of the five Phase I surface soil samples. The only concentration above both the RRS 1 (0.005 mg/kg) and the MSC (0.5 mg/kg) was detected in the surface soil sample from BHGLSWMU06001 (4 9 J mg/kg). The concentrations detected in the other Phase I surface soil samples were 0.057 mg/kg at BHGLSWMU61002, 0.014 mg/kg at BHGLSWMU61003, and 0.028 J mg/kg at BHGLSWMU61004. These detections of PCE were above RRS 1, but well below the MSC. Based on the Phase I investigation results, eight surface soil samples were collected to delineate PCE during Phase II. Four of the eight Phase II surface samples contained concentrations of PCE above the RRS 1, but well below the MSC. The soil borings with detections of PCE were BHGLSWMU61006 (0.01 mg/kg), BHGLSWMU61007 (0.016 mg/kg), BHGLSWMU61008 (0.022 mg/kg), and BHGLSWMU61009 (0.009 mg/kg). Based upon the results of the Phase II sampling, three additional surface soil samples were collected during Phase III. The concentration of PCE in the parent and duplicate surface soil samples collected from BEEGSWMU61012 contained concentrations above RRS 1, but well below the MSC, at 0.017 mg/kg and 0.02 mg/kg, respectively. The surface samples from soil borings BEEGSWMU61013 and BEEGSWMU61014 either did not detect PCE, or the concentration was below the RRS 1.

- **Fluorene** was detected in the surface soil sample collected from boring BHGLSWMU61001 (0.34 F mg/kg). This detection of fluorene was above the RRS 1 (0.33 mg/kg), but well below the MSC (408.8 mg/kg).

- **TPH** was detected at 8500 mg/kg (total) in the surface soil sample collected from boring BHGLSWMU61001. This detection of TPH was above the RRS 1 (50 mg/kg) and the TNRCC action level (500 mg/kg).

4.4.3 Subsurface Soil Detections

During Phase I soil sampling activities, a total of six subsurface soil samples were collected for analysis at SWMU 61 (Figure 4.16). All subsurface soil samples were analyzed for the list of

analyses presented in Section 3.2.3.2. Based on the results from the Phase I soil investigation, additional subsurface soil samples were collected from the 5-foot intervals of borings BHGLSWMU61006 through BHGLSWMU61011, WHGLTA034, and WHGLTA035. The Phase II subsurface soil samples were analyzed for the selected constituent, PCE, described in Section 3.2.3.3. One additional subsurface sample, BEEGSWMU61012, was collected during Phase III for PCE. As presented in Table 4.11 and depicted in Figure 4.16, analytical results of subsurface soil samples indicate low concentrations of one organic compound in the subsurface soils sampled at SWMU 61.

4.4.3.1 Inorganic Constituents

No inorganic constituents were detected in the subsurface soil samples collected at SWMU 61.

4.4.3.2 Organic Constituents

The following organic compounds were detected above background in the subsurface soil samples collected at SWMU 61:

- **Ethylene glycol** was detected at 28 mg/kg in the soil sample collected from the 5-foot interval of boring BHGLSWMU61003. The detection of ethylene glycol was above RRS 1 (5 mg/kg), but well below the MSC (20,440 mg/kg). Ethylene glycol was not identified as a CoC at the site and further sampling for this analyte was not conducted.

- **PCE** was detected in five of the six Phase I subsurface soil samples. All of the concentrations were above RRS 1 (0.005 mg/kg), but below the MSC (0.5 mg/kg). The concentrations detected in the 5-foot interval of these Phase I subsurface soil samples were 0.006 J mg/kg at BHGLSWMU61001, 0.021 J mg/kg at the parent sample of BHGLSWMU61002, and 0.029 J mg/kg in the duplicate, 0.013 mg/kg at BHGLSWMU61003, and 0.008 J mg/kg at BHGLSWMU61004 Based on the Phase I investigation results, ten additional subsurface soil samples were collected at the 5-foot interval to delineate PCE during Phase II. All of the Phase II subsurface samples either had no detections of PCE or had concentrations below the RRS 1 value An additional subsurface sample was collected from the 5-foot interval at BEEGSWMU61012 during Phase III for delineation purposes. The concentration of PCE in the Phase III subsurface sample was below the RRS 1 value.

4.4.4 Soil pH

Historical records indicate that SWMU 61 stored drummed battery acid. As a result, all Phase I soil samples collected at SWMU 61 were analyzed for pH. Soil pH levels at SWMU 61 ranged from 7.5 to 8.2 in the surface soil, and from 8 to 8.8 in the subsurface soil. Surface soil pH results are shown in Table 4.10, and subsurface soil pH results are shown in Table 4 11. Soil pH levels at SWMU 61 range from neutral to slightly alkaline, and are consistent with the native calcareous soils (Section 2.2) at NAS Fort Worth JRB.

4.4.5 IRA Detections

As depicted in Figure 4.17, an excavation was completed at SWMU 61 as part of an IRA to remove soil contaminated with concentrations of PCE above the RRS 2. Excavation SWMU 61A, initially centered on BHGLSWMU6101, removed soils contaminated with concentrations of PCE and TPH above RRS 2, as well as other VOCs detected at concentrations above RRS 1. The excavation took the form of a rectangle that measured 330 square feet by 5 feet deep A total of 61 cubic yards were removed from excavation 61A. A confirmation sample was collected and analyzed for VOCs and TPH directly below BHGLSWMU61001 at a depth of 2 feet bgs. Four additional samples, analyzed for VOCs and TPH, were collected at the 2-foot interval with locations centered on the north, south, east, and west sidewalls of the excavation. The results of IRA excavation confirmation samples show that all target CoCs were removed in the excavations. The IRA results are presented in Appendix C.

4.4.6 Groundwater Detections

Two rounds of groundwater samples were collected from existing upgradient monitoring well WITCTA034 and newly installed downgradient monitoring wells WHGLTA034 and WHGLTA035 during Phase II of the RFI. A total of two additional rounds of groundwater samples were collected during Phase III for TCE and PCE from WITCTA034, WHGLTA034, WHGLTA035, and from another existing upgradient monitoring well, SD13-05. Groundwater samples were analyzed for the constituents described in Section 3.2.1.5. Groundwater results are depicted in Figure 4.18 and presented in Table 4.12.

The following analyte was detected in groundwater in the area of SWMU 61:

- **PCE** was detected at concentrations of 0.003 and 0.004 mg/L in the groundwater samples collected from upgradient monitoring well WITCTA034 in March and October 2000. These concentrations of PCE were above RRS 1 (0.0005 mg/L), but below the MSC (0.005 mg/L). PCE was either not detected or detected at a concentration below the RRS 1 in all other groundwater samples collected at the site.

Figures

Figure 4 1 . SWMUs 5 and 6 Lithologic Cross Section
Figure 4 2 RFI Soil Results—SWMUs 5 and 6
Figure 4 3 RFI Groundwater Results—SWMUs 5 and 6
Figure 4.4 SWMU 12 Lithologic Cross Section
Figure 4.5 RFI Soil Results—SWMU 12
Figure 4.6 SWMU 12—12A Excavation Confirmation Sampling Locations
Figure 4 7 SWMU 12—12B Excavation Confirmation Sampling Locations
Figure 4 8 SWMU 12—12C Excavation Confirmation Sampling Locations
Figure 4 9 SWMU 12—12D Excavation Confirmation Sampling Locations
Figure 4 10 RFI Groundwater Results—SWMU 12
Figure 4 11 SWMU 31 Lithologic Cross Section
Figure 4.12 RFI Soil Results—SWMU 31
Figure 4 13 SWMU 31—31A Excavation Confirmation Sampling Locations
Figure 4.14 SWMU 31—31B Excavation Confirmation Sampling Locations
Figure 4.15 SWMU 61 Lithologic Cross Section
Figure 4 16 RFI Soil Results—SWMU 61
Figure 4.17 SWMU 61—61A Excavation Confirmation Sampling Locations
Figure 4.18 RFI Groundwater Results—SWMU 61

Figure 4.1
SWMUs 5 and 6
Lithologic Cross Section
A - A'

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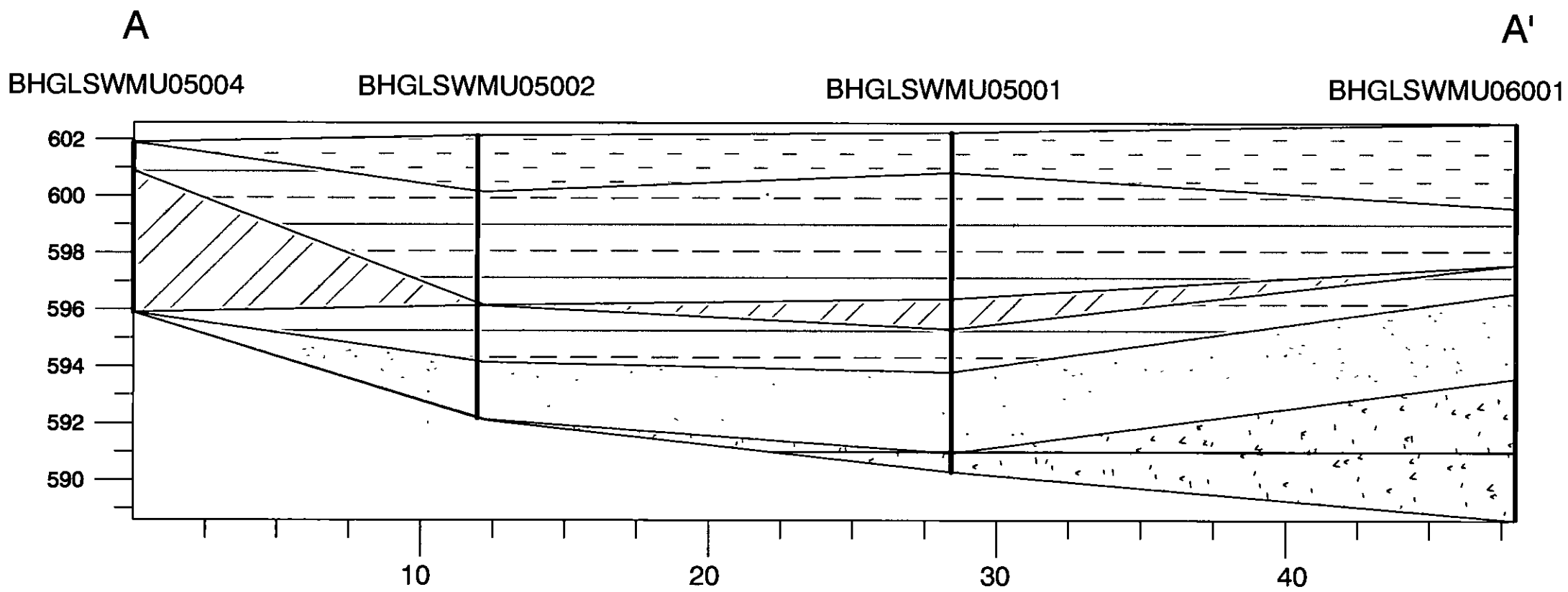
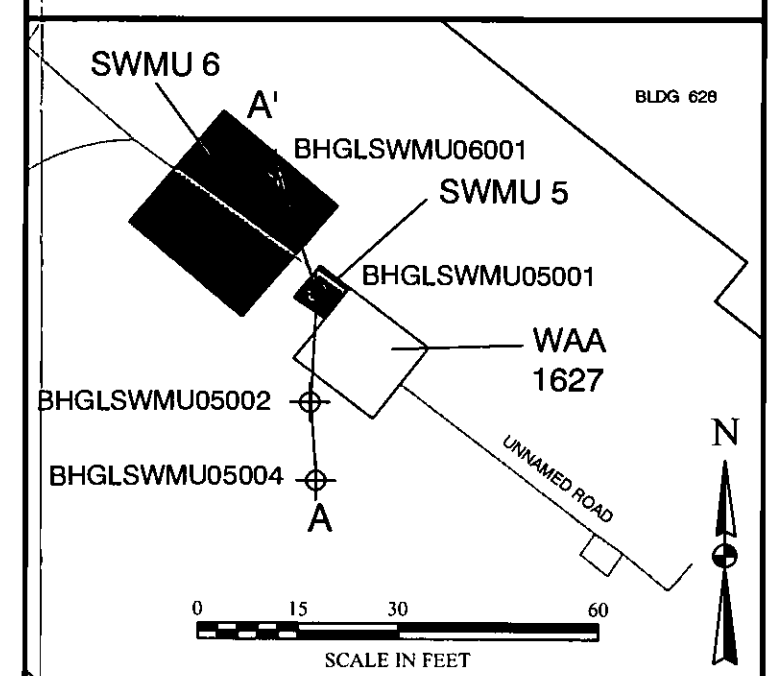


Vertical Exaggeration = 1x

Legend

- Clayey Silt
- Sand and Gravel
- Silty Sand
- SWMU
- Sandy Clay
- WAA
- Sand
- Boring Location
- GWE Oct. 2001



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Revised. 04/29/02 tbraswell
Map Source HydroGeoLogic, Inc 2002

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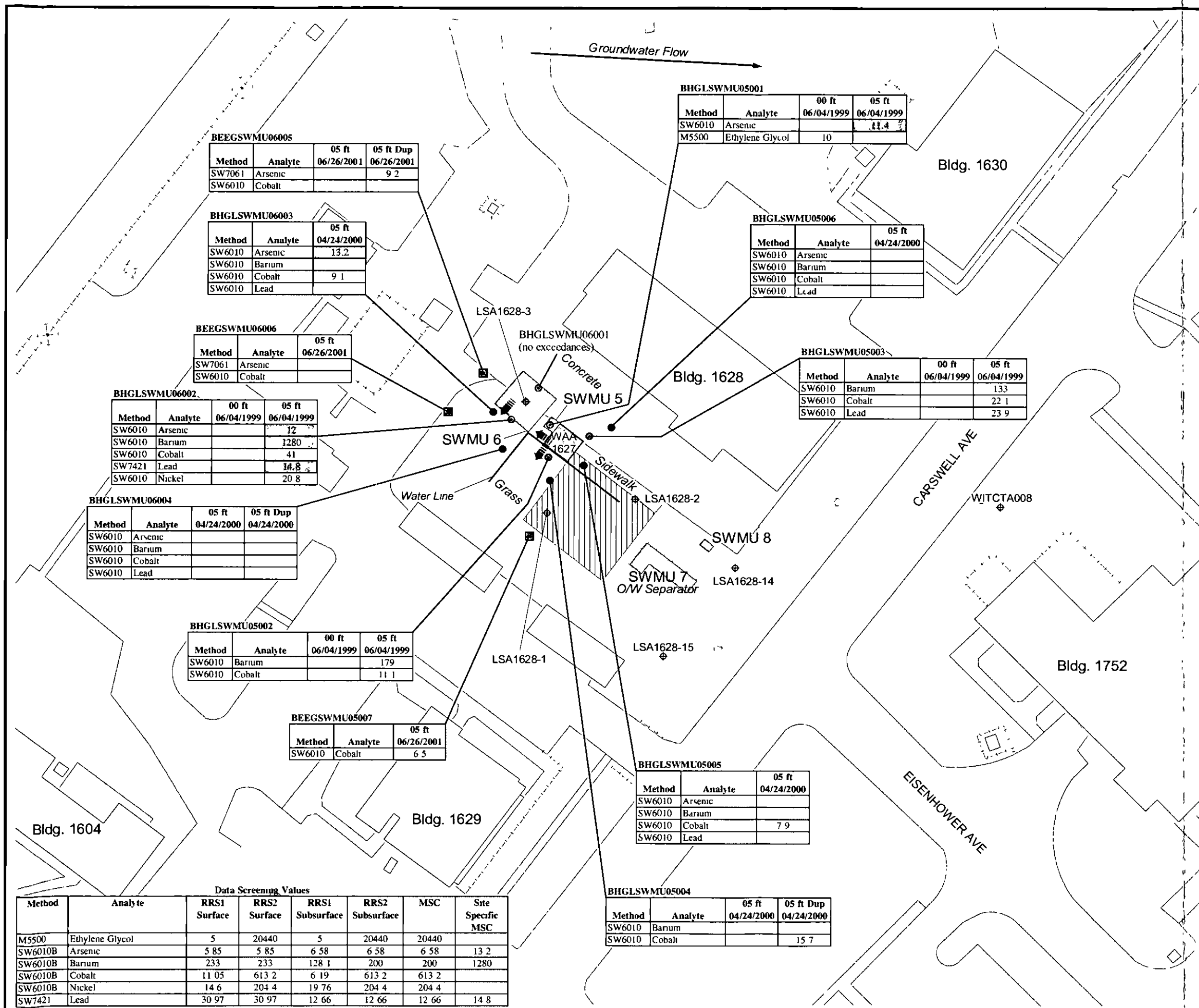
HYDRO GeoLogic



BHGLSWMU05001

Method	Analyte	00 ft 06/04/1999	05 ft 06/04/1999
SW6010	Arsenic		11.4
M5500	Ethylene Glycol	10	

BEEGSWMU06005

Method	Analyte	05 ft 06/26/2001	05 ft Dup 06/26/2001
SW7061	Arsenic		9 2
SW6010	Cobalt		

BHGLSWMU06003

Method	Analyte	05 ft 04/24/2000
SW6010	Arsenic	13.2
SW6010	Barium	
SW6010	Cobalt	9 1
SW6010	Lead	

BHGLSWMU05006

Method	Analyte	05 ft 04/24/2000
SW6010	Arsenic	
SW6010	Barium	
SW6010	Cobalt	
SW6010	Lead	

BEEGSWMU06006

Method	Analyte	05 ft 06/26/2001
SW7061	Arsenic	
SW6010	Cobalt	

BHGLSWMU05003

Method	Analyte	00 ft 06/04/1999	05 ft 06/04/1999
SW6010	Barium		133
SW6010	Cobalt		22 1
SW6010	Lead		23 9

BHGLSWMU06002

Method	Analyte	00 ft 06/04/1999	05 ft 06/04/1999
SW6010	Arsenic		12
SW6010	Barium		1280
SW6010	Cobalt		41
SW7421	Lead		14.8
SW6010	Nickel		20 8

BHGLSWMU06004

Method	Analyte	05 ft 04/24/2000	05 ft Dup 04/24/2000
SW6010	Arsenic		
SW6010	Barium		
SW6010	Cobalt		
SW6010	Lead		

BHGLSWMU05002

Method	Analyte	00 ft 06/04/1999	05 ft 06/04/1999
SW6010	Barium		179
SW6010	Cobalt		11 1

BEEGSWMU05007

Method	Analyte	05 ft 06/26/2001
SW6010	Cobalt	6 5

BHGLSWMU05005

Method	Analyte	05 ft 04/24/2000
SW6010	Arsenic	
SW6010	Barium	
SW6010	Cobalt	7 9
SW6010	Lead	

BHGLSWMU05004

Method	Analyte	05 ft 04/24/2000	05 ft Dup 04/24/2000
SW6010	Barium		
SW6010	Cobalt		15 7

Data Screening Values

Method	Analyte	RRS1 Surface	RRS2 Surface	RRS1 Subsurface	RRS2 Subsurface	MSC	Site Specific MSC
M5500	Ethylene Glycol	5	20440	5	20440	20440	
SW6010B	Arsenic	5 85	5 85	6 58	6 58	6 58	13 2
SW6010B	Barium	233	233	128 1	200	200	1280
SW6010B	Cobalt	11 05	613 2	6 19	613 2	613 2	
SW6010B	Nickel	14 6	204 4	19 76	204 4	204 4	
SW7421	Lead	30 97	30 97	12 66	12 66	12 66	14 8

Figure 4.2
RFI Soil Results
SWMUs 5 and 6

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Legend

- Solid Waste Management Unit (SWMU)
- Waste Accumulation Area (WAA)
- Former UST Site
- Monitoring Well
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Surface Runoff

Gold — Gold Headers indicate Phase I Soil Samples
Grey — Grey Headers indicate Delineation Soil Samples
Yellow — Yellow Header indicates SWMUs 5 and 6 Site Screening Values

Color Codes

- Analyte detected above RRS 2
- Analyte detected above RRS 2 but below site specific MSC
- Initial analyte detection above RRS 1 or 2 but not confirmed during subsequent sampling
- Analyte not detected or detected below RRS 1 concentration

Notes
All results in mg/kg
CoC - Contaminant of Concern
MSC - Media Specific Concentration
na - Not Analyzed
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2

File: 17A-80-10
C.M.

N

25 0 25 50 75
SCALE IN FEET

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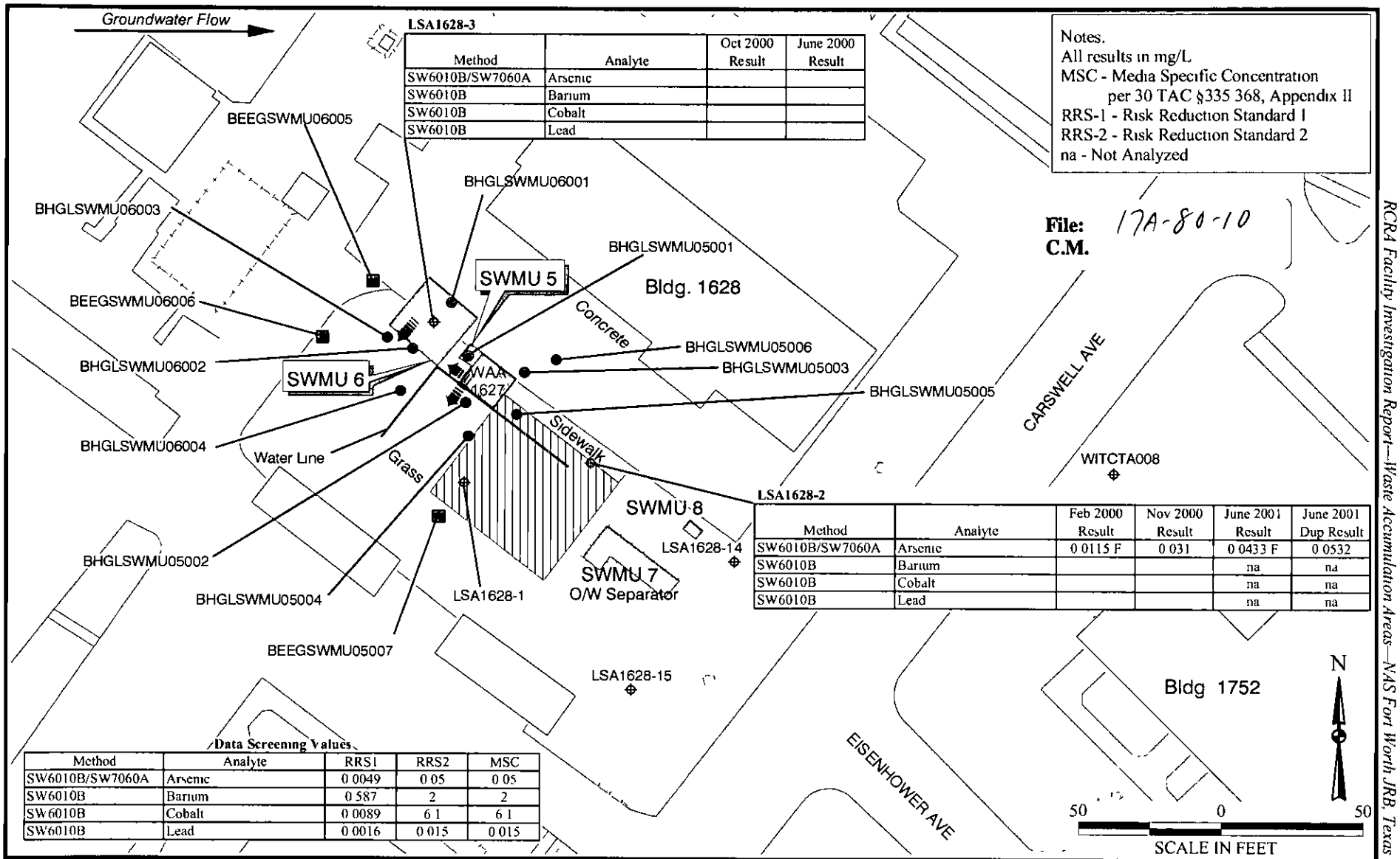
EL LIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC.



LSA1628-3

Method	Analyte	Oct 2000 Result	June 2000 Result
SW6010B/SW7060A	Arsenic		
SW6010B	Barium		
SW6010B	Cobalt		
SW6010B	Lead		

Notes.
All results in mg/L
MSC - Media Specific Concentration per 30 TAC §335 368, Appendix II
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2
na - Not Analyzed

File: 17A-80-10
C.M.

LSA1628-2

Method	Analyte	Feb 2000 Result	Nov 2000 Result	June 2001 Result	June 2001 Dup Result
SW6010B/SW7060A	Arsenic	0 0115 F	0 031	0 0433 F	0 0532
SW6010B	Barium			na	na
SW6010B	Cobalt			na	na
SW6010B	Lead			na	na

Data Screening Values

Method	Analyte	RRS1	RRS2	MSC
SW6010B/SW7060A	Arsenic	0 0049	0 05	0 05
SW6010B	Barium	0 587	2	2
SW6010B	Cobalt	0 0089	6 1	6 1
SW6010B	Lead	0 0016	0 015	0 015

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Created 10/26/99 jbelcher
Revised 04/30/02 tbraswell
Map Source HydroGeoLogic, Inc GIS Database, 2002

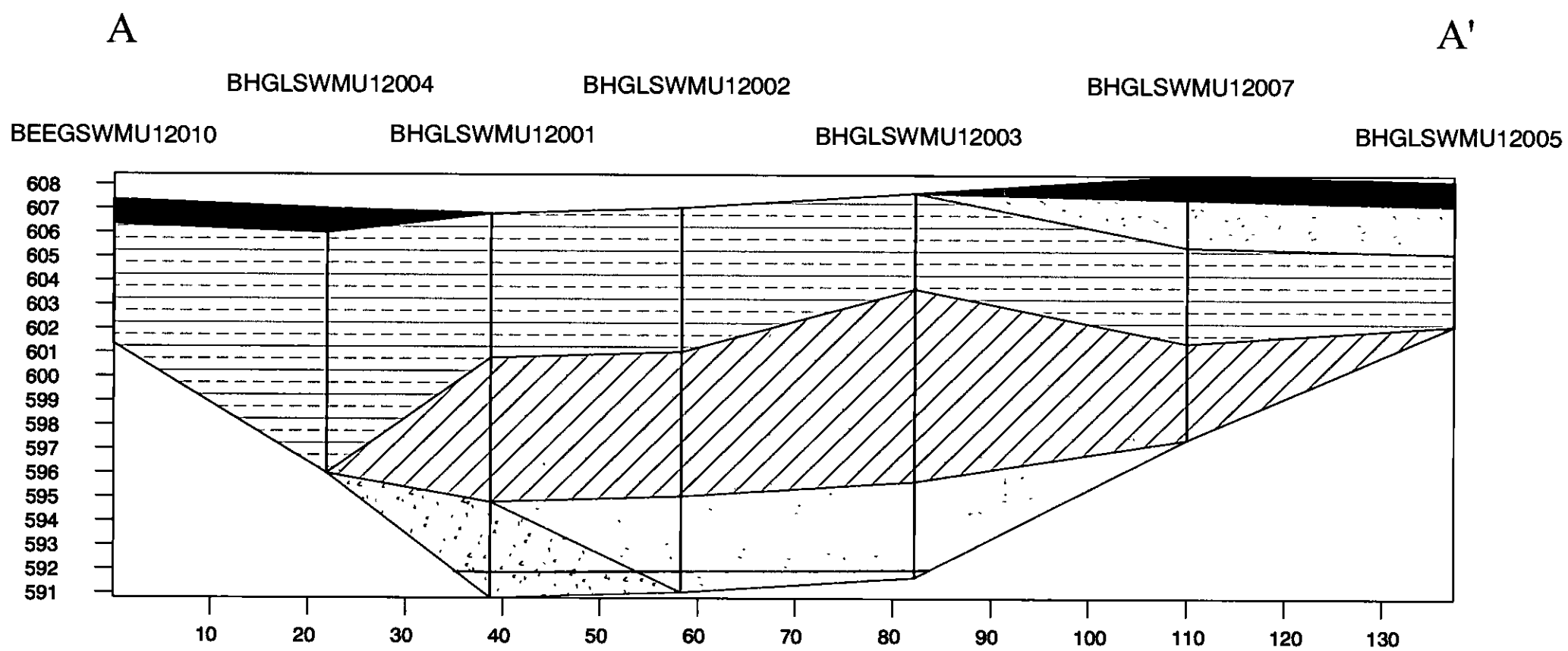
ELLIS ENVIRONMENTAL GROUP LC

HYDRO GeoLogic INC

Legend

- Solid Waste Management Unit (SWMU)
- Waste Accumulation Area (WAA)
- Former UST Site
- Monitoring Well
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Surface Runoff
- Analyte detected above RRS 1 but not confirmed
- Analyte not detected or detected below RRS 1 concentration

Figure 4.3
RFI Goundwater Results
SWMUs 5 and 6



Vertical Exaggeration = 2.5x

RCRA Facility Investigation Report, Waste Accumulation Areas
NAS Fort Worth JRB, Texas

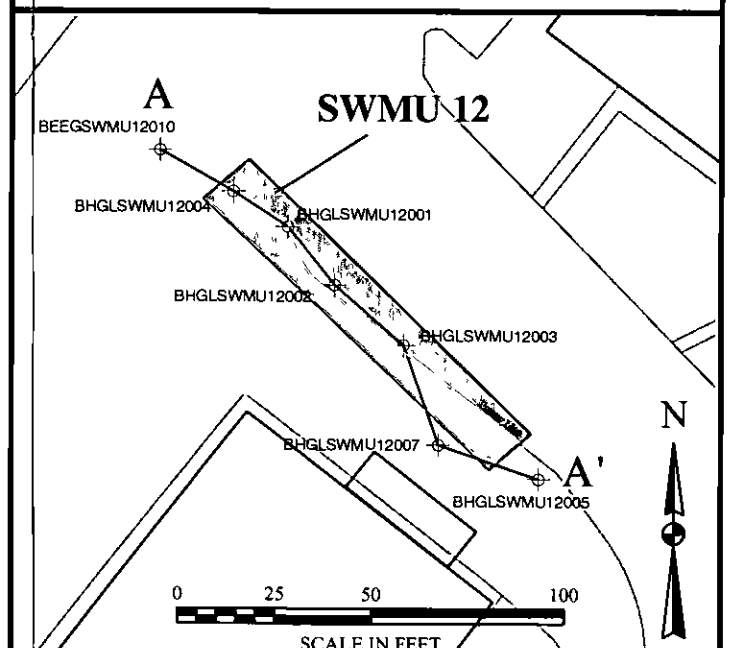
Figure 4.4
SWMU 12
Lithologic Cross Section
A - A'

U.S. Air Force Center for Environmental Excellence

Legend

- Concrete
- Sand and Gravel
- Sand
- SWMU
- Silty Clay
- Boring Location
- Sandy Silt
- GWE Oct. 2001

File: 17A-80-10
C.M.



