



KELLY AFB
TEXAS

ADMINISTRATIVE RECORD
COVER SHEET

AR File Number 3283

KELLY RESTORATION ADVISORY BOARD
TECHNICAL REVIEW SUBCOMMITTEE
REVISED MEETING AGENDA
Wednesday, 8 March 2000, 6:30 P.M.
St. Mary's University, Garni Science Hall

- | | | |
|--|-------------|------------|
| I. Introduction | 6:30 - 6:35 | Dr Lené |
| A. Agenda Review and Handouts | | |
| II. Shallow Groundwater in Bexar County Report Discussion | 6:35 -7:15 | Mr. Miller |
| III. Administrative | 7:15 - 7:35 | Dr Lené |
| A. BCT Update | | |
| B. Spill Summary Report | | |
| C. Documents to TRS/RAB | | |
| D. Action Item Review | | |
| 1. CERCLA Alternatives criteria. | | |
| 2. When will the 300 area contamination sources be controlled. | | |
| E. Agenda/Location/Time of Next TRS Meeting | | |
| IV. Adjournment | 7:35 | |

MEETING MINUTES

KELLY AFB TECHNICAL REVIEW SUBCOMMITTEE (TRS)

TO THE RESTORATION ADVISORY BOARD (RAB)

8 Mar 00, St. Mary's University, Garni Science Hall

I. Introduction: The TRS meeting began at 6:45 p.m. Attachment 1 is the attendance report.

II. An Assessment of the Shallow Groundwater Zone in Southwest Bexar County:

Mr. John Miller, Mitretek, presented the shallow groundwater assessment briefing. Mr. Miller emphasized his employer is a not-for-profit firm which is chartered to work in the public interest, providing unbiased solutions to problems. Mr. Miller covered the report's general findings and conclusions. Members present questioned Mr. Miller at length about his analysis. Mr. Miller's briefing is included as attachment 6.

- A. Copies of the full report have been provided to Dr. Lené, the San Antonio Public Library, Government Documents Section, and the Kelly AFB Library.

III. Administrative

A. Documents to TRS/RAB: See attachment 2.

B. Spill Summary Report: There were no reportable spills during the month of February 2000.

C. Next TRS meeting: The next TRS meeting will be held 9 May 00 at 6:30 p.m. at St. Mary's Garni Science Hall.

D. Action Items: No new action items were discussed.

1. Items from February's meeting:

a) CERCLA Evaluation Criteria requested by Mr. Quintanilla was provided. See attachment 4.

b) The answer to Mr. Rice's question is found in attachment 5.

E. Other Administrative Items:

1. There will be no meeting in April.

2. Selection of subjects for the next round of TAPP reports was discussed. It was decided to postpone the final selection. The agreement reached was the selections may be negotiated via a conference call or other forum prior to the next TRS meeting.

IV. Adjournment: The TRS adjourned at 9:30 p.m.

Attachments:

1. Attendance List
2. Documents List
3. Spill Summary Report
4. CERCLA Evaluation Criteria in response to Mr. Quintanilla Question
5. Response to Mr. Rice's Question
6. Shallow Groundwater Zone in SW Bexar County Briefing Slides
7. BCT Minutes and Handouts, 8 Mar 00
8. Executive Summaries of Reports submitted to St. Mary's TRS Library

DRAFT

MEETING MINUTES
KELLY AFB TECHNICAL REVIEW SUBCOMMITTEE (TRS)
TO THE RESTORATION ADVISORY BOARD (RAB)
11 Jan 00, St. Mary's University, Garni Science Hall

I. Introduction: The TRS meeting began at 6:45 p.m. Attachment 1 is the attendance report.

II. An Assessment of the Shallow Groundwater Zone in Southwest Bexar County:
Mr. John Miller, Mitretek, presented the shallow groundwater assessment briefing. Mr. Miller emphasized his employer is a not-for-profit firm which is chartered to work in the public interest, providing unbiased solutions to problems. Mr. Miller covered the reports general findings and conclusions. Members present questioned Mr. Miller at length about his analysis. Mr. Miller's briefing is included as attachment 6.
A. Copies of the full report have been provided to Dr. Lené, the San Antonio Public Library, Government Documents Section, and the Kelly AFB Library.

III. Administrative

- A. Documents to TRS/RAB: See attachment 2.
- B. Spill Summary Report: There were no reportable spills during the month of February 2000.
- C. Next TRS meeting: The next TRS meeting will be held 9 May 00 at 6:30 p.m. at St. Mary's Garni Science Hall.
- D. Action Items: No new action items were discussed.
 - 1. Items from February's meeting:
 - a) CERCLA Evaluation Criteria requested by Mr. Quintanilla was provided. See attachment 4.
 - b) The answer to Mr. Rice's question is found in attachment 5.
- E. Other Administrative Items:
 - 1. There will be no meeting in April.
 - 2. Selection of subjects for the next round of TAPP reports was discussed. It was decided to postpone the final selection. The agreement reached was the selections may be selected via a conference call or other forum prior to the next TRS meeting.

IV. Adjournment: The TRS adjourned at 9:30 p.m.

Attachments:

- 1. Attendance List
- 2. Documents List
- 3. Spill Summary Report
- 4. CERCLA Evaluation Criteria in response to Mr. Quintanilla Question
- 5. Response to Mr. Rice's Question
- 6. Shallow Groundwater Zone in SW Bexar County Briefing Slides
- 7. BCT Minutes and Handouts, 8 Mar 00
- 8. Executive Summaries of Reports submitted to St. Mary's TRS Library

Question from TRS meeting on 8 Feb 00.

Mr. Rice asked when would the 300 area contamination sources be contained.

Answer

There is the potential for the sources to be contained by the end of 2001.

We expect the sources to be contained no later than the end of 2002.

READ COPY



DEPARTMENT OF THE AIR FORCE
HEADQUARTERS SAN ANTONIO AIR LOGISTICS CENTER (AFMC)
KELLY AIR FORCE BASE, TEXAS

2 MAR 2000

MEMORANDUM FOR REMEDIAL ACTION BOARD/TECHNICAL REVIEW
SUBCOMMITTEE (RAB/TRS)

FROM: SA-ALC/EMC
307 Tinker Drive, Bldg. 306
Kelly AFB, TX 78241-5917

SUBJECT: Monthly Spill Report for February 2000

There have been no reportable quantity or otherwise notable spills for the month of February 2000. Should you have any further questions or require additional information, please contact Mr. Jerry Pantoja by phone at 925-3100 ext. 310 or by email at jerrypantoja@kelly.af.mil.

A handwritten signature in cursive script that reads "B. M. Fitzgerald".

BRIAN M. FITZGERALD, Capt, USAF, BSC
Chief, Environmental Compliance Division

CERCLA Evaluation Criteria

Criteria	Description
Overall Protection of Human Health and the Environment	Addresses whether or not a remedy provides adequate protection and describes how risks posed through each pathway are eliminated, reduced, or controlled through treatment, engineering controls, or institutional controls.
Compliance with Applicable or Relevant and Appropriate Requirements (ARARs)	Addresses whether or not a remedy will meet all of the applicable or relevant and appropriate federal and state environmental statutes and requirements or whether grounds exist for invoking a waiver.
Long-Term Effectiveness and Permanence	Refers to the ability of a remedy to maintain reliable protection of human health and the environment over time, once cleanup goals have been met.
Reduction of Toxicity, Mobility, and Volume Through Treatment	Refers to the anticipated performance of the treatment technologies a remedy may employ.
Short-Term Effectiveness	Addresses the period of time needed to achieve protection and any adverse impacts on human health and the environment that may be posed during the construction and implementation period until the cleanup goals are achieved.
Implementability	Refers to the technical and administrative feasibility of a remedy, including the availability of materials and services needed to implement a particular option.
Cost	Includes the estimated capital and operation and maintenance costs and net present worth costs of each alternative.
State/Support Agency Acceptance	Indicates whether, based on a review of the RI/FS reports Proposed Plan, the state/support agency concurs, opposes, or has no comment on the preferred alternative at the present time.
Community Acceptance	Will be assessed in the Record of Decision (ROD) following review of the public comments received on the Proposed Plan.

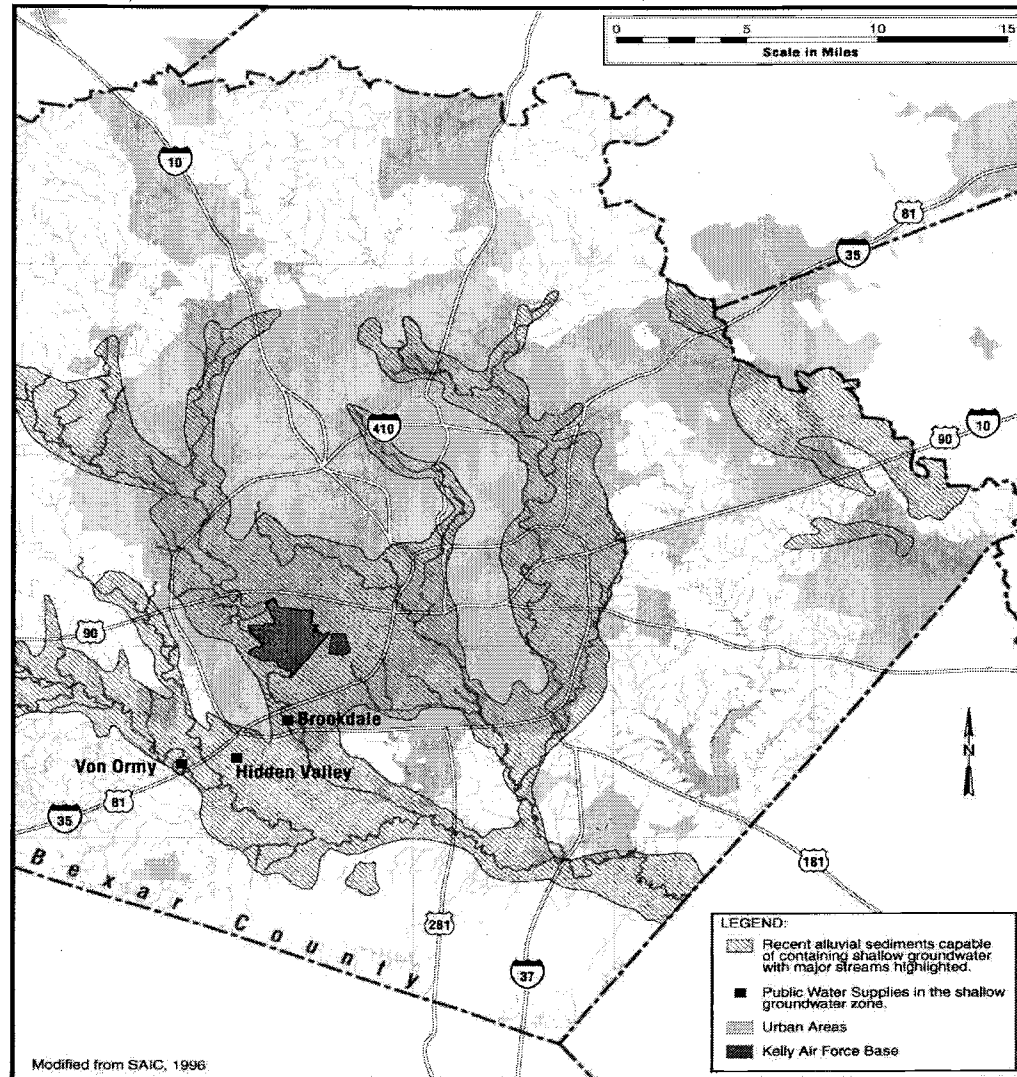
An Assessment of the Shallow Groundwater Zone in Southwest Bexar County, Texas