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Revised 04/29/02 tbraswell
Map Source HydroGeoLogic, Inc 2002

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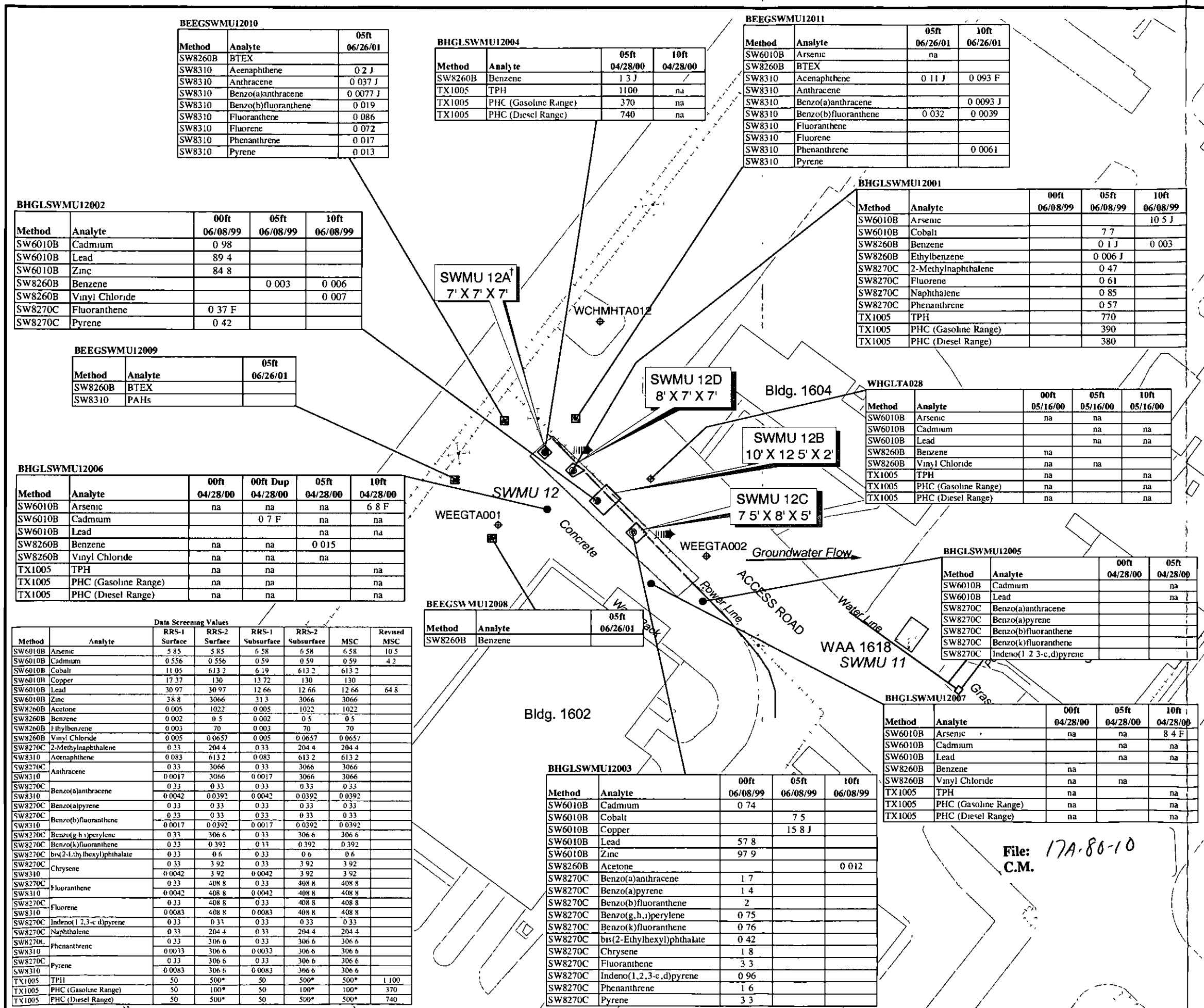
HYDRO GeoLogic

RCRA Facility Investigation—Waste Accumulation Areas
NAS Fort Worth JRB, Texas

Figure 4.5

RFI Soil Results
SWMU 12

U.S. Air Force Center for Environmental Excellence



BEEGSWMU12010

Method	Analyte	05ft 06/26/01
SW8260B	BTEX	
SW8310	Acenaphthene	0 2 J
SW8310	Anthracene	0 037 J
SW8310	Benzo(a)anthracene	0 0077 J
SW8310	Benzo(b)fluoranthene	0 019
SW8310	Fluoranthene	0 086
SW8310	Fluorene	0 072
SW8310	Phenanthrene	0 017
SW8310	Pyrene	0 013

BHGLSWMU12004

Method	Analyte	05ft 04/28/00	10ft 04/28/00
SW8260B	Benzene	1 3 J	
TX1005	TPH	1100	na
TX1005	PHC (Gasoline Range)	370	na
TX1005	PHC (Diesel Range)	740	na

BEEGSWMU12011

Method	Analyte	05ft 06/26/01	10ft 06/26/01
SW6010B	Arsenic	na	
SW8260B	BTEX		
SW8310	Acenaphthene	0 11 J	0 093 F
SW8310	Anthracene		
SW8310	Benzo(a)anthracene		0 0093 J
SW8310	Benzo(b)fluoranthene	0 032	0 0039
SW8310	Fluoranthene		
SW8310	Fluorene		
SW8310	Phenanthrene		0 0061
SW8310	Pyrene		

BHGLSWMU12002

Method	Analyte	00ft 06/08/99	05ft 06/08/99	10ft 06/08/99
SW6010B	Cadmium	0 98		
SW6010B	Lead	89 4		
SW6010B	Zinc	84 8		
SW8260B	Benzene		0 003	0 006
SW8260B	Vinyl Chloride			0 007
SW8270C	Fluoranthene	0 37 F		
SW8270C	Pyrene	0 42		

BHGLSWMU12001

Method	Analyte	00ft 06/08/99	05ft 06/08/99	10ft 06/08/99
SW6010B	Arsenic			10 5 J
SW6010B	Cobalt		7 7	
SW8260B	Benzene		0 1 J	0 003
SW8260B	Ethylbenzene		0 006 J	
SW8270C	2-Methylnaphthalene		0 47	
SW8270C	Fluorene		0 61	
SW8270C	Naphthalene		0 85	
SW8270C	Phenanthrene		0 57	
TX1005	TPH		770	
TX1005	PHC (Gasoline Range)		390	
TX1005	PHC (Diesel Range)		380	

BEEGSWMU12009

Method	Analyte	05ft 06/26/01
SW8260B	BTEX	
SW8310	PAHs	

WHGLTA028

Method	Analyte	00ft 05/16/00	05ft 05/16/00	10ft 05/16/00
SW6010B	Arsenic	na	na	
SW6010B	Cadmium		na	na
SW6010B	Lead		na	na
SW8260B	Benzene	na		
SW8260B	Vinyl Chloride	na	na	
TX1005	TPH	na		na
TX1005	PHC (Gasoline Range)	na		na
TX1005	PHC (Diesel Range)	na		na

BHGLSWMU12006

Method	Analyte	00ft 04/28/00	00ft Dup 04/28/00	05ft 04/28/00	10ft 04/28/00
SW6010B	Arsenic	na	na	na	6 8 F
SW6010B	Cadmium		0 7 F	na	na
SW6010B	Lead			na	na
SW8260B	Benzene	na	na	0 015	
SW8260B	Vinyl Chloride	na	na	na	
TX1005	TPH	na	na		na
TX1005	PHC (Gasoline Range)	na	na		na
TX1005	PHC (Diesel Range)	na	na		na

BHGLSWMU12005

Method	Analyte	00ft 04/28/00	05ft 04/28/00
SW6010B	Cadmium		na
SW6010B	Lead		na
SW8270C	Benzo(a)anthracene		
SW8270C	Benzo(a)pyrene		
SW8270C	Benzo(b)fluoranthene		
SW8270C	Benzo(k)fluoranthene		
SW8270C	Indeno(1 2 3-c,d)pyrene		

BEEGSWMU12008

Method	Analyte	05ft 06/26/01
SW8260B	Benzene	

Data Screening Values

Method	Analyte	RRS-1 Surface	RRS-2 Surface	RRS-1 Subsurface	RRS-2 Subsurface	MSC	Revised MSC
SW6010B	Arsenic	5 85	5 85	6 58	6 58	6 58	10 5
SW6010B	Cadmium	0 556	0 556	0 59	0 59	0 59	4 2
SW6010B	Cobalt	11 05	613 2	6 19	613 2	613 2	
SW6010B	Copper	17 37	130	13 72	130	130	
SW6010B	Lead	30 97	30 97	12 66	12 66	12 66	64 8
SW6010B	Zinc	38 8	3066	31 3	3066	3066	
SW8260B	Acetone	0 005	1022	0 005	1022	1022	
SW8260B	Benzene	0 002	0 5	0 002	0 5	0 5	
SW8260B	Ethylbenzene	0 003	70	0 003	70	70	
SW8260B	Vinyl Chloride	0 005	0 0657	0 005	0 0657	0 0657	
SW8270C	2-Methylnaphthalene	0 33	204 4	0 33	204 4	204 4	
SW8310	Acenaphthene	0 083	613 2	0 083	613 2	613 2	
SW8270C	Anthracene	0 33	3066	0 33	3066	3066	
SW8310		0 0017	3066	0 0017	3066	3066	
SW8270C	Benzo(a)anthracene	0 33	0 33	0 33	0 33	0 33	
SW8310		0 0042	0 0392	0 0042	0 0392	0 0392	
SW8270C	Benzo(a)pyrene	0 33	0 33	0 33	0 33	0 33	
SW8270C	Benzo(b)fluoranthene	0 33	0 33	0 33	0 33	0 33	
SW8310		0 0017	0 0392	0 0017	0 0392	0 0392	
SW8270C	Benzo(g h i)perylene	0 33	306 6	0 33	306 6	306 6	
SW8270C	Benzo(k)fluoranthene	0 33	0 392	0 33	0 392	0 392	
SW8270C	bis(2-Ethylhexyl)phthalate	0 33	0 6	0 33	0 6	0 6	
SW8270C	Chrysene	0 33	3 92	0 33	3 92	3 92	
SW8310		0 0042	3 92	0 0042	3 92	3 92	
SW8270C	Fluoranthene	0 33	408 8	0 33	408 8	408 8	
SW8310		0 0042	408 8	0 0042	408 8	408 8	
SW8270C	Fluorene	0 33	408 8	0 33	408 8	408 8	
SW8310		0 0083	408 8	0 0083	408 8	408 8	
SW8270C	Indeno(1 2,3-c d)pyrene	0 33	0 33	0 33	0 33	0 33	
SW8270C	Naphthalene	0 33	204 4	0 33	204 4	204 4	
SW8270C	Phenanthrene	0 33	306 6	0 33	306 6	306 6	
SW8310		0 0033	306 6	0 0033	306 6	306 6	
SW8270C	Pyrene	0 33	306 6	0 33	306 6	306 6	
SW8310		0 0083	306 6	0 0083	306 6	306 6	
TX1005	TPH	50	500*	50	500*	500*	1 100
TX1005	PHC (Gasoline Range)	50	100*	50	100*	100*	370
TX1005	PHC (Diesel Range)	50	500*	50	500*	500*	740

BHGLSWMU12003

Method	Analyte	00ft 06/08/99	05ft 06/08/99	10ft 06/08/99
SW6010B	Cadmium	0 74		
SW6010B	Cobalt		7 5	
SW6010B	Copper		15 8 J	
SW6010B	Lead	57 8		
SW6010B	Zinc	97 9		
SW8260B	Acetone			0 012
SW8270C	Benzo(a)anthracene	1 7		
SW8270C	Benzo(a)pyrene	1 4		
SW8270C	Benzo(b)fluoranthene	2		
SW8270C	Benzo(g,h,i)perylene	0 75		
SW8270C	Benzo(k)fluoranthene	0 76		
SW8270C	bis(2-Ethylhexyl)phthalate	0 42		
SW8270C	Chrysene	1 8		
SW8270C	Fluoranthene	3 3		
SW8270C	Indeno(1,2,3-c,d)pyrene	0 96		
SW8270C	Phenanthrene	1 6		
SW8270C	Pyrene	3 3		

BHGLSWMU12007

Method	Analyte	00ft 04/28/00	05ft 04/28/00	10ft 04/28/00
SW6010B	Arsenic	na	na	8 4 F
SW6010B	Cadmium		na	na
SW6010B	Lead		na	na
SW8260B	Benzene	na		
SW8260B	Vinyl Chloride	na	na	
TX1005	TPH	na		na
TX1005	PHC (Gasoline Range)	na		na
TX1005	PHC (Diesel Range)	na		na

File: 17A-80-10
C.M.

Legend

- Solid Waste Management Unit (SWMU)
- Waste Accumulation Area (WAA)
- Monitoring Well
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Excavation Location
- Surface Runoff

Gold	Gold Headers indicate Phase I Soil Samples
Grey	Grey Headers indicate Delineation Soil Samples
Pink	Pink Headers indicate Sample interval to be removed in IRA
Yellow	Yellow Header indicates SWMU 61 Site Screening Values

Color Codes

- Analyte detected above RRS 2
- Analyte detected above RRS 2 but below site-specific MSC
- Initial analyte detection above RRS 1 or 2, but not comfirmed during subsequent sampling
- Analyte not detected or detected below RRS 1
- IRA Excavation Interval for CoC(s) above RRS 2

Notes
Soil concentrations reported in mg/kg
Groundwater concentrations reported in mg/L
MSC—Medium-Specific Concentration per 30 TAC §335 368, Appendix II
Revised MSC—Value based on SPLP result
NV—No Value
ND—Not Detected
F—The analyte was positively identified but the associated numerical value is below the adjusted method quantitation limit
J—The analyte was positively identified, the quantitation is an estimation
PHC—Petroleum Hydrocarbons
* TNRCC Action Level for course-grained soils (TNRCC RG-17)
† Excavation not performed due to site restrictions and result of confirmation sample

25 0 25 50 75
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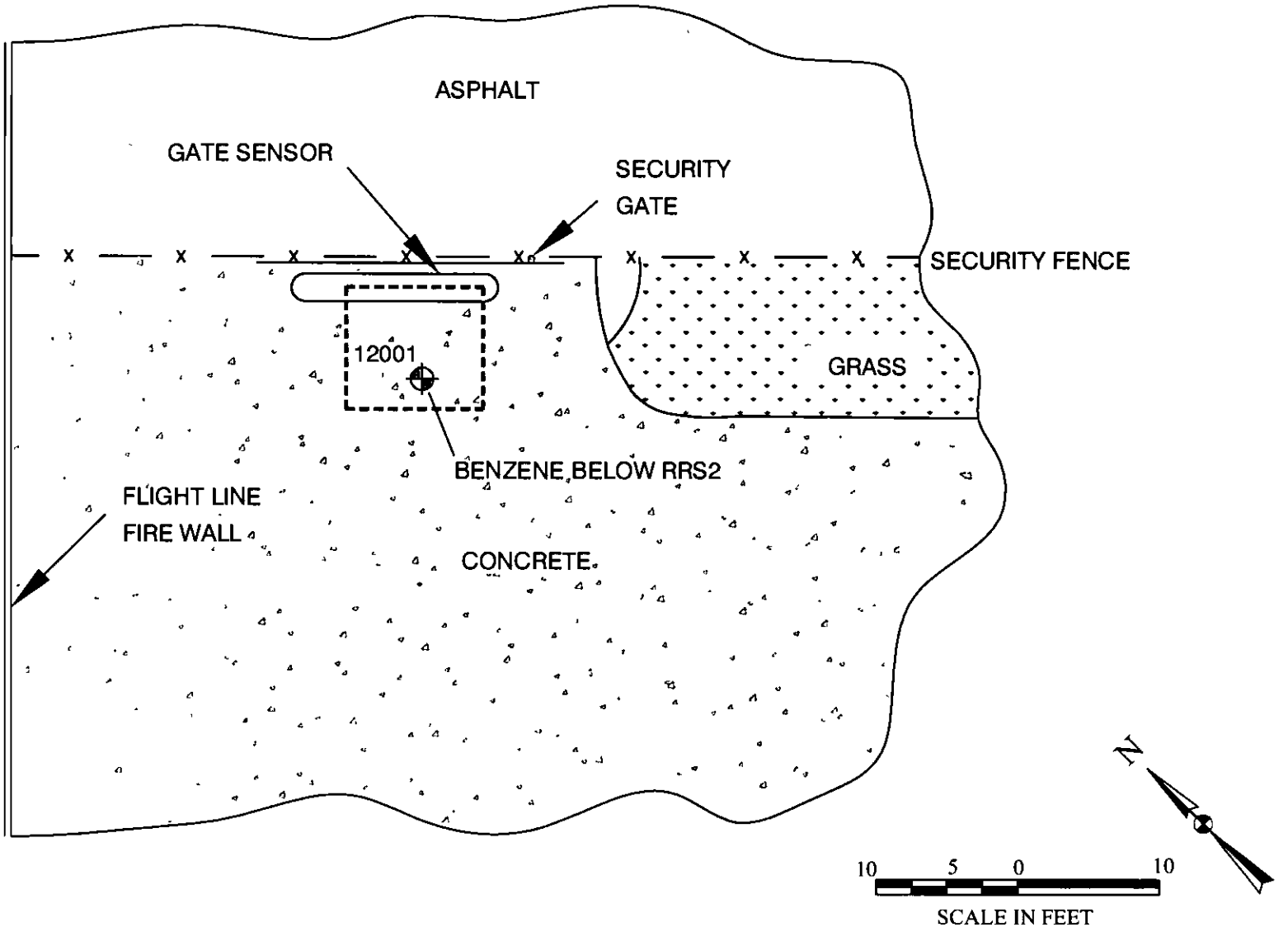
HYDRO Geologic INC



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Revised 04/30/02 tbraswell
Source Ellis Environmental Group, 2002

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic

Legend

PROPOSED EXCAVATION

SOIL BORINGS

† Excavation not performed due to site restrictions and result of confirmation sample

Figure 4.6
SWMU 12
12A† Excavation Confirmation Sampling Locations

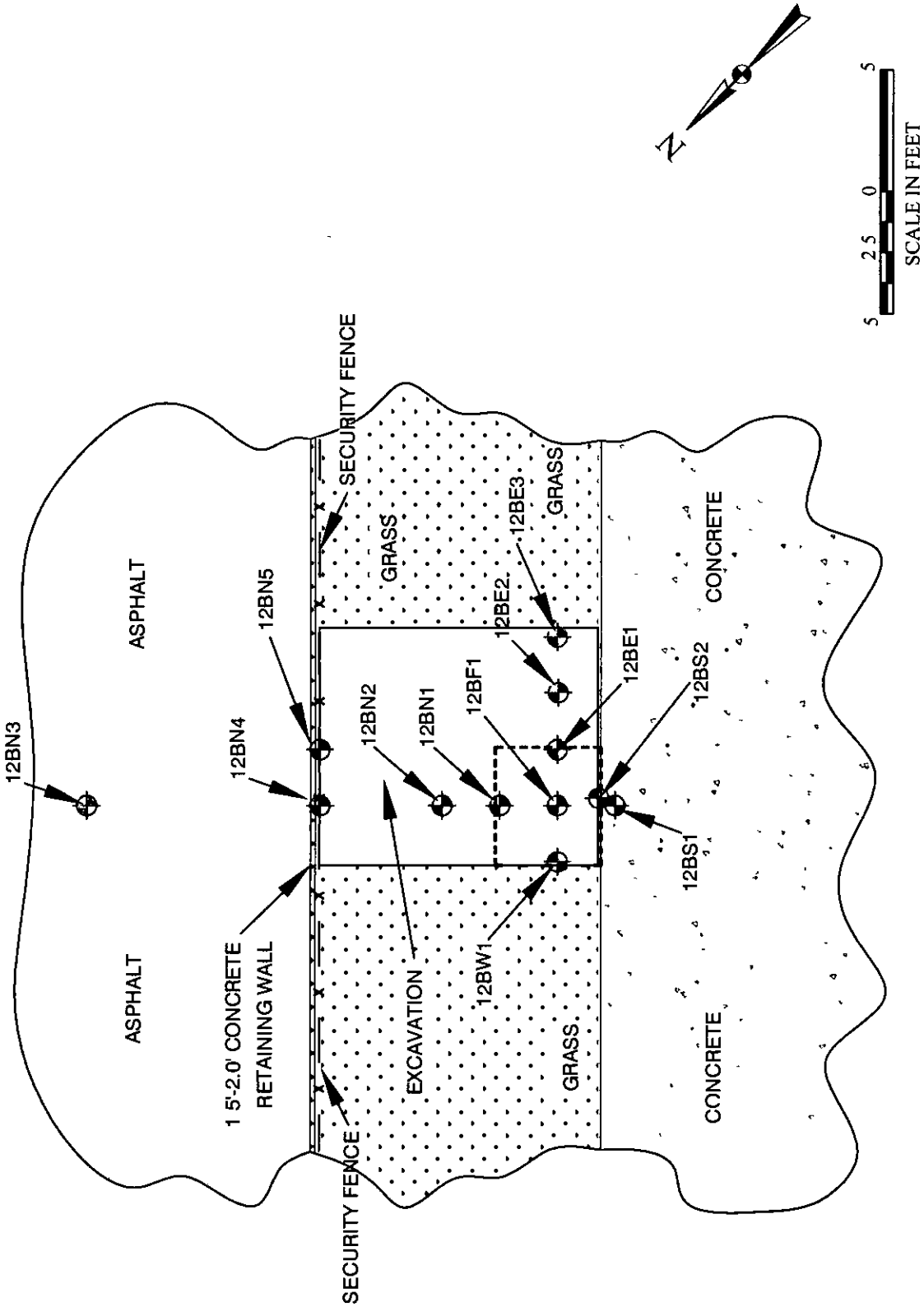

Figure 4.7
SWMU 12
12B Excavation Confirmation Sampling Locations

Legend

PROPOSED EXCAVATION

ACTUAL EXCAVATION

SOIL BORINGS

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic

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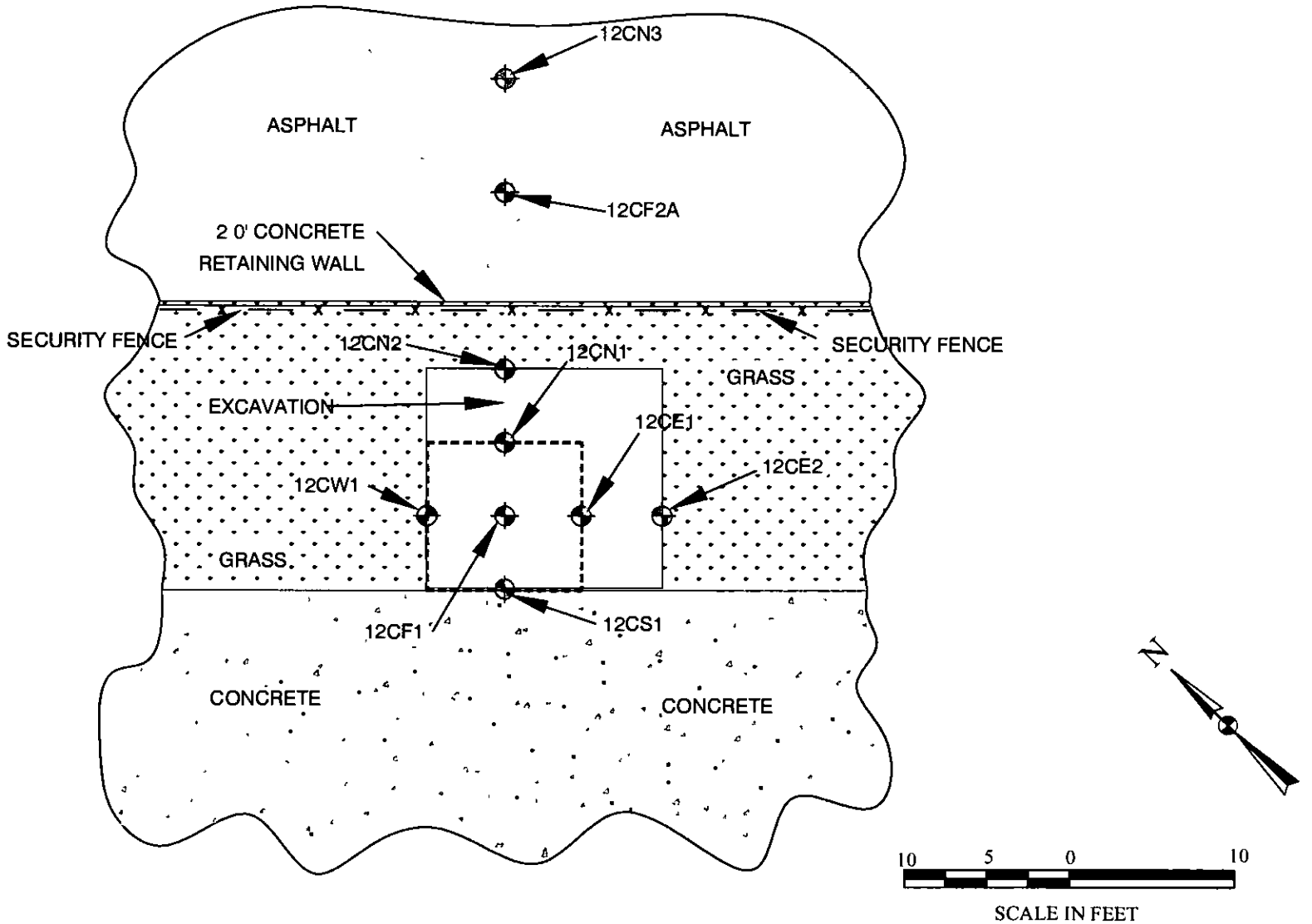

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HYDRO GeoLogic

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PROPOSED EXCAVATION

ACTUAL EXCAVATION

SOIL BORINGS

Figure 4.8
SWMU 12
12C Excavation Confirmation Sampling Locations

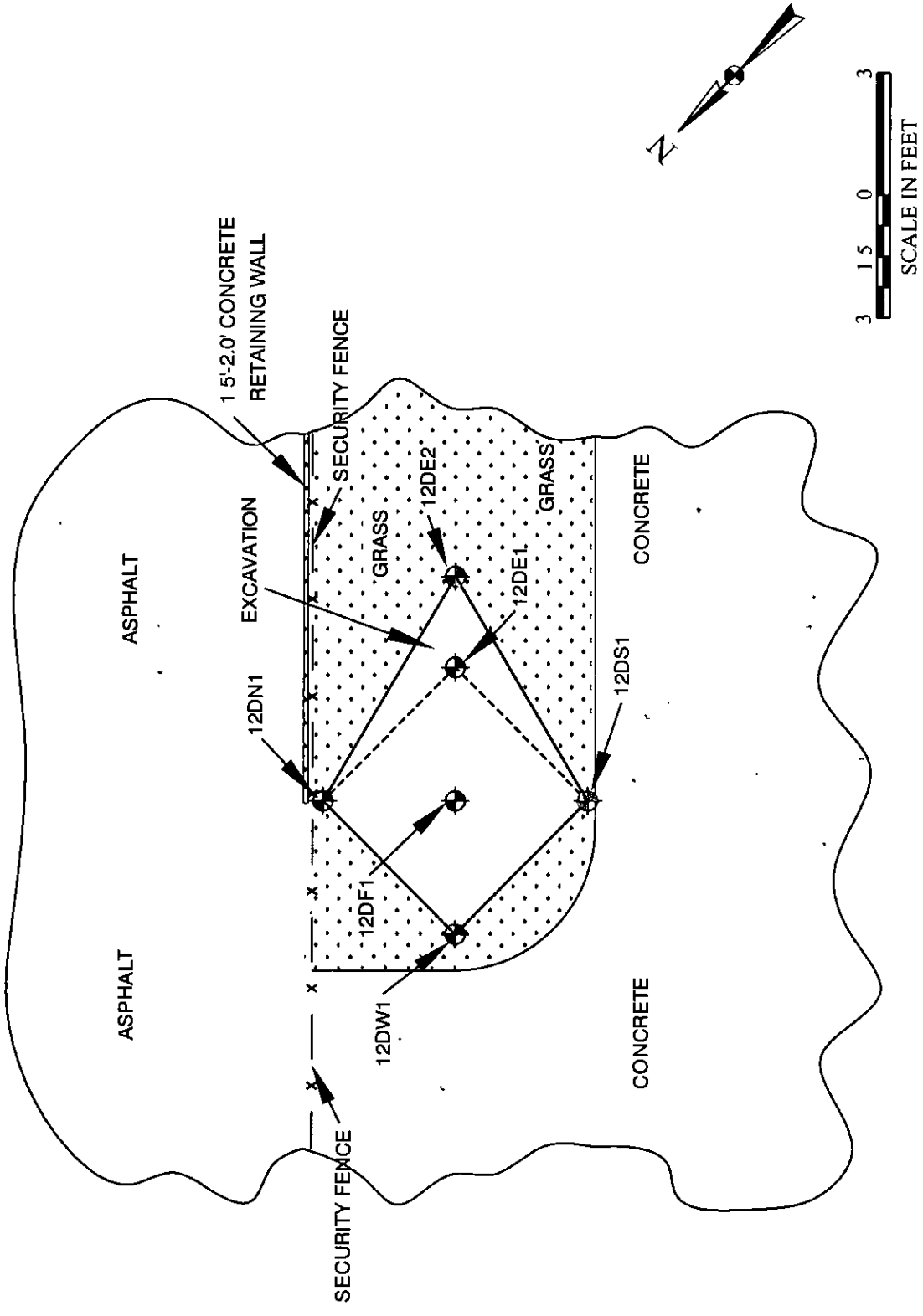

Figure 4.9
SWMU 12
12D Excavation Confirmation Sampling Locations

Legend

PROPOSED EXCAVATION

ACTUAL EXCAVATION

SOIL BORINGS

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic

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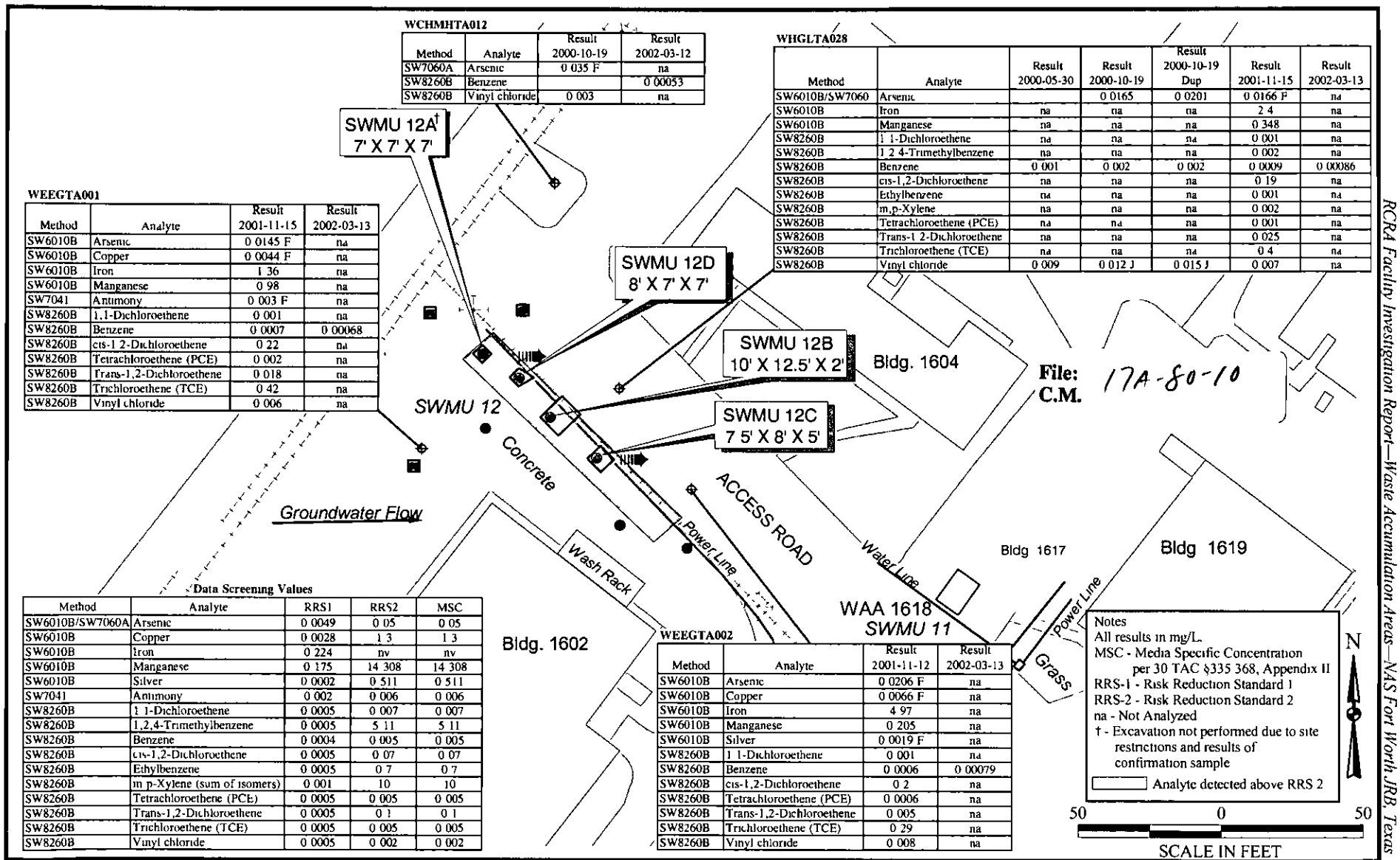

WCHMHTA012

Method	Analyte	Result 2000-10-19	Result 2002-03-12
SW7060A	Arsenic	0 035 F	na
SW8260B	Benzene		0 00053
SW8260B	Vinyl chloride	0 003	na

WHGLTA028

Method	Analyte	Result 2000-05-30	Result 2000-10-19	Result 2000-10-19 Dup	Result 2001-11-15	Result 2002-03-13
SW6010B/SW7060	Arsenic		0 0165	0 0201	0 0166 F	na
SW6010B	Iron	na	na	na	2 4	na
SW6010B	Manganese	na	na	na	0 348	na
SW8260B	1 1-Dichloroethene	na	na	na	0 001	na
SW8260B	1 2 4-Trimethylbenzene	na	na	na	0 002	na
SW8260B	Benzene	0 001	0 002	0 002	0 0009	0 00086
SW8260B	cis-1,2-Dichloroethene	na	na	na	0 19	na
SW8260B	Ethylbenzene	na	na	na	0 001	na
SW8260B	m,p-Xylene	na	na	na	0 002	na
SW8260B	Tetrachloroethene (PCE)	na	na	na	0 001	na
SW8260B	Trans-1 2-Dichloroethene	na	na	na	0 025	na
SW8260B	Trichloroethene (TCE)	na	na	na	0 4	na
SW8260B	Vinyl chloride	0 009	0 012 J	0 015 J	0 007	na

WEEGTA001

Method	Analyte	Result 2001-11-15	Result 2002-03-13
SW6010B	Arsenic	0 0145 F	na
SW6010B	Copper	0 0044 F	na
SW6010B	Iron	1 36	na
SW6010B	Manganese	0 98	na
SW7041	Antimony	0 003 F	na
SW8260B	1,1-Dichloroethene	0 001	na
SW8260B	Benzene	0 0007	0 00068
SW8260B	cis-1 2-Dichloroethene	0 22	na
SW8260B	Tetrachloroethene (PCE)	0 002	na
SW8260B	Trans-1,2-Dichloroethene	0 018	na
SW8260B	Trichloroethene (TCE)	0 42	na
SW8260B	Vinyl chloride	0 006	na

Data Screening Values

Method	Analyte	RRS1	RRS2	MSC
SW6010B/SW7060A	Arsenic	0 0049	0 05	0 05
SW6010B	Copper	0 0028	1 3	1 3
SW6010B	Iron	0 224	nv	nv
SW6010B	Manganese	0 175	14 308	14 308
SW6010B	Silver	0 0002	0 511	0 511
SW7041	Antimony	0 002	0 006	0 006
SW8260B	1 1-Dichloroethene	0 0005	0 007	0 007
SW8260B	1,2,4-Trimethylbenzene	0 0005	5 11	5 11
SW8260B	Benzene	0 0004	0 005	0 005
SW8260B	cis-1,2-Dichloroethene	0 0005	0 07	0 07
SW8260B	Ethylbenzene	0 0005	0 7	0 7
SW8260B	m p-Xylene (sum of isomers)	0 001	10	10
SW8260B	Tetrachloroethene (PCE)	0 0005	0 005	0 005
SW8260B	Trans-1,2-Dichloroethene	0 0005	0 1	0 1
SW8260B	Trichloroethene (TCE)	0 0005	0 005	0 005
SW8260B	Vinyl chloride	0 0005	0 002	0 002

WEEGTA002

Method	Analyte	Result 2001-11-12	Result 2002-03-13
SW6010B	Arsenic	0 0206 F	na
SW6010B	Copper	0 0066 F	na
SW6010B	Iron	4 97	na
SW6010B	Manganese	0 205	na
SW6010B	Silver	0 0019 F	na
SW8260B	1 1-Dichloroethene	0 001	na
SW8260B	Benzene	0 0006	0 00079
SW8260B	cis-1,2-Dichloroethene	0 2	na
SW8260B	Tetrachloroethene (PCE)	0 0006	na
SW8260B	Trans-1,2-Dichloroethene	0 005	na
SW8260B	Trichloroethene (TCE)	0 29	na
SW8260B	Vinyl chloride	0 008	na