John K. Miller

March 2000

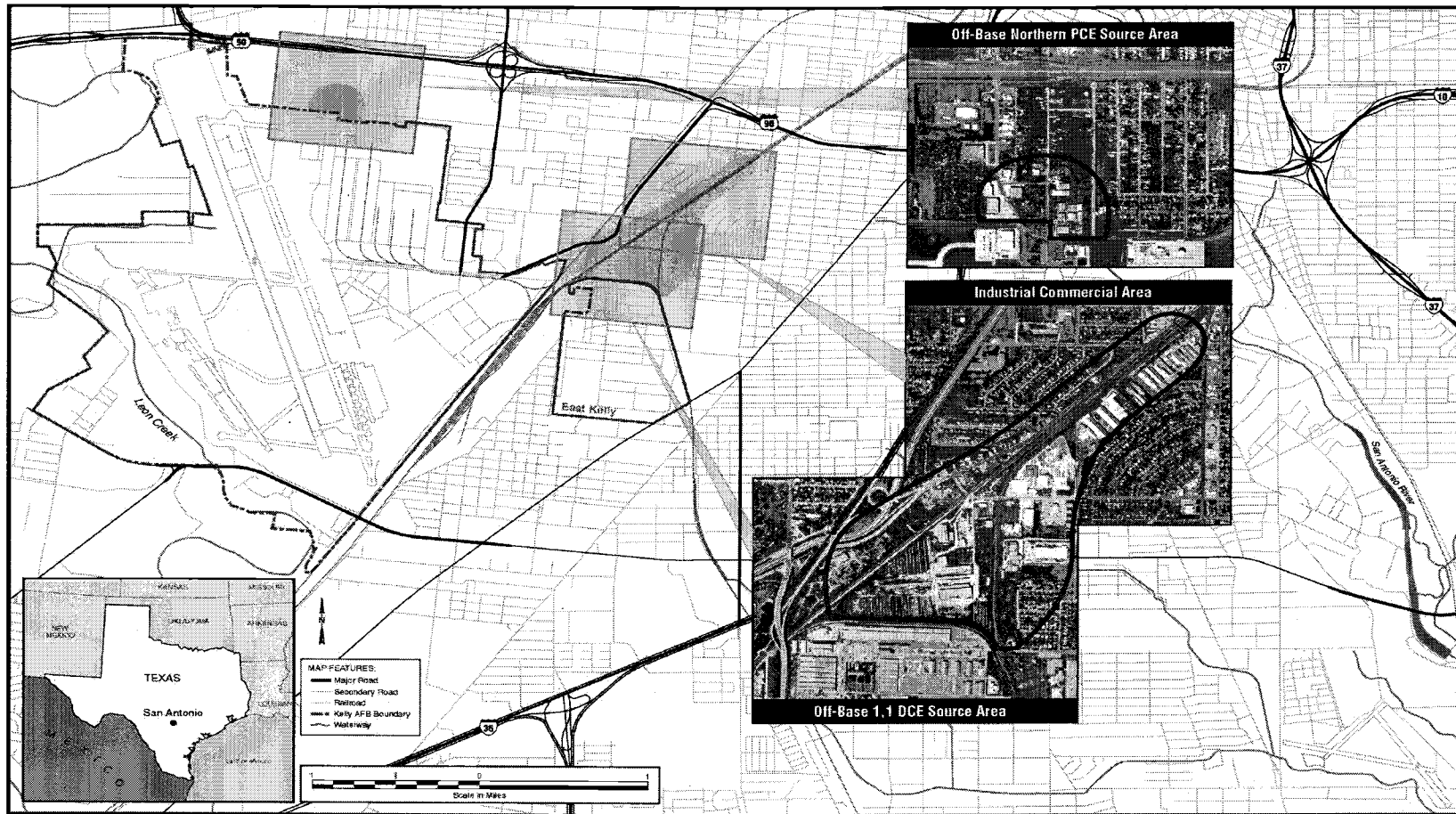
ControlNumber

Areas with Potential Shallow Groundwater



ControlNumber

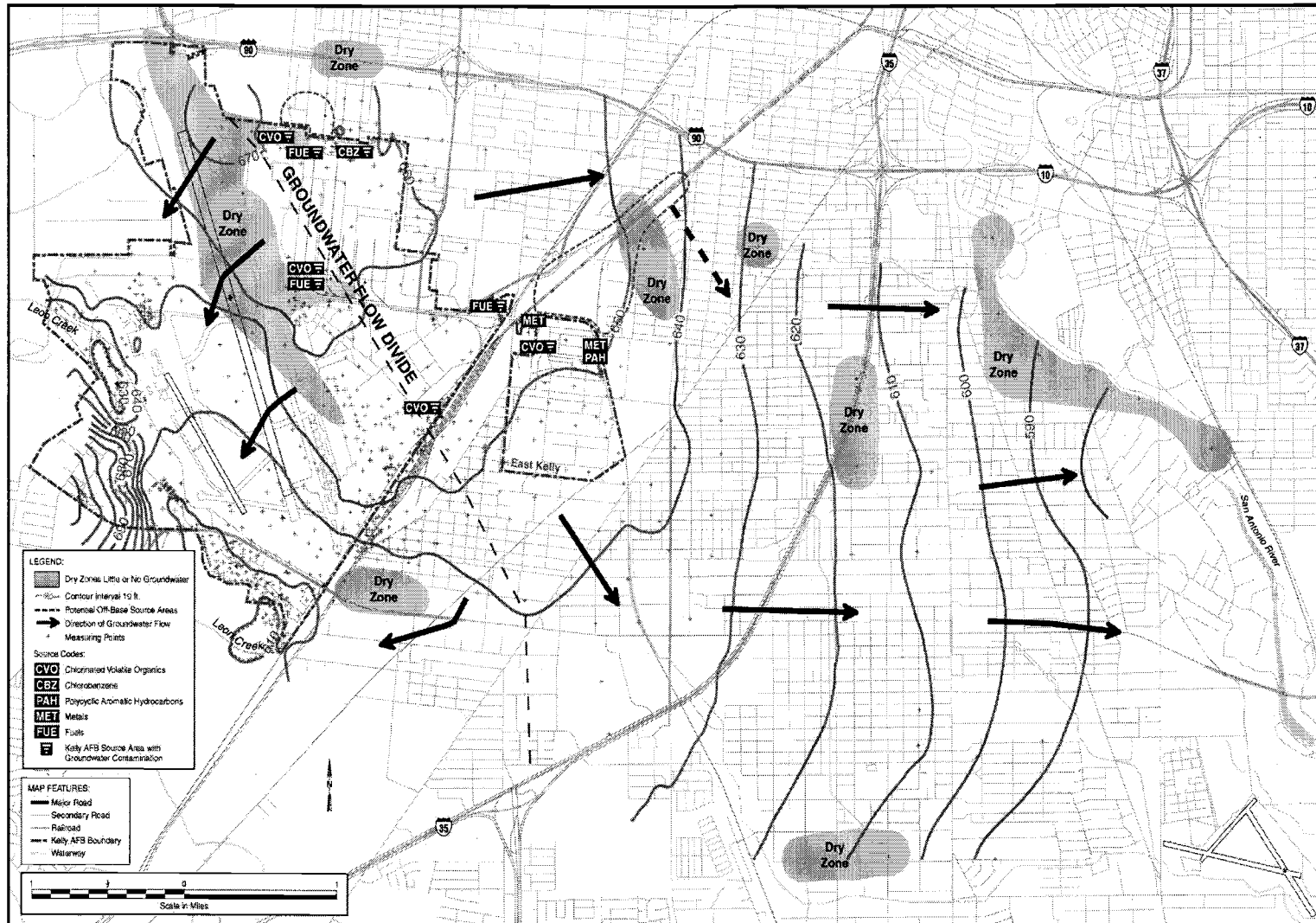
Potential Off-Base Source Areas near Kelly Air Force Base



(Source: CH2M Hill)

ControlNumber

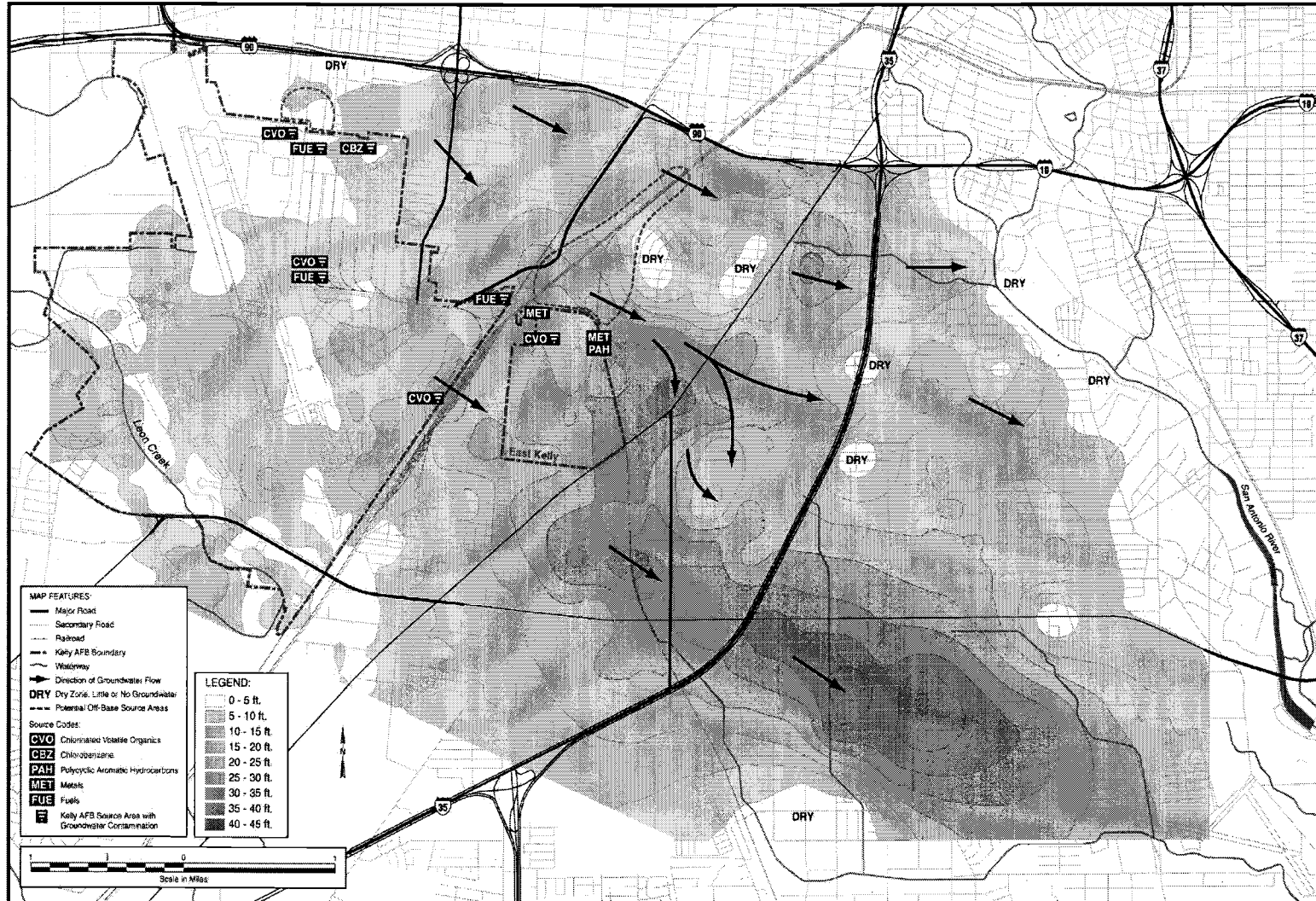
Groundwater Elevation and Flow Direction



(Source: DIRM 199)

ControlNumber

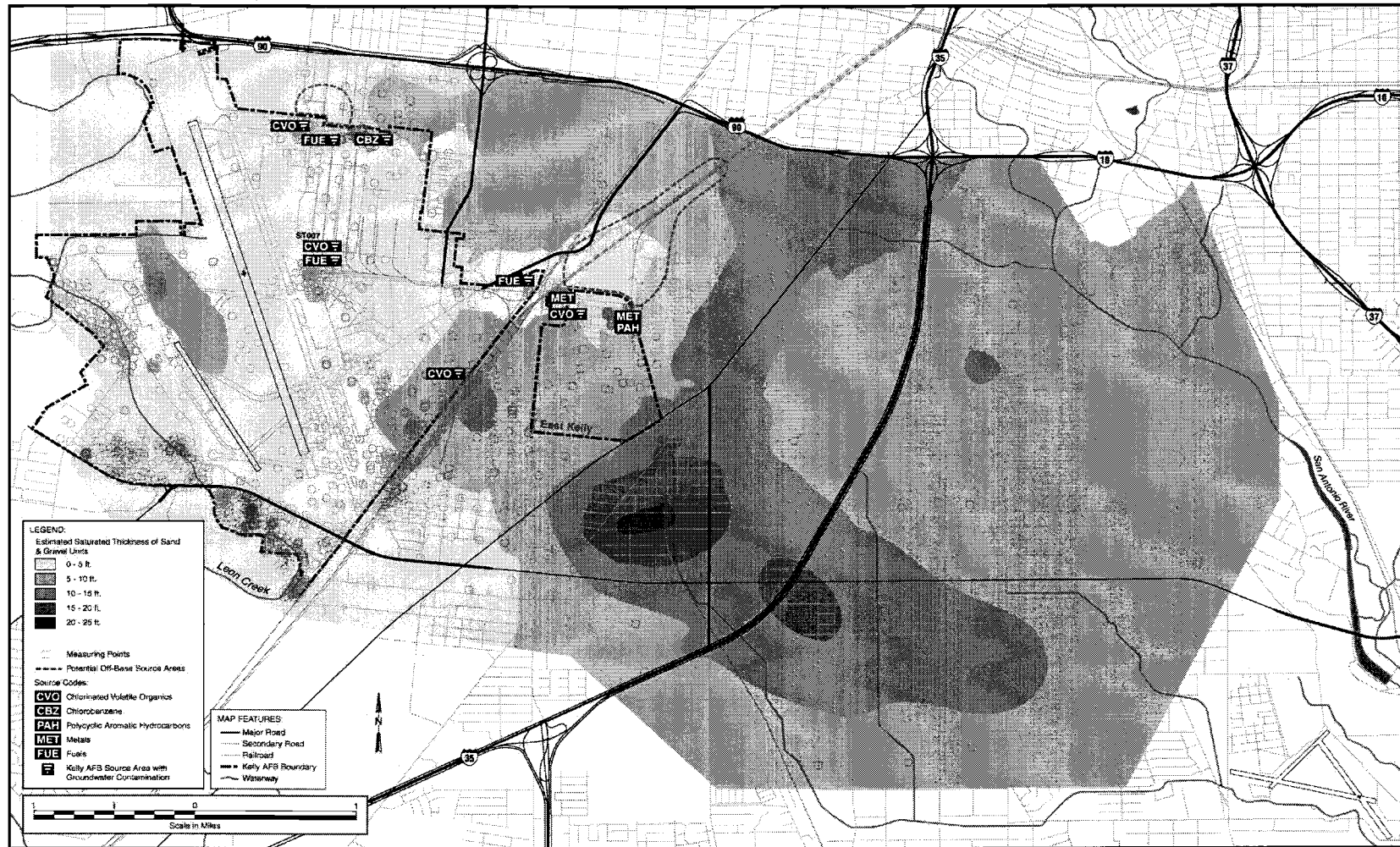
Static or Standing Water Level Thickness



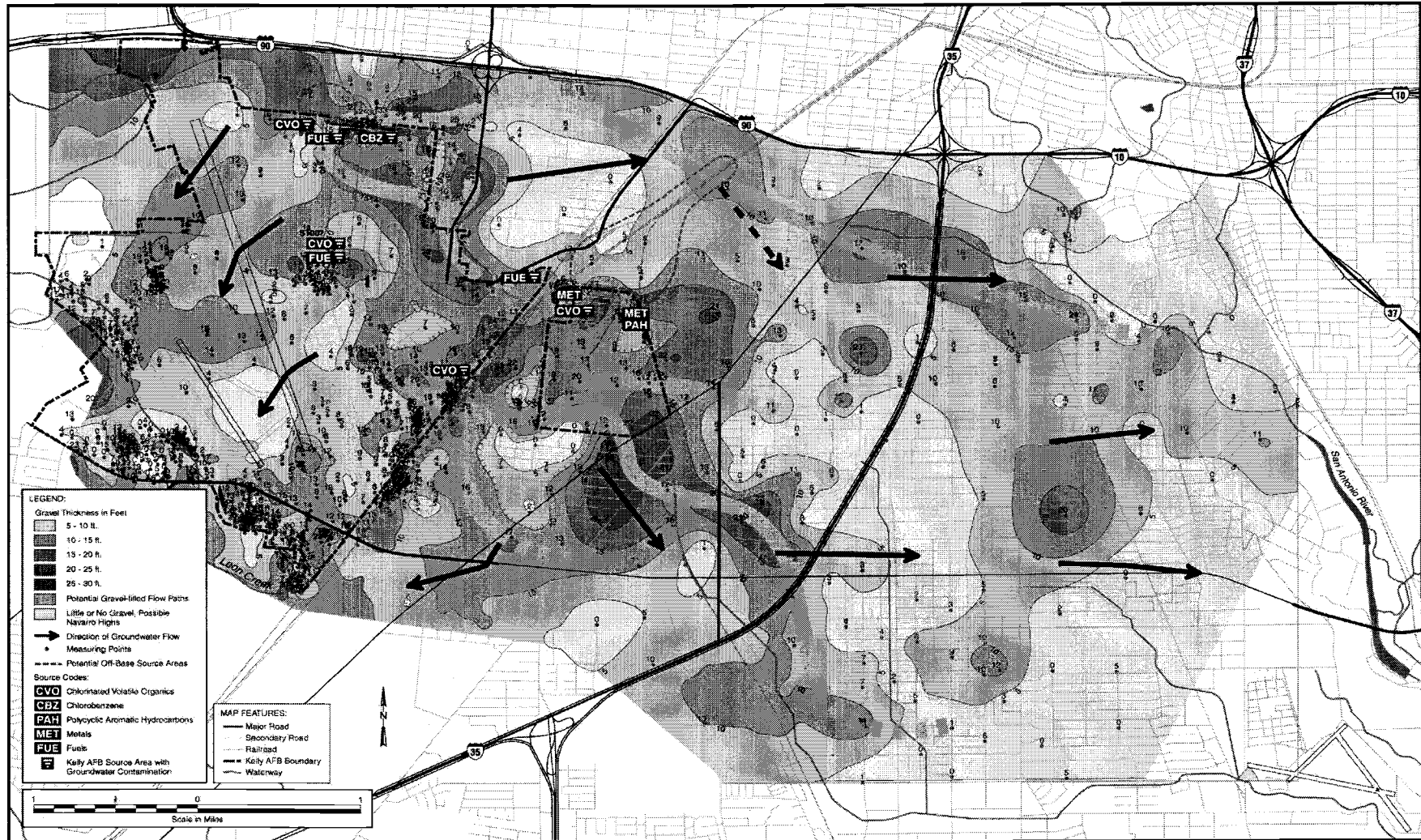
Note: This map overstates the saturated or true thickness of the shallow groundwater where it is confined; areas north and southeast of East Kelly are confined.

ControlNumber

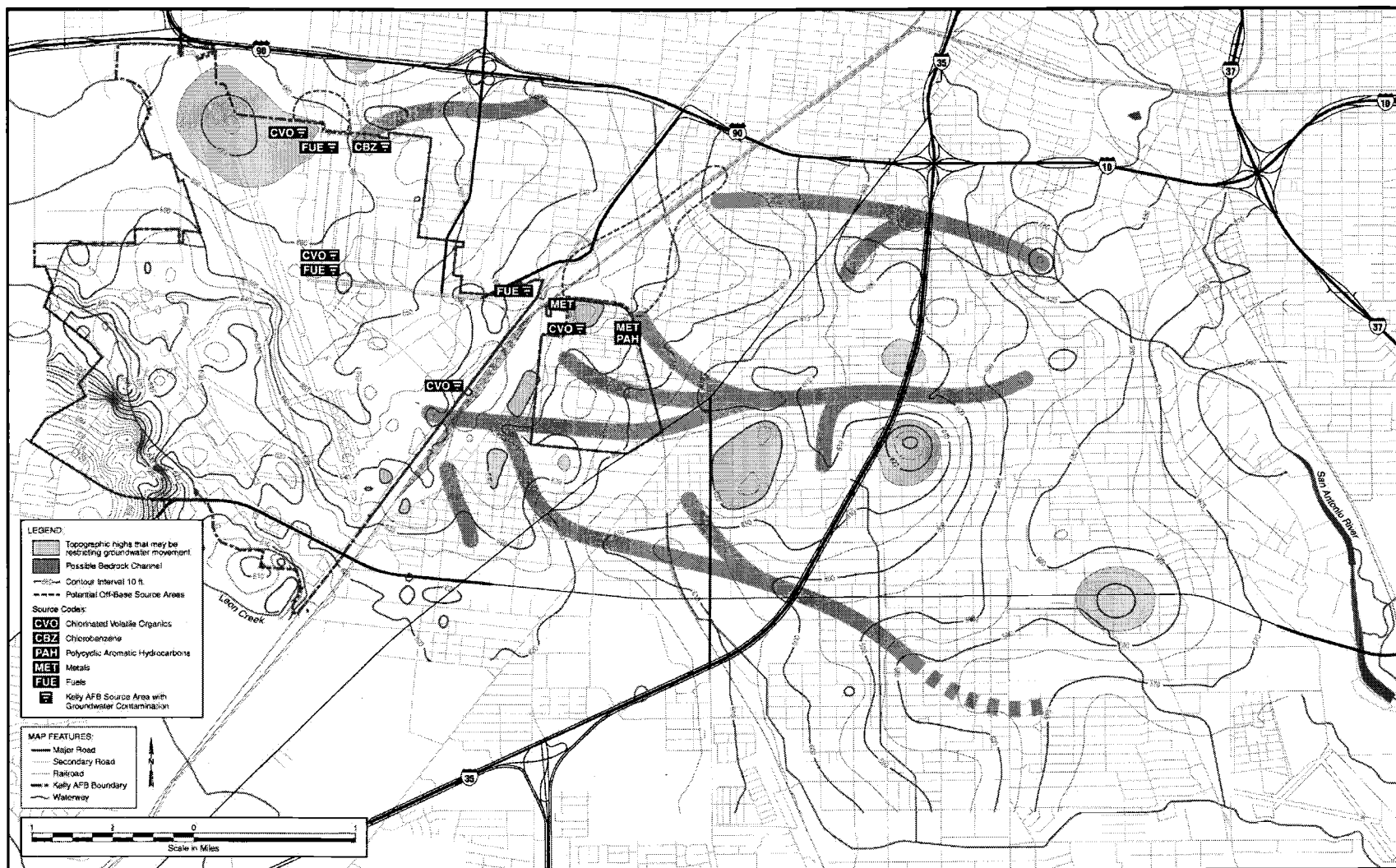
Estimated Saturated Transmissive Units Thickness Map



Basal Gravel Thickness Map

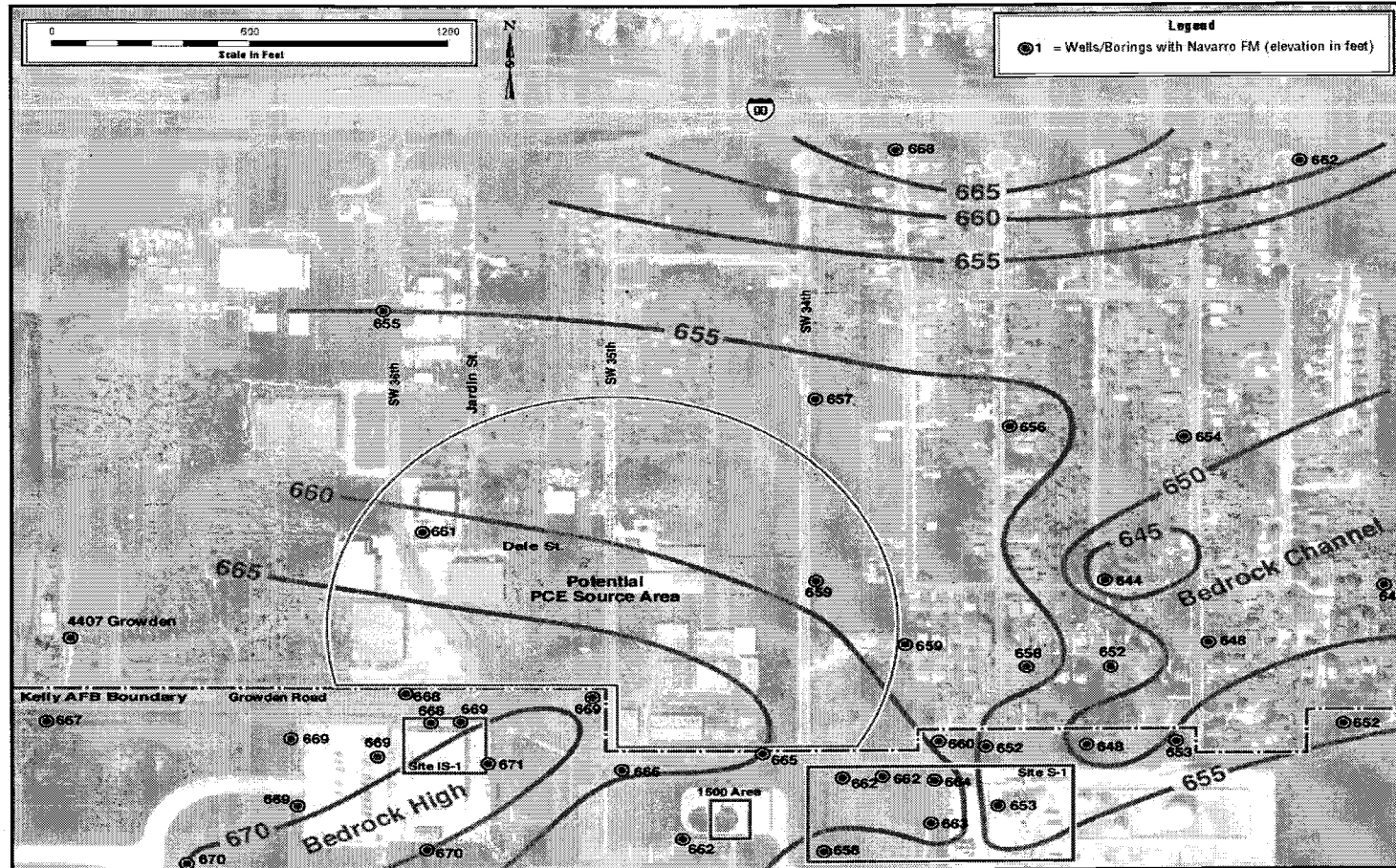


Topography of the Navarro Formation

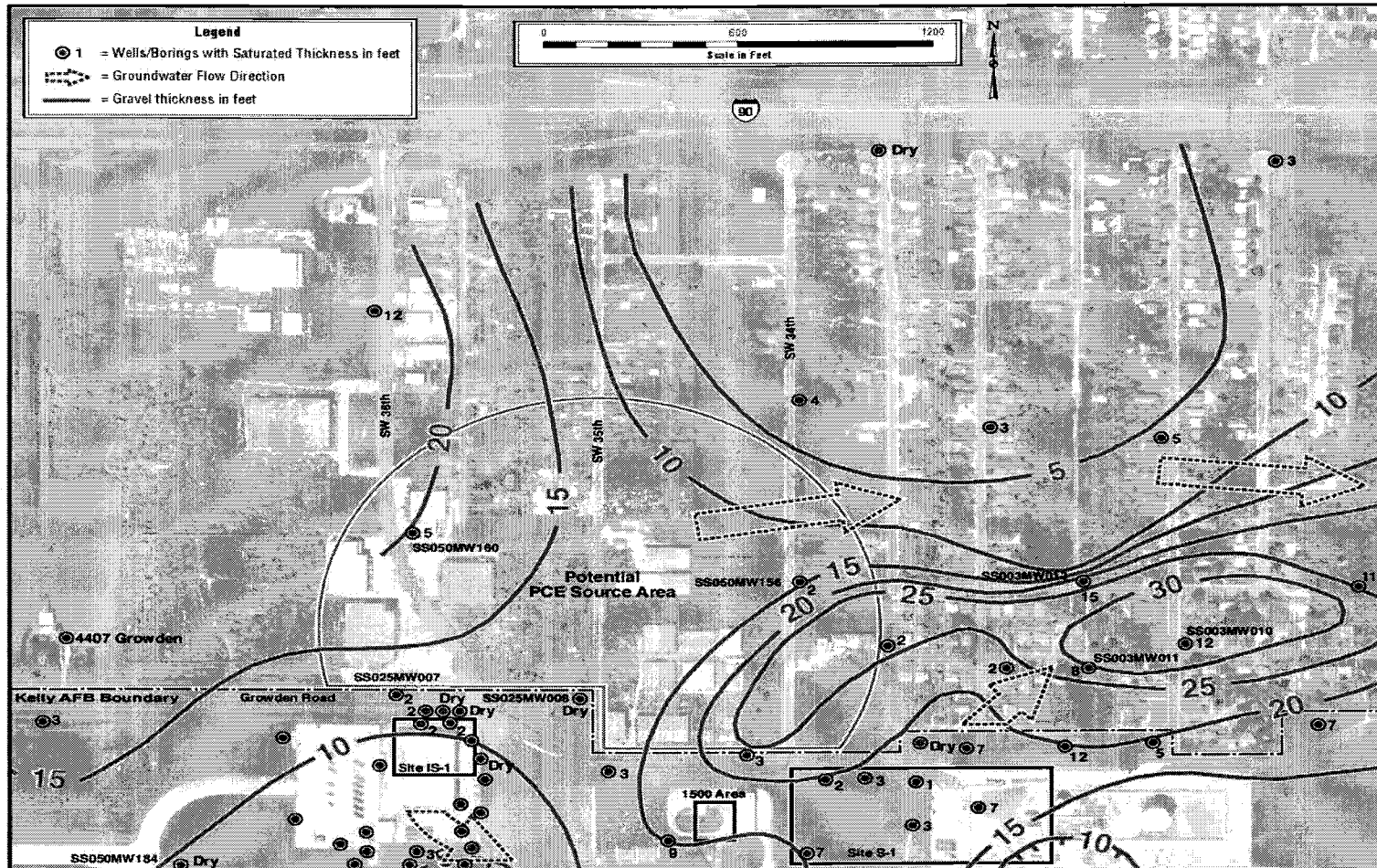


[Source: CH2M Hill]