Notes
All results in mg/L.
MSC - Media Specific Concentration per 30 TAC §335 368, Appendix II
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2
na - Not Analyzed
† - Excavation not performed due to site restrictions and results of confirmation sample
Analyte detected above RRS 2

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Revised 04/30/02 tbraswell
Map Source HydroGeoLogic, Inc GIS Database 2002

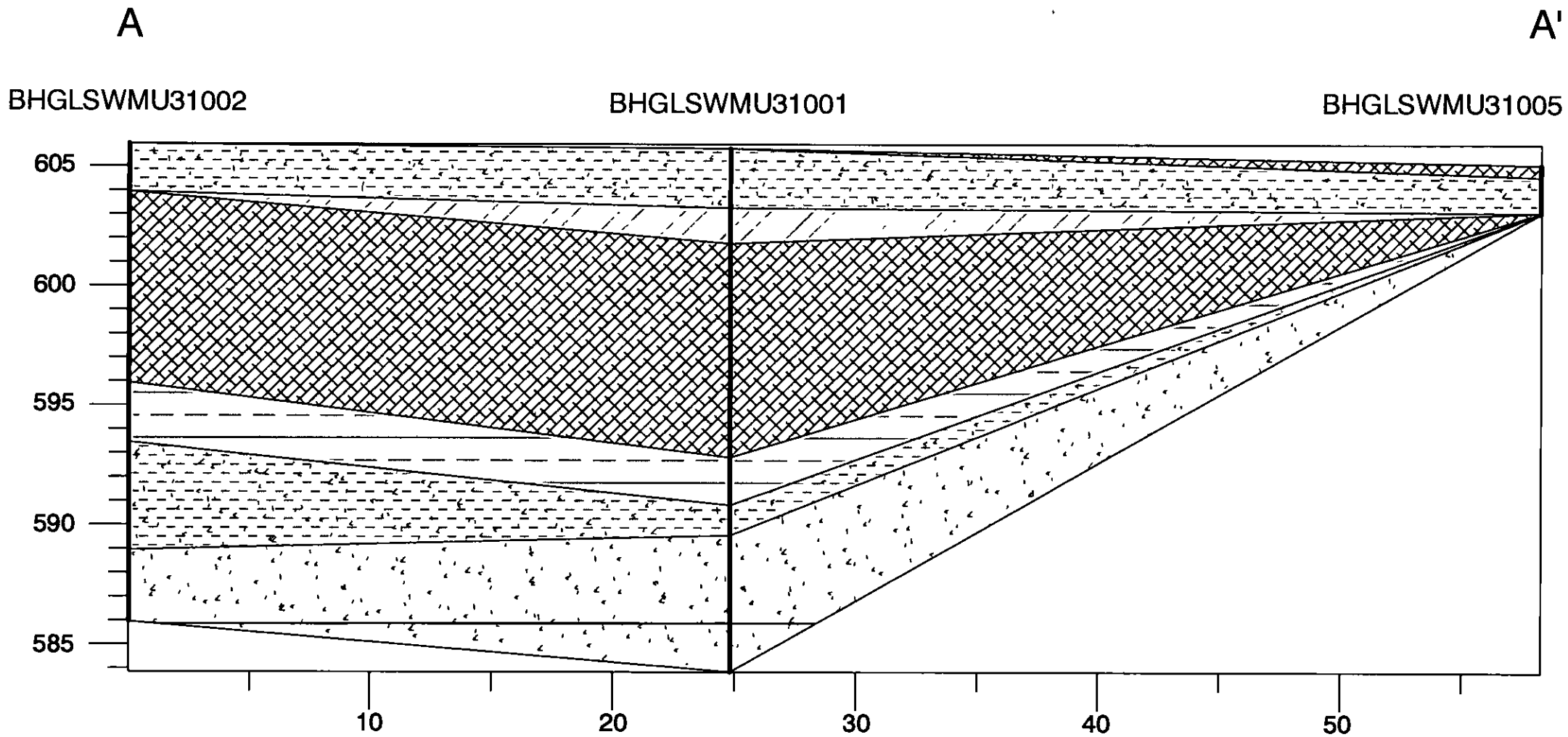
ELLIS ENVIRONMENTAL GROUP LC

HYDRO GeoLogic INC

Legend

- Solid Waste Management Unit (SWMU)
- Area of Concern (AOC)
- Waste Accumulation Area (WAA)
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Monitoring Well
- Excavation Location
- Surface Runoff

Figure 4.10
RFI Groundwater Results
SWMU 12



Vertical Exaggeration = 1x

RCRA Facility Investigation Report, Waste Accumulation Areas
NAS Fort Worth JRB, Texas

Figure 4.11
SWMU 31
Lithologic Cross Section
A - A'

U.S. Air Force Center for Environmental Excellence

Legend

	Fill		Sand and Gravel
	Silt Sand Gravel		SWMU
	Sandy Clay		Boring Location
	Silty Sand		GWE Oct. 2001

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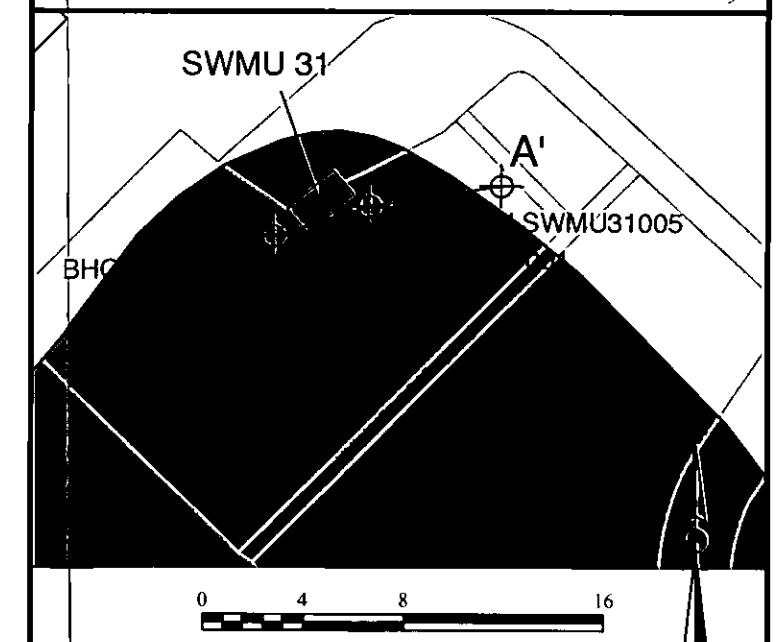
C.M.



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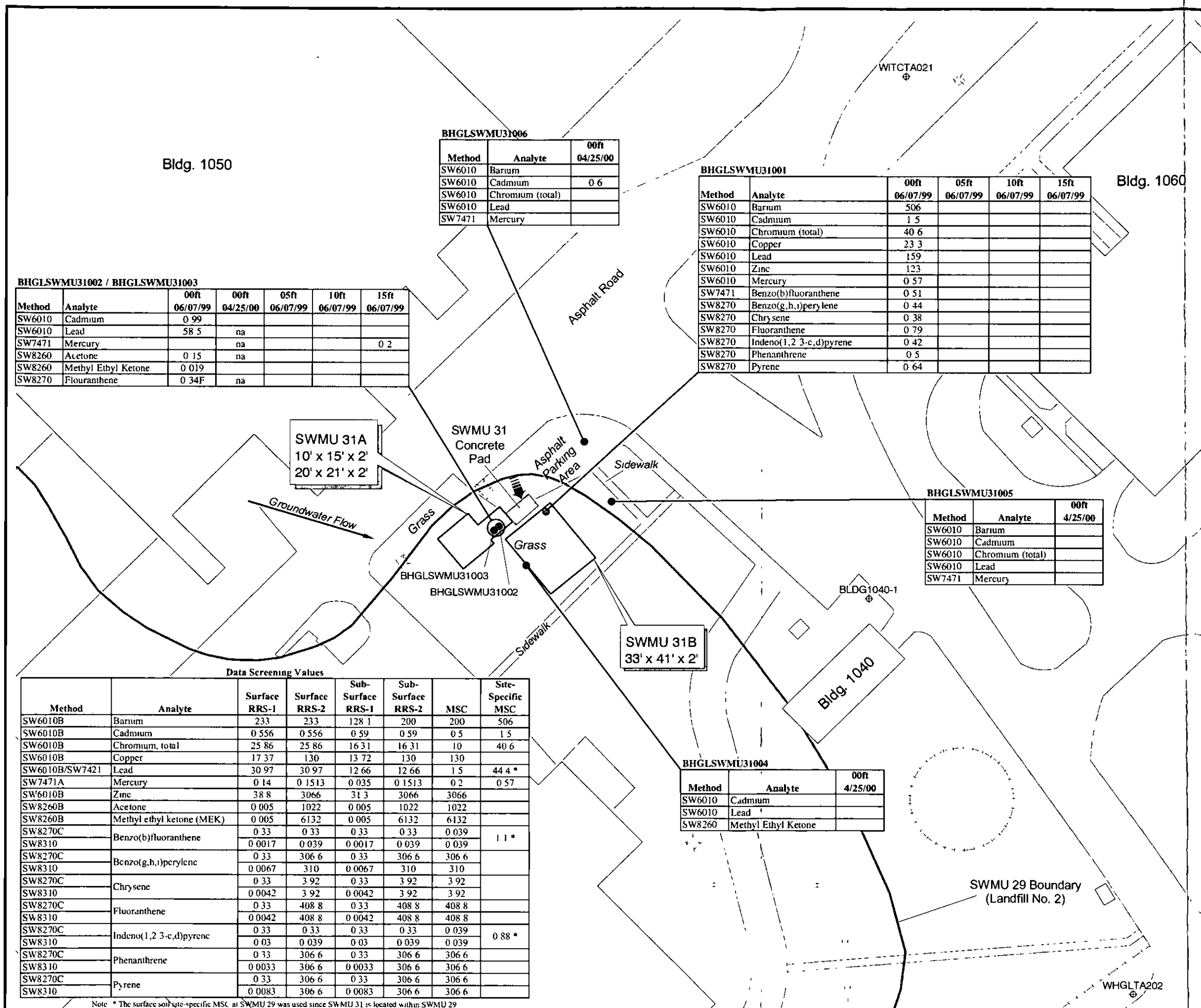
HYDRO GeoLogic



BHGLSWMU31006

Method	Analyte	00ft 04/25/00
SW6010	Barium	
SW6010	Cadmium	0 6
SW6010	Chromium (total)	
SW6010	Lead	
SW7471	Mercury	

BHGLSWMU31001

Method	Analyte	00ft 06/07/99	05ft 06/07/99	10ft 06/07/99	15ft 06/07/99
SW6010	Barium	506			
SW6010	Cadmium	1 5			
SW6010	Chromium (total)	40 6			
SW6010	Copper	23 3			
SW6010	Lead	159			
SW6010	Zinc	123			
SW6010	Mercury	0 57			
SW7471	Benzo(b)fluoranthene	0 51			
SW8270	Benzo(g,h,i)perylene	0 44			
SW8270	Chrysene	0 38			
SW8270	Fluoranthene	0 79			
SW8270	Indeno(1,2 3-c,d)pyrene	0 42			
SW8270	Phenanthrene	0 5			
SW8270	Pyrene	0 64			

BHGLSWMU31002 / BHGLSWMU31003

Method	Analyte	00ft 06/07/99	00ft 04/25/00	05ft 06/07/99	10ft 06/07/99	15ft 06/07/99
SW6010	Cadmium	0 99				
SW6010	Lead	58 5	na			
SW7471	Mercury		na			0 2
SW8260	Acetone	0 15	na			
SW8260	Methyl Ethyl Ketone	0 019				
SW8270	Flouranthene	0 34F	na			

BHGLSWMU31005

Method	Analyte	00ft 4/25/00
SW6010	Barium	
SW6010	Cadmium	
SW6010	Chromium (total)	
SW6010	Lead	
SW7471	Mercury	

BHGLSWMU31004

Method	Analyte	00ft 4/25/00
SW6010	Cadmium	
SW6010	Lead	
SW8260	Methyl Ethyl Ketone	

Data Screening Values

Method	Analyte	Surface RRS-1	Surface RRS-2	Sub-Surface RRS-1	Sub-Surface RRS-2	MSC	Site-Specific MSC
SW6010B	Barium	233	233	128 1	200	200	506
SW6010B	Cadmium	0 556	0 556	0 59	0 59	0 5	1 5
SW6010B	Chromium, total	25 86	25 86	16 31	16 31	10	40 6
SW6010B	Copper	17 37	130	13 72	130	130	
SW6010B/SW7421	Lead	30 97	30 97	12 66	12 66	1 5	44 4 *
SW7471A	Mercury	0 14	0 1513	0 035	0 1513	0 2	0 57
SW6010B	Zinc	38 8	3066	31 3	3066	3066	
SW8260B	Acetone	0 005	1022	0 005	1022	1022	
SW8260B	Methyl ethyl ketone (MEK)	0 005	6132	0 005	6132	6132	
SW8270C	Benzo(b)fluoranthene	0 33	0 33	0 33	0 33	0 039	1 1 *
SW8310		0 0017	0 039	0 0017	0 039	0 039	
SW8270C	Benzo(g,h,i)perylene	0 33	306 6	0 33	306 6	306 6	
SW8310		0 0067	310	0 0067	310	310	
SW8270C	Chrysene	0 33	3 92	0 33	3 92	3 92	
SW8310		0 0042	3 92	0 0042	3 92	3 92	
SW8270C	Fluoranthene	0 33	408 8	0 33	408 8	408 8	
SW8310		0 0042	408 8	0 0042	408 8	408 8	
SW8270C	Indeno(1,2 3-c,d)pyrene	0 33	0 33	0 33	0 33	0 039	0 88 *
SW8310		0 03	0 039	0 03	0 039	0 039	
SW8270C	Phenanthrene	0 33	306 6	0 33	306 6	306 6	
SW8310		0 0033	306 6	0 0033	306 6	306 6	
SW8270C	Pyrene	0 33	306 6	0 33	306 6	306 6	
SW8310		0 0083	306 6	0 0083	306 6	306 6	

Note * The surface soil site-specific MSC at SWMU 29 was used since SWMU 31 is located within SWMU 29

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NAS Fort Worth JRB, Texas

Figure 4.12
RFI Soil Results
SWMU 31

U.S. Air Force Center for Environmental Excellence

Legend

- Solid Waste Management Unit (SWMU)
- Monitoring Well
- Round I Soil Boring Location
- Round II Soil Boring Location
- Excavation Location
- Surface Runoff

Gold	Gold Headers indicate Phase I Soil Samples
Grey	Grey Headers indicate Delineation Soil Samples
Pink	Pink Headers indicate Sample interval to be removed in IRA
Yellow	Yellow Header indicates SWMU 31 Site Screening Values

Color Codes

- Analyte detected above RRS 2
- Analyte detected above RRS 2 but below site-specific MSC
- Initial analyte detection above RRS 1 or 2 but not comfirmed during subsequent sampling
- Analyte not detected or detected below RRS 1 concentration

Notes
All results in mg/kg
CoC - Contaminant of Concern
IRA - Iterim Remedial Action
MSC - Media Specific Concentration
per 30 TAC §335 368, Appendix II
na - Not Analyzed
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2

File: 17A-80-10
C.M.

N

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SCALE IN FEET

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Project EEG001-001-02-13
Created 10/26/99 jbelcher
Revised 04/30/02 tbraswell
Map Source HGL ArcView Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

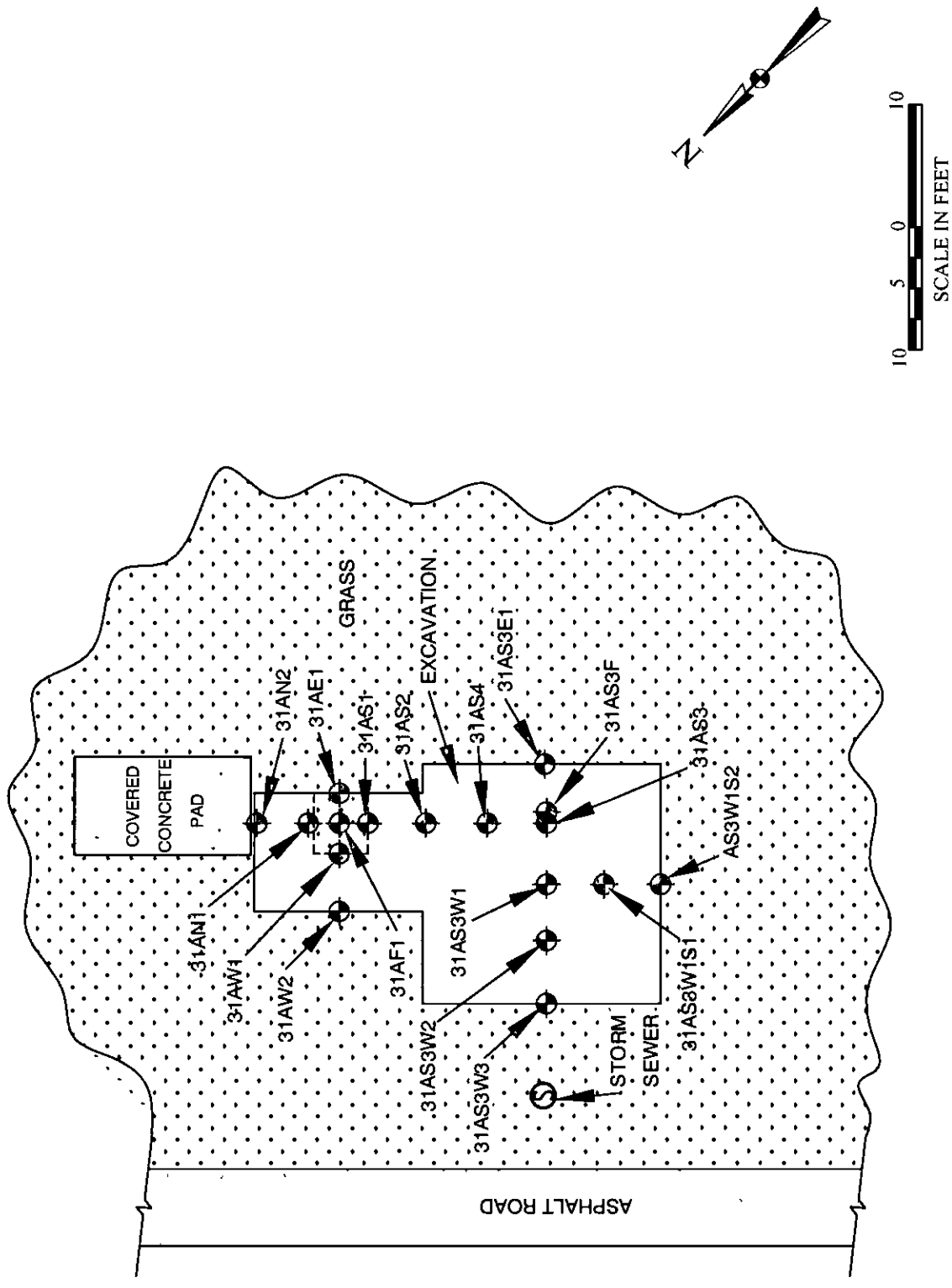

Figure 4.13
SWMU 31
31A Excavation Confirmation Sampling Locations

Legend

- PROPOSED EXCAVATION
- ACTUAL EXCAVATION
- SOIL BORINGS

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO Geologic

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Project EEG001-001-02-13
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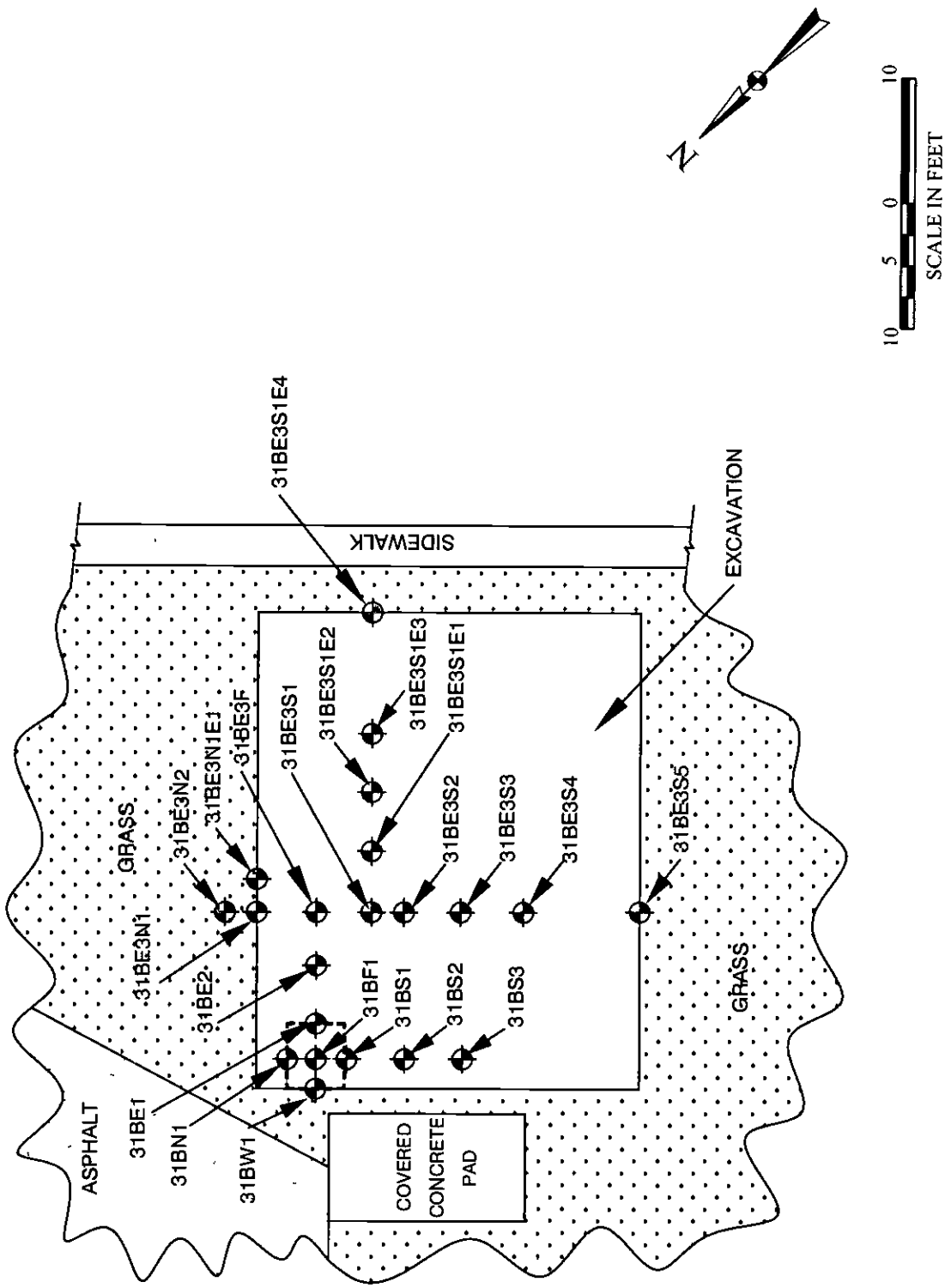

Figure 4.14
SWMU 31
31B Excavation Confirmation Sampling Locations

Legend

PROPOSED EXCAVATION

ACTUAL EXCAVATION

SOIL BORINGS

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic

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Created by 03/20/02 tbraswell
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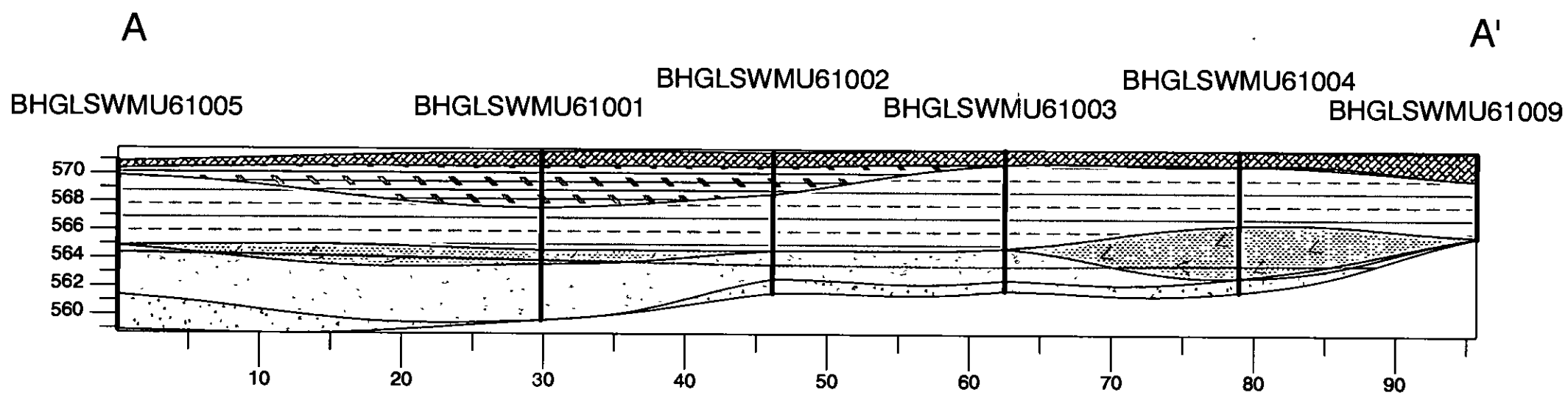


Vertical Exaggeration = 1x

RCRA Facility Investigation Report, Waste Accumulation Areas
NAS Fort Worth JRB, Texas

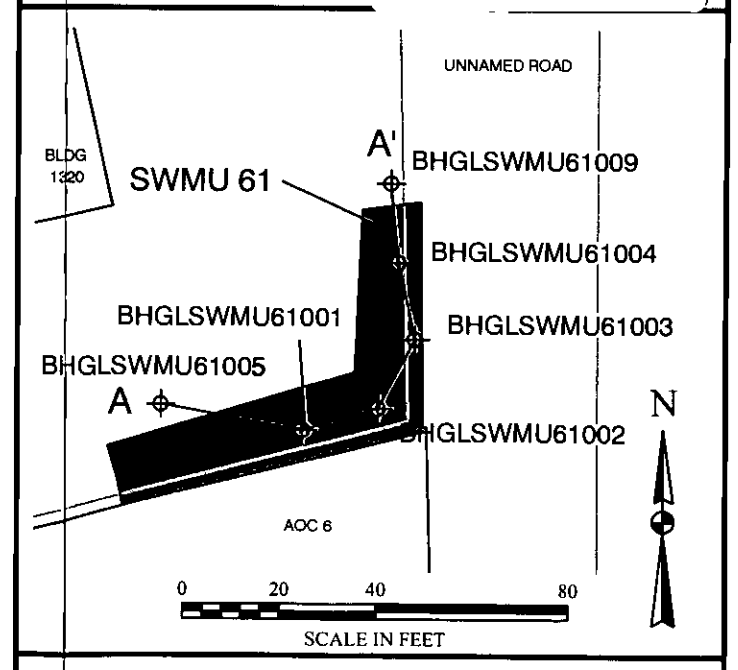
Figure 4.15
SWMU 61
Lithologic Cross Section
A - A'

U.S. Air Force Center for Environmental Excellence

Legend

- Fill
- Silty Clay
- Sandy Silt
- Silt Sand Gravel
- Sand
- Sand and Gravel
- SWMU
- AOC
- Boring Location
- GWE Oct 2001

File: 17A-80-10
C.M.



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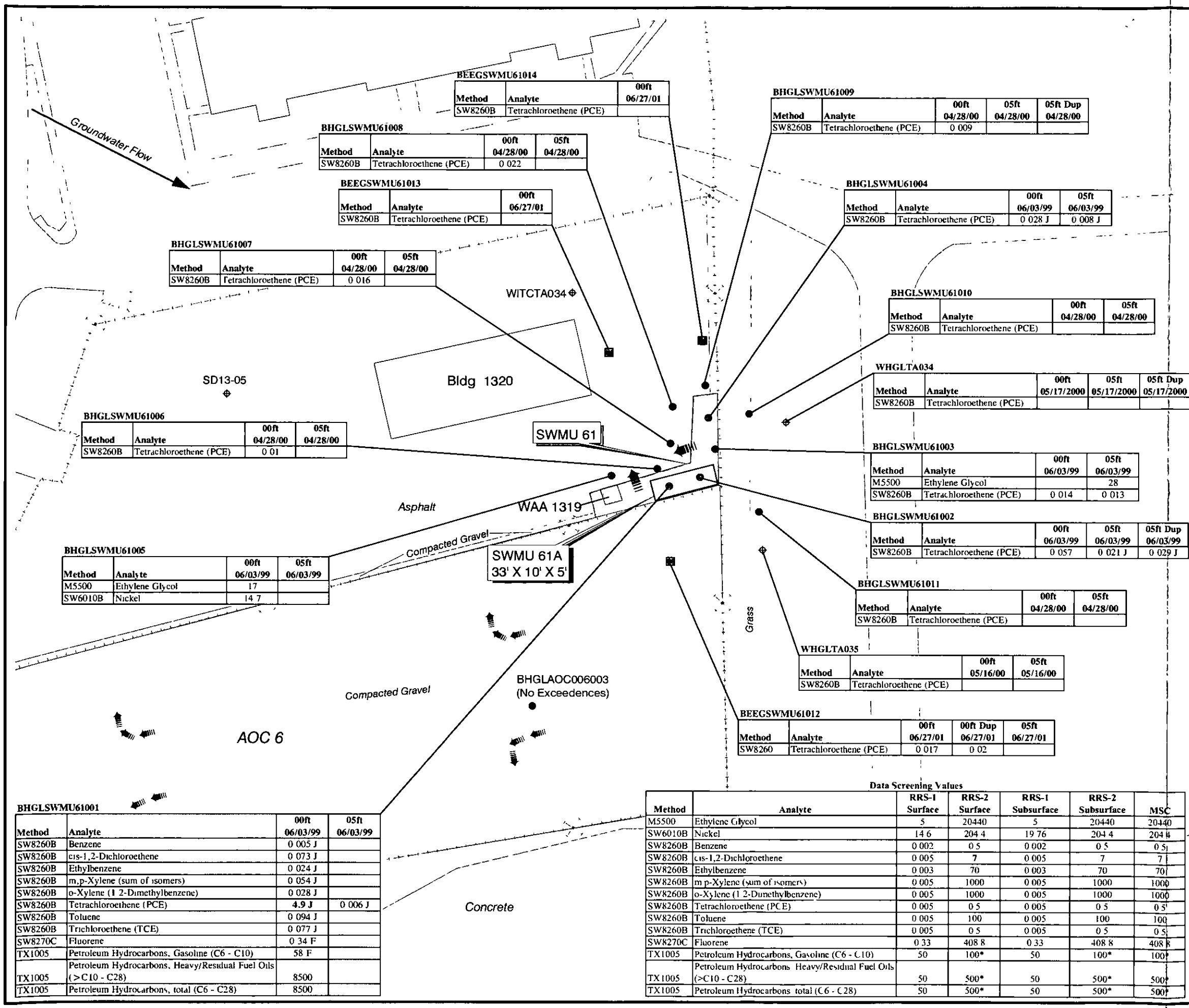
Revised 04/29/02 tbraswell
Map Source HydroGeoLogic, Inc 2002

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic



BEEGSWMU61014

Method	Analyte	00ft 06/27/01
SW8260B	Tetrachloroethene (PCE)	

BHGLSWMU61008

Method	Analyte	00ft 04/28/00	05ft 04/28/00
SW8260B	Tetrachloroethene (PCE)	0 022	

BEEGSWMU61013

Method	Analyte	00ft 06/27/01
SW8260B	Tetrachloroethene (PCE)	

BHGLSWMU61007

Method	Analyte	00ft 04/28/00	05ft 04/28/00
SW8260B	Tetrachloroethene (PCE)	0 016	

BHGLSWMU61006

Method	Analyte	00ft 04/28/00	05ft 04/28/00
SW8260B	Tetrachloroethene (PCE)	0 01	

BHGLSWMU61005

Method	Analyte	00ft 06/03/99	05ft 06/03/99
M5500	Ethylene Glycol	17	
SW6010B	Nickel	14 7	

BHGLSWMU61001

Method	Analyte	00ft 06/03/99	05ft 06/03/99
SW8260B	Benzene	0 005 J	
SW8260B	cis-1,2-Dichloroethene	0 073 J	
SW8260B	Ethylbenzene	0 024 J	
SW8260B	m,p-Xylene (sum of isomers)	0 054 J	
SW8260B	o-Xylene (1 2-Dimethylbenzene)	0 028 J	
SW8260B	Tetrachloroethene (PCE)	**4.9 J**	0 006 J
SW8260B	Toluene	0 094 J	
SW8260B	Trichloroethene (TCE)	0 077 J	
SW8270C	Fluorene	0 34 F	
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	58 F	
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	8500	
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	8500	

BHGLSWMU61009

Method	Analyte	00ft 04/28/00	05ft 04/28/00	05ft Dup 04/28/00
SW8260B	Tetrachloroethene (PCE)	0 009		

BHGLSWMU61004

Method	Analyte	00ft 06/03/99	05ft 06/03/99
SW8260B	Tetrachloroethene (PCE)	0 028 J	0 008 J

BHGLSWMU61010

Method	Analyte	00ft 04/28/00	05ft 04/28/00
SW8260B	Tetrachloroethene (PCE)		

WHGLTA034

Method	Analyte	00ft 05/17/2000	05ft 05/17/2000	05ft Dup 05/17/2000
SW8260B	Tetrachloroethene (PCE)			

BHGLSWMU61003

Method	Analyte	00ft 06/03/99	05ft 06/03/99
M5500	Ethylene Glycol		28
SW8260B	Tetrachloroethene (PCE)	0 014	0 013