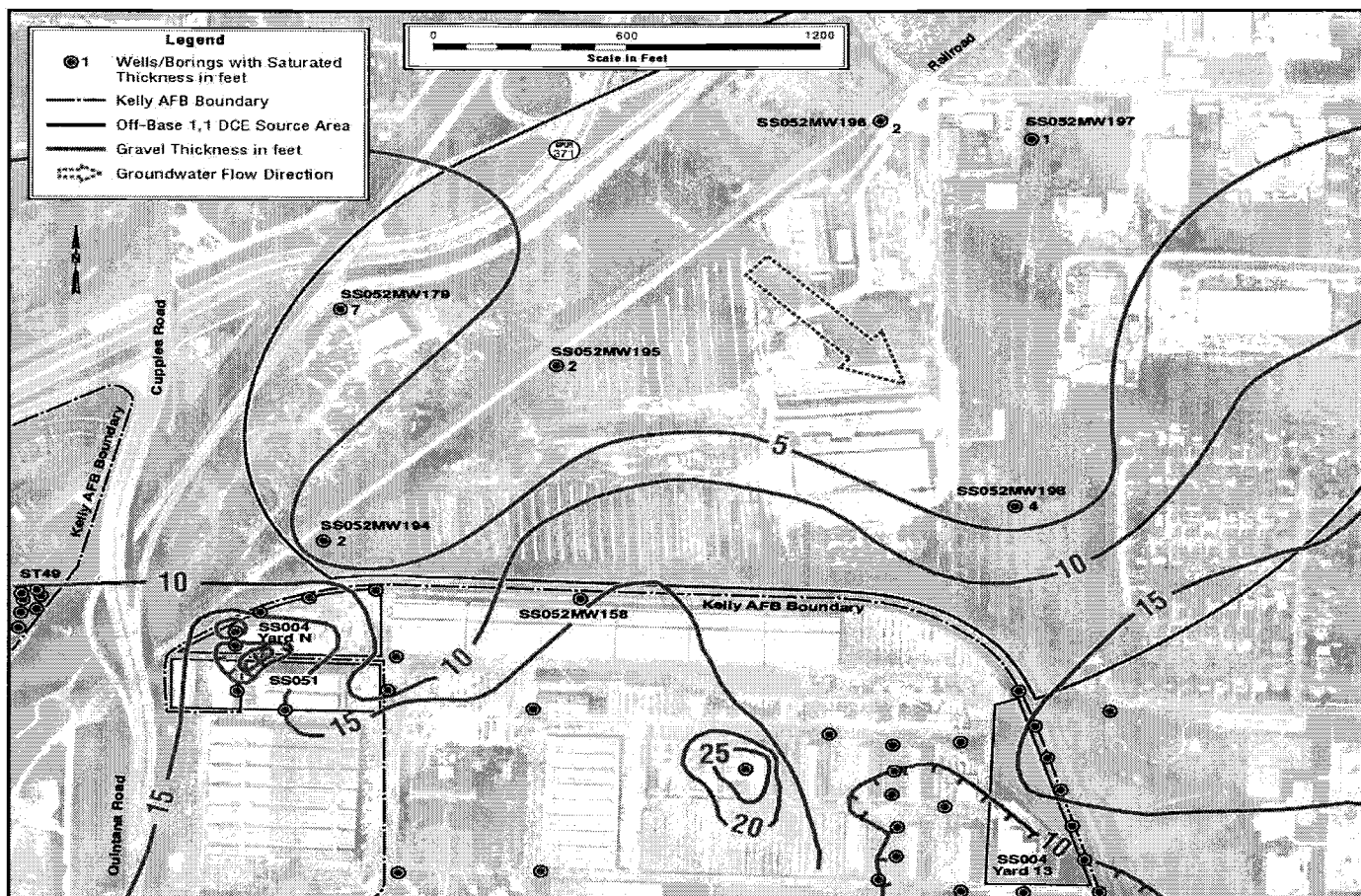
Detailed Navarro Surface Topography in the Off-Base PCE Potential Source Area



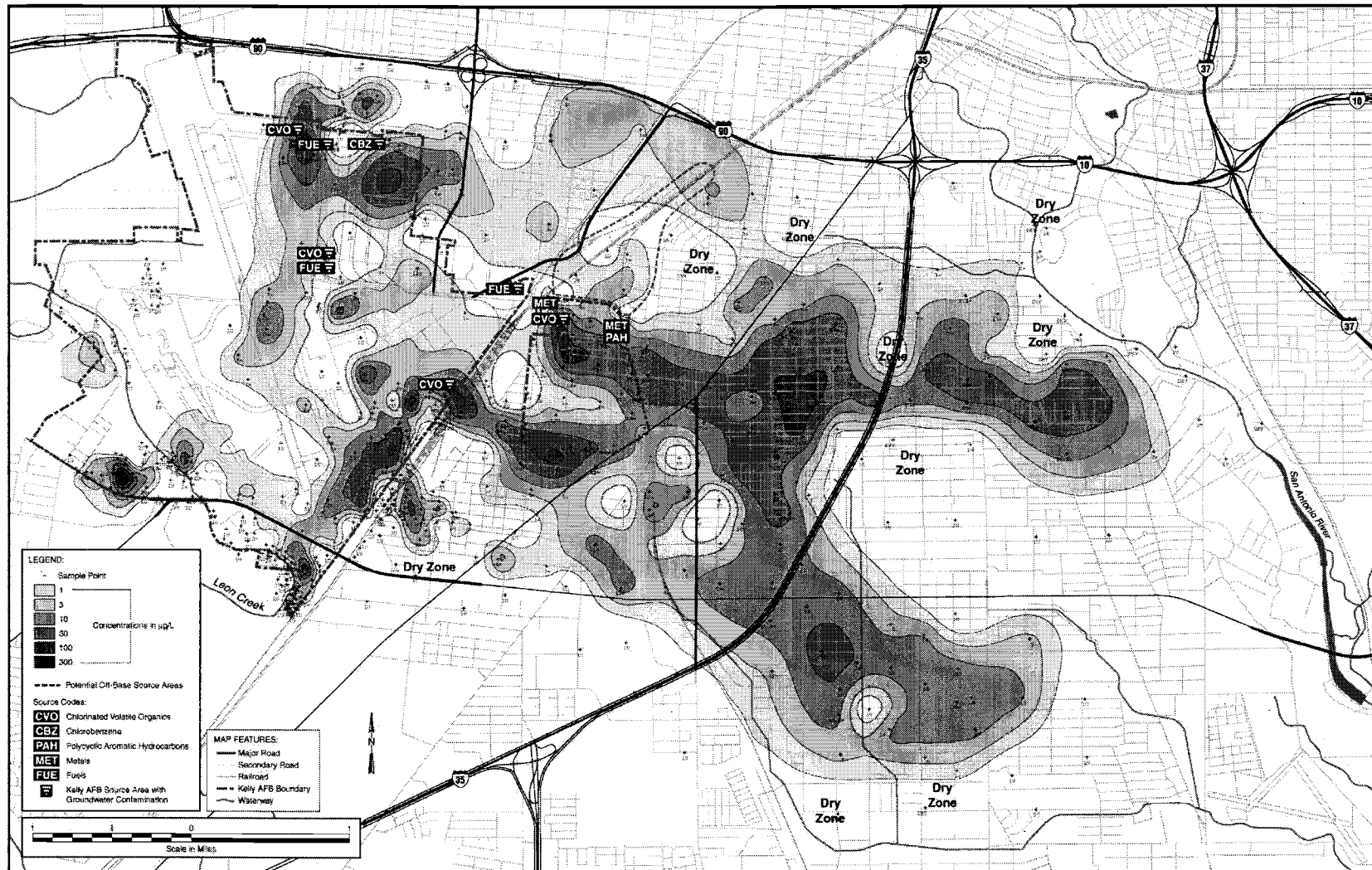
Gravel and Saturated Thickness in the Off-Base Northern Potential PCE Source Area



Gravel and Saturated Thickness in the Off-Base 1,1 DCE Potential Source Area

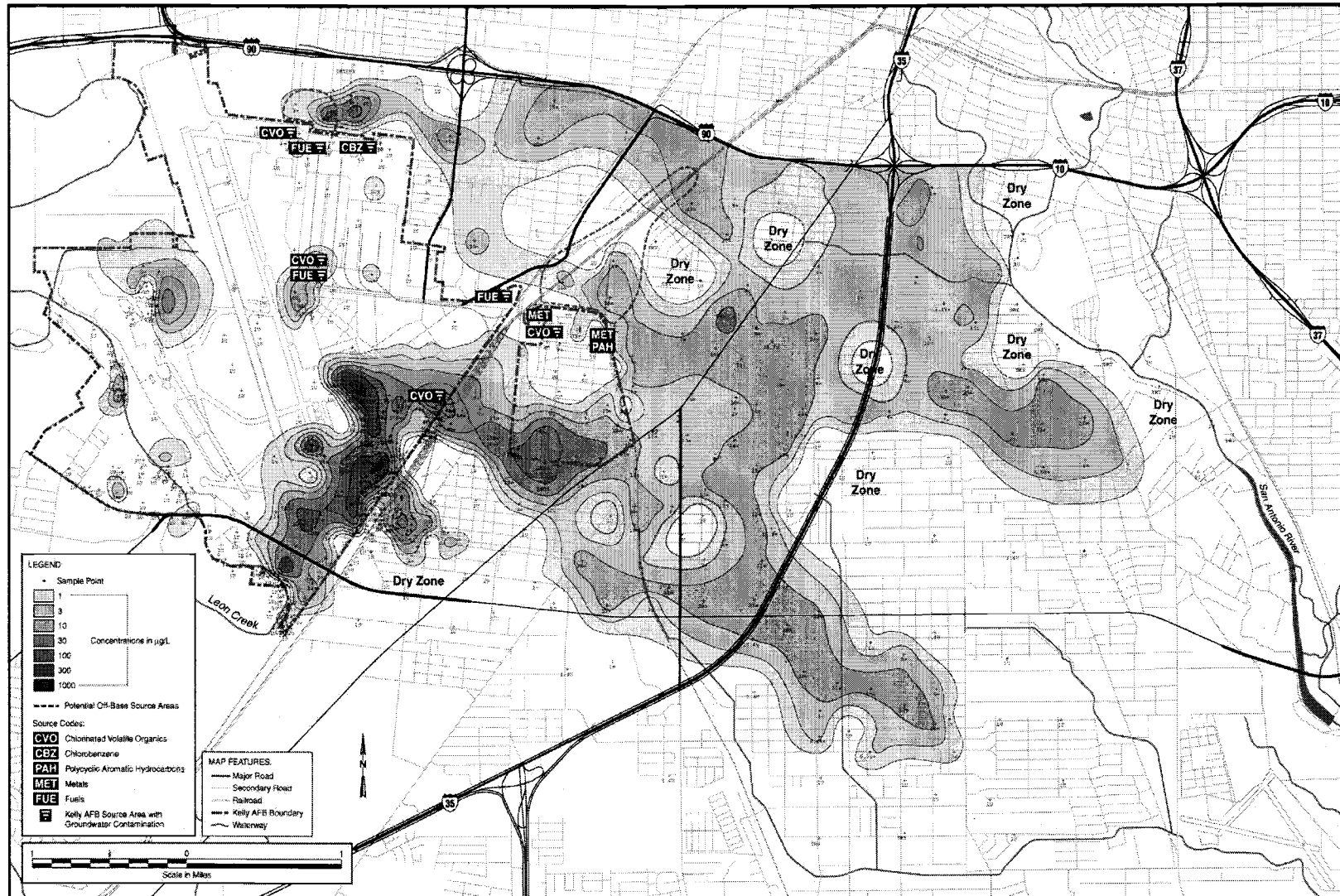


TCE in Shallow Groundwater

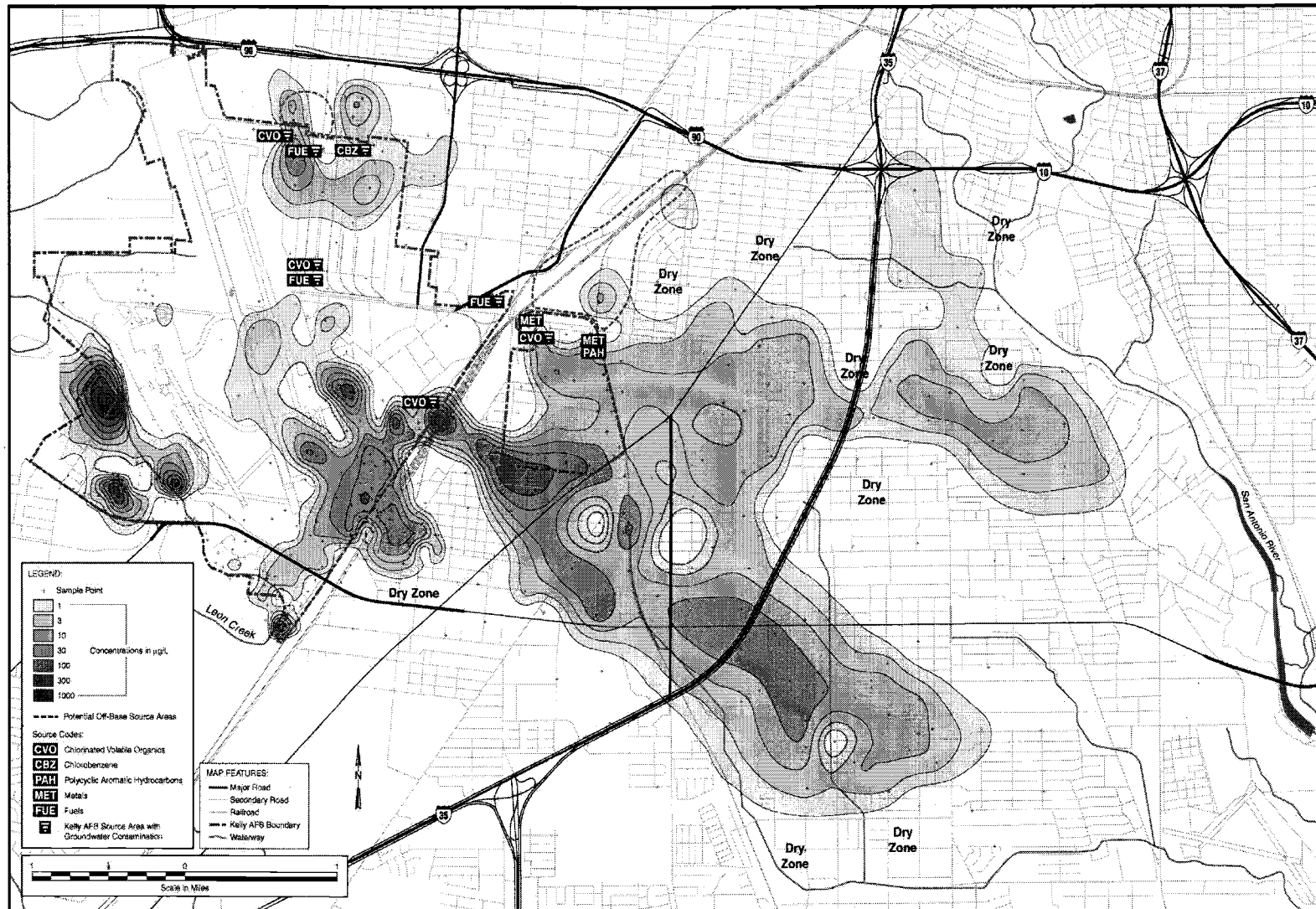


(Source: CH2M Hill)

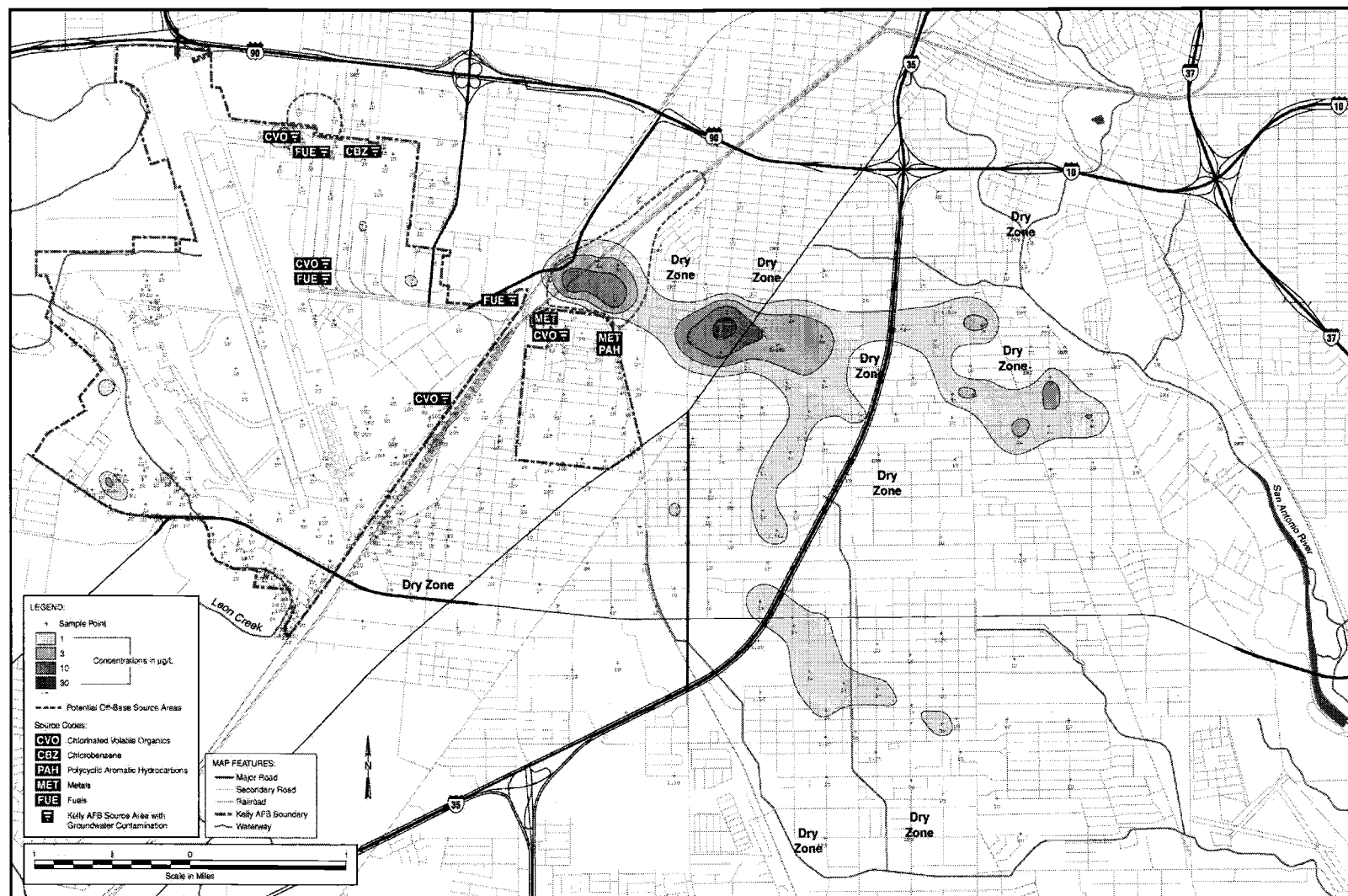
PCE in Shallow Groundwater



1,2 DCE in Shallow Groundwater

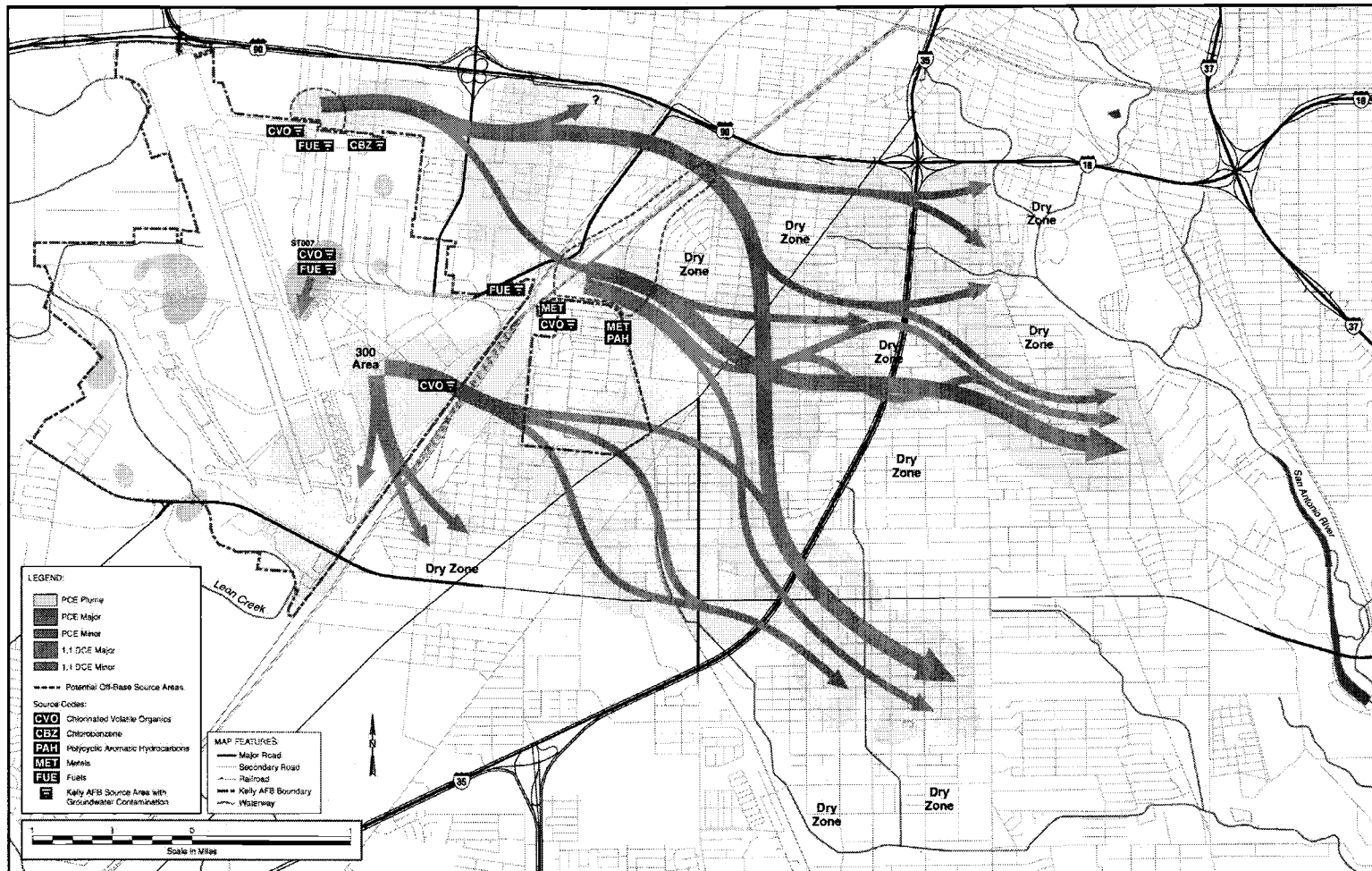


1,1 DCE in Shallow Groundwater



(Source: CH2M Hill)

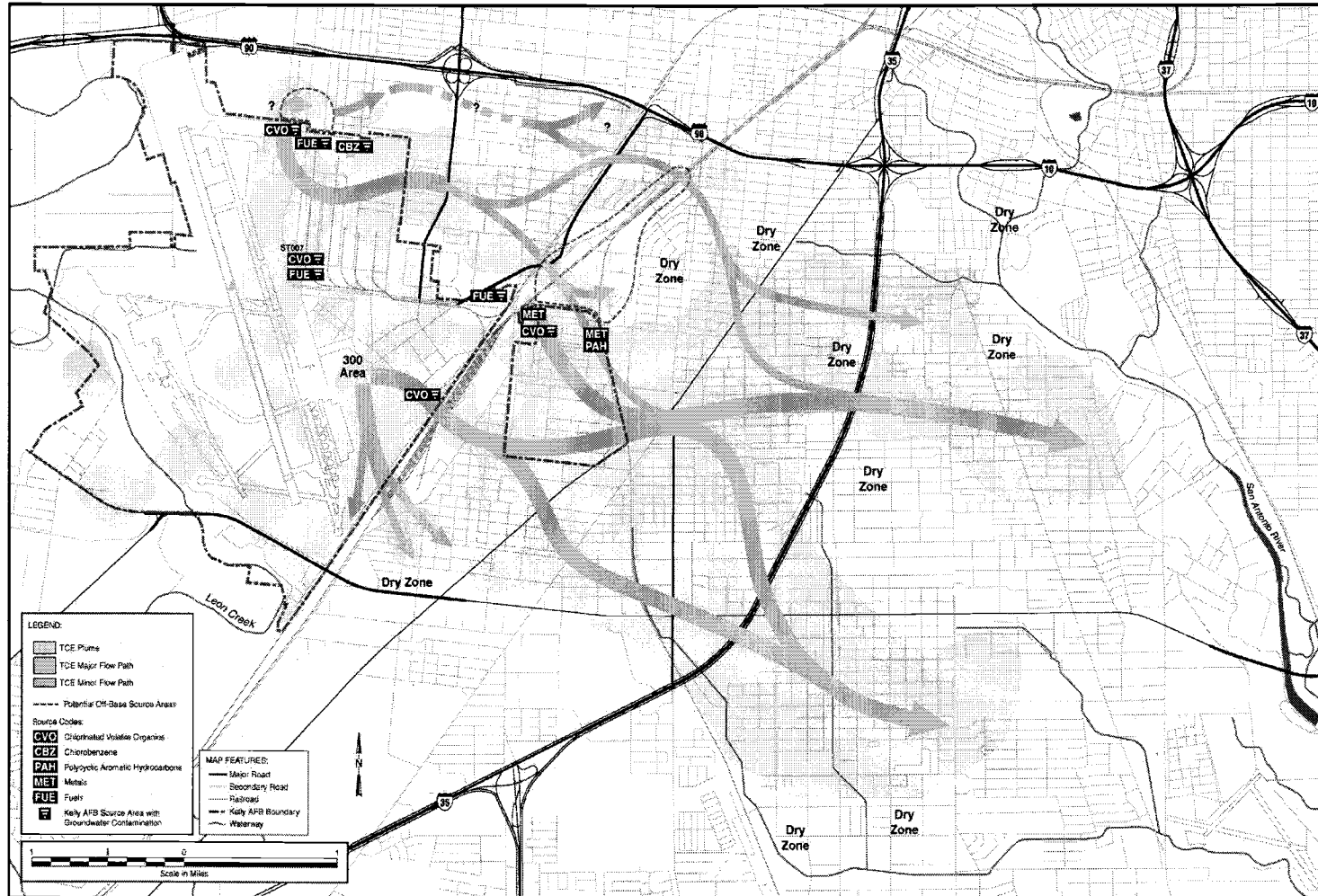
Conceptual PCE and 1,1 DCE Plume Flow Paths Based on Plume Centerlines



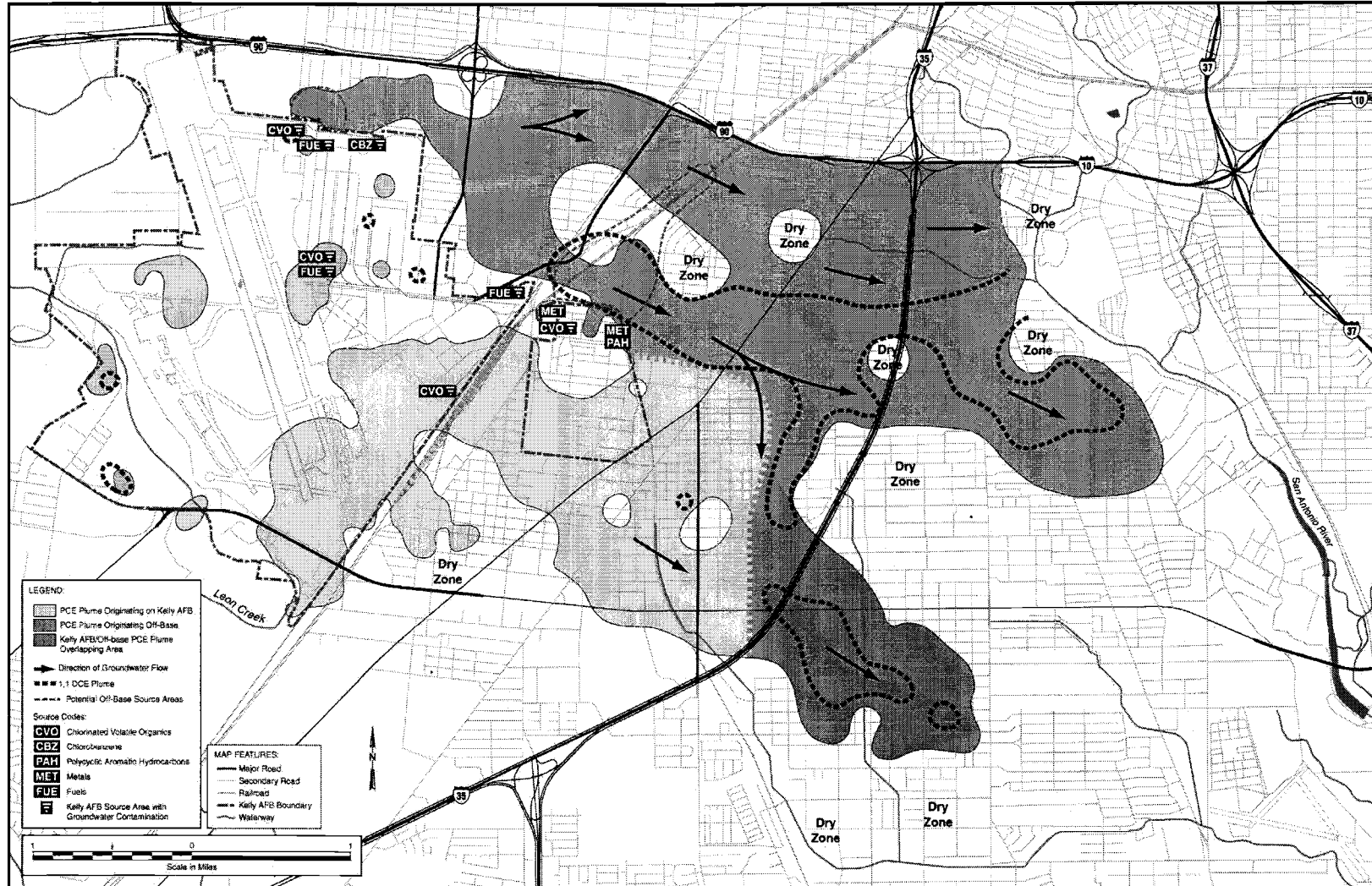
(Source: CH2M Hill)