BHGLSWMU61002

Method	Analyte	00ft 06/03/99	05ft 06/03/99	05ft Dup 06/03/99
SW8260B	Tetrachloroethene (PCE)	0 057	0 021 J	0 029 J

BHGLSWMU61011

Method	Analyte	00ft 04/28/00	05ft 04/28/00
SW8260B	Tetrachloroethene (PCE)		

WHGLTA035

Method	Analyte	00ft 05/16/00	05ft 05/16/00
SW8260B	Tetrachloroethene (PCE)		

BEEGSWMU61012

Method	Analyte	00ft 06/27/01	00ft Dup 06/27/01	05ft 06/27/01
SW8260	Tetrachloroethene (PCE)	0 017	0 02	

Data Screening Values

Method	Analyte	RRS-1 Surface	RRS-2 Surface	RRS-1 Subsurface	RRS-2 Subsurface	MSC
M5500	Ethylene Glycol	5	20440	5	20440	20440
SW6010B	Nickel	14 6	204 4	19 76	204 4	204 4
SW8260B	Benzene	0 002	0 5	0 002	0 5	0 5
SW8260B	cis-1,2-Dichloroethene	0 005	7	0 005	7	7
SW8260B	Ethylbenzene	0 003	70	0 003	70	70
SW8260B	m p-Xylene (sum of isomers)	0 005	1000	0 005	1000	1000
SW8260B	o-Xylene (1 2-Dimethylbenzene)	0 005	1000	0 005	1000	1000
SW8260B	Tetrachloroethene (PCE)	0 005	0 5	0 005	0 5	0 5
SW8260B	Toluene	0 005	100	0 005	100	100
SW8260B	Trichloroethene (TCE)	0 005	0 5	0 005	0 5	0 5
SW8270C	Fluorene	0 33	408 8	0 33	408 8	408 8
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	50	100*	100*
TX1005	Petroleum Hydrocarbons Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	50	500*	500*
TX1005	Petroleum Hydrocarbons total (C6 - C28)	50	500*	50	500*	500*

RCRA Facility Investigation Report—Waste Accumulation Areas
NAS Fort Worth JRB, Texas

Figure 4.16
RFI Soil Results
SWMU 61

U.S. Air Force Center for Environmental Excellence

Legend

- Solid Waste Management Unit (SWMU)
- Area of Concern (AOC)
- Waste Accumulation Area (WAA)
- Monitoring Well
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Excavation Location
- Surface Runoff

Gold	Gold Headers indicate Phase I Soil Samples
Grey	Grey Headers indicate Delineation Soil Samples
Pink	Pink Headers indicate Sample interval to be removed in IRA
Yellow	Yellow Header indicates SWMU 61 Site Screening Values

Color Codes

- Analyte detected above RRS 2
- Analyte not detected or detected below RRS 1 concentration

Notes
All results in mg/kg
CoC - Contaminant of Concern
IRA - Interim Remedial Action
MSC - Media Specific Concentration
per 30 TAC §335 368, Appendix II
na - Not Analyzed.
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2
* TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

N **File: C.M.** 17A-80-10

25 0 25 50 75
SCALE IN FEET

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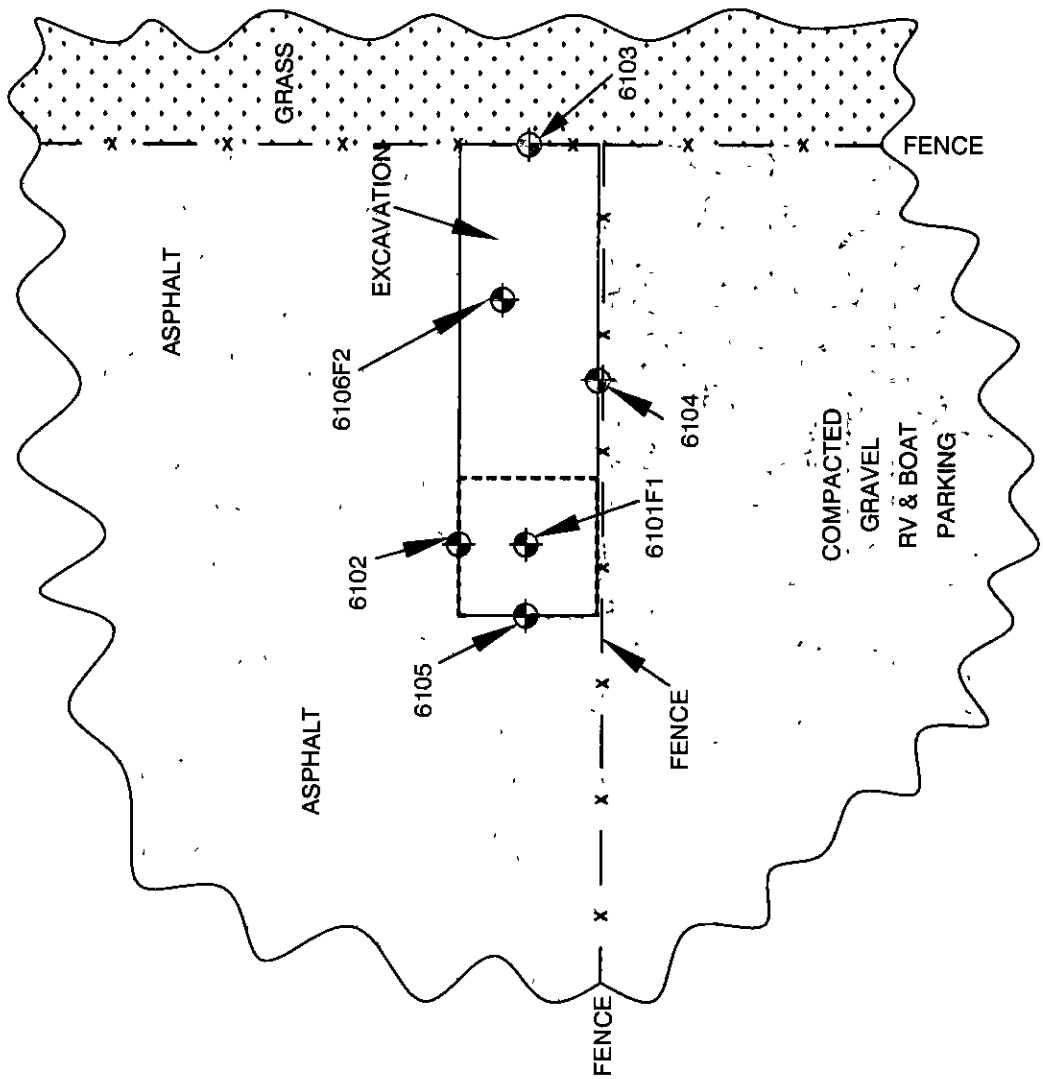
Created 10/26/99 jbelcher
Revised 04/30/02 tbraswell
Map Source. HGL ArcView Database

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC



N

10 5 0 10
SCALE IN FEET

Figure 4.17
SWMU 61
61A Excavation Confirmation Sampling Locations

Legend
PROPOSED EXCAVATION
ACTUAL EXCAVATION
SOIL BORINGS

ELLIS ENVIRONMENTAL GROUP, LC
HYDRO GeoLogic

Filename X \EEG001\DO1\Maps\ RCRA_IR_WAA\61 dwg
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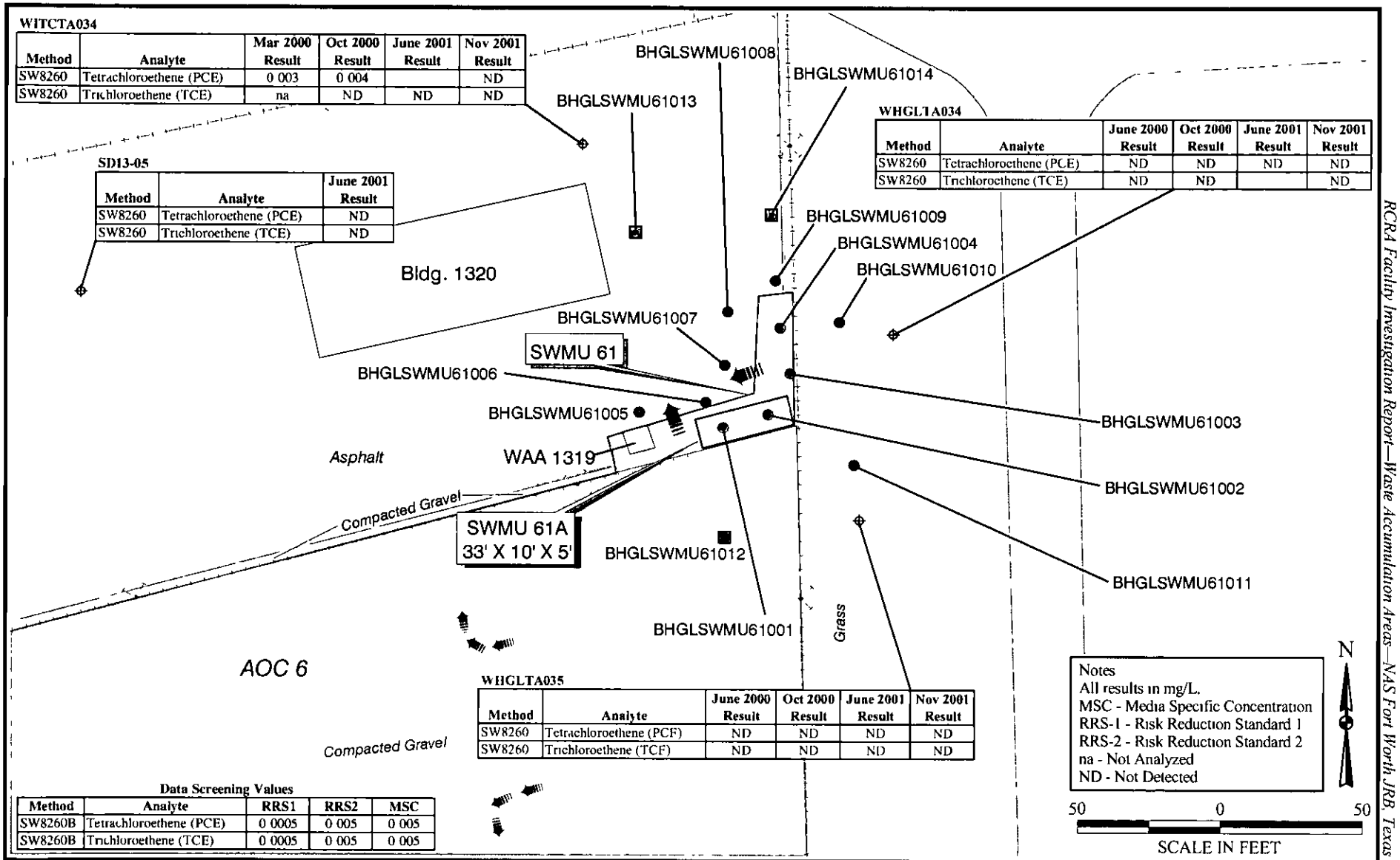


WITCTA034

Method	Analyte	Mar 2000 Result	Oct 2000 Result	June 2001 Result	Nov 2001 Result
SW8260	Tetrachloroethene (PCE)	0 003	0 004		ND
SW8260	Trichloroethene (TCE)	na	ND	ND	ND

SD13-05

Method	Analyte	June 2001 Result
SW8260	Tetrachloroethene (PCE)	ND
SW8260	Trichloroethene (TCE)	ND

WHGLTA034

Method	Analyte	June 2000 Result	Oct 2000 Result	June 2001 Result	Nov 2001 Result
SW8260	Tetrachloroethene (PCE)	ND	ND	ND	ND
SW8260	Trichloroethene (TCE)	ND	ND		ND

WHGLTA035

Method	Analyte	June 2000 Result	Oct 2000 Result	June 2001 Result	Nov 2001 Result
SW8260	Tetrachloroethene (PCE)	ND	ND	ND	ND
SW8260	Trichloroethene (TCE)	ND	ND	ND	ND

Data Screening Values

Method	Analyte	RRS1	RRS2	MSC
SW8260B	Tetrachloroethene (PCE)	0 0005	0 005	0 005
SW8260B	Trichloroethene (TCE)	0 0005	0 005	0 005

Notes
All results in mg/L.
MSC - Media Specific Concentration
RRS-1 - Risk Reduction Standard 1
RRS-2 - Risk Reduction Standard 2
na - Not Analyzed
ND - Not Detected

Filename X \EEG001\do1\maps\ rcra_ir_waa\ SWMU 61-GW apr
Project EEG001-001-02-13
Created 10/26/99 jbelcher
Revised 04/10/02 tbraswell
Map Source HydroGeoLogic, Inc GIS Database 2002

ELLIS ENVIRONMENTAL GROUP, LLC

HYDRO GeoLogic INC

Legend

- Solid Waste Management Unit (SWMU)
- Area of Concern (AOC)
- Waste Accumulation Area (WAA)
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Monitoring Well
- Excavation Location
- Surface Runoff

Figure 4.18
RFI Groundwater Results
SWMU 61

TAB

SECTION 5.0

5.0 Discussion of Analytical Results

5.1 SWMUs 5 and 6 Analytical Results

5.1.1 Surface Soil

There was only one detection of an analyte above RRS 1 in the surface soil samples collected at SWMUs 5 and 6.

- **Ethylene glycol** was detected in an isolated concentration of 10.03 mg/kg in the surface soil sample collected from boring BHGLSWMU05001 (Figure 4.2). Since ethylene glycol was detected above RRS 1 in only one sample, no pattern of occurrence could be established. In addition, the concentration detected for this compound was only slightly above the RRS 1 of 5 mg/kg and was well below the MSC of 20,440 mg/kg. Based on this information, the detection of ethylene glycol is not indicative of a release from SWMUs 5 and 6 and did not warrant further consideration.

5.1.2 Subsurface Soil

Several constituents were detected in the subsurface soils collected from the 5-foot interval at SWMUs 5 and 6 (Figure 4 2) during Phase I of the RFI These constituents consisted of arsenic, barium, cobalt, lead, and nickel. A brief discussion of each analyte is given below.

- **Arsenic** was detected at concentrations above RRS 2 in four subsurface sampling locations; however, the detection of arsenic in the duplicate sample for BEEGSWMU06005-05' was not confirmed above background in the parent sample. Note the detection of arsenic above MSC at BHGLSWMU06003 provides the site-specific MSC of 13.2 mg/kg for SWMUs 5 and 6 as arsenic was detected below MSC in the corresponding extract. All detections of arsenic at SWMUs 5 and 6 are currently below the site-specific MSC. The detections of arsenic in the 5-foot intervals of BHGLSWMU05001, BHGLSWMU06002, and BHGLSWMU06003 are delineated to the north by BEEGSWMU06005 and BHGLSWMU06001, to the east by BHGLSWMU05003 and BHGLSWMU05006, to the south by BHGLSWMU05002, BHGLSWMU05005, and BHGLSWMU06004, and to the west by BEEGSWMU06006.

- **Barium** was initially detected at concentrations above RRS 2 in three subsurface soil locations at SWMUs 5 and 6. Note the detection of barium above the MSC at BHGLSWMU06002 provides a site-specific MSC of 1280 mg/kg for SWMUs 5 and 6 as barium was detected below the MSC in the corresponding extract All detections of barium at SWMUs 5 and 6 are currently below the site-specific MSC. The detections of barium in the 5-foot intervals of BHGLSWMU05002, BHGLSWMU05003, and BHGLSWMU06002 are delineated to the north by BHGLSWMU05001 and BHGLSWMU06001, to the east by BHGLSWMU05005 and BHGLSWMU05006, to the south by BHGLSWMU05004, BHGLSWMU05005, and BHGLSWMU06004, and to the west by BHGLSWMU06003.

- **Cobalt** was detected at concentrations above RRS 1 in five subsurface soil locations at SWMUs 5 and 6; however, the detection of cobalt in the BHGLSWMU05004-05' duplicate sample was not confirmed above background in the parent sample. The detections of cobalt in the 5-foot intervals of BHGLSWMU05002, BHGLSWMU05003, BHGLSWMU06002, and BHGLSWMU06003 are delineated to the north by BHGLSWMU05001, BHGLSWMU06001 and BEEGSWMU06005. to the east by BHGLSWMU05006 and to decreasing concentrations just above background by BHGLSWMU05005; to the south by BHGLSWMU05004, BHGLSWMU06004, and to decreasing concentrations just above background by BEEGSWMU05007; and to the west by BHGLSWMU06004 and BEEGSWMU06006.

- **Lead** was initially detected at concentrations above RRS 2 in two subsurface soil locations at SWMUs 5 and 6 The detection of lead above the MSC at boring BHGLSWMU06002 was detected below the MSC in the corresponding extract providing a site-specific MSC of 14.8 mg/kg for SWMUs 5 and 6. However, lead failed SPLP at boring BHGLSWMU05003 (23.9 mg/kg). It should be noted that a concrete cover approximately 1-foot in thickness is present over the location of boring BHGLSWMU05003. This cover effectively prevents the migration of precipitation through the 5-foot interval containing the concentration of lead above RRS 2. In addition, lead was not detected in groundwater downgradient of the site. Consequently, the detection of lead in the 5-foot interval of boring BHGLSWMU05003 is not deemed a threat to the environment. As such, removal of the lead contaminated soil was not necessary and closure of this site under TNRCC RRS 2 should not be impeded by this detection of lead. The detections of lead in the 5-foot intervals of BHGLSWMU05003 and BHGLSWMU06002 are delineated to the north by BHGLSWMU06001; to the east by BHGLSWMU05006; to the south by BHGLSWMU05005 and BHGLSWMU06004; and to the west by BHGLSWMU05001 and BHGLSWMU06003.

- **Nickel** was detected at a concentration of 20.8 mg/kg in the sample collected from the 5-foot interval of boring BHGLSWMU06002. This concentration was only slightly above the background level of 19.76 mg/kg and was not repeated in any of the other samples collected at SWMUs 5 and 6. As a result, no pattern of occurrence could be established. Based on this information, the detection of nickel is not indicative of a release from SWMUs 5 and 6 and did not warrant further consideration.

5.1.3 Goundwater

Groundwater samples were analyzed for selected total metals (arsenic, barium, cobalt, and lead) during three rounds of groundwater sampling at existing monitoring wells LSA1628-3 and LSA1628-2. Analytical results from LSA1628-3, located in the center of SWMU 6, indicate all CoCs were either non-detect or detected below RRS 1 concentrations in both rounds of sampling. However analytical results from LSA1628-2, located downgradient of SWMUs 5 and 6, revealed detections of arsenic above background (Figure 4 3). These analytical results are discussed below.

- **Arsenic** was not detected above RRS 2 in the first two rounds of groundwater sampling; however, arsenic was detected at concentrations above RRS 1 in all three rounds of

groundwater sampling (Table 4.4). It should be noted that monitoring well LSA1628-2 is located near the former pump islands within LPST site 106684, discussed in detail in Section 3.2.1.1. The LPST site is located directly upgradient of monitoring well LSA1628-2 and downgradient of SWMUs 5 and 6 (Figure 4.2). Benzene was detected at concentrations above RRS 2 in groundwater from LSA1628-2 (Tables 3 2 and 3.3). These benzene detections coincide with the detections of arsenic, as the presence of a benzene plume in groundwater affects water chemistry through the geochemical/biological process of anaerobic reduction making it possible for metals to go into solution (EPA, 1998b and IRTC, 1999). In addition, the low concentrations of arsenic in the soil samples collected at SWMUs 5 and 6 are protective of groundwater. As a result, the detections of arsenic at LSA1628-2 are most likely related to the presence of benzene associated with LPST site 106684, therefore no further groundwater monitoring for arsenic is recommended for SWMUs 5 and 6.

5.2 SWMU 12 Analytical Results

5.2.1 Surface Soil

Several inorganic and organic constituents were identified in the surface soils collected at SWMU 12 during the RFI (Figure 4.5). These constituents include cadmium, lead, zinc, bis(2-Ethylhexyl)phthalate, and several PAHs [benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, indeno(1,2,3-c,d)pyrene, phenanthrene, and pyrene]. Detections of surface CoCs above RRS 2 include cadmium and lead.

IRAs were performed at SWMU 12 for the analytes exceeding their respective RRS 2 values. Excavation contaminant intervals are highlighted in pink on Figure 4.5, and the excavation sampling locations are depicted in Figures 4.6 through 4.9. Contaminated soil was removed during the IRA excavation activities with confirmation sampling showing delineation to RRS 1 both aerially and vertically for the CoCs (lead, cadmium, zinc, benzene, and TPH). IRA results are presented in Appendix C. A brief discussion of each constituent detected in the surface soil at SWMU 12 is given below.

- **Cadmium** was detected above both background and the MSC in two surface soil samples collected at SWMU 12: 0.98 mg/kg in BHGLSWMU12002 and 0.74 mg/kg in BHGLSWMU12003. An SPLP extraction was performed on both of these samples, and the cadmium results were below the industrial groundwater MSC, establishing a site-specific MSC of 0.98 mg/kg for cadmium. IRAs were centered on BHGLSWMU12002 and BHGLSWMU12003, removing the soils contaminated with cadmium. A new site-specific MSC of 4.2 mg/kg was established from the confirmation and delineation samples collected during the IRAs (Appendix C). In addition, the detections of cadmium in the surface soil are delineated to the north by BHGLSWMU12001; to the east by WHGLTA028; to the south by BHGLSWMU12007; and to the west by BHGLSWMU12006.

- **Lead** was detected above both background and the MSC in two surface soil samples collected at SWMU 12: 89.4 mg/kg in BHGLSWMU12002 and 57.8 mg/kg in BHGLSWMU12003. The SPLP extractions of both samples were above the industrial groundwater MSC of 0.0150 mg/L, therefore a site-specific MSC for lead was not established during Phase I. During Phase III, IRAs were centered on BHGLSWMU12002 and BHGLSWMU12003, removing the soils contaminated with lead. A site-specific MSC of 64 8 mg/kg was established from the confirmation and delineation samples collected during the IRAs (Appendix C). In addition, the detections of lead in the surface soil are delineated to the north by BHGLSWMU12001; to the east by WHGLTA028; to the south by BHGLSWMU12007; and to the west by BHGLSWMU12006.

- **Zinc** was detected above background in two surface soil samples collected at SWMU 12: 84.8 mg/kg in BHGLSWMU12002 and 97.9 mg/kg in BHGLSWMU12003. These detections of zinc were above background, but well below the MSC IRAs were performed over both borings, removing the zinc contaminated soil from SWMU 12. All remaining detections of zinc at SWMU 12 are below background.

- **Bis(2-ethylhexyl)phthalate** was detected at 0.42 mg/kg in the surface soil sample collected from Phase I boring BHGLSWMU12003. This was the only detection of bis(2-Ethylhexyl)phthalate in the soils at SWMU 12. As no pattern of occurrence could be established, this detection of bis(2-Ethylhexyl)phthalate was most likely attributed to laboratory contamination. Based on this information, the detection of bis(2-Ethylhexyl)phthalate was not indicative of a release from SWMU 12 and did not warrant further investigation.

- **PAHs** were detected in the surface soil of BHGLSWMU12002 and BHGLSWMU12003; however PAHs were not detected in the subsurface samples at these locations Since the surface soil samples at BHGLSMWU12002 and BHGLSWMU12003 were collected adjacent to a concrete parking lot and near the flightline and Alert Apron, the detections of PAHs are considered related to surface water runoff and/or lawn mowing activities. Additionally these concentrations of PAHs in the surface soil were removed during the IRAs centered over borings BHGLSWMU12002 and BHGLSWMU12003. The results of the IRA confirmation and delineation sampling are located in Appendix C.

5.2.2 Subsurface Soil

Several inorganic and organic constituents were identified in the subsurface soil samples collected at SWMU 12 (Figure 4.5). These constituents include arsenic, copper, cobalt, benzene, ethylbenzene, vinyl chloride, TPH, and several PAHs. Detections of subsurface CoCs above MSC include arsenic and benzene encountered in the subsurface soil samples collected from BHGLSWMU12001 and BHGLSWMU12004. These CoCs are also detected above RRS 1, but below MSC in the subsurface soil samples collected from BHGLSWMU12002, BHGLSWMU12006, and BHGLSWMU12007. Concentrations of ethylbenzene and vinyl chloride are also detected above RRS 1, but below MSC in the subsurface soil at SWMU 12.

IRAs were performed at SWMU 12 for the analytes exceeding their respective MSC values. Excavation contaminant intervals are highlighted in pink on Figure 4.5, and the excavation sampling locations are depicted in Figures 4.6 through 4.9. Contaminated soil was removed during the IRA excavation activities with confirmation sampling showing delineation to RRS 1 both aerially and vertically for the CoCs (lead, cadmium, zinc, benzene, and TPH). IRA results are presented in Appendix C. A brief discussion of each constituent detected in the subsurface soil at SWMU 12 is given below.

- **Arsenic** was detected at a concentration above MSC in three subsurface sampling locations. The detection of arsenic above MSC at BHGLSWMU12001 provides the site-specific MSC of 10.5 J mg/kg for SWMU 12. All detections of arsenic at SWMU 12 are below the site-specific MSC. Additionally, arsenic is delineated in the subsurface soil to decreasing concentrations or below background to the north by BEEGSWMU12011; to the east by WHGLTA028, to the south by BHGLSWMU12007; and to the west by BHGLSWMU12006.

- **Copper** was detected slightly above background (13.72 mg/kg) at a concentration of 15.8 J mg/kg in the subsurface soil sample collected from the 5-foot interval of soil boring BHGLSWMU12003. As this detection of copper was not repeated in any of the other subsurface soil samples collected at SWMU 12, no pattern of occurrence could be established. Based on this information, the detection of copper was not indicative of a release from SWMU 12 and did not warrant further investigation.

- **Cobalt** was detected slightly above background (6.19 mg/kg) at concentrations of 7.7 mg/kg in the 5-foot interval of BHGLSWMU12001, and 7.5 mg/kg in the 5-foot interval of BHGLSWMU12003. Cobalt was detected below background in the surface and 10-foot intervals at these locations, therefore the concentrations in the 5-foot intervals are most likely a natural variation of background. Based on this information, the detections of cobalt are not indicative of a release from SWMU 12 and did not warrant further investigation.

- **Benzene** was detected above RRS 1 in six subsurface samples collected at SWMU 12. One of those six detections (1.3 J mg/kg at BHGLSWMU12004) was also above MSC (0.5 mg/kg). An IRA was proposed to remove the subsurface soil centered on BHGLSWMU12004, however the location of the IRA would have impacted the sensors for the gate leading to the Alert Apron and flightline (Figure 4.6). Therefore a pre-excavation boring was advanced in order to confirm the presence of benzene above MSC before commencing with the IRA. The concentration of benzene above MSC was subsequently not confirmed in pre-excavation boring BEEGSWMU12001 [0.035 mg/kg (Appendix C)] and as a result, the IRA proposed at this location was not performed. All other detections of benzene in the 5- and 10-foot intervals were below MSC, and are delineated to the north by BEEGSWMU12010 and BEEGSWMU12011; to the east by WHGLTA028; to the south by BHGLSWMU12007; and to the west by BEEGSWMU12008, BEEGSWMU12009, and BHGLSWMU12006

- **Ethylbenzene** was detected above RRS 1 in one boring (the 5-foot interval of BHGLSWMU12001) at a concentration of 0.006 J mg/kg This detection is well below the MSC (70 mg/kg) and was not repeated in any of the other subsurface soil samples collected at SWMU 12. In addition, ethylbenzene is delineated to the north by BEEGSWMU12011; to the southeast by BHGLSWMU12002; and to the west by BEEGSWMU12009. Therefore, no pattern of occurrence can be established and the detection is not indicative of a release from SWMU 12.

- **Vinyl Chloride** was detected above RRS 1 in one boring (the 10-foot interval of BHGLSWMU12002) at a concentration of 0.007 mg/kg. This detection is below the MSC (0.0657 mg/kg) and was not repeated in any of the other subsurface soil samples collected at SWMU 12. In addition vinyl chloride is delineated to the north by BHGLSWMU12001, to the east by WHGLTA028; to the south by BHGLSWMU12003; and to the west by BHGLSWMU12006 Therefore no pattern of occurrence can be established and the detection is not indicative of a release from SWMU 12

- **TPH** was detected in two borings (the 5-foot interval of BHGLSWMU12001 and the 5-foot interval of BHGLSWMU12004) at 770 mg/kg and 1,100 mg/kg, respectively. These detections of TPH were above the RRS 1 (50 mg/kg), as well as the TNRCC action level for coarse-grained soils (500 mg/kg). An SPLP extraction was performed on BHGLSWMU12004, and the TPH result was below RRS 1 and the above-mentioned TNRCC action level, establishing a site-specific MSC for TPH (1,100 mg/kg) at SWMU 12 (Table 4 1). In addition, the soil at BHGLSWMU12001 was also removed during IRA activities and the concentrations of TPH in the 5-foot interval of BHGLSWMU12004 are protective of groundwater. Concentrations of TPH are delineated to below background to the east by WHGLTA028; to the south by BHGLSWMU12003; and to the west by BHGLSWMU12006.

- **PAHs** were detected in the subsurface soil samples collected from borings BHGLSWMU12001, BEEGSWMU12010, and BEEGSWMU12011. The concentrations detected in the 5-foot interval of BHGLSWMU12001 were above the respective RRS 1 values for method SW8270C, but were below the MSCs. This soil was removed by the IRA centered over BHGLSWMU12001 (12D) PAHs are delineated to below RRS 1 in the subsurface soil by BHGLSWMU12002 (south) and BEEGSWMU12009 (west). PAHs are delineated to decreasing concentrations by BEEGSWMU12010 (north) and BEEGSWMU12011 (east).

5.2.3 Goundwater

A total of four rounds of groundwater samples were collected from both new and existing monitoring wells at SWMU 12. Groundwater samples were collected during sampling events from each monitoring well as follows:

- Round 1 (May 2000) – WHGLTA028
- Round 2 (October 2000) – WCHMHTA012, WHGLTA028

- Round 3 (November 2001) – WEEGTA001, WEEGTA002, WCHMHTA012, WHGLTA028
- Round 4 (March 2002) – WEEGTA001, WEEGTA002, WHGLTA028

Several inorganic and organic constituents were detected in the groundwater samples collected at SWMU 12 (Figure 4.10). A brief discussion of each analyte is given below.

SWMU 12 is located within the Northern Lobe of the Regional TCE plume. TCE and breakdown products (e.g., 1,1-DCE, *cis*-1,2-DCE, *trans*-1,2-DCE, and vinyl chloride) were detected at concentrations exceeding the MSC value for industrial groundwater in both the upgradient and downgradient monitoring wells in the area of SWMU 12 (See Table 4.7 and Figure 4 10). Concentrations of TCE in the upgradient-monitoring well (WEEGTA001) were higher than concentrations in the downgradient monitoring wells (WEEGTA002 and WHGLTA028). Consequently, detections above the RRS values for these compounds were not attributed to a release at SWMU 12 Concentrations of PCE were also detected just above RRS 1 and well below MSC values in the up- and downgradient monitoring wells. This compound is also most likely associated with the Regional TCE plume. None of these analytes, with the exception of an isolated detection of vinyl chloride, were detected in the site soils sampled at SWMU 12.

- **Antimony** was detected at a concentration of 0.003 F mg/L in WEEGTA001 in Round 3 of groundwater sampling at SWMU 12. Antimony was not sampled for during the first two rounds because it was not a CoC identified in site soils at SWMU 12. However, the groundwater samples collected during the Round 3 sampling were analyzed for the SW6010B list of metals. This detection of antimony was below the MSC, not identified in the site soils, and detected in only one of the three monitoring wells sampled during Round 3. Based on this information, further sampling for antimony in the groundwater at SWMU 12 was not warranted.

- **Arsenic** was detected at concentrations ranging from 0.035 F mg/L (WCHMHTA012) to 0.0145 F mg/L (WEEGTA001). These detections of arsenic were above the RRS 1, but below the MSC. Concentrations of arsenic detected in the soils at SWMU 12 were at or below the site-specific MSC and therefore protective of groundwater Therefore, it is possible that arsenic detections may be related to the Regional TCE plume and benzene impacted groundwater at SWMU 12. The presence of TCE and benzene in groundwater affects water chemistry through the geochemical/biological process of anaerobic reduction that make it possible for metals to go into solution (EPA, 1998b and IRTC, 1999). Based on these results, no further groundwater monitoring for arsenic is recommended for SWMU 12.

- **Copper** was detected at concentrations of 0.0044 F mg/L in WEEGTA001 and 0.0066 F mg/L in WEEGTA002 during Round 3 of groundwater sampling. Copper was not sampled for during the first two rounds because it was not a CoC identified in site soils at SWMU 12. However, the groundwater samples collected during the Round 3 sampling were analyzed for the SW6010B list of metals. These detections of copper were detected sporadically, slightly above RRS 1, and well below the MSC. Based on this information, further sampling for copper in the groundwater at SWMU 12 was not warranted.

- **Iron** was detected at concentrations of 2.4 mg/L in WHGLTA028; 1.36 mg/L in WEEGTA001; and 4.97 mg/L in WEEGTA002 during Round 3 of groundwater sampling. Iron was not sampled for during the first two rounds because it was not a CoC identified in site soils at SWMU 12. However, the groundwater samples collected during the Round 3 sampling were analyzed for the SW6010B list of metals. This detection of iron was above RRS 1 in all three monitoring wells sampled during Round 3, however this compound does not have an established MSC and is not considered to be a risk to human health. Based on this information, further sampling for iron in the groundwater at SWMU 12 was not warranted.

- **Manganese** was detected above the background (0.0175 mg/L) during Round 3 in the groundwater sampled collected from both up- and downgradient monitoring wells WEEGTA001, WEEGTA002, and WHGLTA028 Manganese was not sampled for during the first two rounds because it was not a CoC identified in site soils at SWMU 12. However, the groundwater samples collected during the Round 3 sampling were analyzed for the SW6010B list of metals. Concentrations of manganese ranged from 0.98 to 0.205 mg/kg, with the highest detection occurring upgradient of SWMU 12. As all the concentrations of manganese were either below background or non-detect during the soil investigation at SWMU 12, these elevated concentrations of manganese in groundwater are most likely related to the geochemical/biological process of anaerobic reductive dechlorination that affects the fringes of the regional TCE plume (EPA, September 1998 and IRTC, September 1999).

- **Silver** was detected at a concentration of 0.0019 F mg/L in WEEGTA002 (November 2001). Silver was not sampled for during the first two rounds because it was not a CoC identified in site soils at SWMU 12. However, the groundwater samples collected during the Round 3 sampling were analyzed for the SW6010B list of metals. This detection of silver was well below the MSC, not identified in the site soils, and detected in only one of the three monitoring wells sampled during Round 3. Based on this information, further sampling for silver in the groundwater at SWMU 12 was not warranted.

- **Benzene** was detected in all of the monitoring wells sampled at SWMU 12. The concentrations in the groundwater samples were all below the MSC (0.005 mg/L), and ranged from 0.00053 mg/L (WCHMHTA012) to 0.002 (WHGLTA028) Concentrations of benzene were found in the up-, cross-, and downgradient monitoring wells. The concentrations of benzene in the soil at SWMU 12 were all below the MSC, with the exception of one detection which was unable to be confirmed. Removal actions were taken to remove petroleum impacted soils from the site. Additionally the concentrations of benzene in the downgradient monitoring well (WHGLTA028) are decreasing after the IRA, therefore further groundwater sampling at SWMU 12 is not recommended.

- **Ethylbenzene** was detected during the November 2001 groundwater sampling round in one monitoring well (WHGLTA028) at a concentration of 0.001 mg/L. This concentration of ethylbenzene was above RRS 1 (0.0005 mg/L), but below the MSC (0.7 mg/L). Multiple rounds of sampling confirmed that there has not been a significant

release of ethylbenzene in the site soils at SWMU 12. Therefore further groundwater sampling for ethylbenzene at SWMU 12 is not considered necessary.

- **m,p-Xylene** (0.002 mg/L) was detected during Round 3 of groundwater sampling in one monitoring well (WHGLTA028). This concentration of m,p-Xylene was slightly above RRS 1 (0.001 mg/L) and well below the MSC (10 mg/L). This constituent was not detected in the soils at SWMU 12 and therefore is not attributed to a release from the site.

5.3 SWMU 31 Analytical Results

5.3.1 Surface Soil

Several inorganic and organic constituents were identified in the surface soil samples collected at SWMU 31 (Figure 4.12). These constituents include barium, cadmium, chromium (total), copper, lead, mercury, zinc, acetone, MEK, and several PAHs [benzo[*b*]fluoranthene, benzo[g,h,i]fluoranthene, chrysene, fluoranthene, indeno[1,2,3-c,d]pyrene, phenanthrene, and pyrene]. All of these constituents, detected in BHGLSWMU31001 and BHGLSWMU31002, were removed during IRAs centered over these boring locations A brief discussion of each analyte is given below.

- **Barium** was detected in one surface soil location at SWMU 31. The detection of barium above the MSC at BHGLSWMU31001 was detected below the MSC in the corresponding extract, providing a site-specific MSC of 506 mg/kg for barium. The detection of barium at BHGLSWMU31001 is delineated to the north by BHGLSWMU31006; to the east by BHGLSWMU31005; to the south by BHGLSWMU31004; and to the west by BHGLSWMU31002.

- **Cadmium** was detected in three surface soil locations at SWMU 31. However, the detection of cadmium at BHGLSWMU31002 (0.99 mg/kg) was not confirmed above RRS 1 at confirmation sample BHGLSWMU31003. The detection of cadmium at BHGLSWMU31006 (0.6 mg/kg) is considered a natural variation of the background concentration of 0.556 mg/kg. The remaining detection of cadmium above the MSC at BHGLSWMU31001 was detected below the MSC in the corresponding extract, providing a current site-specific MSC of 1.5 mg/kg for cadmium. The detection of cadmium in surface soil at BHGLSWMU31001 is delineated to the north by BHGLSWMU31006; to the east by BHGLSWMU31005; to the south by BHGLSWMU31004; and to the west by BHGLSWMU31003.

- **Chromium** (total) was detected in one surface soil location at SWMU 31. The detection of chromium above the MSC at BHGLSWMU31001 was detected below the MSC in the corresponding SPLP extract, providing SWMU 31 with a site-specific MSC of 40.6 mg/kg for chromium. The detection of chromium at BHGLSWMU31001 is delineated to the north by BHGLSWMU31006; to the east by BHGLSWMU31005; to the south by BHGLSWMU31004, and to the west by BHGLSWMU31002.

- **Copper** was detected only in one surface sample (BHGLSWMU31002) but not in any of the subsurface samples. As no pattern of occurrence could be established and the detected

concentration of this compound was not indicative of a release, further delineation of copper was not warranted.

- **Lead** was detected in two surface soil locations at SWMU 31. The detections of lead above MSC at BHGLSWMU31001 (159 mg/kg) and BHGLSWMU31002 (58.5 mg/kg) are delineated to the north by BHGLSWMU31006; to the east by BHGLSWMU31005; to the south by BHGLSWMU31004; and to the west by BHGLSWMU31003. As both the BHGLSWMU31001 and BHGLSWMU31002 detections of lead in surface soil samples were above the MSC and the corresponding SPLP extracts were detected above the groundwater MSC, the areas around BHGLSWMU31001 and BHGLSWMU31002 were excavated during IRAs. Excavation contaminant intervals are highlighted in pink on Figure 4.12 and excavation sampling locations are depicted in Figures 4.13 and 4.14. Excavation confirmation results indicate that all lead-impacted soil has been removed from SWMU 31 surface soil. IRA results are presented in Appendix C

- **Mercury** was detected at a concentration of 0.57 mg/kg in one surface soil location at SWMU 31 (BHGLSWMU31001). This detection of mercury was above the MSC (0.2 mg/kg); however it was detected below the MSC in the corresponding extract, providing a site-specific MSC of 0.57 mg/kg for mercury at SWMU 31. This detection of mercury at BHGLSWMU31001 was removed during the IRA and is delineated to the north by BHGLSWMU31006; to the east by BHGLSWMU31005; to the south by BHGLSWMU31004; and to the west by BHGLSWMU31002.

- **Zinc** was only detected in the surface sample of BHGLSWMU31002 but not in any of the subsurface samples. As noted in Table 1.1, zinc was not a CoC stored at SWMU 31 and as such, the detection of zinc at BHGLSWMU31002 is considered a true but extreme variation of background. As a result, zinc was not delineated.

- **Acetone** was detected only in one surface sample (BHGLSWMU31002) but not in any of the subsurface samples. Acetone is also a common laboratory contaminant. As no pattern of occurrence could be established and the detected concentration of this compound was not indicative of a release, further delineation of acetone was not warranted.

- **MEK** was not verified in confirmation boring BHGLSWMU31003 and as such, further delineation was not warranted

- **PAHs** were detected in the surface soil of BHGLSWMU31001 and BHGLSWMU31002; however, PAHs were not detected in any of the subsurface samples at these locations. Since the surface samples at BHGLSWMU31001 and BHGLSWMU31002 were collected directly adjacent to an asphalt parking lot and road, the detections of PAHs are considered related to pieces of asphalt transported by surface water runoff and/or lawn mowing activities.

5.3.2 Subsurface Soil

No CoCs were identified in the subsurface soils at SWMU 31 following the initial RFI investigation. Only one constituent was detected in the subsurface soil at SWMU 31. A brief discussion of this analyte is given below.

- Mercury (0 2 mg/kg) was detected in the sample collected at the 15-foot interval of boring BHGLSWMU31002. However, since mercury was not detected the surface-, 5- and 10-foot intervals, this detection is not likely to be related to SWMU 31 activities Consequently, the delineation of mercury in the 15-foot interval of BHGLSWMU31002 will be addressed as part of the current RFI of SWMU 29/Landfill 2. No further subsurface soil sampling at this site is required.

5.3.3 Goundwater

All CoCs at SWMU 31 were identified in the surface soil samples only. As a result, a groundwater investigation at SWMU 31 was not conducted

5.4 SWMU 61 Analytical Results

5.4.1 Surface Soil

Nickel (14.7 mg/kg) was detected slightly above background (14.6 mg/kg) in the surface soil sample collected from boring BHGLSWMU61005 As this detection of nickel was not repeated in any of the other samples collected at SWMU 61, no pattern of occurrence could be established Based on this information, the detection of nickel was not indicative of a release from SWMU 61 and did not warrant further consideration.

Ethylene glycol (17 mg/kg) was detected above RRS 1 (5 mg/kg), but well below the MSC (20, 440 mg/kg) in the surface soil sample collected from boring BHGLSWMU61005. As this detection of ethylene glycol was not repeated in any of the other surface samples collected at SWMU 61, no pattern of occurrence could be established. Based on this information, the detection of ethylene glycol was not indicative of a release from SWMU 61 and did not warrant further consideration.

Several inorganic and organic CoCs were identified in the surface soil samples collected at SWMU 61. These CoCs include BTEX; cis-1,2-DCE; PCE; TCE; fluorene; and TPH as gasoline (C_6-C_{10}), as heavy/residual fuel oils (>C_{10}-C_{28}), and total petroleum hydrocarbons (PHC) (C_6-C_{28}).

Concentrations of BTEX, cis-1,2-DCE, PCE, TCE, and TPH were detected in the surface interval of boring BHGLSWMU61001. With the exception of PCE, none of these constituents were detected in any of the other surface or subsurface samples collected at the site. In addition, boring BHGLSWMU61001 was advanced over a small black stain at the surface of the unit. As these constituents are limited to the surface location of boring BHGLSWMU61001, no further sampling was conducted. However, excavation of this surface location and confirmation sampling for VOCs and TPH was performed (Figure 4.17 and Appendix C).

PCE was the only significant CoC detected in surface soil at SWMU 61. The delineation of PCE was the main focus of the Phase II and III investigation activities A brief discussion of PCE is given below.

- PCE was detected at concentrations slightly above RRS 1 in nine surface soil samples collected at SWMU 61. PCE detections at BHGLSWMU61001 through BHGLSWMU61004 and BHGLSWMU61006 through BHGLSWMU61009 are delineated to the north by BHGLSWMU61013 and BHGLSWMU61014; to the east by BHGLSWMU61010, WHGLTA034, and BHGLSWMU61011; to the south by WHGLTA035 and BHGLAOC006003; and to the west by BHGLSWMU61005. As the detection of PCE at BHGLSWMU6101 was above MSC, the area around BHGLSWMU6101 was excavated in an IRA Excavation contaminant intervals are highlighted in pink on Figure 4.16, and the excavation sampling locations are depicted in Figure 4.17. In addition, all CoCs were removed during the IRA excavation activities with confirmation sampling showing delineation to RRS 1 both aerially and vertically. IRA results are presented in Appendix C.

5.4.2 Subsurface Soil

A total of two constituents were identified in the subsurface soils at SWMU 61 following the initial RFI investigation. A brief discussion of each analyte is given below.

- **Ethylene glycol** (28 mg/kg) was encountered in the 5-foot interval of BHGLSWMU61003. Since ethylene glycol was detected above RRS 1 in only one subsurface sample, no pattern of occurrence could be established. In addition, the concentration detected for this compound was not significantly above the RRS 1 of 5 mg/kg and was well below the MSC of 20,440 mg/kg Based on this information, the detection of ethylene glycol is not indicative of a release from SWMU 61 and did not warrant further consideration.

- **PCE** was the only CoC detected in subsurface characterization samples at SWMU 61. PCE was detected at concentrations above RRS 1 in the 5-foot intervals of borings BHGLSWMU61001 through BHGLSWMU61004 (Figure 4.16). Subsurface samples were collected from the 5-foot intervals of all eight Phase II delineation borings, BHGLSWMU61006 through BHGLSWMU61011, WHGLTA034, and WHGLTA035. The Phase II soil samples were successful in delineating PCE to the north, east, southeast, and west of the unit. The Phase III soil sample collected at the 5-foot interval of BEEGSWMU61012 completed the delineation of PCE in subsurface soil to the south of SWMU 61.

5.4.3 Goundwater

Groundwater samples collected from the existing upgradient monitoring well WITCTA034, and the new downgradient monitoring wells, WHGLTA034 and WHGLTA035 were analyzed for

PCE and TCE[1]. A total of four rounds of groundwater samples were collected from both new and existing monitoring wells at SWMU 12. Groundwater samples were collected during sampling events from each monitoring well as follows:

- Round 1 (March 2000) – WITCTA034
- Round 2 (June 2000) – WHGLTA034, WHGLTA035
- Round 3 (October 2000) – WITCTA034, WHGLTA034, WHGLTA035
- Round 4 (June 2001) – SD13-05, WITCTA034, WHGLTA034, WHGLTA035
- Round 5 (November 2001) – SD13-05, WITCTA034, WHGLTA034, WHGLTA035

Concentrations of TCE were either below RRS 1 or not detected in all of the groundwater samples collected at SWMU 61; PCE was the only constituent detected in any of the SWMU 61 groundwater samples. A brief discussion of PCE is given below.

- **PCE** was not detected in downgradient monitoring wells WHGLTA034 and WHGLTA035 in any groundwater sampling round. PCE was detected at MSC concentrations in the groundwater samples collected from the upgradient-monitoring well WITCTA034 in Rounds 1 and 3; however, PCE was not detected above RRS 1 in any of the subsequent groundwater sampling rounds. In addition, no concentration of PCE was detected in the groundwater sample collected from upgradient monitoring well SD13-05 (Figure 4.18) during Round 4 As PCE was not detected in the last 2 rounds of groundwater sampling at upgradient-monitoring well WITCTA034, and PCE was not detected in all four rounds of groundwater sampling at downgradient-monitoring wells WHGLTA034 and WHGLTA035, further groundwater sampling for PCE at SWMU 61 is not recommended

[1] TCE was not sampled for in the initial groundwater sample collected from WITCTA034.

TAB

SECTION 6.0

6.0 Conclusions and Recommendations

6.1 SWMUs 5 and 6

Field observations and analytical results indicate that SWMUs 5 and 6 may have had an impact on the surrounding environment. Although one detection of lead above RRS 2 in the subsurface soil failed SPLP, this detection of lead was located under a concrete cover approximately 1-foot in thickness. This cover effectively prevents the migration of precipitation through the 5-foot interval containing the concentration of lead exceeding the MSC value. In addition, lead was not detected in groundwater downgradient of the site. Consequently, the detection of lead in the 5-foot interval of boring BHGLSWMU05003 is not deemed a threat to human health or the environment. As such, removal of the lead contaminated soil was not necessary. Concentrations in the subsurface soil of arsenic, barium, cobalt, and lead that exceeded MSC were subsequently detected below the MSC in the corresponding SPLP extracts. All detections of these analytes are at or below the site-specific MSCs. Detections of arsenic, barium, cobalt, and lead have been delineated to decreasing concentrations or to RRS 1 values and do not pose a potential threat to groundwater.

No concentrations of SWMU 5 and 6 CoCs were detected in the groundwater collected from a monitoring well located directly in the center of SWMU 6 (LSA1628-3). However, arsenic was detected at low MSC concentrations in monitoring well LSA1628-2, located downgradient of SWMUs 5 and 6 (Figure 4.3). It should be noted that LPST site 106684 is located directly between SWMUs 5 and 6 and the downgradient-monitoring wells. The LPST site has had a release of petroleum hydrocarbons into the subsurface soil and groundwater. This release occurred in the downgradient direction from SWMUs 5 and 6, but upgradient from monitoring well LSA1628-2 (ENSR, 1998). It is likely that the arsenic concentrations present in groundwater samples collected from this well are a result of this release. Geochemical changes occur when petroleum hydrocarbons naturally biodegrade in the subsurface resulting in natural occurrences of metals, including iron, manganese, and arsenic, being released into solution (IRTC, 1998). Therefore the arsenic concentrations detected in groundwater samples collected from LSA1628-2 are not a result of past site activities at SWMUs 5 and 6.

The washrack and drain previously comprising SWMU 6 no longer exists. All wastes stored at SWMU 5 are enclosed in a permitted HW storage shed under Navy management. Based on the results of this RFI, SWMUs 5 and 6 do not appear to present a threat to human health or the environment since all analytes detected at the site are currently below site-specific MSCs and a 1-foot concrete cover protects the sole detection of lead above MSC. In addition, all CoCs are delineated to decreasing concentrations and/or RRS 1 at SWMUs 5 and 6.

Pursuant with Chapter 335, Subchapter S, and Sections 335.555 through 335.560 of the TNRCC RRS, the conditions for applying RRS 2 (Closure/Remediation to Health-based Standards and Criteria) have been achieved, and closure of SWMUs 5 and 6 soils is recommended with no release to groundwater. Analytes to be included in the RRS 2 deed certification include arsenic, barium, cobalt, and lead. Should this RFI Report be accepted, a letter stating that closure of SWMU 5 and 6 was carried out in accordance with Section 335.555, signed by the AFCEE representative, will be transmitted to TNRCC, along with a metes and bounds description of

SWMU 5 and 6. The metes and bounds description will correspond to the surveyed coordinates of the affected area shown in Figure 6.1. The draft deed certification language is provided in Appendix H.

6.2 SWMU 12

Field observations and analytical results indicate that SWMU 12 may have had an impact on the surrounding environment. IRAs were conducted to remove all analytical concentrations in site soils exceeding MSC, and all analytes are delineated to background or decreasing concentrations. Concentrations in the surface and subsurface soil of arsenic, cadmium, and lead that exceeded MSC were subsequently detected below the MSC in the corresponding SPLP extracts. All detections of these analytes are at or below the site-specific MSCs. Detections of arsenic, cadmium, and lead have been delineated to decreasing concentrations or to RRS 1 and do not pose a potential threat to groundwater. All elevated concentrations of benzene, PAHs, and TPH in the surface and subsurface soils have been removed in IRAs, are below site-specific MSCs, and delineated to below RRS 1 or decreasing concentrations.

Concentrations of antimony, copper, iron, and manganese were detected just above respective RRS 1 values in upgradient monitoring well WEEGTA001 and downgradient monitoring wells WEEGTA002 and WHGLTA028 (iron and manganese only) Silver was also detected just above RRS 1 values in WEEGTA002. The detections of antimony, copper, and silver were well below the corresponding MSC values, and since these compounds were detected sporadically just above background concentrations they do not demonstrate a pattern of release. Iron was also detected above RRS 1; however, this compound does not have a MSC value and is not considered a risk to human health (TNRCC, December 2001). Arsenic and benzene were detected at concentrations above RRS 1, but below MSC, in the upgradient monitoring well WEEGTA001, the cross-gradient monitoring well WCHMHTA012, and both downgradient monitoring wells WEEGTA002 and WHGLTA028. As the detections of arsenic coincided with detections of benzene, the detections of arsenic are most likely associated with the benzene concentrations in the groundwater. Benzene and arsenic are both detected in the upgradient monitoring well WEEGTA001, as well as the cross- and downgradient monitoring wells. The petroleum contaminated soil was removed from SWMU 12 and consequently the detections of benzene in the groundwater are decreasing in concentration. In addition, the detections of arsenic in the soil at SWMU 12 are below the site-specific MSC and therefore protective of groundwater. Based on this information, it does not appear the soils at SWMU 12 are continuing to contribute to the benzene in the groundwater. It should be noted that the basewide TCE plume flows directly beneath SWMU 12, accounting for the concentrations of TCE, PCE, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride detected in the groundwater at SWMU 12.

No wastes are currently stored at SWMU 12. It is believed, based on the results of this RFI, that SWMU 12 does not present a threat to human health or the environment since all analytes detected at the site are currently below site-specific MSCs. In addition, all CoCs are delineated to decreasing concentrations and/or RRS 1 at SWMU 12.

Pursuant with Chapter 335, Subchapter S, and Sections 335.555 through 335.560 of the TNRCC RRS, the conditions for applying RRS 2 (Closure/Remediation to Health-based Standards and

Criteria) have been achieved, and closure of SWMU 12 soils and groundwater. Analytes to be included in the RRS 2 deed certification survey include arsenic, lead, benzene, 2-methylnaphthalene, acenaphthene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, chrysene, fluoranthene, fluorene, indeno(1,2,3-c,d)pyrene, naphthalene, phenanthrene, pyrene, and TPH. Should this RFI Report be accepted, a letter stating that closure of SWMU 12 was carried out in accordance with Section 335.555, signed by the AFCEE representative, will be transmitted to TNRCC, along with a metes and bounds description of SWMU 12. The metes and bounds description will correspond to the surveyed coordinates of the affected area shown in Figure 6.2 Draft deed certification text is presented in Appendix H.

6.3 SWMU 31

Field observations and analytical results indicate that SWMU 31 may have had an impact on the surrounding surface soil but did not have an impact on subsurface soil. Concentrations of barium, cadmium, chromium (total), and mercury detected above the MSC were detected below the MSC in the corresponding SPLP extracts These constituents have been delineated to RRS 1 and do not pose a potential threat to groundwater. However, detections of lead above the MSC at two locations were also detected above the MSC in the corresponding SPLP extracts. As a result, two IRA excavations to remove lead-impacted soils above MSC and other CoCs were completed. Excavation confirmation results indicate that all concentrations of lead, barium, cadmium, chromium, mercury, zinc, MEK, and benzene above RRS 1 have been removed from SWMU 31 surface soil. In addition, all detections of lead and other CoCs were delineated to below RRS 1 both vertically and aerially at SWMU 31. The delineation of mercury in the 15-foot interval of BHGLSWMU31002 will be addressed as part of the current RFI of SWMU 29/Landfill 2.

No wastes are currently stored at SWMU 31. It is believed, based on the results of this RFI, that SWMU 31 does not present a threat to human health or the environment as all analytes detected at the site are currently below background and are delineated to RRS 1. All lead- and CoC-impacted soil with detections above RRS 1 and MSC has been removed from SWMU 31 with confirmation both aerially and vertically.

Pursuant with Chapter 335, Subchapter S, and Sections 335.555 through 335 560 of the TNRCC RRS, the conditions for applying RRS 1 (Closure/Remediation to Health-based Standards and Criteria) have been achieved, and clean closure of SWMU 31 is recommended with no release to soil or groundwater.

6.4 SWMU 61

Field observations and analytical results indicate that storage practices at SWMU 61 may have had an impact on soil in the vicinity of unit. Concentrations of PCE, BTEX. cis-1,2-DCE, TCE, fluorine, and TPH as gasoline (C_6-C_{10}), as heavy/residual fuel oils (>C_{10}-C_{28}), and total PHC (C_6-C_{28}) were detected in the surface soil of SWMU 61. However, with the exception of PCE, all of these constituents were limited to a small area of stained soil at the surface of the unit. As PCE was detected at multiple locations in surface and subsurface as well as groundwater, PCE was the most significant CoC detected at SWMU 61.

The highest and only detection of PCE above RRS 2 occurred in the surface soil in one location. This detection was in the same boring and sampling interval as the detections of BTEX, cis-1,2-DCE, TCE, fluorine, and TPH. None of these CoCs, with the exception of PCE, were detected in subsurface soil or in the groundwater. As a result, an IRA excavation for PCE and the other CoCs was completed at this surface location. Excavation confirmation results indicate that all soils impacted with concentrations of PCE above MSC and concentrations of other CoCs above RRS 1 and MSC have been removed from SWMU 61 soil, and all remaining detections of PCE have been delineated to RRS 1 in soil both aerially and vertically.

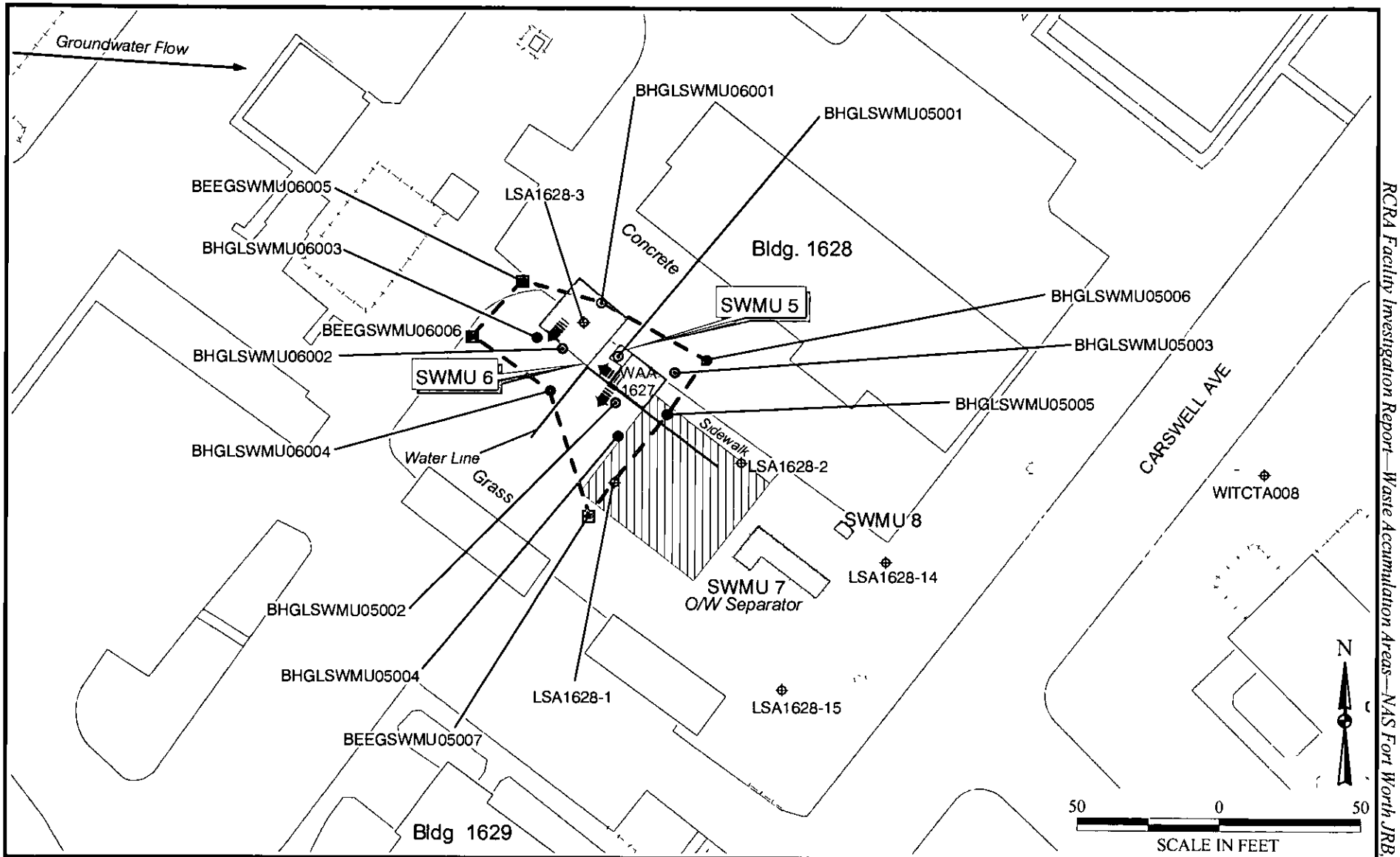
The concentrations of PCE detected in the groundwater in the area of SWMU 61 were below MSC and only detected sporadically in an upgradient monitoring well (WITCTA034). No CoCs were detected in the groundwater samples collected from the two downgradient monitoring wells. Therefore based on the results of the groundwater sampling conducted at SWMU 61, low levels of PCE in the soil at SWMU 61 do not appear to present a threat to groundwater.

Wastes stored at SWMU 61 are enclosed in a permitted HW storage area under Navy management. Based on the results of this RFI, SWMU 61 does not present a threat to human health or the environment as all analytes detected at the site are currently below site-specific MSCs and are delineated to RRS 1.

Pursuant with Chapter 335, Subchapter S, and Sections 335.555 through 335.560 of the TNRCC RRS, the conditions for applying RRS 2 (Closure/Remediation to Health-based Standards and Criteria) have been achieved, and closure of SWMU 61 soils with no release to groundwater is recommended. Analytes to be incorporated in the RRS 2 deed certification survey include only PCE as all other CoCs were removed during the IRA excavation activities. Should this RFI Report be accepted, a letter stating that closure of SWMU 61 was carried out in accordance with Section 335.555, signed by the AFCEE representative, will be transmitted to TNRCC, along with a metes and bounds description of SWMU 61. The metes and bounds description will correspond to the surveyed coordinates of the affected area shown in Figure 6 3. Draft deed certification text is provided in Appendix H.

Figures

Figure 6 1 SWMUs 5 and 6—Proposed Metes and Bounds
Figure 6 2 SWMU 12—Proposed Metes and Bounds
Figure 6.3 SWMU 61—Proposed Metes and Bounds



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Revised 03/20/02 tbraswell
Map Source HydroGeoLogic, Inc.
GIS Database 2002

ELLIS ENVIRONMENTAL GROUP, LC

HYDRO GeoLogic INC

Legend

- Solid Waste Management Unit (SWMU)
- Waste Accumulation Area (WAA)
- Former UST Site
- Phase I Soil Boring Location
- Phase II Soil Boring Location
- Phase III Soil Boring Location
- Monitoring Well
- Surface Runoff
- Proposed Metes and Bounds

Figure 6.1
Proposed Metes and Bounds
SWMUs 5 and 6

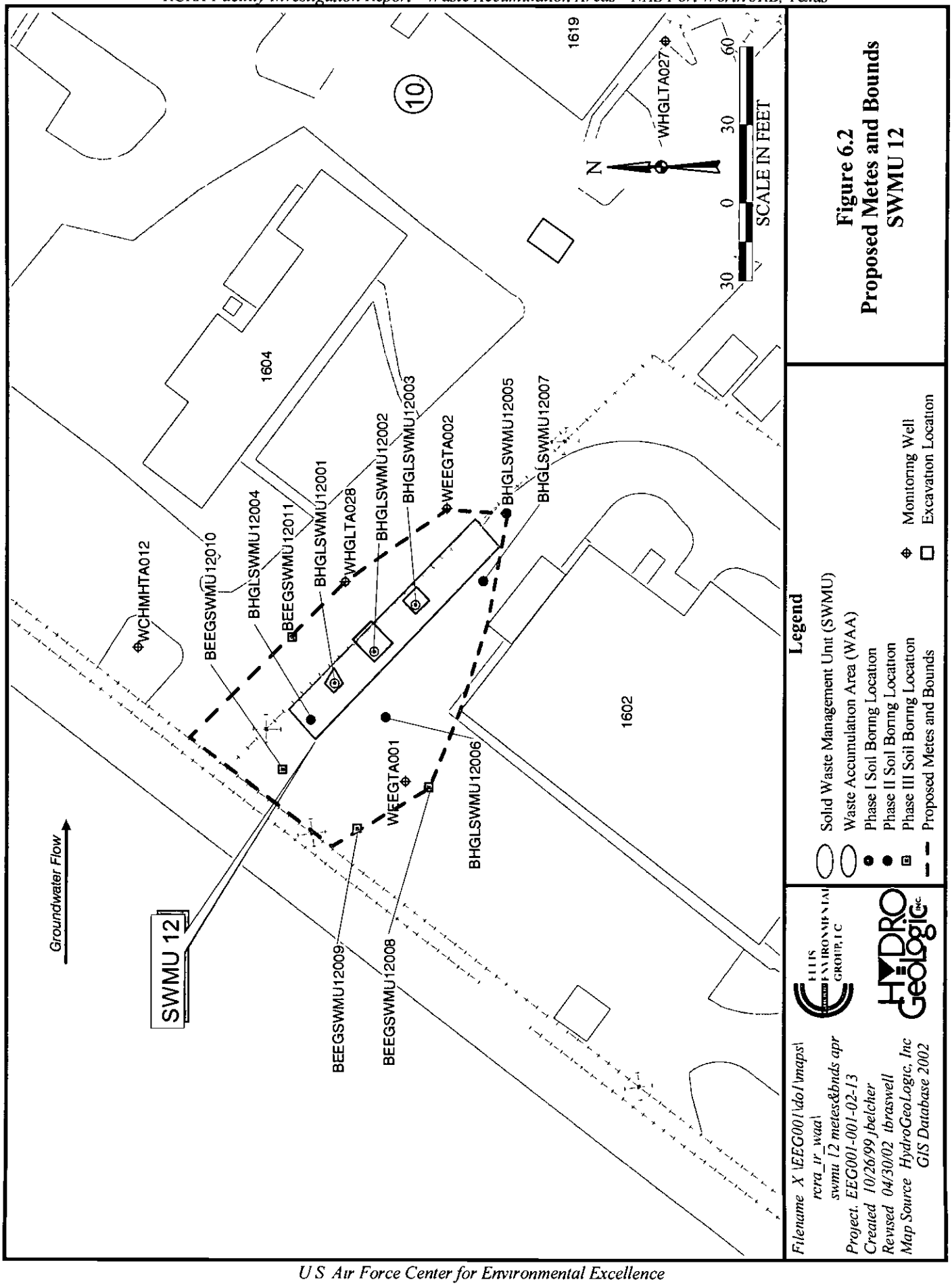

Figure 6.2
Proposed Metes and Bounds
SWMU 12

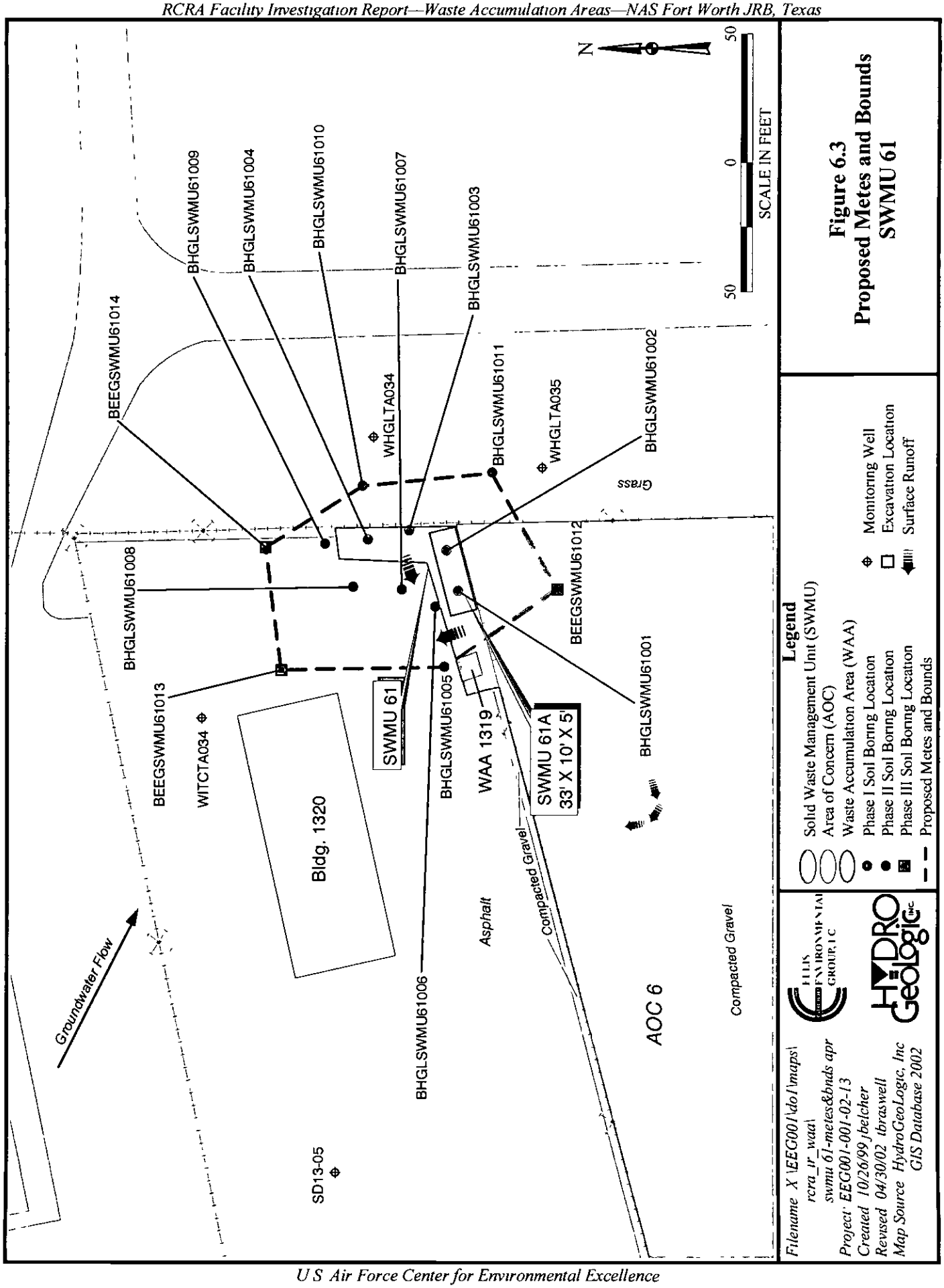

Figure 6.3
Proposed Metes and Bounds
SWMU 61

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SECTION 7.0

7.0 References

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Table 3.5 SPLP Results and Site-Specific MSCs—SWMU 29/Landfill 2—NAS Fort Worth JRB, Texas
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Table 4.2 Surface Soil Detections, SWMUs 5 and 6—NAS Fort Worth JRB, Texas
Table 4 3 Subsurface Soil Detections, SWMUs 5 and 6—NAS Fort Worth JRB, Texas
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Table 4 5 Surface Soil Detections, SWMU 12—NAS Fort Worth JRB, Texas
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Table 4.12 RFI Groundwater Results, SWMU 61—NAS Fort Worth JRB, Texas