ControlNumber

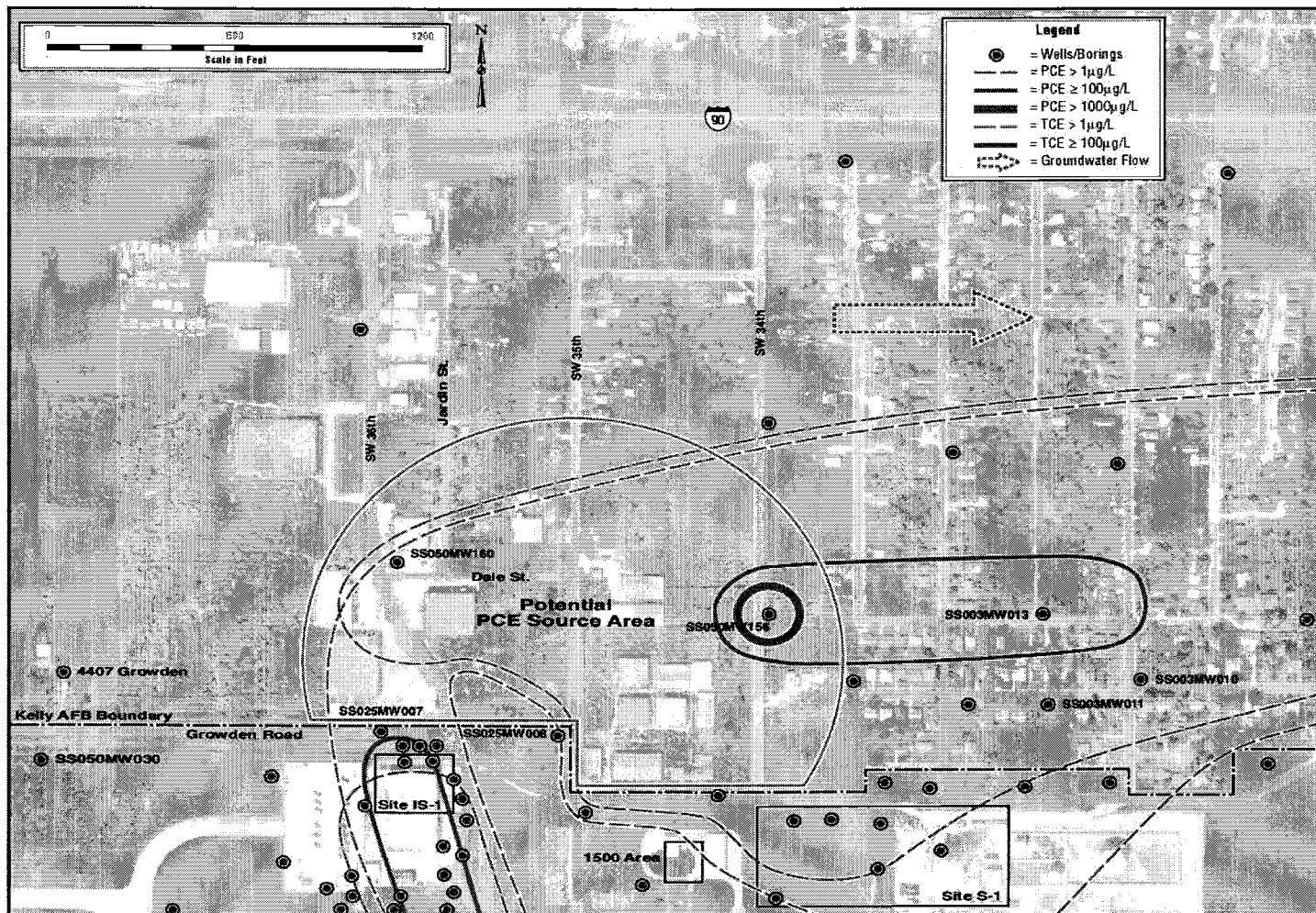
Conceptual TCE Plume Flow Paths Based on Plume Centerlines



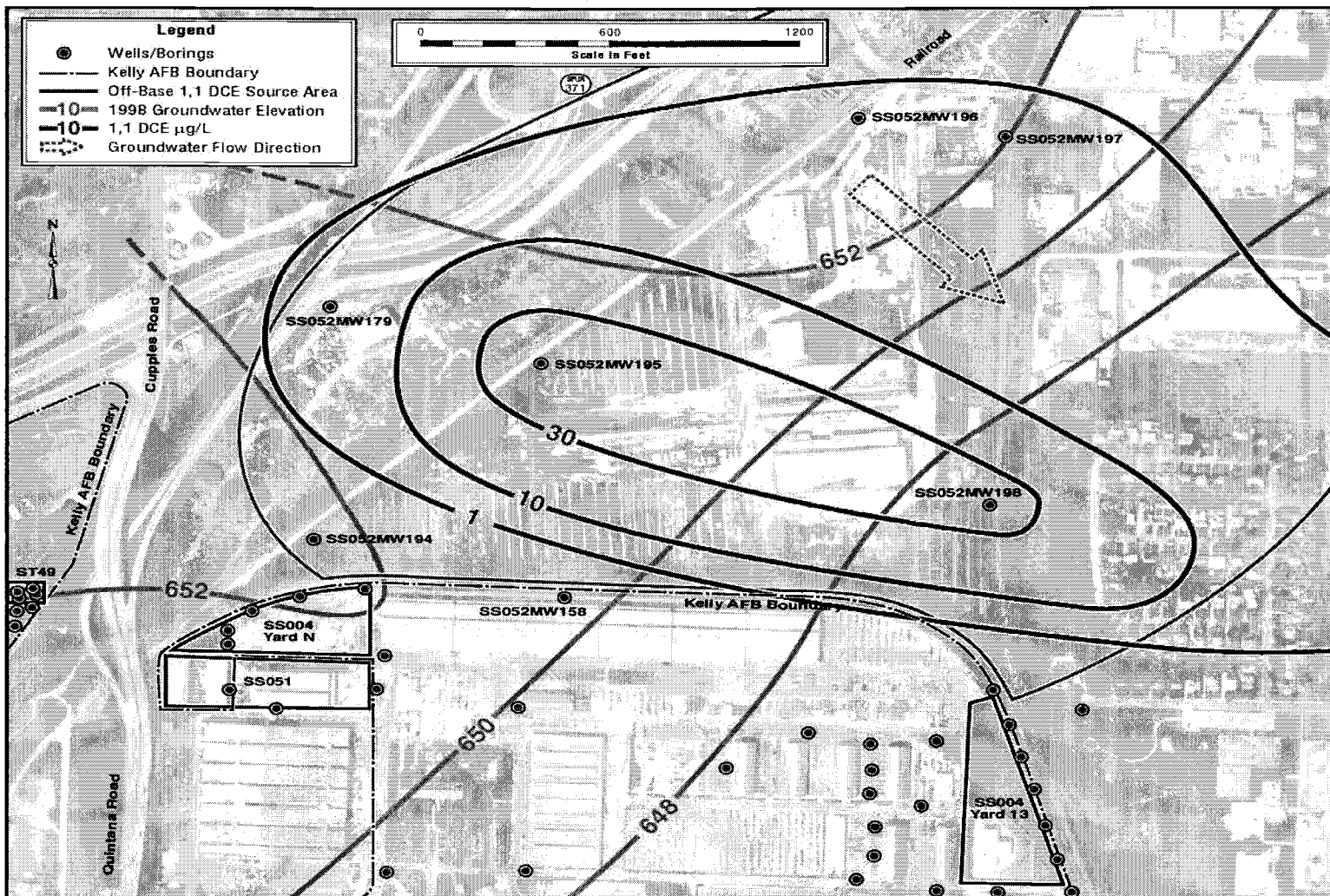
Partitioned PCE Plumes



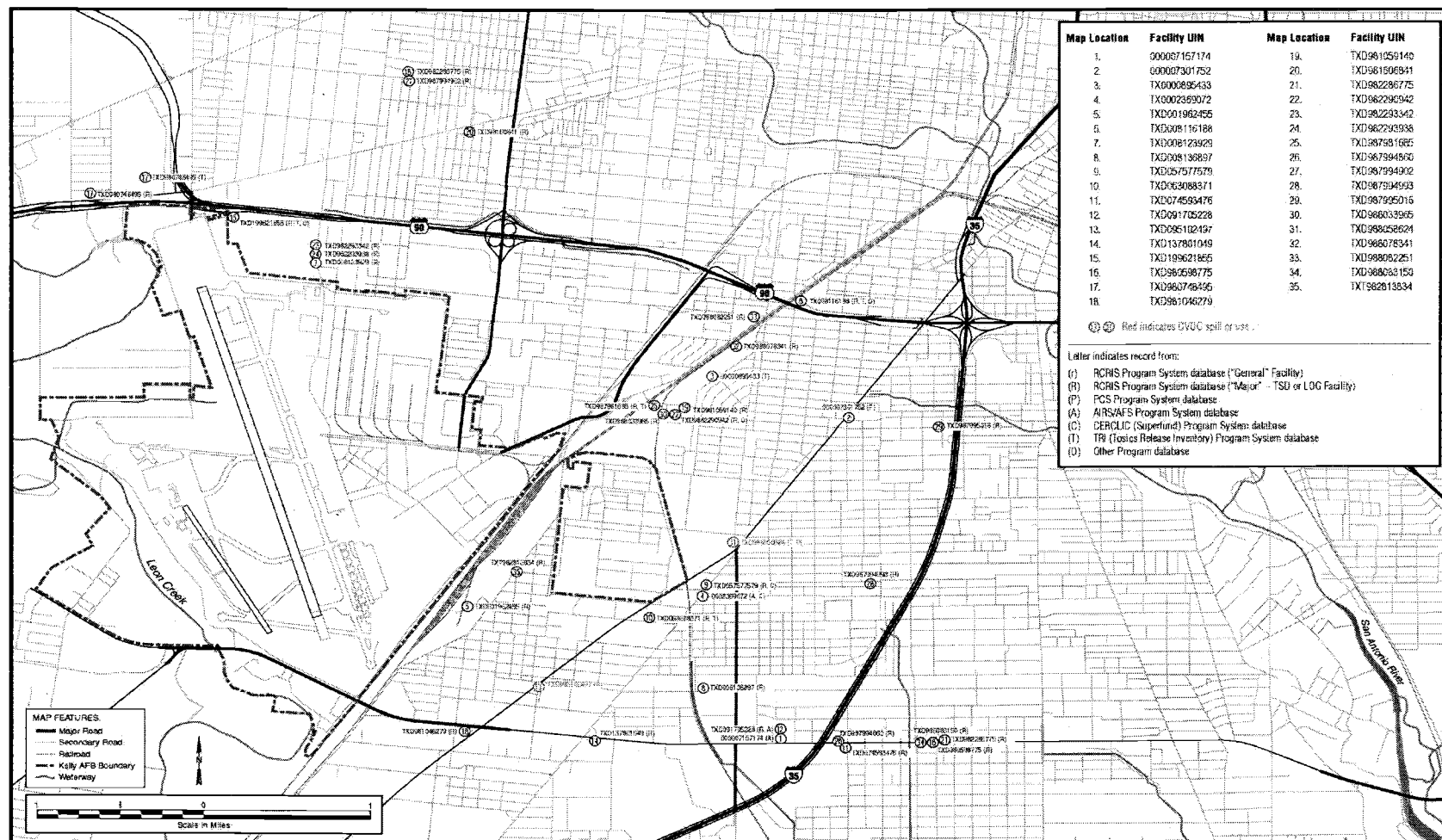
PCE and TCE Concentrations in the Off-Base Northern PCE Potential Source Area



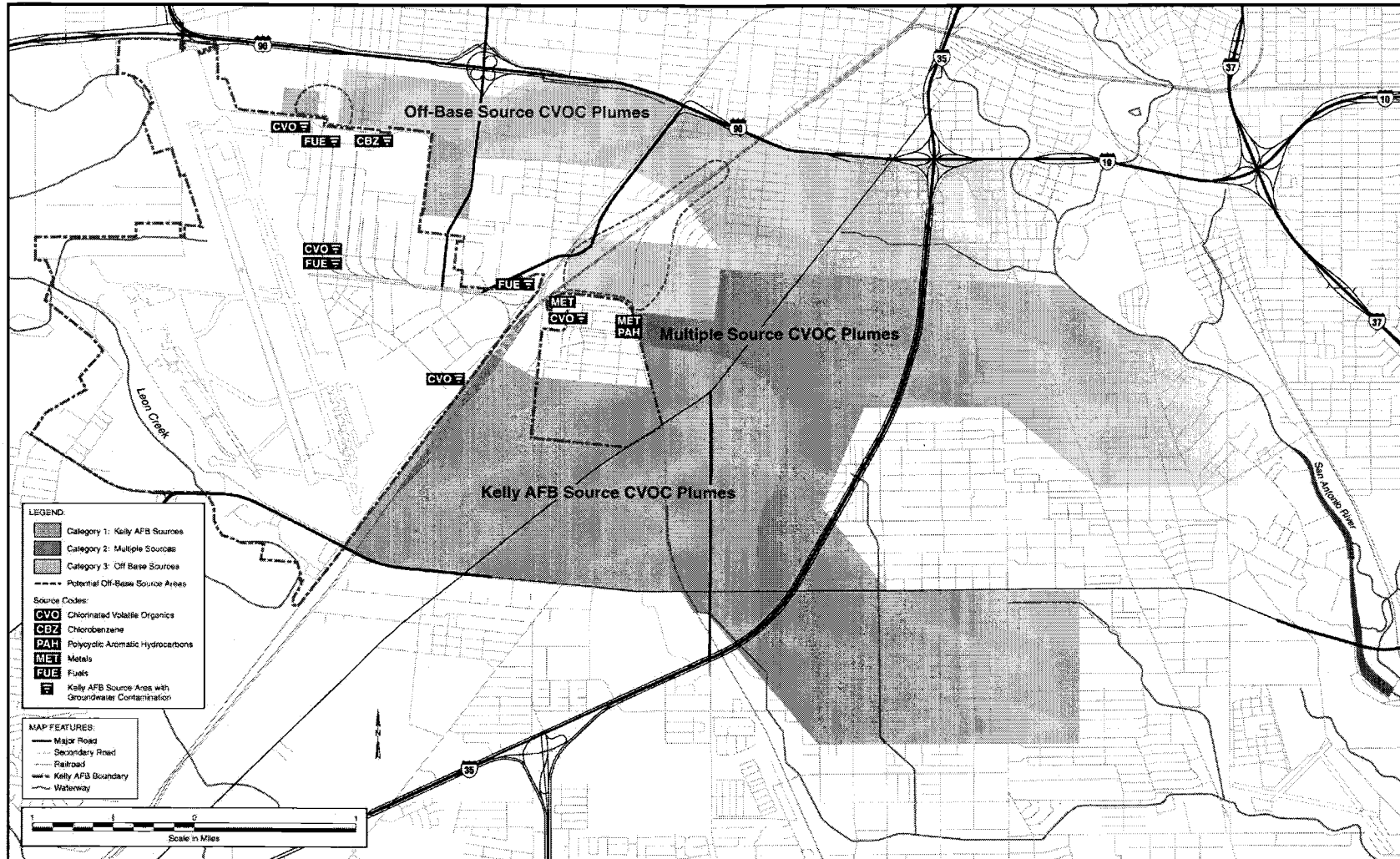
1,1 DCE Concentrations in the Off-Base Potential 1,1 DCE Source Area



Selected EPA/State Regulated Units North and East of Kelly AFB



Off-Base Plume Categories



Executive Summary

Site WP020 has been reported to have contained an oil evaporation pit. The site is located in Zone 1 at southwestern side of Kelly Air Force Base (AFB) in San Antonio, Texas. The site, which measures about 0.5 acres, is currently beneath a pond on the base golf course within landfill site LF017 and fire control training site FT023. The existing pond is about 100 feet in diameter and is 2 to 5 feet deep. Site WP020 is near other inactive waste management sites that underlie the present golf course at the base. These sites are collectively referred to as Zone 1 at Kelly AFB for implementation of the Air Force Installation Restoration Program (IRP).