Table 1.1
Current SWMU Summary
NAS Fort Worth JRB, Texas

SWMU/ WAA	Waste Source:	Operational Period	Materials Received	Status
SWMU 5 WAA 1627	Building 1628 - Corrosion Control Shop AGE Maintenance Shop	Approx. 1982 - Present	PD-680 (Type II) (petroleum naptha solvent)(660 gal/yr) - drummed JP-4 (2,500 gal/yr) - drummed Synthetic oil (150 gal/yr) – drummed 7808 engine oil (1,000 gal/yr) – 500-gallon bowser Hydraulic, transmission, and brake fluids (120 gal/yr) – bowser Antifreeze (60 gal/yr) - drummed Paints and thinners (toluol [toluene], methyl ethyl ketone (MEK), isopropanol, naphtha, xylene)(120 gal/yr) - drummed Paint stripper (methylene chloride, toluene) (110 gal/yr) – drummed Spent lead acid batteries (unspecified amount) – pallet Mean Green Soap (aircraft soap) (660 gal/yr) - OWS MEK (12 gal/yr) - used in process	New walls were added to the former storage shed, which is now used by the 301st Air Reserve.
SWMU 6	Building 1628 - Washrack and Drain	1979 – Approx. 1990	Mean Green Soap (aircraft soap) (660 gal/yr) – OWS PD-680 (Type II) (petroleum naptha solvent)(300 gal/yr) – OWS Wastewater containing fractions of: JP-4, waste paints and thinners, hydraulic fluids, engine oil (unspecified amount) - OWS May have received runoff from SWMU 5: PD-680 (Type II) (petroleum naptha solvent)(660 gal/yr) - drummed JP-4 (2,500 gal/yr) - drummed Synthetic oil (150 gal/yr) – drummed 7808 engine oil (1,000 gal/yr) – 500-gallon bowser Hydraulic, transmission, and brake fluids (120 gal/yr) – bowser Antifreeze (60 gal/yr) - drummed Paints and thinners (toluol [toluene], methyl ethyl ketone (MEK), isopropanol, naphtha, xylene)(120 gal/yr) - drummed Paint stripper (methylene chloride, toluene) (110 gal/yr) – drummed Spent lead acid batteries (unspecified amount) – pallet Mean Green Soap (aircraft soap) (660 gal/yr) - OWS MEK (12 gal/yr) - used in process	The washrack and drain no longer exist at the site.

Table 1.1 (continued)
Current SWMU Summary
NAS Fort Worth JRB, Texas

SWMU/ WAA	Waste Source:	Operational Period	Materials Received	Status
SWMU 12	Building 1602 - Propulsion Shop	Approx. 1982 - 1990	Waste JP-4 (84 gal/yr) - drummed 7808 engine oil (84 gal/yr) - drummed PD-680 (Type II) (petroleum naptha solvent) (60 gal/yr) – drummed	The concrete pad under the storage area no longer exists. No waste is currently stored in this area.
SWMU 31	Building 1050 - Pneudraulics Shop Building 1050 - Fire Control Shop	1955 - 1990	Waste hydraulic fluid and oil (120 gal/yr) - drummed PD-680 (Type II) (petroleum naptha solvent)(150 gal/yr) - drummed MEK (unspecified amount) – unspecified container TCE (unspecified amount) – unspecified container Perchloroethylene (unspecified amount) – unspecified container SE-377C (solvent) contaminated with cadmium (unspecified amount) – unspecified container Citri-Kleen (solvent) (unspecified amount) – unspecified container Silicone damping fluid contaminated with Freon 113 (unspecified amount) – unspecified container	No waste is currently stored in the area. A roof has been erected over the concrete pad, which serves as a base for a picnic table.
SWMU 61 WAA 1319	Building 1320 – Power Production Maintenance Facility	Approx. 1982 – 1990	Waste gasoline and diesel fuel (108 gal/yr) – drummed 7808 engine oil (156 gal/yr) – bowser PD-680 (Type II) (108 gal/yr) – drummed Antifreeze (156 gal/yr) - drummed Battery acid (360 gal/yr) – DRMO Hard material similar to roofing tar (unspecified amount) - bucket	Waste is currently stored outside, within the former storage area next to Building 1319.

Sources:
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Table 3.1
1993 Subsurface Soil Sampling Results
LPST Site 106684
NAS Fort Worth JRB, Texas

Analyte	Method	Background (mg/kg)	RRS 2 (mg/kg)	LSA1628-1						LSA1628-2		LSA1628-3	
				FS-1 5-8' (mg/kg)	FS-1QC 5-8' (mg/kg)	FS-1QA 5-8' (mg/kg)	FS-2 11.5-13' (mg/kg)	FS-2QC 11.5-13' (mg/kg)	FS-2QA 11.5-13' (mg/kg)	FS-1 5-8' (mg/kg)	FS-2 10-13' (mg/kg)	FS-1 5-9.5' (mg/kg)	FS-2 10-11.5' (mg/kg)
Fluorene	SW8310	PQL	409	1.24	ND	ND	ND	ND	ND	ND	0.673	ND	ND
Fluoranthene	SW8310	PQL	409	ND	ND	ND	ND	ND	ND	0.292	ND	ND	ND
Naphthalene	SW8310	PQL	409	3.54	ND	ND	1 43	ND	0.230 J	1 7	1.92	ND	ND
Phenanthrene	SW8310	PQL	310	0.597	ND	ND	ND	ND	0.060 J	0.726	ND	ND	ND
Benzene	SW8020	PQL	0.5	(2)	(4.6)	(6 57)	0.29	ND	ND	0.27	(0.56)	ND	ND
Ethylbenzene	SW8020	PQL	70	12	17	27.7	0.39	ND	ND	1 3	ND	ND	ND
Toluene	SW8020	PQL	100	30	46	60.2	2	ND	ND	2 3	7 7	ND	ND
Xylenes	SW8020	PQL	1000	65	86	131	1.9	ND	ND	8	15	0.0059	ND
MTBE	SW8020	NV	NV	ND	ND	3.81	ND	ND	ND	ND	ND	ND	ND
TPH	418.1	NV	NV	0.184	ND	ND	0.047	ND	ND	4.87	0 136	ND	ND

Notes
Values above background are bold.
Values above RRS 2 are bolded and enclosed in ( ).
PQL = practical quantitation limit
NA = Not analyzed
ND = Not detected
NV = No value
J = Estimated quantitation based upon QC criteria
Source LSA, Building 1628 (LPST ID No 106684), USACE-Ft Worth District, February 1994

Table 3.2
1993 Groundwater Sampling Results
LPST Site 10684
NAS Fort Worth JRB, Texas

Analyte	Method	Background (mg/L)	RRS2 (mg/L)	LSA1628-1 (mg/L)	LSA1628-2 (mg/L)	LSA1628-3 (mg/L)
Naphthalene	SW8310	PQL	409	ND	**0.0047 J**	ND
Acenaphthylene	SW8310	NV	NV	0 038	ND	ND
Acenaphthene	SW8310	NV	2.19	0 073	ND	ND
Benzo(a)anthracene	SW8310	PQL	0.0004	**(0.00073)**	ND	ND
Benzene	SW8240	PQL	0 005	**(7.77)**	**(1.55)**	ND
trans-1,2-Dichloroethene	SW8240	PQL	0 1	ND	ND	**0.04**
trans-1,3-Dichloropropene	SW8240	NV	NV	ND	0.02	ND
Ethyl benzene	SW8240	PQL	0.7	**(2.81)**	**0.378**	ND
Toluene	SW8240	PQL	1	**(24.3)**	**0.035**	ND
Trichloroethene	SW8240	PQL	0.005	ND	**(0.031)**	**(0.131)**
Vinyl Chloride	SW8240	PQL	0.002	ND	**(0.022)**	ND
Xylenes (total)	SW8240	PQL	10	**(12.3)**	**0.542**	ND
MTBE	SW8240	NV	NV	0 45	ND	ND
TPH	418.1	NV	NV	0 0163	0.00398	ND
Total Dissolved Solids	160 1	NV	NV	NA	NA	814

Notes:
Values above background are bold
Values above RRS 2 are bolded and enclosed in ( )
PQL = practical quantitation limit
NA = Not analyzed
ND = Not detected
NV = No value.
J = Estimated quantitation based upon QC criteria
Source: LSA, Building 1628 (LPST ID No 106684), USACE-Ft Worth District, February 1994

Table 3.3
1995 Groundwater Sampling Results
LPST Site 106684
NAS Fort Worth JRB, Texas

Analyte	Method	Background (mg/L)	RRS 2 (mg/L)	LSA1628-1 June 1995 (mg/L)	LSA1628-1 July 1995 (mg/L)	LSA1628-2 June 1995 (mg/L)	LSA1628-2 July 1995 (mg/L)	LSA1628-3 June 1995 (mg/L)	LSA1628-3 July 1995 (mg/L)
Barium	SW6010	0 587	2	0 3	0 244	**0.67**	0 5	0 39	0.412
Calcium	SW6010	266 3	NA	75	74.7	77	68 9	110	112
Iron	SW6010	0 2239	0 3	**(9)**	**(7.84)**	**(8.2)**	**(7.86)**	**(2.8)**	**(3.82)**
Magnesium	SW6010	37 8	NA	20	19 8	17	16	14	14 3
Manganese	SW6010	0 175	2 4	**0.63**	**0.621**	**0.38**	**0.367**	**(2.8)**	**2.25**
Potassium	SW6010	15 03	NA	2 9	3 44	1 7	1 38	1 3	1 39
Sodium	SW6010	167 2	NA	130	128	**180**	**186**	57	68 7
Zinc	SW6010	0 0123	0 71	ND	ND	0.01	ND	**0.013**	ND
Arsenic	SW7060	0 0049	0 05	**0.048**	0 0464	**0.039**	**(0.0503)**	0 016	**0.0216**
Lead	SW3005M/7421	0 0016	0 015	**(0.031)**	**(0.0254)**	**(0.017)**	ND	ND	ND
Benzene	SW8240	PQL	0 005	**(5.8)**	**(4.48)**	**(1.4)**	**(1.81)**	ND	**0.00385 JQ**
Ethylbenzene	SW8240	PQL	0 7	**0.68**	**(1.11)**	**0.21**	**0.231**	ND	**0.00321 JQ**
Methylene chloride	SW8240	PQL	0 005	ND	**(0.233 JQ)**	ND	**(0.0257 JQ)**	ND	**(0.018)**
Toluene	SW8240	PQL	1	**(12)**	**(121)**	**0.018 JQ**	**0.0139 JQ**	ND	**0.00857**
Trichloroethene	SW8240	PQL	0 005	ND	ND	**(0.054)**	ND	**(0.390 J)**	**(0.0823)**
Xylenes (total)	SW8240	PQL	10	**5.8**	**7.99**	**0.26**	**0.257**	ND	**0.00853**
cis-1,2-Dichloroethene	SW8240	PQL	0 07	ND	ND	ND	**0.0122 JQ**	**0.062**	**0.0163**
trans-1,2- Dichloroethene	SW8240	PQL	0 1	ND	ND	**0.033 JQ**	**0.0293 JQ**	**0.017**	**0.00901**
2-Methylnapthalene	SW8270/SW3520	NV	NV	0 48	0 269 JQ	2 1	0.404 JQ	ND	ND
Acenaphthene	SW8270/SW3520	NV	2 19	ND	ND	0 11 JQ	ND	ND	ND
Butyl benzyl phthalate	SW8270/SW3520	NV	NV	ND	0 331 JQ	ND	0 332 JQ	ND	0 00882 JQ
Di-n-butylphthalate	SW8270/SW3520	PQL	3 65	ND	ND	ND	ND	**0.00057 JB**	ND
Di-n-octylphthalate	SW8270/SW3520	PQL	0 73	**0.017 JQ**	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	SW8270/SW3520	PQL	0 006	ND	**(2.27)**	ND	**(2.33)**	ND	**0.00252 JQ**
Fluorene	SW8270/SW3520	PQL	1 46	ND	ND	**0.12 JQ**	ND	ND	ND
Fluroanthene	SW8270/SW3520	PQL	1 46	**0.045 JQ**	ND	ND	ND	ND	ND
Naphthalene	SW8270/SW3520	PQL	1 46	**0.8**	**0.559**	**1.4**	**0.205 JQ**	ND	ND
Phenanthrene	SW8270/SW3520	PQL	3 1	**0.0081 JQ**	ND	ND	ND	ND	ND

Notes
Values above background are **bold**
Values above RRS 2 are **bolded** and enclosed in ( )
NA = Not analyzed
ND = Not detected
NV = No value

J = Estimated quantitation based upon QC criteria
JB = Estimated quantitation. possibly biased high or a false positive based upon blank information
JQ = Estimated quantitation detected below the PQL (Law Engineering, 1995)
PQL= practical quantitation limit
Source LSA, Building 1628 (LPST ID No. 106684), USACE-Ft Worth District, February 1994

Table 3.4
1998 Groundwater Remedial Action Sampling Results
Building 1628
NAS Fort Worth JRB, Texas

Analyte	Method	Background (mg/L)	RRS 2 (mg/L)	LSA1628-1		LSA1628-2		LSA1628-3	
				June 1998 (mg/L)	Sept. 1998 (mg/L)	June 1998 (mg/L)	Sept. 1998 (mg/L)	June 1998 (mg/L)	Sept. 1998 (mg/L)
Benzene	SW8260	PQL	0.005	**(0.701)**	**(1.69)**	**(0.116)**	**(0.0303)**	ND	ND
Toluene	SW8260	PQL	1	**(1.83)**	**(3.7)**	ND	**0.00501**	ND	ND
Ethylbenzene	SW8260	PQL	0.7	**(0.748)**	**(1.22)**	ND	**0.00607**	ND	ND
Xylene (total)	SW8260	PQL	10	**3.839**	**8.92**	ND	**0.0107**	ND	ND
Acetone	SW8260	PQL	NV	ND	**0.0865**	ND	ND	ND	ND
Carbon disulfide	SW8260	PQL	NV	**0.00934**	ND	ND	ND	ND	ND
Chloroethane	SW8260	PQL	0.73	ND	ND	**0.00261**	ND	ND	ND
cis-1,2-Dichloroethene	SW8260	PQL	0.07	**0.028**	**0.0219**	**0.0216**	**0.00932**	**(0.0713)**	**(0.0933)**
trans-1,2-Dichloroethene	SW8260	PQL	0 1	**0.0248**	**0.0196**	**0.0251**	**0.00633**	**0.0554**	ND
2-Hexane	SW8260	PQL	NV	**0.0838**	ND	ND	ND	ND	ND
Trichloroethene	SW8260	PQL	0.005	**(0.0941)**	**(0.0765)**	**(0.0606)**	**(0.0229)**	**(0.386)**	**(0.36)**
Vinyl chloride	SW8260	PQL	0 002	ND	ND	**(0.0115)**	**(0.00604)**	ND	ND
Benzo(a)anthracene	SW8310	PQL	0.0004	ND	**(0.00312)**	ND	ND	ND	**0.000164**
Benzo(b)fluoranthene	SW8310	PQL	0 0004	ND	**(0.00254)**	ND	**(0.00052)**	ND	ND
Benzo(k)fluoranthene	SW8310	PQL	NV	ND	**0.00895**	ND	**0.000512**	ND	ND
Benzo(a)pyrene	SW8310	PQL	0.0002	ND	**(0.002)**	ND	**(0.0004)**	ND	ND
Chrysene	SW8310	PQL	0 039	ND	ND	**0.0096**	ND	ND	ND
Fluoranthene	SW8310	PQL	1.46	ND	**0.00552**	ND	ND	ND	ND
Naphthalene	SW8310	PQL	1.46	**0.024**	**0.0296**	**0.023**	ND	ND	ND
Pyrene	SW8310	PQL	1.1	ND	**0.00372**	ND	ND	ND	ND
TPH (C6-C10)	TX1005	PQL	5*	**(15.2)**	**(19)**	ND	ND	ND	ND
TPH (>C10-C28)	TX1005	PQL	5*	ND	**(11.3)**	**(8.5)**	ND	ND	ND
TPH (C6-C28)	TX1005	PQL	5*	**(15.2)**	**(30.3)**	**(8.5)**	ND	ND	ND

Table 3.4 (continued)
1998 Groundwater Remedial Action Sampling Results
Building 1628
NAS Fort Worth JRB, Texas

Analyte	Method	Background (mg/L)	RRS 2 (mg/L)	LSA1628-14		LSA1628-15	
				June 1998 (mg/L)	Sept. 1998 (mg/L)	June 1998 (mg/L)	Sept. 1998 (mg/L)
Benzene	SW8260	PQL	0.005	**(0.0154)**	**(0.0271)**	ND	ND
Toluene	SW8260	PQL	1	NA	NA	NA	NA
Ethylbenzene	SW8260	PQL	0.7	NA	NA	NA	NA
Xylene (total)	SW8260	PQL	10	NA	NA	NA	NA
Acetone	SW8260	PQL	NV	NA	NA	NA	NA
Carbon disulfide	SW8260	PQL	NV	NA	NA	NA	NA
Chloroethane	SW8260	PQL	0.73	NA	NA	NA	NA
cis-1,2-Dichloroethene	SW8260	PQL	0.07	**0.0171**	**0.0186**	**0.0474**	**(0.0715)**
trans-1,2-Dichloroethene	SW8260	PQL	0.1	**0.0124**	**0.011**	**0.057**	**0.0522**
2-Hexane	SW8260	PQL	NV	NA	NA	NA	NA
Trichloroethene	SW8260	PQL	0 005	**(0.0699)**	**(0.0696)**	**(0.144)**	**(0.325)**
Vinyl chloride	SW8260	PQL	0.002	NA	NA	NA	NA
Benzo(a)anthracene	SW8310	PQL	0.0004	NA	NA	NA	NA
Benzo(b)fluoranthene	SW8310	PQL	0 0004	NA	NA	NA	NA
Benzo(k)fluoranthene	SW8310	PQL	NV	NA	NA	NA	NA
Benzo(a)pyrene	SW8310	PQL	0 0002	NA	NA	NA	NA
Chrysene	SW8310	PQL	0.039	NA	NA	NA	NA
Fluoranthene	SW8310	PQL	1.46	NA	NA	NA	NA
Naphthalene	SW8310	PQL	1 46	NA	NA	NA	NA
Pyrene	SW8310	PQL	1.1	NA	NA	NA	NA
TPH (C6-C10)	TX1005	PQL	5*	NA	NA	NA	NA
TPH (>C10-C28)	TX1005	PQL	5*	NA	NA	NA	NA
TPH (C6-C28)	TX1005	PQL	5*	NA	NA	NA	NA

Notes
Groundwater action level for coarse-grained soils (TNRCC RG-17).
Values above background are **bold**
Source September 1998 Quarterly Groundwater Monitoring Data, Bldg.1628 (ENSR, 1998)

Values above RRS 2 are **bolded** and enclosed in ( )
NA = Not Analyzed.
ND = Not detected.
PQL = practical quantitation limit

Table 3.5
SPLP Results and Site-Specific MSCs
SWMU 29/Landfill 2
NAS Fort Worth JRB, Texas

Sample	Interval	Soil Method	SPLP Method	Analyte	Result (mg/kg)	MSC (mg/L)	SPLP Result (mg/L)
BHGLTA251 00	00 ft	SW6010B	SW6010B	Barium	1750	2	0.482 U
BHGLTA251 00	00 ft	SW6010B	SW6010B	Cadmium	4 7	0 005	0.005 UJ
BHGLTA251 00	00 ft	SW6010B	SW7191	Chromium, total	150	0.1	0.0449
BHGLTA229 00	00 ft	SW6010B	SW6010B	Lead	44.4 J	0.015	0.0138
BHGLTA251 00	00 ft	SW7421	SW7421	Lead	1470	0.015	0.0432 F
BHGLTA251 00	00 ft	SW8270C	SW8310	Dibenz(a,h)anthracene	5	0.0002	0.00022 U
BHGLTA229 00	00 ft	SW8310	SW8310	Benzo(a)anthracene	1.2	0.00039	0.00012 U
BHGLTA229 05	05 ft	SW8310	SW8310	Benzo(a)anthracene	24	0.00039	0.00012 F
BHGLTA229 10	10 ft	SW8310	SW8310	Benzo(a)anthracene	37	0.00039	0 00035 F
BHGLTA229 15	15 ft	SW8310	SW8310	Benzo(a)anthracene	11 J	0.00039	0.00061 U
BHGLTA229 15 Dup	15 ft	SW8310	SW8310	Benzo(a)anthracene	6.4 J	0.00039	0 00011 F
BHGLTA229 00	00 ft	SW8310	SW8310	Benzo(a)pyrene	1.3	0.0002	0.00022 UJ
BHGLTA229 05	05 ft	SW8310	SW8310	Benzo(a)pyrene	22	0.0002	0.00022 UJ
BHGLTA229 10	10 ft	SW8310	SW8310	Benzo(a)pyrene	30	0.0002	0.0011 UJ
BHGLTA229 15	15 ft	SW8310	SW8310	Benzo(a)pyrene	8.4 F	0.0002	0.0011 UJ
BHGLTA229 15 Dup	15 ft	SW8310	SW8310	Benzo(a)pyrene	5 4	0.0002	0.00022 UJ
BHGLTA229 00	00 ft	SW8310	SW8310	Benzo(b)fluoranthene	1 1	0.00039	0.00017 U
BHGLTA229 05	05 ft	SW8310	SW8310	Benzo(b)fluoranthene	18 F	0.00039	0.00013 F
BHGLTA229 10	10 ft	SW8310	SW8310	Benzo(b)fluoranthene	27 F	0.00039	0.00011 F
BHGLTA229 15	15 ft	SW8310	SW8310	Benzo(b)fluoranthene	6.6 F	0.00039	0.00023 F
BHGLTA229 15 Dup	15 ft	SW8310	SW8310	Benzo(b)fluoranthene	4	0 00039	0.00017 UJ
BHGLTA229 00	00 ft	SW8310	SW8310	Benzo(k)fluoranthene	0 55 F	0 0039	0.00016 UJ
BHGLTA229 05	05 ft	SW8310	SW8310	Benzo(k)fluoranthene	8.3	0 0039	0.00016 UJ
BHGLTA229 10	10 ft	SW8310	SW8310	Benzo(k)fluoranthene	12	0 0039	0.00081 UJ
BHGLTA229 15	15 ft	SW8310	SW8310	Benzo(k)fluoranthene	3.9 F	0.0039	0.0008 UJ
BHGLTA229 15 Dup	15 ft	SW8310	SW8310	Benzo(k)fluoranthene	2.3 F	0.0039	0.00016 UJ
BHGLTA229 05	05 ft	SW8310	SW8310	Chrysene	22 F	0 039	0.00011 F
BHGLTA229 10	10 ft	SW8310	SW8310	Chrysene	33 F	0.039	0.00029 F
BHGLTA229 15	15 ft	SW8310	SW8310	Chrysene	9.4 F	0.039	0.0071 UJ
BHGLTA229 15 Dup	15 ft	SW8310	SW8310	Chrysene	5.7 F	0 039	0.00012 F
BHGLTA229 00	00 ft	SW8310	SW8310	Indeno(1,2,3-c,d)pyrene	0.88 F	0 00039	0.00041 UJ
BHGLTA229 05	05 ft	SW8310	SW8310	Indeno(1,2,3-c,d)pyrene	12 F	0 00039	0.00041 UJ
BHGLTA229 10	10 ft	SW8310	SW8310	Indeno(1,2,3-c,d)pyrene	16 F	0.00039	0.002 UJ
BHGLTA229 15	15 ft	SW8310	SW8310	Indeno(1,2,3-c,d)pyrene	4 7 F	0.00039	0.002 UJ
BHGLTA229 15 Dup	15 ft	SW8310	SW8310	Indeno(1,2,3-c,d)pyrene	3 2 F	0.00039	0 00041 UJ

Notes

RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
SPLP = Synthetic Precipitation Leaching Procedure
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
Dup = Field Duplicate Sample

U = The analyte was analyzed for, but not detected The associated numerical value is the MQL
UJ = The analyte was analyzed for, but not detected. The associated numerical value is the MQL estimated due to deficiencies in the QC criteria

Table 4.1
SPLP Results and Site-Specific MSCs
SWMUs 5, 6, 12, and 31
NAS Fort Worth JRB, Texas

Soil Boring	Sample Depth (ft)	Analyte	Result (mg/kg)	SPLP Result (mg/L)	MSC (mg/L)
BHGLSWMU05001	5'	Arsenic	11.4	0 0100 U	0 0500
BHGLSWMU05003	5'	Lead	23 9	0.0271	0 0150
BHGLSWMU06002	5'	Arsenic	12	0 0100 U	0 0500
BHGLSWMU06002	5'	Barium	1280*	1.1600	2 0000
BHGLSWMU06002	5'	Lead	14.8**	0.0100 U	0 0150
BHGLSWMU06003	5'	Arsenic	13.2*	0 0209	0.0500
BHGLSWMU12001	10'	Arsenic	10.5 J*	0.0113	0 0500
BHGLSWMU12002	0'	Cadmium	0.98	0.0020 U	0.0050
BHGLSWMU12002	0'	Lead	[89.4]	[0.0944]	0.0150
BHGLSWMU12003	0'	Cadmium	0.74	0.0020 U	0.0050
BHGLSWMU12003	0'	Lead	[57.8]	[0.1080]	0 0150
BHGLSWMU12004	5'	Benzene	[1.3 J]	[0.020]	0 0050
BHGLSWMU12004	5'	TPH	1,100*	5.0 U	NV
BHGLSWMU12004	5'	PHC (gasoline range)	370*	5.0 U	NV
BHGLSWMU12004	5'	PHC (diesel range)	740*	5.0 U	NV
BEEGSWMU12BN2	0'	Cadmium	4.2*	0.0005 U	0.0050
BEEGSWMU12CE1	5'	Lead	64.8*	0.0027	0 0150
BHGLSWMU31001	0'	Barium	506*	0.4030	2.0000
BHGLSWMU31001	0'	Cadmium	1.5*	0 0050 U	0.0050
BHGLSWMU31001	0'	Chromium	40 6*	0.0200 U	0 1000
BHGLSWMU31001	0'	Mercury	0 57*	0 0020 U	0 0020
BHGLSWMU31001	0'	Lead	[159]	[0 0175]	0.0150
BHGLSWMU31002	0'	Cadmium	0 99	0.0020 U	0.0050
BHGLSWMU31002	0'	Lead	[58 5]	[0 0630]	0.0150
BEEGSWMU31BS3	0'	Cadmium	1.7*	0 0015 F	0.0050
BEEGSWMU31AS3W1S2	0'	Lead	37 9*	0.0069 F	0.0150

Notes
MSC = Medium-specific concentration for industrial groundwater
SPLP = Synthetic Precipitation Leaching Procedure.
Values in brackets indicate SPLP concentrations detected above MSC
* Indicates site-specific MSC.
** Indicates site-specific MSC for subsurface soil only
U = The analyte was not detected The associated numerical value is the MQL
J = Estimated concentration
MQL = method quantitation limit.
NV = No value
TPH = total petroleum hydrocarbons
PHC = petroleum hydrocarbons
No SPLP analysis was performed at SWMU 61.

Table 4.2
RFI Surface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU05001 00 ft 1999-06-04	BHGLSWMU05002 00 ft 1999-06-04	BHGLSWMU05003 00 ft 1999-06-04
M5500	Ethylene glycol	5	20440	mg/kg	(10)	2 8 F	2 F
SW6010B	Arsenic	5.85	5.85	mg/kg	3.7 F	4	3.8 F
SW6010B	Barium	233	233	mg/kg	50.4	90 5	52.7
SW6010B	Beryllium	1.02	1 02	mg/kg	0 53 J	0.69 J	0.54 J
SW6010B	Cadmium	0.556	0 556	mg/kg	--	0.41	--
SW6010B	Chromium, total	25.86	25.86	mg/kg	12.1	15.2	10 1
SW6010B	Cobalt	11.05	613.2	mg/kg	3.6 F	4 6 F	3 8 F
SW6010B	Copper	17 37	130	mg/kg	7.2 F	8.4	6.9 F
SW6010B	Nickel	14.6	204 4	mg/kg	6.6 F	11.6	7 F
SW6010B	Vanadium	46.3	71 54	mg/kg	22.5 F	25.9	22.3 F
SW6010B	Zinc	38 8	3066	mg/kg	21.2 F	34.1	16.8 F
SW7421	Lead	30.97	30.97	mg/kg	15.6	16.4	8.8
SW7471A	Mercury	0.14	0.1513	mg/kg	--	0.02 F	0.04
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	--	--	0.2 F
SW8270C	Benzo(a)pyrene	0.33	0.33	mg/kg	--	--	0.076 F
SW8270C	Benzoic acid	1.7	40880	mg/kg	--	0.44 F	0.57 F
SW8270C	Benzyl butyl phthalate	0.33	2044	mg/kg	--	--	0.043 F
SW8270C	Chrysene	0.33	3.92	mg/kg	--	--	0.06 F
SW8270C	Naphthalene	0.33	204.4	mg/kg	--	--	0.21 F
SW8270C	Phenanthrene	0.33	306.6	mg/kg	--	--	0.092 F
SW9045C	pH	nv	nv	pH Units	8.1	8.2	8.3
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	--	--	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	--	--	--

Notes:

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are bold and enclosed in ( )

Values above RRS 2 are bold and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

Table 4.2
RFI Surface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU06001 00 ft 1999-06-04	BHGLSWMU06002 00 ft 1999-06-04
M5500	Ethylene glycol	5	20440	mg/kg	5 F	--
SW6010B	Arsenic	5.85	5.85	mg/kg	3.2 F	4.5
SW6010B	Barium	233	233	mg/kg	83.2	79.8
SW6010B	Beryllium	1.02	1.02	mg/kg	0 63 J	0.75 J
SW6010B	Cadmium	0.556	0 556	mg/kg	--	--
SW6010B	Chromium, total	25.86	25.86	mg/kg	10.2	11.5
SW6010B	Cobalt	11.05	613.2	mg/kg	8.2	5.3
SW6010B	Copper	17 37	130	mg/kg	7.1 F	8.2
SW6010B	Nickel	14.6	204.4	mg/kg	9.6	8.8
SW6010B	Vanadium	46.3	71.54	mg/kg	25.8 F	28.8
SW6010B	Zinc	38.8	3066	mg/kg	14 F	17.6 F
SW7421	Lead	30.97	30.97	mg/kg	11.2	11.3
SW7471A	Mercury	0.14	0.1513	mg/kg	--	--
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	--	--
SW8270C	Benzo(a)pyrene	0.33	0.33	mg/kg	--	--
SW8270C	Benzoic acid	1.7	40880	mg/kg	--	--
SW8270C	Benzyl butyl phthalate	0.33	2044	mg/kg	--	--
SW8270C	Chrysene	0.33	3.92	mg/kg	--	--
SW8270C	Naphthalene	0 33	204 4	mg/kg	--	--
SW8270C	Phenanthrene	0.33	306.6	mg/kg	--	--
SW9045C	pH	nv	nv	pH Units	8.6	8.1
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	38 F	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	38 F	--

Notes

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are **bold** and enclosed in ( )

Values above RRS 2 are **bold** and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

Table 4.3
RFI Subsurface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU05001 05 ft 1999-06-04	BHGLSWMU05002 05 ft 1999-06-04	BHGLSWMU05003 05 ft 1999-06-04
M5500	Ethylene glycol	5	20440	mg/kg	4.7 F	--	3.7 F
SW6010B	Arsenic	6.58	6 58	mg/kg	**[(11.4)]**	3.5 F	4.9
SW6010B	Barium	128.1	200	mg/kg	117	**(179)**	**(133)**
SW6010B	Beryllium	1.13	1.13	mg/kg	0.84	0.49 J	0.71 J
SW6010B	Cadmium	0 59	0.59	mg/kg	--	--	--
SW6010B	Chromium, total	16 31	16.31	mg/kg	9.5	8.8	11.7
SW6010B	Cobalt	6.19	613.2	mg/kg	5.4	**(11.1)**	**(22.1)**
SW6010B	Copper	13.72	130	mg/kg	8 F	5.7 F	8 F
SW6010B	Nickel	19.76	204.4	mg/kg	15.7	12	18.9
SW6010B	Vanadium	37.4	71.54	mg/kg	30.3	16 2 F	21.8 F
SW6010B	Zinc	31.3	3066	mg/kg	16 F	14.1 F	21.3 F
SW7421	Lead	12.66	12.66	mg/kg	6.3	4.4	**[(23.9)]**
SW7841	Thallium	1.5	1.5	mg/kg	--	--	0.19 F
SW9045C	pH	nv	nv	pH Units	8.2	8.3	8.3
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	--	--	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	--	--	--

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
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NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.3
RFI Subsurface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU06001 05 ft 1999-06-04	BHGLSWMU06002 05 ft 1999-06-04	BHGLSWMU05004 05 ft 2000-04-24
M5500	Ethylene glycol	5	20440	mg/kg	4.6 F	--	NA
SW6010B	Arsenic	6 58	6.58	mg/kg	4.2	**[(12)]**	NA
SW6010B	Barium	128.1	200	mg/kg	62	**[(1280)]**	58.8
SW6010B	Beryllium	1.13	1.13	mg/kg	0.49 J	0.95	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	--	0.46	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	9.6	9.8	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	3.3 F	**(41)**	5.4
SW6010B	Copper	13.72	130	mg/kg	7.3 F	8.1 F	NA
SW6010B	Nickel	19.76	204.4	mg/kg	9	**(20.8)**	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	23.9 F	35.2	NA
SW6010B	Zinc	31.3	3066	mg/kg	13.9 F	15.2 F	NA
SW7421	Lead	12.66	12.66	mg/kg	5.2	**[(14.8)]**	NA
SW7841	Thallium	1.5	1.5	mg/kg	--	0.28 F	NA
SW9045C	pH	nv	nv	pH Units	8.4	8.2	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	40 F	--	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	40 F	--	NA

Notes
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RRS 2 = Risk Reduction Standard 2
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J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.3
RFI Subsurface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU05004 05 ft 2000-04-24 Dup	BHGLSWMU05005 05 ft 2000-04-24	BHGLSWMU05006 05 ft 2000-04-24
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	4	3.1 F
SW6010B	Barium	128.1	200	mg/kg	66.2	43.9	86 3
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	**(15.7)**	**(7.9)**	2.4 F
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7421	Lead	12.66	12.66	mg/kg	NA	7.7 F	6.3
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW9045C	pH	nv	nv	pH Units	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.3
RFI Subsurface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU05007 05 ft 2001-06-26	BHGLSWMU06003 05 ft 2000-04-24	BHGLSWMU06004 05 ft 2000-04-24
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	**[(13.2)]**	--
SW6010B	Barium	128.1	200	mg/kg	NA	20.3 F	44.3 J
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	**(6.5)**	**(9.1)**	2.1 F
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7421	Lead	12.66	12.66	mg/kg	NA	11.7	5
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW9045C	pH	nv	nv	pH Units	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes:
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.3
RFI Subsurface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU06004 05 ft 2000-04-24 Dup	BEEGSWMU06005 05 ft 2001-06-26	BEEGSWMU06005 05 ft 2001-06-26 Dup
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	--	5.4	**[(9.2)]**
SW6010B	Barium	128.1	200	mg/kg	33.7 F	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	1.8 F	3 F	3.3 F
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7421	Lead	12.66	12.66	mg/kg	4.7	NA	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW9045C	pH	nv	nv	pH Units	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes.
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.3
RFI Subsurface Soil Detections
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU06006 05 ft 2001-06-26
M5500	Ethylene glycol	5	20440	mg/kg	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	4.4
SW6010B	Barium	128.1	200	mg/kg	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	2.9 F
SW6010B	Copper	13.72	130	mg/kg	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA
SW7421	Lead	12.66	12.66	mg/kg	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA
SW9045C	pH	nv	nv	pH Units	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
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J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.4
RFI Groundwater Results
SWMUs 5 and 6
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	LSA1628-2 2000-02-29	LSA1628-2 2000-11-01	LSA1628-2 2001-06-28	LSA1628-2 2001-06-28 Dup	LSA1628-3 2000-06-02	LSA1628-3 2000-10-10
SW6010B	Arsenic	0.0049	0.05	mg/L	**(0.0115 F)**	NA	**(0.0433 F)**	**[(0.0532)]**	--	--
SW6010B	Barium	0.587	2	mg/L	0.279	0.263	NA	NA	0.12 F	0.133 F
SW7060A	Arsenic	0.0049	0.05	mg/L	NA	**(0.031)**	NA	NA	NA	NA

Notes.

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are **bold** and enclosed in ( )

Values above RRS 2 are **bold** and enclosed in [( )]

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

Table 4.5
Surface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12001 00 ft 1999-06-08	BHGLSWMU12002 00 ft 1999-06-08	BHGLSWMU12003 00 ft 1999-06-08	BHGLSWMU12005 00 ft 2000-04-28
SW6010B	Arsenic	5 85	5.85	mg/kg	2 F	4 4 J	3 7 F	NA
SW6010B	Barium	233	233	mg/kg	69 8	79 3	51 9	NA
SW6010B	Beryllium	1.02	1 02	mg/kg	0 78	0.56	0.44	NA
SW6010B	Cadmium	0 556	0.556	mg/kg	0 05 F	[(0.98)]	[(0.74)]	--
SW6010B	Chromium, total	25.86	25.86	mg/kg	10.8 J	15.2 J	11 7 J	NA
SW6010B	Cobalt	11.05	613.2	mg/kg	3.3 F	4.1 F	3 3 F	NA
SW6010B	Copper	17 37	130	mg/kg	5.8 F	10 3 J	6 4 F	NA
SW6010B	Lead	30 97	30 97	mg/kg	8 4	[(89.4)]	[(57.8)]	NA
SW6010B	Nickel	14 6	204.4	mg/kg	8 2	8 6	7 F	NA
SW6010B	Vanadium	46 3	71 54	mg/kg	16 4 F	18.4 F	17.2 F	NA
SW6010B	Zinc	38.8	3066	mg/kg	15.5 F	(84.8)	(97.9)	NA
SW7421	Lead	30 97	30.97	mg/kg	NA	NA	NA	5.4 F
SW7740	Selenium	0 907	5	mg/kg	--	0.25 F	0 16 F	NA
SW7761	Silver	0.213	51.1	mg/kg	0 09 F	0.11 F	0.09 F	NA
SW8270C	Anthracene	0.33	3066	mg/kg	--	--	0.29 F	NA
SW8270C	Benzo(a)anthracene	0.33	0.33	mg/kg	--	0 22 F	[(1.7)]	--
SW8270C	Benzo(a)pyrene	0.33	0.33	mg/kg	--	0.22 F	[(1.4)]	--
SW8270C	Benzo(b)fluoranthene	0.33	0.33	mg/kg	--	0.32 F	[(2)]	--
SW8270C	Benzo(g,h,i)perylene	0.33	306 6	mg/kg	--	0.15 F	(0.75)	NA
SW8270C	Benzo(k)fluoranthene	0 33	0.392	mg/kg	--	0.13 F	[(0.76)]	--
SW8270C	bis(2-Ethylhexyl)phthalate	0 33	0 6	mg/kg	--	--	(0.42)	NA
SW8270C	Chrysene	0 33	3 92	mg/kg	--	0.25 F	(1.8)	NA
SW8270C	Dibenz(a,h)anthracene	0 33	0 33	mg/kg	--	--	0.2 F	NA
SW8270C	Fluoranthene	0.33	408.8	mg/kg	--	(0.37 F)	(3.3)	NA
SW8270C	Fluorene	0.33	408.8	mg/kg	--	--	0.081 F	NA
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	mg/kg	--	0 18 F	[(0.96)]	--
SW8270C	Phenanthrene	0.33	306.6	mg/kg	--	0.13 F	(1.6)	NA
SW8270C	Pyrene	0.33	306 6	mg/kg	--	(0.42)	(3.3)	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	3 7 F	3.5 F	3.4 F	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	11 F	8 7 F	10 F	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	15 F	12 F	14 F	NA

Notes
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J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.5
Surface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12006 00 ft 2000-04-28	BHGLSWMU12006 00 ft 2000-04-28 Dup	BHGLSWMU12007 00 ft 2000-04-28	WHGLTA028 00 ft 2000-05-16
SW6010B	Arsenic	5.85	5.85	mg/kg	NA	NA	NA	NA
SW6010B	Barium	233	233	mg/kg	NA	NA	NA	NA
SW6010B	Beryllium	1.02	1.02	mg/kg	NA	NA	NA	NA
SW6010B	Cadmium	0 556	0 556	mg/kg	0 24 F	**[(0.7 F)]**	0.08 F	--
SW6010B	Chromium, total	25 86	25.86	mg/kg	NA	NA	NA	NA
SW6010B	Cobalt	11.05	613 2	mg/kg	NA	NA	NA	NA
SW6010B	Copper	17.37	130	mg/kg	NA	NA	NA	NA
SW6010B	Lead	30.97	30.97	mg/kg	NA	NA	NA	NA
SW6010B	Nickel	14.6	204 4	mg/kg	NA	NA	NA	NA
SW6010B	Vanadium	46.3	71.54	mg/kg	NA	NA	NA	NA
SW6010B	Zinc	38 8	3066	mg/kg	NA	NA	NA	NA
SW7421	Lead	30.97	30.97	mg/kg	11.3 F	9 6 F	4 5 F	10.5
SW7740	Selenium	0 907	5	mg/kg	NA	NA	NA	NA
SW7761	Silver	0 213	51.1	mg/kg	NA	NA	NA	NA
SW8270C	Anthracene	0.33	3066	mg/kg	NA	NA	NA	NA
SW8270C	Benzo(a)anthracene	0 33	0 33	mg/kg	NA	NA	NA	NA
SW8270C	Benzo(a)pyrene	0 33	0.33	mg/kg	NA	NA	NA	NA
SW8270C	Benzo(b)fluoranthene	0.33	0 33	mg/kg	NA	NA	NA	NA
SW8270C	Benzo(g,h,i)perylene	0 33	306 6	mg/kg	NA	NA	NA	NA
SW8270C	Benzo(k)fluoranthene	0 33	0 392	mg/kg	NA	NA	NA	NA
SW8270C	bis(2-Ethylhexyl)phthalate	0 33	0 6	mg/kg	NA	NA	NA	NA
SW8270C	Chrysene	0 33	3.92	mg/kg	NA	NA	NA	NA
SW8270C	Dibenz(a,h)anthracene	0 33	0 33	mg/kg	NA	NA	NA	NA
SW8270C	Fluoranthene	0 33	408 8	mg/kg	NA	NA	NA	NA
SW8270C	Fluorene	0 33	408.8	mg/kg	NA	NA	NA	NA
SW8270C	Indeno(1,2,3-c,d)pyrene	0 33	0 33	mg/kg	NA	NA	NA	NA
SW8270C	Phenanthrene	0 33	306 6	mg/kg	NA	NA	NA	NA
SW8270C	Pyrene	0 33	306 6	mg/kg	NA	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA	NA

Notes
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RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
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J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12001 05 ft 1999-06-08	BHGLSWMU12001 10 ft 1999-06-08	BHGLSWMU12002 05 ft 1999-06-08
SW6010B	Antimony	0.712	0.712	mg/kg	--	--	--
SW6010B	Arsenic	6.58	6.58	mg/kg	3.4 F	**[(10.5 J)]**	3.9 F
SW6010B	Barium	128.1	200	mg/kg	56.2	123	82.5
SW6010B	Beryllium	1.13	1.13	mg/kg	0.59	0.58	0.92
SW6010B	Cadmium	0.59	0.59	mg/kg	--	--	0.06 F
SW6010B	Chromium, total	16.31	16.31	mg/kg	11.1 J	4.2 F	14.2 J
SW6010B	Cobalt	6.19	613.2	mg/kg	**(7.7)**	4.4 F	4.9
SW6010B	Copper	13.72	130	mg/kg	7.1 F	5.7 F	8.4 J
SW6010B	Lead	12.66	12.66	mg/kg	7.5	8.2	10.1
SW6010B	Nickel	19.76	204.4	mg/kg	9.3	6.3 F	9.9
SW6010B	Vanadium	37.4	71.54	mg/kg	21.8 J	10.2 F	27.2 J
SW6010B	Zinc	31.3	3066	mg/kg	15.7 F	10.5 F	19.8 F
SW7740	Selenium	0.313	5	mg/kg	--	--	0.24 F
SW7761	Silver	0.128	51.1	mg/kg	0.08 F	0.07 F	0.1 F
SW7841	Thallium	1.5	1.5	mg/kg	0.17 F	--	0.15 F
SW8260B	Acetone	0.005	1022	mg/kg	--	--	--
SW8260B	Benzene	0.002	0.5	mg/kg	**(0.1 J)**	**(0.003)**	**(0.003)**
SW8260B	Ethylbenzene	0.003	70	mg/kg	**(0.006 J)**	--	--
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	--	--	--
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	**(0.47)**	--	--
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	0.22 F	--	--
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	0.26 F	--	--
SW8270C	Fluorene	0.33	408.8	mg/kg	**(0.61)**	--	--
SW8270C	Naphthalene	0.33	204.4	mg/kg	**(0.85)**	--	--
SW8270C	Phenanthrene	0.33	306.6	mg/kg	**(0.57)**	--	--
SW8310	Acenaphthene	0.083	613.2	mg/kg	NA	NA	NA
SW8310	Anthracene	0.0017	3066	mg/kg	NA	NA	NA
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	NA	NA	NA
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	NA	NA	NA
SW8310	Chrysene	0.0042	3.92	mg/kg	NA	NA	NA
SW8310	Dibenz(a,h)anthracene	0.017	0.02	mg/kg	NA	NA	NA
SW8310	Fluoranthene	0.0042	408.8	mg/kg	NA	NA	NA

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12001 05 ft 1999-06-08	BHGLSWMU12001 10 ft 1999-06-08	BHGLSWMU12002 05 ft 1999-06-08
SW8310	Fluorene	0.0083	408.8	mg/kg	NA	NA	NA
SW8310	Phenanthrene	0.0033	306.6	mg/kg	NA	NA	NA
SW8310	Pyrene	0.0083	306.6	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	**(390)**	3.4 F	3.6 F
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	**(380)**	46 F	23 F
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	**(770)**	49 F	27 F

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12002 10 ft 1999-06-08	BHGLSWMU12003 05 ft 1999-06-08	BHGLSWMU12003 10 ft 1999-06-08
SW6010B	Antimony	0.712	0.712	mg/kg	--	0.48 F	0.54 F
SW6010B	Arsenic	6.58	6.58	mg/kg	1.7 F	6.5 J	2.1 F
SW6010B	Barium	128.1	200	mg/kg	67.9	63.4	49
SW6010B	Beryllium	1.13	1.13	mg/kg	0.66	0.52	0.41
SW6010B	Cadmium	0.59	0.59	mg/kg	0.05 F	--	0.1 F
SW6010B	Chromium, total	16.31	16.31	mg/kg	6 F	9.3 J	7.9 J
SW6010B	Cobalt	6.19	613.2	mg/kg	4.5	**(7.5)**	3.8 F
SW6010B	Copper	13.72	130	mg/kg	7.8 J	**(15.8 J)**	5.4 F
SW6010B	Lead	12.66	12.66	mg/kg	8.6	8.3	7.7
SW6010B	Nickel	19.76	204.4	mg/kg	6 F	7.9	7 F
SW6010B	Vanadium	37.4	71.54	mg/kg	12.3 F	22.5 J	13.7 F
SW6010B	Zinc	31.3	3066	mg/kg	14.7 F	17.5 F	17.3 F
SW7740	Selenium	0.313	5	mg/kg	0.25 F	0.15 F	--
SW7761	Silver	0.128	51.1	mg/kg	0.1 F	--	--
SW7841	Thallium	1.5	1.5	mg/kg	--	--	--
SW8260B	Acetone	0.005	1022	mg/kg	--	--	**(0.012)**
SW8260B	Benzene	0.002	0.5	mg/kg	**(0.006)**	--	--
SW8260B	Ethylbenzene	0.003	70	mg/kg	--	--	--
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	**(0.007)**	--	0.003 F
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	--	--	--
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	--	--	--
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	--	--	--
SW8270C	Fluorene	0.33	408.8	mg/kg	--	--	--
SW8270C	Naphthalene	0.33	204.4	mg/kg	--	--	--
SW8270C	Phenanthrene	0.33	306.6	mg/kg	--	--	--
SW8310	Acenaphthene	0.083	613.2	mg/kg	NA	NA	NA
SW8310	Anthracene	0.0017	3066	mg/kg	NA	NA	NA
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	NA	NA	NA
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	NA	NA	NA
SW8310	Chrysene	0.0042	3.92	mg/kg	NA	NA	NA
SW8310	Dibenz(a,h)anthracene	0.017	0.02	mg/kg	NA	NA	NA
SW8310	Fluoranthene	0.0042	408.8	mg/kg	NA	NA	NA

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12002 10 ft 1999-06-08	BHGLSWMU12003 05 ft 1999-06-08	BHGLSWMU12003 10 ft 1999-06-08
SW8310	Fluorene	0.0083	408.8	mg/kg	NA	NA	NA
SW8310	Phenanthrene	0.0033	306.6	mg/kg	NA	NA	NA
SW8310	Pyrene	0.0083	306.6	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	3.5 F	3.7 F	3.7 F
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	36 F	2.5 F	9 F
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	40 F	6.2 F	13 F

Notes:
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12004 05 ft 2000-04-28	BHGLSWMU12004 10 ft 2000-04-28	BHGLSWMU12006 05 ft 2000-04-28
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	3.2 F	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7740	Selenium	0.313	5	mg/kg	NA	NA	NA
SW7761	Silver	0.128	51.1	mg/kg	NA	NA	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW8260B	Acetone	0.005	1022	mg/kg	NA	NA	NA
SW8260B	Benzene	0.002	0.5	mg/kg	**[(1.3 J)]**	--	**(0.015)**
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA	NA	NA
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	NA	NA	NA
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	NA	NA	NA
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	NA	NA	NA
SW8270C	Fluorene	0.33	408.8	mg/kg	NA	NA	NA
SW8270C	Naphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0.33	306.6	mg/kg	NA	NA	NA
SW8310	Acenaphthene	0.083	613.2	mg/kg	NA	NA	NA
SW8310	Anthracene	0.0017	3066	mg/kg	NA	NA	NA
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	NA	NA	NA
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	NA	NA	NA
SW8310	Chrysene	0.0042	3.92	mg/kg	NA	NA	NA
SW8310	Dibenz(a,h)anthracene	0.017	0.02	mg/kg	NA	NA	NA
SW8310	Fluoranthene	0.0042	408.8	mg/kg	NA	NA	NA

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12004 05 ft 2000-04-28	BHGLSWMU12004 10 ft 2000-04-28	BHGLSWMU12006 05 ft 2000-04-28
SW8310	Fluorene	0.0083	408.8	mg/kg	NA	NA	NA
SW8310	Phenanthrene	0.0033	306.6	mg/kg	NA	NA	NA
SW8310	Pyrene	0.0083	306.6	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	**(1100)**	NA	--
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	**(740)**	NA	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	**(370)**	NA	--

Notes:
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12006 10 ft 2000-04-28	BHGLSWMU12007 05 ft 2000-04-28	BHGLSWMU12007 10 ft 2000-04-28
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	**[(6.8 F)]**	NA	**[(8.4 F)]**
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7740	Selenium	0.313	5	mg/kg	NA	NA	NA
SW7761	Silver	0.128	51.1	mg/kg	NA	NA	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW8260B	Acetone	0.005	1022	mg/kg	NA	NA	NA
SW8260B	Benzene	0.002	0.5	mg/kg	--	--	--
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA	NA	NA
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	--	NA	--
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	NA	NA	NA
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	NA	NA	NA
SW8270C	Fluorene	0.33	408.8	mg/kg	NA	NA	NA
SW8270C	Naphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0.33	306.6	mg/kg	NA	NA	NA
SW8310	Acenaphthene	0.083	613.2	mg/kg	NA	NA	NA
SW8310	Anthracene	0.0017	3066	mg/kg	NA	NA	NA
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	NA	NA	NA
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	NA	NA	NA
SW8310	Chrysene	0.0042	3.92	mg/kg	NA	NA	NA
SW8310	Dibenz(a,h)anthracene	0.017	0.02	mg/kg	NA	NA	NA
SW8310	Fluoranthene	0.0042	408.8	mg/kg	NA	NA	NA

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU12006 10 ft 2000-04-28	BHGLSWMU12007 05 ft 2000-04-28	BHGLSWMU12007 10 ft 2000-04-28
SW8310	Fluorene	0.0083	408.8	mg/kg	NA	NA	NA
SW8310	Phenanthrene	0.0033	306.6	mg/kg	NA	NA	NA
SW8310	Pyrene	0.0083	306.6	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	--	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	--	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	--	NA

Notes:
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU12008 05 ft 2001-06-26	BEEGSWMU12009 05 ft 2001-06-26	BEEGSWMU12010 05 ft 2001-06-26
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	NA	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7740	Selenium	0.313	5	mg/kg	NA	NA	NA
SW7761	Silver	0.128	51.1	mg/kg	NA	NA	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW8260B	Acetone	0.005	1022	mg/kg	NA	NA	NA
SW8260B	Benzene	0.002	0.5	mg/kg	--	--	--
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA	--	--
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	NA	NA	NA
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	NA	NA	NA
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	NA	NA	NA
SW8270C	Fluorene	0.33	408.8	mg/kg	NA	NA	NA
SW8270C	Naphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0.33	306.6	mg/kg	NA	NA	NA
SW8310	Acenaphthene	0.083	613.2	mg/kg	NA	--	**(0.2 J)**
SW8310	Anthracene	0.0017	3066	mg/kg	NA	--	**(0.037 J)**
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	NA	--	**(0.0077 J)**
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	NA	--	**(0.019)**
SW8310	Chrysene	0.0042	3.92	mg/kg	NA	--	--
SW8310	Dibenz(a,h)anthracene	0.017	0.02	mg/kg	NA	--	--
SW8310	Fluoranthene	0.0042	408.8	mg/kg	NA	--	**(0.086)**

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU12008 05 ft 2001-06-26	BEEGSWMU12009 05 ft 2001-06-26	BEEGSWMU12010 05 ft 2001-06-26
SW8310	Fluorene	0.0083	408.8	mg/kg	NA	--	**(0.072)**
SW8310	Phenanthrene	0.0033	306.6	mg/kg	NA	--	**(0.017)**
SW8310	Pyrene	0.0083	306.6	mg/kg	NA	--	**(0.013)**
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes:
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU12011 05 ft 2001-06-26	BEEGSWMU12011 10 ft 2001-06-26	WHGLTA028 05 ft 2000-05-16
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	2.7 F	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW7740	Selenium	0.313	5	mg/kg	NA	NA	NA
SW7761	Silver	0.128	51.1	mg/kg	NA	NA	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA	NA	NA
SW8260B	Acetone	0.005	1022	mg/kg	NA	NA	NA
SW8260B	Benzene	0.002	0.5	mg/kg	--	0.001 F	--
SW8260B	Ethylbenzene	0.003	70	mg/kg	--	--	NA
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	NA	NA	NA
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	NA	NA	NA
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	NA	NA	NA
SW8270C	Fluorene	0.33	408.8	mg/kg	NA	NA	NA
SW8270C	Naphthalene	0.33	204.4	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0.33	306.6	mg/kg	NA	NA	NA
SW8310	Acenaphthene	0.083	613.2	mg/kg	**(0.11 J)**	**(0.093 F)**	NA
SW8310	Anthracene	0.0017	3066	mg/kg	--	--	NA
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	--	**(0.0093 J)**	NA
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	**(0.032)**	**(0.0039)**	NA
SW8310	Chrysene	0.0042	3.92	mg/kg	--	0.0033 F	NA
SW8310	Dibenz(a,h)anthracene	0.017	0 02	mg/kg	--	0.011 F	NA
SW8310	Fluoranthene	0.0042	408.8	mg/kg	--	--	NA

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU12011 05 ft 2001-06-26	BEEGSWMU12011 10 ft 2001-06-26	WHGLTA028 05 ft 2000-05-16
SW8310	Fluorene	0.0083	408.8	mg/kg	--	--	NA
SW8310	Phenanthrene	0.0033	306.6	mg/kg	--	**(0.0061)**	NA
SW8310	Pyrene	0.0083	306.6	mg/kg	--	--	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA	--
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	--

Notes:
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
Values above RRS 2 are **bold** and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WHGLTA028 10 ft 2000-05-16
SW6010B	Antimony	0.712	0.712	mg/kg	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	2.5 F
SW6010B	Barium	128.1	200	mg/kg	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA
SW6010B	Copper	13.72	130	mg/kg	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA
SW7740	Selenium	0.313	5	mg/kg	NA
SW7761	Silver	0.128	51.1	mg/kg	NA
SW7841	Thallium	1.5	1.5	mg/kg	NA
SW8260B	Acetone	0.005	1022	mg/kg	NA
SW8260B	Benzene	0.002	0.5	mg/kg	--
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA
SW8260B	Vinyl chloride	0.005	0.0657	mg/kg	--
SW8270C	2-Methylnaphthalene	0.33	204.4	mg/kg	NA
SW8270C	bis(2-Ethylhexyl)phthalate	0.33	0.6	mg/kg	NA
SW8270C	Dibenzofuran	0.33	40.88	mg/kg	NA
SW8270C	Fluorene	0.33	408.8	mg/kg	NA
SW8270C	Naphthalene	0.33	204.4	mg/kg	NA
SW8270C	Phenanthrene	0.33	306.6	mg/kg	NA
SW8310	Acenaphthene	0.083	613.2	mg/kg	NA
SW8310	Anthracene	0.0017	3066	mg/kg	NA
SW8310	Benzo(a)anthracene	0.0042	0.0392	mg/kg	NA
SW8310	Benzo(b)fluoranthene	0.0017	0.0392	mg/kg	NA
SW8310	Chrysene	0.0042	3.92	mg/kg	NA
SW8310	Dibenz(a,h)anthracene	0.017	0.02	mg/kg	NA
SW8310	Fluoranthene	0 0042	408.8	mg/kg	NA

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Table 4.6
Subsurface Soil Detections
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WHGLTA028 10 ft 2000-05-16
SW8310	Fluorene	0.0083	408.8	mg/kg	NA
SW8310	Phenanthrene	0.0033	306.6	mg/kg	NA
SW8310	Pyrene	0.0083	306.6	mg/kg	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA

Notes.

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are **bold** and enclosed in ( )

Values above RRS 2 are **bold** and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.7
RFI Groundwater Results
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WCHMHTA012 2000-10-19	WCHMHTA012 2002-03-12	WEEGTA001 2001-11-15	WEEGTA001 2002-03-14	WEEGTA002 2001-11-12	WEEGTA002 2002-03-13
SW6010B	Aluminum	1 332	102 2	mg/L	NA	NA	--	NA	0 133 F	NA
SW6010B	Arsenic	0 0049	0 05	mg/L	NA	NA	**(0.0145 F)**	NA	**(0.0206 F)**	NA
SW6010B	Barium	0 587	2	mg/L	NA	NA	0 198 F	NA	0 164 F	NA
SW6010B	Calcium	266 3	-1000	mg/L	NA	NA	106	NA	121	NA
SW6010B	Cobalt	0 0089	6 132	mg/L	NA	NA	--	NA	0 002 F	NA
SW6010B	Copper	0 0028	1.3	mg/L	NA	NA	**(0.0044 F)**	NA	**(0.0066 F)**	NA
SW6010B	Iron	0 224	-1000	mg/L	NA	NA	**(1.36)**	NA	**(4.97)**	NA
SW6010B	Magnesium	37 8	-1000	mg/L	NA	NA	8 2	NA	6 4	NA
SW6010B	Manganese	0 175	14 308	mg/L	NA	NA	**(0.98)**	NA	**(0.205)**	NA
SW6010B	Molybdenum	0 0144	0 511	mg/L	NA	NA	--	NA	0 0045 F	NA
SW6010B	Nickel	0 0204	2 044	mg/L	NA	NA	0 0035 F	NA	0 0032 F	NA
SW6010B	Potassium	15 03	-1000	mg/L	NA	NA	1 37 F	NA	4 16 F	NA
SW6010B	Silver	0 0002	0 511	mg/L	NA	NA	--	NA	**(0.0019 F)**	NA
SW6010B	Sodium	167	-1000	mg/L	NA	NA	134	NA	125	NA
SW6010B	Vanadium	0 012	0 7154	mg/L	NA	NA	--	NA	0 0038 F	NA
SW6010B	Zinc	0 118	30 66	mg/L	NA	NA	--	NA	0 0362 F	NA
SW7041	Antimony	0 002	0 006	mg/L	NA	NA	**(0.003 F)**	NA	--	NA
SW7060A	Arsenic	0 0049	0 05	mg/L	**(0.035 F)**	NA	NA	NA	NA	NA
SW7191	Chromium, total	0 006	0 1	mg/L	NA	NA	--	NA	0 0021 F	NA
SW8260B	1,1-Dichloroethene	0 0005	0 007	mg/L	NA	NA	**(0.001)**	NA	**(0.001)**	NA
SW8260B	1,2,4-Trimethylbenzene	0 0005	5 11	mg/L	NA	NA	--	NA	--	NA
SW8260B	1,3,5-Trimethylbenzene	0 0005	5 11	mg/L	NA	NA	--	NA	--	NA
SW8260B	Benzene	0 0004	0 005	mg/L	0 0004	**(0.00053)**	**(0.0007)**	**(0.00068)**	**(0.0006)**	**(0.00079)**
SW8260B	Chloroform	0 0003	0 1	mg/L	NA	NA	0 0003	NA	--	NA
SW8260B	cis-1,2-Dichloroethene	0 0005	0 07	mg/L	NA	NA	**[(0.22)]**	NA	**[(0.2)]**	NA
SW8260B	Ethylbenzene	0 0005	0 7	mg/L	NA	NA	--	NA	--	NA
SW8260B	m,p-Xylene (sum of isomers)	0 001	10	mg/L	NA	NA	--	NA	--	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 0005	10	mg/L	NA	NA	--	NA	--	NA
SW8260B	Tetrachloroethene (PCE)	0 0005	0 005	mg/L	NA	NA	**(0.002)**	NA	**(0.0006)**	NA
SW8260B	Toluene	0 0005	1	mg/L	NA	NA	--	NA	--	NA
SW8260B	Trans-1,2-Dichloroethene	0 0005	0 1	mg/L	NA	NA	**(0.018)**	NA	**(0.005)**	NA
SW8260B	Trichloroethene (TCE)	0 0005	0 005	mg/L	NA	NA	**[(0.42)]**	NA	**[(0.29)]**	NA
SW8260B	Vinyl chloride	0 0005	0 002	mg/L	**[(0.003)]**	NA	**[(0.006)]**	NA	**[(0.008)]**	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are bold and enclosed in ( )
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-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit

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Table 4.7
RFI Groundwater Results
SWMU 12
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WHGLTA028 2000-05-30	WHGLTA028 2000-10-19	WHGLTA028 2000-10-19 Dup	WHGLTA028 2001-11-15	WHGLTA028 2002-03-12
SW6010B	Aluminum	1 332	102 2	mg/L	NA	NA	NA	--	NA
SW6010B	Arsenic	0 0049	0 05	mg/L	--	NA	NA	**(0.0166 F)**	NA
SW6010B	Barium	0 587	2	mg/L	NA	NA	NA	0 197 F	NA
SW6010B	Calcium	266 3	-1000	mg/L	NA	NA	NA	118	NA
SW6010B	Cobalt	0.0089	6 132	mg/L	NA	NA	NA	--	NA
SW6010B	Copper	0 0028	1 3	mg/L	NA	NA	NA	--	NA
SW6010B	Iron	0 224	-1000	mg/L	NA	NA	NA	**(2.4)**	NA
SW6010B	Magnesium	37 8	-1000	mg/L	NA	NA	NA	7 95	NA
SW6010B	Manganese	0 175	14 308	mg/L	NA	NA	NA	**(0.348)**	NA
SW6010B	Molybdenum	0 0144	0 511	mg/L	NA	NA	NA	--	NA
SW6010B	Nickel	0 0204	2 044	mg/L	NA	NA	NA	--	NA
SW6010B	Potassium	15 03	-1000	mg/L	NA	NA	NA	1 29 F	NA
SW6010B	Silver	0 0002	0 511	mg/L	NA	NA	NA	--	NA
SW6010B	Sodium	167	-1000	mg/L	NA	NA	NA	133	NA
SW6010B	Vanadium	0 012	0 7154	mg/L	NA	NA	NA	--	NA
SW6010B	Zinc	0 118	30 66	mg/L	NA	NA	NA	--	NA
SW7041	Antimony	0 002	0 006	mg/L	NA	NA	NA	--	NA
SW7060A	Arsenic	0 0049	0 05	mg/L	NA	**(0.0165)**	**(0.0201)**	NA	NA
SW7191	Chromium, total	0 006	0 1	mg/L	NA	NA	NA	--	NA
SW8260B	1,1-Dichloroethene	0 0005	0 007	mg/L	NA	NA	NA	**(0.001)**	NA
SW8260B	1,2,4-Trimethylbenzene	0 0005	5 11	mg/L	NA	NA	NA	**(0.002)**	NA
SW8260B	1,3,5-Trimethylbenzene	0 0005	5 11	mg/L	NA	NA	NA	0 0005	NA
SW8260B	Benzene	0 0004	0 005	mg/L	**(0.001)**	**(0.002)**	**(0.002)**	**(0.0009)**	**(0.00086)**
SW8260B	Chloroform	0 0003	0 1	mg/L	NA	NA	NA	0 0002 F	NA
SW8260B	cis-1,2-Dichloroethene	0 0005	0 07	mg/L	NA	NA	NA	**[(0.19)]**	NA
SW8260B	Ethylbenzene	0 0005	0 7	mg/L	NA	NA	NA	**(0.001)**	NA
SW8260B	m,p-Xylene (sum of isomers)	0 001	10	mg/L	NA	NA	NA	**(0.002)**	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 0005	10	mg/L	NA	NA	NA	0 0004 F	NA
SW8260B	Tetrachloroethene (PCE)	0 0005	0 005	mg/L	NA	NA	NA	**(0.001)**	NA
SW8260B	Toluene	0 0005	1	mg/L	NA	NA	NA	0 0003 F	NA
SW8260B	Trans-1,2-Dichloroethene	0 0005	0 1	mg/L	NA	NA	NA	**(0.025)**	NA
SW8260B	Trichloroethene (TCE)	0 0005	0 005	mg/L	NA	NA	NA	**[(0.4)]**	NA
SW8260B	Vinyl chloride	0 0005	0 002	mg/L	**[(0.009)]**	**[(0.012 J)]**	**[(0.015 J)]**	**[(0.007)]**	NA