This report contains the findings of previous studies and field sampling implemented in accordance with the Quality Project Plan Zone 1 Data Gap Sampling for Soils Feasibility Study (FS) approved by TNRCC in February 1998. The intent of this report is to present recommendations for closure of Site WP020 and remediation of the site contaminants with landfill Site LF017. The groundwater beneath all of Zone 1 is in the corrective action phase under the Air Force IRP.

Operational History

The site is currently located beneath a pond on the base golf course within landfill site LF017 about 1,100 feet southwest of Leon Creek and 400 feet north of Military Drive. In 1982, the Phase I Records Search report indicated that Site WP020 was operated as an oil evaporation pit from 1961 to 1970. The Phase I report also indicated that top layer of oil was frequently burned off to reduce the volume of liquids in the pit.

The Phase I report also indicated that during the early 1970s, liquid waste materials were reportedly removed from the evaporation pond and some contaminated and uncontaminated soils might have been excavated from the pit to construct a pond for the base golf course. A silty clay liner, about 6.5 to 9 feet thick, was placed under the pond to prevent the leakage. However, there are no written records or photographic evidence to corroborate this description.

Water is added to the golf course pond periodically to make up for evaporative losses.

Closure Investigation Results

The Quality Project Plan, Zone 1 Data Gap Sampling for Soils Feasibility Study that was submitted to TNRCC in February 1998 describes the sampling rationale. One additional soil boring was drilled and three soil samples were collected from upgradient of the site area during the site closure investigation (CI). Chemical analysis of the soil samples and previous soil samples form the basis of the closure process. These samples were analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and cyanide.

The Risk Reduction Standards (RRSs) require the owner to show that a site meets one of the following standards:

- RRS No. 1: Closure to Background
- RRS No. 2: Closure to Health-Based Standards and Criteria
- RRS No. 3: Closure with Controls

Relevant data collected at the site and the surrounding area were compiled to determine which standard applies to Site WP020. To evaluate the site against RRS No. 1, chemical data were compared to background values specific to Kelly AFB. Seven metals exceeded background concentrations; and 27 organic contaminants were also detected above reporting limits.

Chemical data were then compared to RRS No. 2 criteria. These criteria determine whether residual contamination after closure poses a threat to human health, assuming the site remains in industrial use. Surface soil analytical data were compared to the direct contact criteria, referred to as the Soil/Air Inhalation and Ingestion standard for soil, or SAI. None of the chemicals were found at concentrations that exceed the SAI criteria. Surface and subsurface soil data were also compared to the groundwater protection criteria to evaluate whether the soils present a future threat to the alluvial groundwater. Four metals and seven organic contaminants were found at concentrations exceeding the criteria. Two of the metals, lead and thallium, are within 1.5 factors of background concentrations; these concentrations are believed to reflect variability in background. The other two metals, cadmium and beryllium, are less than 8 times background concentrations. Among the organic exceedances, only Arochlor-1242 was detected in one soil sample collected within Site WP020 at depth interval of 2-4 feet in the clay liner. All the other organic exceedances were detected in an area outside of Site WP020, within Sites FT023 and LF017. Therefore, the inorganic and organic contamination might have been caused by any one or all the three site activities.

Conclusions

The CI for Site WP020 indicates that only Arochlor-1242, beryllium, and cadmium are present within the site boundary at concentrations exceeding the RRS No. 2 criterion for protection of groundwater. The closure investigation demonstrates that Arochlor-1242 is also found at elevated concentrations within Sites FT023 and LF017. All other contaminants are present at concentrations below the RRS No. 2 criteria for protection of groundwater, and below the RRS No. 2 criteria for inhalation and ingestion of surface soil in an industrial setting.

There are no written records or photographic evidence that indicate that an oil evaporation pond ever existed at this site. To the contrary, an aerial photograph taken in 1966, when the oil evaporation pit was reported to have been active, clearly shows that there is no pond at the suspected WP020 location.

Since the Phase I report was written in 1982, other possible evaporation pits have been discovered in Zone 1. The 1998 investigations collected aerial photographs, later supported by analytical data, that indicate evaporation ponds or chemical disposal pits were operated

within IRP Sites LF001 and WP029. Also, there is a previously documented evaporation pit located at IRP Site LF015. It is possible that one of these other evaporation ponds was incorrectly identified as being located at Site WP020.

Regardless of the site history, Site WP020 should not be treated as a discrete Solid Waste Management Unit (SWMU) because the site lies entirely within Site LF017 and the contaminants detected most likely originated from the landfill. Future remedial activities at Site LF017 are currently being addressed as part of the Zone 1 Soils CMS, to be submitted to the TNRCC in 1999. The LF017 remedial selection process will take into consideration the contaminants found at Site WP020.

Kelly AFB requests that Site WP020 (SWMU No. 12) be granted No Further Action Required status and that it be closed as a SWMU. In addition, the Air Force will seek removal of SWMU No. 12 from the Compliance Plan. A Class 2 or 3 permit modification will be required to remove this site from the Groundwater Compliance Plan.

Executive Summary

Site SS041 is a former lumber storage and burning area located on the southwestern side of Kelly Air Force Base (AFB) in San Antonio, Texas. Site SS041 is a 0.3-acre, flat-graded, grass-covered area. It was used for storage and burning of lumber from 1965 to 1966. Site SS041 is near general waste management sites that underlie the present golf course at the base. These sites are collectively referred to as Zone 1 for implementation of the Air Force Installation Restoration Program (IRP).

This report contains the findings of previous studies and recent field sampling conducted as part of the Data Gap Sampling for Soils Feasibility Study (FS) project in 1998. The purpose of this report is to present the findings of all environmental investigative activities performed at Site SS041, and also to present a comprehensive site history.

Operational History

The exact location and size of Site SS041 are uncertain. In previous studies, Site SS041 was designated as an area southeast of Site LF017 and about 300 feet southeast of its current suspected location. The current suspected location and dimensions of the burn site are based on historical aerial photographs that were recently discovered in the Kelly AFB Library Archives. To ensure that both suspected burn area locations are completely covered in this closure investigation, the data collected from an area that encompasses both locations has been evaluated.

Site SS041 was a salvage lumber burn area located at the southeastern end of landfill site LF017 about 1,200 feet southwest of Leon Creek and 100 feet north of Southwest Military Drive. Historical documents indicate that the site was used for storage and periodic burning of lumber during 1965 and 1966. During the late 1960s, the current suspected burn site was graded over and became part of cut-and-fill waste disposal site LF017. Additional fill material was placed at the site and regraded during construction of the Kelly AFB golf course in 1970.

After Site SS041 became inactive in 1966, other activities at the location removed any physical evidence that a burn site had been located there. From 1961 to 1970, Kelly AFB operated a cut-and-fill landfill, currently designated IRP Site LF017, in the vicinity of the former burn site. LF017 landfill trenches were cut through the SS041 location. In the early 1970s, the entire area was regraded as a result of construction of the Kelly AFB golf course.

Closure Investigation Results

During the Zone 1 Remedial Investigation (RI) from 1990 to 1992, a limited number of soil samples were collected at or near the formerly suspected site area. No other prior soil investigations were conducted specifically for the site.

The Zone 1 Data Gap Sampling for Soils Feasibility Study Quality Project Plan submitted to the Texas Natural Resource Conservation Commission (TNRCC) in February 1998 detailed

the sampling rationale. During the site closure investigation, two additional soil borings were drilled and seven soil samples (including a field duplicate) were collected from and near the current suspected site area. These samples were analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and cyanide.

The Risk Reduction Standards (RRSs) require the owner to show that a site meets one of the following standards:

- RRS No. 1: Closure to Background
- RRS No. 2: Closure to Health-Based Standards and Criteria
- RRS No. 3: Closure with Controls

Relevant data collected at the site and the surrounding area were compiled to determine which standard applies to Site SS041. To evaluate the site against RRS No. 1, chemical data were compared to background values specific to Kelly AFB. Nine metals exceeded background concentrations. Twelve organic compounds were detected above reporting limits.

Chemical data were then compared to RRS No. 2 criteria. These criteria determine whether residual contamination after closure poses a threat to human health, assuming the site remains in industrial use. Surface soil analytical data were compared to the direct contact criteria, referred to as the Soil/Air Inhalation and Ingestion standard for soil (SAI). None of the chemicals were found at concentrations that exceeded the SAI criteria. Surface and subsurface soil data were also compared to the groundwater protection criteria (GWP) to evaluate whether the soils presented a future threat to the shallow groundwater. Six metals and one organic contaminant (Arochlor-1260) were found at concentrations exceeding the criteria. The organic contaminant was detected in a surface soil sample collected from a location within the landfill Site LF017. Soil was analyzed using the Synthetic Precipitation Leaching Procedure (SPLP) to further evaluate the future threat to the shallow groundwater by metals. Lead, cadmium, and chromium were found at concentrations exceeding groundwater protection criteria. Chromium is not considered as a potential contaminant for groundwater, however, because the sample for which the SPLP chromium concentration exceeded the groundwater maximum contaminant level (MCL) had a total chromium concentration less than groundwater protection criterion (GWP-Ind). The sample with elevated lead and cadmium concentrations in SPLP extract was collected from the landfill area at the same location as the sample with an elevated Arochlor-1260 concentration. Lead, cadmium, and Arochlor-1260 contamination is not likely related to the burning of lumber. This contamination is considered to be the result of the landfilling activities.

Conclusions

The results of the closure investigation soil sampling indicate that cadmium, lead, and Arochlor-1260 contamination at the current suspected site area exceed the TNRCC RRS No. 2 criteria. This area, however, is located within IRP Site LF017 (a former landfill) and these contaminants are being addressed in the Zone 1 Corrective Measures Study (CMS) currently under way. Kelly AFB believes that Site SS041 does not merit further consideration as a Solid Waste Management Unit (SWMU) and requests that No Further Action (NFA) status be granted by TNRCC based upon the following facts:

- No discrete chemical evidence indicates that a burn site has impacted soil or groundwater at this location. The contaminants detected are not consistent with other sites impacted by scrap lumber burning activities. Landfilling operations are the most likely cause of contamination at this location.
- If the burn site had impacted any soils at this location, the soils have since been removed by landfilling operations and regrading activities.
- Site SS041 is located entirely within another SWMU (IRP Site LF017). Therefore, any future activities at Site LF017 will include Site SS041.
- Groundwater at this location is unlikely to have been impacted by lumber burning activities, but is being remediated regardless on a zone-wide basis.

In addition, the Air Force requests removal of this SWMU (No. 28) from the Compliance Plan. A Class 2 or 3 permit modification is required to remove the site from the Groundwater Compliance Plan.

Executive Summary

Site LF018 is an inactive fill area located in the west-central portion of Zone 1 within the Security Hill area, on the southwestern side of Kelly Air Force Base (AFB) in San Antonio, Texas. The site is a 2-acre grass and concrete-covered area. It was used for disposal of yard and construction debris from late 1970s to early 1980s. Site LF018 is near other general waste management sites that underlie the present golf course at the base. These sites are collectively referred to as Zone 1 at Kelly AFB for implementation of the Air Force Installation Restoration Program (IRP).

This report fulfills the requirements for closure of Site LF018 under the Texas Natural Resource Conservation Commission (TNRCC) Risk Reduction Standards (RRSs). It contains the findings of field sampling, implemented in accordance with the Quality Project Plan Zone 1 Data Gap Sampling for Soils Feasibility Study (FS) approved by TNRCC in February 1998. The intent of this report is to demonstrate the closure of the soils at this site according to the regulations cited above. The groundwater beneath all of Zone 1 is in the corrective action phase under the Air Force IRP.

Operational History

Site LF018 was an area that received various types of fill from the late 1970s to early 1980s. The primary wastes placed at this site were construction rubble, broken runway sections, hardfill, and general refuse. No site documents indicate that hazardous materials have been disposed at this site. Yard and construction debris was also placed on the side of the hill and in a nearby ravine that was later regraded. In the early 1980s, the disposal site was regraded with fill material to serve as a parking lot for maintenance vehicles.

During the Zone 1 Remedial Investigation (RI) from 1990 to 1992, a limited number of soil samples were collected at or near the suspected site. The analytical results indicated that no significant contamination was present at the site.

Closure Investigation Results

The *Zone 1 Soils FS Quality Project Plan* was submitted to TNRCC in February 1998 and describes the sampling rationale. Three additional soil borings were drilled and nine soil samples were collected from the site during the site closure investigation. Chemical analysis of the soil forms the basis of the closure process. These samples were analyzed for metals, volatile organic compounds (VOCs), semi-volatile organic compounds (SVOCs), pesticides/polychlorinated biphenyls (PCBs), and cyanide.