Notes
RRS 1 = Risk Reduction Standard 1
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Values above RRS 1 are bold and enclosed in ( )
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J = Estimated value above the reporting limit

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Table 4.8
RFI Surface Soil Detections
SWMU 31
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU31001 00 ft 1999-06-07	BHGLSWMU31002 00 ft 1999-06-08	BHGLSWMU31003 00 ft 2000-04-25	BHGLSWMU31004 00 ft 2000-04-25
SW6010B	Arsenic	5 85	5.85	mg/kg	3 F	2 1 F	NA	NA
SW6010B	Barium	233	233	mg/kg	**[(506)]**	35.7	NA	NA
SW6010B	Beryllium	1 02	1.02	mg/kg	0.29	0.12 F	NA	NA
SW6010B	Cadmium	0 556	0.556	mg/kg	**[(1.5)]**	**[(0.99)]**	0 31 F	0.35 F
SW6010B	Chromium, total	25.86	25.86	mg/kg	**[(40.6)]**	12 6	NA	NA
SW6010B	Cobalt	11 05	613 2	mg/kg	4 5	2.1 F	NA	NA
SW6010B	Copper	17.37	130	mg/kg	**(23.3)**	10.2	NA	NA
SW6010B	Lead	30 97	30.97	mg/kg	**[(159)]**	**[(58.5)]**	NA	NA
SW6010B	Nickel	14 6	204 4	mg/kg	8.4	4.8 F	NA	NA
SW6010B	Vanadium	46.3	71 54	mg/kg	16.3 F	10.6 F	NA	NA
SW6010B	Zinc	38 8	3066	mg/kg	**(123)**	22.6	NA	NA
SW7421	Lead	30 97	30 97	mg/kg	NA	NA	15.8	19 5
SW7471A	Mercury	0.14	0 1513	mg/kg	**[(0.57)]**	--	NA	NA
SW8260B	Acetone	0.005	1022	mg/kg	--	**(0.15)**	NA	NA
SW8260B	Methyl ethyl ketone (2-Butanone)	0.005	6132	mg/kg	--	**(0.019)**	--	--
SW8270C	2,4-Dimethylphenol	0 33	204.4	mg/kg	--	0 14 F	NA	NA
SW8270C	Anthracene	0.33	3066	mg/kg	0.052 F	--	NA	NA
SW8270C	Benzo(a)anthracene	0.33	0.33	mg/kg	0.28 F	0.13 F	NA	NA
SW8270C	Benzo(a)pyrene	0.33	0 33	mg/kg	0 28 F	0.12 F	NA	NA
SW8270C	Benzo(b)fluoranthene	0 33	0.33	mg/kg	**[(0.51)]**	0.22 F	NA	NA
SW8270C	Benzo(g,h,i)perylene	0 33	306 6	mg/kg	**(0.44)**	0.14 F	NA	NA
SW8270C	Benzo(k)fluoranthene	0 33	0 392	mg/kg	0.17 F	0 084 F	NA	NA
SW8270C	Benzoic acid	1.7	40880	mg/kg	0.41 F	--	NA	NA
SW8270C	Chrysene	0 33	3.92	mg/kg	**(0.38)**	0.16 F	NA	NA
SW8270C	Cresols, m & p	0 33	51 1	mg/kg	--	0.12 F	NA	NA
SW8270C	Dibenz(a,h)anthracene	0 33	0.33	mg/kg	0 069 F	--	NA	NA
SW8270C	Fluoranthene	0.33	408 8	mg/kg	**(0.79)**	**(0.34 F)**	NA	NA
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	mg/kg	**[(0.42)]**	0.14 F	NA	NA
SW8270C	Phenanthrene	0.33	306 6	mg/kg	**(0.5)**	0 15 F	NA	NA
SW8270C	Pyrene	0 33	306 6	mg/kg	**(0.64)**	0.27 F	NA	NA

Notes
RRS 1 = Risk Reduction Standard 1
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J = Estimated value above the reporting limit

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Table 4.8
RFI Surface Soil Detections
SWMU 31
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU31005 00 ft 2000-04-25	BHGLSWMU31006 00 ft 2000-04-25
SW6010B	Arsenic	5.85	5 85	mg/kg	NA	NA
SW6010B	Barium	233	233	mg/kg	71.2	69.3
SW6010B	Beryllium	1 02	1.02	mg/kg	NA	NA
SW6010B	Cadmium	0.556	0 556	mg/kg	0 45 F	**[(0.6)]**
SW6010B	Chromium, total	25.86	25 86	mg/kg	11 9	13 3
SW6010B	Cobalt	11.05	613.2	mg/kg	NA	NA
SW6010B	Copper	17.37	130	mg/kg	NA	NA
SW6010B	Lead	30 97	30 97	mg/kg	NA	NA
SW6010B	Nickel	14 6	204.4	mg/kg	NA	NA
SW6010B	Vanadium	46.3	71.54	mg/kg	NA	NA
SW6010B	Zinc	38 8	3066	mg/kg	NA	NA
SW7421	Lead	30.97	30 97	mg/kg	10.2	22 8
SW7471A	Mercury	0 14	0.1513	mg/kg	--	--
SW8260B	Acetone	0.005	1022	mg/kg	NA	NA
SW8260B	Methyl ethyl ketone (2-Butanone)	0 005	6132	mg/kg	NA	NA
SW8270C	2,4-Dimethylphenol	0 33	204.4	mg/kg	NA	NA
SW8270C	Anthracene	0.33	3066	mg/kg	NA	NA
SW8270C	Benzo(a)anthracene	0.33	0 33	mg/kg	NA	NA
SW8270C	Benzo(a)pyrene	0 33	0.33	mg/kg	NA	NA
SW8270C	Benzo(b)fluoranthene	0 33	0 33	mg/kg	NA	NA
SW8270C	Benzo(g,h,i)perylene	0 33	306 6	mg/kg	NA	NA
SW8270C	Benzo(k)fluoranthene	0 33	0.392	mg/kg	NA	NA
SW8270C	Benzoic acid	1 7	40880	mg/kg	NA	NA
SW8270C	Chrysene	0.33	3 92	mg/kg	NA	NA
SW8270C	Cresols, m & p	0.33	51.1	mg/kg	NA	NA
SW8270C	Dibenz(a,h)anthracene	0.33	0.33	mg/kg	NA	NA
SW8270C	Fluoranthene	0 33	408 8	mg/kg	NA	NA
SW8270C	Indeno(1,2,3-c,d)pyrene	0.33	0.33	mg/kg	NA	NA
SW8270C	Phenanthrene	0.33	306 6	mg/kg	NA	NA
SW8270C	Pyrene	0.33	306.6	mg/kg	NA	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are **bold** and enclosed in ( )
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NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit

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Table 4.9
RFI Subsurface Soil Detections
SWMU 31
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU31001 05 ft 1999-06-07	BHGLSWMU31001 10 ft 1999-06-07	BHGLSWMU31001 15 ft 1999-06-07	BHGLSWMU31001 15 ft 1999-06-07 Dup
SW6010B	Antimony	0.712	0.712	mg/kg	--	0.28 F	0.32 F	--
SW6010B	Arsenic	6.58	6.58	mg/kg	2.5 F	3 8	4.4	3.5 F
SW6010B	Barium	128.1	200	mg/kg	28.1 F	38.3	29.5 F	24.6 F
SW6010B	Beryllium	1.13	1.13	mg/kg	0.08 F	0.43	0.35	0.28
SW6010B	Cadmium	0.59	0.59	mg/kg	0.05 F	0.1 F	0.08 F	0.09 F
SW6010B	Chromium, total	16.31	16.31	mg/kg	6.9 F	11.5	10.4 J	7.4 J
SW6010B	Cobalt	6.19	613.2	mg/kg	1.9 F	4.8	2 F	1.8 F
SW6010B	Copper	13.72	130	mg/kg	3 1 F	5.2 F	4.3 F	4 F
SW6010B	Lead	12.66	12.66	mg/kg	3.4	8.1	5.1	5.1
SW6010B	Nickel	19.76	204.4	mg/kg	5.3 F	9.7	6.5 F	5.6 F
SW6010B	Vanadium	37.4	71.54	mg/kg	10.3 F	22.2	21.8 F	16.3 F
SW6010B	Zinc	31.3	3066	mg/kg	9.8 F	17.8 F	13.9 F	11.6 F
SW7471A	Mercury	0.035	0.1513	mg/kg	--	--	--	--
SW8270C	Benzoic acid	1.7	40880	mg/kg	0.41 F	--	--	--

Notes:

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are **bold** and enclosed in ( )

Values above RRS 2 are **bold** and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

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Table 4.9
RFI Subsurface Soil Detections
SWMU 31
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU31002 05 ft 1999-06-08	BHGLSWMU31002 10 ft 1999-06-08	BHGLSWMU31002 15 ft 1999-06-08
SW6010B	Antimony	0.712	0.712	mg/kg	--	--	--
SW6010B	Arsenic	6.58	6.58	mg/kg	2.3 F	3.6 F	3.2 F
SW6010B	Barium	128.1	200	mg/kg	38.3	38.9	29 1
SW6010B	Beryllium	1.13	1.13	mg/kg	0.22 F	0.5	0.36
SW6010B	Cadmium	0 59	0.59	mg/kg	0.05 F	0.13 F	0.11 F
SW6010B	Chromium, total	16.31	16 31	mg/kg	7 F	11.1	9.8
SW6010B	Cobalt	6.19	613.2	mg/kg	2.4 F	3.3 F	2 F
SW6010B	Copper	13 72	130	mg/kg	3.8 F	5 F	3 6 F
SW6010B	Lead	12.66	12.66	mg/kg	4.5	6	6 3
SW6010B	Nickel	19.76	204.4	mg/kg	5.3 F	9.2	6.1 F
SW6010B	Vanadium	37.4	71.54	mg/kg	12 F	16.4 F	16.7 F
SW6010B	Zinc	31.3	3066	mg/kg	13.9 F	18.3 F	13.6 F
SW7471A	Mercury	0.035	0.1513	mg/kg	--	--	**[(0.2)]**
SW8270C	Benzoic acid	1 7	40880	mg/kg	--	--	--

Notes:

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are bold and enclosed in ( )

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-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

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Table 4.10
RFI Surface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU61001 00 ft 1999-06-03	ft 1999-06-03	ft 1999-06-03
M5500	Ethylene glycol	5	20440	mg/kg	--	--	--
SW6010B	Antimony	0.56	0.6	mg/kg	--	0 4 F	0.33 F
SW6010B	Arsenic	5.85	5.85	mg/kg	3 F	2.8 F	1 9 F
SW6010B	Barium	233	233	mg/kg	109	80 2	40 9
SW6010B	Beryllium	1.02	1 02	mg/kg	0 9	0 8	0.48
SW6010B	Cadmium	0.556	0.556	mg/kg	0.19 F	0.17 F	0.08 F
SW6010B	Chromium, total	25 86	25 86	mg/kg	14.9	15.3	8 9
SW6010B	Cobalt	11.05	613 2	mg/kg	4 2 F	4 F	2.5 F
SW6010B	Copper	17 37	130	mg/kg	8 7	9.3	6 5 F
SW6010B	Lead	30 97	30.97	mg/kg	9.2 J	13 6 J	5.3 J
SW6010B	Nickel	14 6	204.4	mg/kg	8.9	8 5	5 6 F
SW6010B	Vanadium	46 3	71.54	mg/kg	26.8	28 7	17.2 F
SW6010B	Zinc	38.8	3066	mg/kg	27.4	28.8	19.6 F
SW8260B	Benzene	0 002	0 5	mg/kg	**(0.005 J)**	--	--
SW8260B	cis-1,2-Dichloroethene	0.005	7	mg/kg	**(0.073 J)**	--	--
SW8260B	Ethylbenzene	0 003	70	mg/kg	**(0.024 J)**	--	--
SW8260B	m,p-Xylene (sum of isomers)	0 005	1000	mg/kg	**(0.054 J)**	--	--
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 005	1000	mg/kg	**(0.028 J)**	--	--
SW8260B	Tetrachloroethene (PCE)	0 005	0.5	mg/kg	**[(4.9 J)]**	**(0.057)**	**(0.014)**
SW8260B	Toluene	0 005	100	mg/kg	**(0.094 J)**	--	--
SW8260B	Trichloroethene (TCE)	0 005	0.5	mg/kg	**(0.077 J)**	--	--
SW8270C	Fluorene	0.33	408 8	mg/kg	**(0.34 F)**	--	--
SW8270C	Phenanthrene	0.33	306 6	mg/kg	0 044 F	--	--
SW9045C	pH	nv	nv	pH units	7.5	8.1	8.2
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	**(58 F)**	3 F	3 3 F
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	**(8500)**	7 6 F	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	**(8500)**	11 F	3.3 F

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are bold and enclosed in ( )
Values above RRS 2 are bold and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.10
RFI Surface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	ft 1999-06-03	ft 1999-06-03	ft 2000-04-28
M5500	Ethylene glycol	5	20440	mg/kg	--	(17)	NA
SW6010B	Antimony	0.56	0 6	mg/kg	--	--	NA
SW6010B	Arsenic	5.85	5 85	mg/kg	1 8 F	3 5 F	NA
SW6010B	Barium	233	233	mg/kg	42 3	147	NA
SW6010B	Beryllium	1 02	1.02	mg/kg	0 29 J	0.97	NA
SW6010B	Cadmium	0 556	0 556	mg/kg	0.14 F	0.33 F	NA
SW6010B	Chromium, total	25.86	25.86	mg/kg	5.4 F	16.4	NA
SW6010B	Cobalt	11 05	613.2	mg/kg	2 6 F	7.1	NA
SW6010B	Copper	17.37	130	mg/kg	5 1 F	8 6	NA
SW6010B	Lead	30.97	30 97	mg/kg	6.3 J	8.8 J	NA
SW6010B	Nickel	14.6	204 4	mg/kg	4.3 F	(14.7)	NA
SW6010B	Vanadium	46 3	71.54	mg/kg	11.6 F	29.2	NA
SW6010B	Zinc	38.8	3066	mg/kg	10 9 F	31.1	NA
SW8260B	Benzene	0.002	0 5	mg/kg	--	--	NA
SW8260B	cis-1,2-Dichloroethene	0 005	7	mg/kg	--	--	NA
SW8260B	Ethylbenzene	0 003	70	mg/kg	--	--	NA
SW8260B	m,p-Xylene (sum of isomers)	0 005	1000	mg/kg	--	--	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 005	1000	mg/kg	--	--	NA
SW8260B	Tetrachloroethene (PCE)	0.005	0.5	mg/kg	**(0.028 J)**	--	**(0.01)**
SW8260B	Toluene	0.005	100	mg/kg	--	--	NA
SW8260B	Trichloroethene (TCE)	0.005	0 5	mg/kg	--	--	NA
SW8270C	Fluorene	0 33	408 8	mg/kg	--	--	NA
SW8270C	Phenanthrene	0.33	306 6	mg/kg	--	--	NA
SW9045C	pH	nv	nv	pH units	8.1	7 9	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	--	3.3 F	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (> C10 - C28)	50	500*	mg/kg	--	--	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	--	3 3 F	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are bold and enclosed in ( )
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J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.10
RFI Surface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	ft 2000-04-28	ft 2000-04-28	ft 2000-04-28
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Antimony	0 56	0.6	mg/kg	NA	NA	NA
SW6010B	Arsenic	5 85	5 85	mg/kg	NA	NA	NA
SW6010B	Barium	233	233	mg/kg	NA	NA	NA
SW6010B	Beryllium	1 02	1.02	mg/kg	NA	NA	NA
SW6010B	Cadmium	0 556	0.556	mg/kg	NA	NA	NA
SW6010B	Chromium, total	25 86	25.86	mg/kg	NA	NA	NA
SW6010B	Cobalt	11.05	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	17.37	130	mg/kg	NA	NA	NA
SW6010B	Lead	30.97	30 97	mg/kg	NA	NA	NA
SW6010B	Nickel	14.6	204 4	mg/kg	NA	NA	NA
SW6010B	Vanadium	46 3	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	38 8	3066	mg/kg	NA	NA	NA
SW8260B	Benzene	0 002	0.5	mg/kg	NA	NA	NA
SW8260B	cis-1,2-Dichloroethene	0 005	7	mg/kg	NA	NA	NA
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA	NA	NA
SW8260B	m,p-Xylene (sum of isomers)	0.005	1000	mg/kg	NA	NA	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 005	1000	mg/kg	NA	NA	NA
SW8260B	Tetrachloroethene (PCE)	0 005	0 5	mg/kg	**(0.016)**	**(0.022)**	**(0.009)**
SW8260B	Toluene	0.005	100	mg/kg	NA	NA	NA
SW8260B	Trichloroethene (TCE)	0 005	0.5	mg/kg	NA	NA	NA
SW8270C	Fluorene	0 33	408.8	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0 33	306.6	mg/kg	NA	NA	NA
SW9045C	pH	nv	nv	pH units	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are bold and enclosed in ( )
Values above RRS 2 are bold and enclosed in [( )]
-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.10
RFI Surface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	ft 2000-04-28	ft 2000-04-28	ft 2001-06-27
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Antimony	0 56	0 6	mg/kg	NA	NA	NA
SW6010B	Arsenic	5 85	5 85	mg/kg	NA	NA	NA
SW6010B	Barium	233	233	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.02	1 02	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.556	0.556	mg/kg	NA	NA	NA
SW6010B	Chromium, total	25 86	25 86	mg/kg	NA	NA	NA
SW6010B	Cobalt	11.05	613 2	mg/kg	NA	NA	NA
SW6010B	Copper	17.37	130	mg/kg	NA	NA	NA
SW6010B	Lead	30.97	30.97	mg/kg	NA	NA	NA
SW6010B	Nickel	14 6	204 4	mg/kg	NA	NA	NA
SW6010B	Vanadium	46 3	71 54	mg/kg	NA	NA	NA
SW6010B	Zinc	38.8	3066	mg/kg	NA	NA	NA
SW8260B	Benzene	0 002	0 5	mg/kg	NA	NA	NA
SW8260B	cis-1,2-Dichloroethene	0.005	7	mg/kg	NA	NA	NA
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA	NA	NA
SW8260B	m,p-Xylene (sum of isomers)	0 005	1000	mg/kg	NA	NA	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 005	1000	mg/kg	NA	NA	NA
SW8260B	Tetrachloroethene (PCE)	0 005	0 5	mg/kg	--	--	**(0.017)**
SW8260B	Toluene	0.005	100	mg/kg	NA	NA	NA
SW8260B	Trichloroethene (TCE)	0 005	0.5	mg/kg	NA	NA	NA
SW8270C	Fluorene	0 33	408 8	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0 33	306 6	mg/kg	NA	NA	NA
SW9045C	pH	nv	nv	pH units	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes
RRS 1 = Risk Reduction Standard 1
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Values above RRS 1 are bold and enclosed in ( )
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J = Estimated value above the reporting limit
nv = no value
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Table 4.10
RFI Surface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BEEGSWMU61012 00 ft 2001-06-27 Dup	BEEGSWMU61013 00 ft 2001-06-27	BEEGSWMU61014 00 ft 2001-06-27
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Antimony	0.56	0 6	mg/kg	NA	NA	NA
SW6010B	Arsenic	5 85	5.85	mg/kg	NA	NA	NA
SW6010B	Barium	233	233	mg/kg	NA	NA	NA
SW6010B	Beryllium	1 02	1 02	mg/kg	NA	NA	NA
SW6010B	Cadmium	0 556	0.556	mg/kg	NA	NA	NA
SW6010B	Chromium, total	25 86	25.86	mg/kg	NA	NA	NA
SW6010B	Cobalt	11.05	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	17 37	130	mg/kg	NA	NA	NA
SW6010B	Lead	30.97	30 97	mg/kg	NA	NA	NA
SW6010B	Nickel	14.6	204 4	mg/kg	NA	NA	NA
SW6010B	Vanadium	46 3	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	38 8	3066	mg/kg	NA	NA	NA
SW8260B	Benzene	0 002	0.5	mg/kg	NA	NA	NA
SW8260B	cis-1,2-Dichloroethene	0 005	7	mg/kg	NA	NA	NA
SW8260B	Ethylbenzene	0 003	70	mg/kg	NA	NA	NA
SW8260B	m,p-Xylene (sum of isomers)	0.005	1000	mg/kg	NA	NA	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 005	1000	mg/kg	NA	NA	NA
SW8260B	Tetrachloroethene (PCE)	0.005	0 5	mg/kg	**(0.02)**	0 003 F	--
SW8260B	Toluene	0 005	100	mg/kg	NA	NA	NA
SW8260B	Trichloroethene (TCE)	0 005	0.5	mg/kg	NA	NA	NA
SW8270C	Fluorene	0 33	408 8	mg/kg	NA	NA	NA
SW8270C	Phenanthrene	0 33	306 6	mg/kg	NA	NA	NA
SW9045C	pH	nv	nv	pH units	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes
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RRS 2 = Risk Reduction Standard 2
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-- indicates the analyte was not detected
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F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.10
RFI Surface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WHGLTA034 00 ft 2000-05-17	WHGLTA035 00 ft 2000-05-16
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA
SW6010B	Antimony	0 56	0.6	mg/kg	NA	NA
SW6010B	Arsenic	5.85	5.85	mg/kg	NA	NA
SW6010B	Barium	233	233	mg/kg	NA	NA
SW6010B	Beryllium	1 02	1 02	mg/kg	NA	NA
SW6010B	Cadmium	0 556	0.556	mg/kg	NA	NA
SW6010B	Chromium, total	25 86	25.86	mg/kg	NA	NA
SW6010B	Cobalt	11.05	613.2	mg/kg	NA	NA
SW6010B	Copper	17 37	130	mg/kg	NA	NA
SW6010B	Lead	30.97	30 97	mg/kg	NA	NA
SW6010B	Nickel	14 6	204 4	mg/kg	NA	NA
SW6010B	Vanadium	46 3	71.54	mg/kg	NA	NA
SW6010B	Zinc	38.8	3066	mg/kg	NA	NA
SW8260B	Benzene	0 002	0.5	mg/kg	NA	NA
SW8260B	cis-1,2-Dichloroethene	0.005	7	mg/kg	NA	NA
SW8260B	Ethylbenzene	0.003	70	mg/kg	NA	NA
SW8260B	m,p-Xylene (sum of isomers)	0 005	1000	mg/kg	NA	NA
SW8260B	o-Xylene (1,2-Dimethylbenzene)	0 005	1000	mg/kg	NA	NA
SW8260B	Tetrachloroethene (PCE)	0 005	0.5	mg/kg	--	--
SW8260B	Toluene	0 005	100	mg/kg	NA	NA
SW8260B	Trichloroethene (TCE)	0.005	0.5	mg/kg	NA	NA
SW8270C	Fluorene	0.33	408 8	mg/kg	NA	NA
SW8270C	Phenanthrene	0 33	306.6	mg/kg	NA	NA
SW9045C	pH	nv	nv	pH units	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	500*	mg/kg	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA

Notes
RRS 1 = Risk Reduction Standard 1
RRS 2 = Risk Reduction Standard 2
Values above RRS 1 are bold and enclosed in ( )
Values above RRS 2 are bold and enclosed in [( )]
-- indicates the analyte was not detected
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F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.11
RFI Subsurface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU61001 05 ft 1999-06-03	BHGLSWMU61002 05 ft 1999-06-03	BHGLSWMU61002 05 ft 1999-06-03 Dup
M5500	Ethylene glycol	5	20440	mg/kg	--	--	--
SW6010B	Antimony	0.712	0.712	mg/kg	--	--	0.33 F
SW6010B	Arsenic	6.58	6.58	mg/kg	1.4 F	1 5 F	0.81 F
SW6010B	Barium	128.1	200	mg/kg	86	72.4	61.8
SW6010B	Beryllium	1.13	1.13	mg/kg	0.22 F	0.24 J	0.23 J
SW6010B	Cadmium	0.59	0.59	mg/kg	0.16 F	0.21 F	0.17 F
SW6010B	Chromium, total	16.31	16.31	mg/kg	5.6 F	6.3 F	6.1 F
SW6010B	Cobalt	6.19	613.2	mg/kg	2.3 F	1.8 F	1.7 F
SW6010B	Copper	13.72	130	mg/kg	2.8 F	4 F	3.1 F
SW6010B	Lead	12.66	12.66	mg/kg	5.1 J	4.5 J	4.3 J
SW6010B	Nickel	19.76	204 4	mg/kg	3.8 F	3 8 F	3 8 F
SW6010B	Vanadium	37.4	71.54	mg/kg	10 4 F	14.1 F	10 4 F
SW6010B	Zinc	31.3	3066	mg/kg	12.6 F	13.3 F	12.5 F
SW8260B	Tetrachloroethene (PCE)	0.005	0 5	mg/kg	**(0.006 J)**	**(0.021 J)**	**(0.029 J)**
SW9045C	pH	nv	nv	mg/kg	8.4	8.3	8.5
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	mg/kg	3.4 F	2.9 F	3.5 F
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	5 F	--	3.4 F
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	8.3 F	2.9 F	6.9 F

Notes:
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-- indicates the analyte was not detected
NA = not analyzed
F = Estimated value below reporting limit and above the MDL
J = Estimated value above the reporting limit
nv = no value
* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.11
RFI Subsurface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU61003 05 ft 1999-06-03	BHGLSWMU61004 05 ft 1999-06-03	BHGLSWMU61005 05 ft 1999-06-03
M5500	Ethylene glycol	5	20440	mg/kg	**(28)**	--	--
SW6010B	Antimony	0.712	0.712	mg/kg	--	--	0.36 F
SW6010B	Arsenic	6.58	6.58	mg/kg	1.2 F	1.2 F	1.9 F
SW6010B	Barium	128.1	200	mg/kg	26.1 F	42.9	61.3
SW6010B	Beryllium	1.13	1.13	mg/kg	0 44	0.3 J	0.36
SW6010B	Cadmium	0.59	0 59	mg/kg	0.13 F	0.2 F	0.18 F
SW6010B	Chromium, total	16.31	16.31	mg/kg	7.1 F	7.3 F	8.5
SW6010B	Cobalt	6.19	613 2	mg/kg	2.2 F	2.3 F	2.2 F
SW6010B	Copper	13.72	130	mg/kg	6.2 F	4.7 F	3.3 F
SW6010B	Lead	12 66	12.66	mg/kg	4 5 J	4 J	5.4 J
SW6010B	Nickel	19.76	204.4	mg/kg	5.6 F	5.6 F	5 F
SW6010B	Vanadium	37.4	71.54	mg/kg	13.4 F	13.1 F	13.5 F
SW6010B	Zinc	31.3	3066	mg/kg	14.4 F	14.2 F	17.9 F
SW8260B	Tetrachloroethene (PCE)	0.005	0.5	mg/kg	**(0.013)**	**(0.008 J)**	--
SW9045C	pH	nv	nv	mg/kg	8	8.6	8.8
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	mg/kg	2 8 F	3.1 F	2.9 F
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	--	--	--
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	2 8 F	3 1 F	2.9 F

Notes

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

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NA = not analyzed

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J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.11
RFI Subsurface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU61006 05 ft 2000-04-28	BHGLSWMU61007 05 ft 2000-04-28	BHGLSWMU61008 05 ft 2000-04-28
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	NA	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16 31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW8260B	Tetrachloroethene (PCE)	0.005	0.5	mg/kg	0.004 F	--	0.005 F
SW9045C	pH	nv	nv	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are **bold** and enclosed in ( )

Values above RRS 2 are **bold** and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.11
RFI Subsurface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU61009 05 ft 2000-04-28	BHGLSWMU61009 05 ft 2000-04-28 Dup	BHGLSWMU61010 05 ft 2000-04-28
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	NA	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13 72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12 66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204 4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW8260B	Tetrachloroethene (PCE)	0.005	0.5	mg/kg	--	--	--
SW9045C	pH	nv	nv	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are bold and enclosed in ( )

Values above RRS 2 are bold and enclosed in [( )]

-- indicates the analyte was not detected

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J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.11
RFI Subsurface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	BHGLSWMU61011 05 ft 2000-04-28	BEEGSWMU61012 05 ft 2001-06-27	WHGLTA034 05 ft 2000-05-17
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA	NA
SW6010B	Antimony	0.712	0.712	mg/kg	NA	NA	NA
SW6010B	Arsenic	6.58	6.58	mg/kg	NA	NA	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA	NA
SW6010B	Nickel	19.76	204.4	mg/kg	NA	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA	NA
SW8260B	Tetrachloroethene (PCE)	0.005	0.5	mg/kg	--	0.004 F	--
SW9045C	pH	nv	nv	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA	NA

Notes

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are bold and enclosed in ( )

Values above RRS 2 are bold and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.11
RFI Subsurface Soil Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WHGLTA034 05 ft 2000-05-17 Dup	WHGLTA035 05 ft 2000-05-16
M5500	Ethylene glycol	5	20440	mg/kg	NA	NA
SW6010B	Antimony	0.712	0 712	mg/kg	NA	NA
SW6010B	Arsenic	6 58	6.58	mg/kg	NA	NA
SW6010B	Barium	128.1	200	mg/kg	NA	NA
SW6010B	Beryllium	1.13	1.13	mg/kg	NA	NA
SW6010B	Cadmium	0.59	0.59	mg/kg	NA	NA
SW6010B	Chromium, total	16.31	16.31	mg/kg	NA	NA
SW6010B	Cobalt	6.19	613.2	mg/kg	NA	NA
SW6010B	Copper	13.72	130	mg/kg	NA	NA
SW6010B	Lead	12.66	12.66	mg/kg	NA	NA
SW6010B	Nickel	19 76	204.4	mg/kg	NA	NA
SW6010B	Vanadium	37.4	71.54	mg/kg	NA	NA
SW6010B	Zinc	31.3	3066	mg/kg	NA	NA
SW8260B	Tetrachloroethene (PCE)	0 005	0.5	mg/kg	--	--
SW9045C	pH	nv	nv	mg/kg	NA	NA
TX1005	Petroleum Hydrocarbons, Gasoline (C6 - C10)	50	100*	mg/kg	NA	NA
TX1005	Petroleum Hydrocarbons, Heavy/Residual Fuel Oils (>C10 - C28)	50	500*	mg/kg	NA	NA
TX1005	Petroleum Hydrocarbons, total (C6 - C28)	50	500*	mg/kg	NA	NA

Notes

RRS 1 = Risk Reduction Standard 1

RRS 2 = Risk Reduction Standard 2

Values above RRS 1 are bold and enclosed in ( )

Values above RRS 2 are bold and enclosed in [( )]

-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

J = Estimated value above the reporting limit

nv = no value

* = TNRCC Action Level for coarse-grained soils (TNRCC RG-17)

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Table 4.12
RFI Groundwater Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	SD13-05 2001-06-27	WHGLTA034 2000-06-01	WHGLTA034 2000-10-16	WHGLTA034 2001-06-26	WHGLTA034 2001-11-16
SW8260B	Tetrachloroethene (PCE)	0.0005	0.005	mg/L	--	--	--	--	--
SW8260B	Trichloroethene (TCE)	0.0005	0.005	mg/L	--	--	--	0.0005	--

Notes

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NA = not analyzed

F = Estimated value below reporting limit and above the MDL

Table 4.12
RFI Groundwater Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WHGLTA035 2000-06-01	WHGLTA035 2000-10-16	WHGLTA035 2001-06-26	WHGLTA035 2001-11-16	WITCTA034 2000-03-01
SW8260B	Tetrachloroethene (PCE)	0.0005	0.005	mg/L	--	--	--	--	**(0.003)**
SW8260B	Trichloroethene (TCE)	0.0005	0.005	mg/L	--	--	--	--	NA

Notes:

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-- indicates the analyte was not detected

NA = not analyzed

F = Estimated value below reporting limit and above the MDL

Table 4.12
RFI Groundwater Detections
SWMU 61
NAS Fort Worth JRB, Texas

Method	Analyte	RRS 1	RRS 2	Unit	WITCTA034 2000-10-17	WITCTA034 2001-06-27	WITCTA034 2001-11-15
SW8260B	Tetrachloroethene (PCE)	0.0005	0.005	mg/L	**(0.004)**	0.0003 F	--
SW8260B	Trichloroethene (TCE)	0.0005	0.005	mg/L	--	--	--

Notes:

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Values above RRS 2 are **bold** and enclosed in [( )]

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NA = not analyzed

F = Estimated value below reporting limit and above the MDL

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