The RRSs require the owner to show that a site meets one of the following standards:

- RRS No. 1: Closure to Background
- RRS No. 2: Closure to Health-Based Standards and Criteria
- RRS No. 3: Closure with Controls

Relevant data collected at the site and the surrounding area were compiled to determine which standard applies to Site LF018. To evaluate the site against RRS No. 1, chemical data were compared to background values specific to Kelly AFB. Seven metals exceeded background concentrations. Six organic contaminants were also detected above reporting limits.

Chemical data were then compared to RRS No. 2 criteria. These criteria determine whether residual contamination after closure poses a threat to human health, assuming the site remains in industrial use. Surface soil analytical data were compared to the direct contact criteria, referred to as the Soil/Air Inhalation and Ingestion standard for soil (SAI). None of the chemicals were found at concentrations that exceeded the SAI criteria. Surface and subsurface soil data were also compared to the groundwater protection criteria (GWP) to evaluate whether the soils presented a future threat to the shallow groundwater. Five metals and two organic contaminants were found at concentrations exceeding GWP criteria. Metals in soil were also analyzed by the Synthetic Precipitation Leaching Procedure (SPLP) to further evaluate the future threat to the shallow groundwater by metals. None of the metals were found at concentrations exceeding groundwater protection criteria. The two organic contaminants—bis(2-ethylhexyl) phthalate (BEHP) and Arochlor-1260—were detected in a surface soil sample collected from a location at the southwestern boundary of the site. The occurrence of BEHP is attributed to field sampling and laboratory contamination, and not considered site contamination. A confirmatory SPLP sample analyzed for Arochlor-1260 indicated there was no potential risk of soil to groundwater transfer.

Conclusions

The Site LF018 closure investigation results indicate that there are no contaminants detected in soils that exceed RRS No. 2 closure criteria. The analytical data initially indicated that Arochlor-1260 at LF018SB011 exceeded the RRS No. 2 GWP-Ind criteria, however subsequent analysis using SPLP extraction proved otherwise. BEHP was also initially flagged as a RRS No. 2 GWP-Ind exceedance, but its presence is attributed to sampling and lab contamination.

Upon receiving TNRCC's concurrence of a RRS No. 2 closure, Kelly AFB will perform the metes and bounds survey and file the deed recordation with the Bexar County Appraisal District. A Class 2 or 3 permit modification will be required to remove the site from the Groundwater Compliance Plan.

Executive Summary

Unit SA-2, the Industrial Waste Sludge Lagoon, is an inactive interim-status surface impoundment located at Kelly Air Force Base (AFB), San Antonio, Texas. Unit SA-2 was operated as part of the Kelly AFB industrial wastewater treatment plant (IWTP). Unit SA-2 ceased operations in 1980, and sludges and contaminated soil were removed in 1984 and 1987. Investigations after the removal actions identified detectable concentrations of contaminants in soil following the removal actions.

In anticipation of the then-pending closure and post-closure Resource Conservation and Recovery Act (RCRA) permit, Kelly AFB elected to proceed with a closure investigation to determine the Texas Natural Resource Conservation Commission (TNRCC) Risk Reduction Standard (RRS) applicable to closure of Unit SA-2. The closure investigation strategy was presented to TNRCC and the U.S. Environmental Protection Agency (EPA) in May 1997. Informal comments received verbally from the regulatory agencies were incorporated into the *Closure Investigation Plan for Units SA-2 and SD-1* dated November 1997 (referred to as the Closure Investigation Plan throughout the remainder of this report). The Closure Investigation Plan was included as an attachment to the *RCRA Closure Plan for Units SA-2 and SD-1* submitted to TNRCC for review in September 1998. TNRCC approved the plan with modification on February 18, 1999. The draft final version of this report was submitted to TNRCC in March 1999. Review comments from the agency were received on June 28, 1999 and the response to those comments is incorporated into this document.

This RCRA Closure Report fulfills the requirements for closure of Unit SA-2 under the RCRA hazardous waste regulations, the TNRCC RRSs, and the conditions of the RCRA permit. It contains the findings of field sampling, implemented in accordance with the Closure Investigation Plan, and the results of the data evaluation. The intent of this report is to demonstrate the closure of the soils at this site according to the regulations and permit conditions referenced above. This report also demonstrates that the closure approach meets the overall closure objective to minimize the need for further maintenance and protect human health and the environment by minimizing post-closure escape of hazardous constituents into the environment.

An extensive groundwater monitoring program was implemented specifically for the four RCRA-regulated units (SA-2, SD-1, E-3 and S-8) to fulfill the requirements of the Updated Groundwater Quality Assessment Plan (GQAP) which was submitted pursuant to an Agreed Order issued in 1989 by the Texas Water Commission, now the TNRCC. The quarterly groundwater monitoring also was conducted to meet the requirements of 40 CFR 265 Subpart F and 30 TAC 335.116. TNRCC issued a RCRA Post-Closure Permit (HW-50310) on June 12, 1998. The permit includes a Groundwater Compliance Plan (CP-50310) that stipulates the groundwater monitoring requirements for the regulated units. The Compliance Plan requires groundwater monitoring at the regulated units to be conducted on a semiannual basis.

The widespread occurrence of SVOCs/PAHs and TPH with increasing concentrations with depth fits the conceptual site model that attributes these characteristics to the presence of asphaltic materials in the fill layer. The asphaltic fill material and the occurrence of pesticides is considered anthropogenic background for Unit SA-2. TPH was detected in groundwater samples from wells both upgradient and downgradient of SA-2. Sampling of the remaining soil in the pit detected TPH at concentrations that are one or two orders-of-magnitude lower than values detected in samples from surrounding fill layer.

Existing site conditions in both soil and groundwater at Unit SA-2 meet RRS No. 2 criteria for human exposure according to 30 TAC 335.558 and 30 TAC 335.559. Kelly AFB intends to close the site under existing conditions according to RRS No. 2. The deed recodation language is included in Appendix F. Kelly AFB will submit a Deed Certification once the TNRCC acknowledges that the site conditions meet RRS No. 2 closure requirements.

1 Executive Summary

2 Introduction

3 The purpose of this Corrective Measures Study (CMS) is to evaluate final remedial
4 alternatives for both on base soil and shallow groundwater contamination and off base
5 shallow groundwater contamination in Zone 5 at Kelly Air Force Base (AFB) in San Antonio,
6 Texas. This CMS integrates the findings of previous reports addressing interim remedial
7 actions for shallow groundwater and soil in Zone 5 with an evaluation of remedial
8 alternatives for other Zone 5 areas of concern that have not been previously evaluated.
9 Thus, this document concludes the remedy selection portion of the phased approach to
10 remediation of Zone 5. It is anticipated that an alternative, or combination of alternatives,
11 will be selected from this CMS report by Kelly AFB and the regulatory agencies and
12 presented in a separate proposed plan to the public for review and comment.

13 Background

14 Kelly AFB consists of two non-contiguous areas, the main portion of Kelly AFB and East
15 Kelly. As a result of past waste management practices, the soil at Kelly AFB and shallow
16 groundwater underlying and adjacent to the installation have become contaminated. To
17 organize cleanup at the installation, Kelly AFB is divided into five zones. Zone 5 consists of
18 all on base areas outside of Zones 1 through 4. This CMS report is focused on evaluation of
19 remedial alternatives at and immediately adjacent to Zone 5.

20 Kelly AFB is authorized for closure and post-closure care of certain hazardous waste units
21 under Permit No. HW-50310 issued by the Texas Natural Resource Conservation
22 Commission (TNRCC). The permit and associated compliance plan specify cleanup
23 requirements for solid waste management units, including many in Zone 5. The cleanup of
24 Kelly AFB is also being addressed pursuant to the *Comprehensive Environmental Response,
25 Compensation, and Liability Act of 1980* (CERCLA) and the Department of Defense
26 Environmental Restoration Program (DERP). The USAF program is called the Installation
27 Restoration Program (IRP) and it is conducted in a manner that is consistent with both
28 CERCLA and the National Contingency Plan, even for those USAF installations that are not
29 on the U.S. Environmental Protection Agency's National Priorities List. Kelly AFB is one of
30 the installations being addressed under the IRP; it is not, however, on the National Priorities
31 List.

32 Soil and Groundwater Characterization

33 The 1999 Final Zone 5 Remedial Investigation (RI) Report constitutes the primary source of
34 environmental data used for this CMS. The RI data have been supplemented by several
35 more recent supplementary characterization efforts.

1 Soil Contamination

2 Site S003 (S-1) is the only site in Zone 5 where significant soil contamination has been
3 documented to date. The primary contaminants of concern (COCs) found in Site S003 (S-1)
4 are chlorobenzene (CB), 1,2-dichlorobenzene (1,2-DCB), and 1,4-dichlorobenzene (1,4-DCB).
5 This contamination shows up at unsaturated zone depths in the sump area ranging from 12
6 to 14 feet below ground surface (bgs) to the water table (24 to 26 feet bgs), which correlates
7 well with the estimated surface elevation of the former sump area. The CB, 1,2-DCB, and
8 1,4-DCB detected in the deeper zone outside of the sump area, referred to as the "smear
9 zone," suggests that this contamination reached this area through light nonaqueous phase
10 liquid (LNAPL) transport. Chlorobenzene and 1,2-DCB are liquids denser than water and
11 1,4-DCB is a solid at room temperature. However, if the CB and DCBs had been mixed with
12 oils (which is quite possible since the site was used to store wastes), they could have formed
13 LNAPL.

14 Groundwater Contamination

15 A total of 35 contaminants of potential concern were identified in Zone 5 groundwater,
16 resulting in the delineation of eleven distinct groundwater contaminant plumes designated
17 A through K. The plumes were grouped by location of contamination, and, for some
18 constituents, the similarity between chemistry. The key contaminants of potential concern in
19 groundwater include trichloroethene (TCE), dichloroethene (DCE), 1,2-DCE,
20 tetrachloroethene (PCE), benzene, CB, and arsenic. As shown in Figure ES.1, the
21 groundwater contaminant plumes and the key contaminants of potential concern present in
22 each are as follows:

- 23 • Plume A (TCE)
- 24 • Plume B (PCE)
- 25 • Plume C (chlorobenzene and arsenic)
- 26 • Plume D (TCE, PCE, and 1,2-DCE)
- 27 • Plume E (benzene and arsenic)
- 28 • Plume F (PCE/TCE)
- 29 • Plume G (benzene and arsenic)
- 30 • Plume H (TCE and total 1,2-DCE)
- 31 • Plume I (PCE, TCE, and DCE)
- 32 • Plume J (PCE and TCE)
- 33 • Plume K (chlorobenzene).

34 The source area¹ and the body of Plume B are located offbase and the plume is migrating to
35 the north/northeast, away from Kelly AFB. The plume is not within Zone 5 and is not

¹ "Source area" is used throughout this report to indicate an area in the contamination plume in which the groundwater exhibits high contaminant concentrations relative to the rest of the plume. "Source area" is the area within which the source of

1 related to operations at Kelly AFB. Therefore, remedial alternatives for Plume B are not
2 discussed in this CMS report.

3 Remedial Action Objectives

4 Based on available data, the soil at Zone 5 does not pose unacceptable risks with respect to
5 direct contact exposure to contaminated soil. However, unacceptable risks do occur at
6 Site SS003 (S-1) if the groundwater below and downgradient is used as a drinking water
7 supply because of the potential for contaminants leaching to the groundwater. Based on
8 this, the objective for soil remedial action for Zone 5 is to prevent migration of soil
9 contaminants to groundwater that could result in exceedances of maximum contaminant
10 levels (MCLs) or, where there are no MCLs, Texas groundwater media-specific
11 concentrations.

12 Although the risk assessment did not show unacceptable risk from direct contact to soil at
13 Zone 5, a remedial objective addressing direct contact exposures is included to allow
14 evaluation of soil data that might be generated in the future. This remedial objective is to
15 prevent exposure to surface soil via ingestion, inhalation, or dermal contact that would
16 result in an excess carcinogenic risk of 1×10^{-4} or a hazard index of 1. A risk of 1×10^{-6} will be
17 used as a point of departure.

18 The shallow groundwater both on base and off base poses unacceptable risks. It is unlikely
19 that on base groundwater will ever be withdrawn directly for use as a drinking water
20 supply, but it still poses risks because it is migrating off base. Based on this, the following
21 are objectives for groundwater remedial actions for Zone 5:

- 22 1. Prevent use of both on base and off base groundwater containing contaminants in
23 concentrations exceeding MCLs, or where those are not available, Texas groundwater
24 medium-specific concentrations.
- 25 2. Reduce or prevent further migration of contaminated groundwater (defined as
26 groundwater with contaminant concentrations that exceed MCLs or, where those are not
27 available, Texas groundwater medium-specific concentrations) from on base areas to off
28 base areas. ²
- 29 3. Restore off base groundwater to MCLs or, where those are not available, to Texas
30 groundwater medium-specific concentrations, within a reasonable time frame.
- 31 4. Restore on base groundwater to MCLs or, where those are not available, to Texas
32 groundwater medium-specific concentrations, within a reasonable time frame. If that
33 time frame exceeds 20 years, establish alternate concentration limits (ACLs) that are no
34 greater than existing contaminant concentrations and ensure that those ACLs are met
35 during the interim time period.

36

groundwater contamination probably originated in the past. Unless otherwise indicated, "source area" does not mean that there is presently an active source of contamination.

² For purposes of selecting an appropriate remedial action, the term "on base" refers only to those areas of Kelly AFB that will be maintained under federal control following base closure. The term "off base" refers both to those areas that are currently outside the Kelly AFB boundaries and to those areas that will be transferred to a non-federal entity following base closure.

1 Preliminary Remediation Goals

2 Preliminary remediation goals (PRGs) were developed for soil and groundwater to establish
3 acceptable concentrations for each COC under relevant exposure settings. PRGs for soil
4 were developed for Site SS003 (S-1). Risk-based concentrations were developed in
5 accordance with EPA's Risk Assessment Guidance for Superfund using two industrial-use
6 exposure scenarios. The assumed direct-contact exposure pathways for each scenario
7 include soil ingestion, inhalation of volatile organic compounds (VOCs) and particulates,
8 and dermal contact. A risk-based soil concentration also was developed for groundwater
9 protection (GWP) based on the EPA's Summers Model, a mass balance approach to
10 contaminant leaching, and mixing with groundwater below the source area.

11 PRGs for groundwater COCs were developed from the 30 TAC 335.568, Appendix II Table
12 of medium-specific concentrations and the TNRCC Compliance Plan for Kelly AFB. For
13 each contaminant, the more stringent value of the two sources constitutes the PRG used in
14 this CMS for identifying the extent of groundwater to be remediated.

15 Development of Remedial Action Alternatives

16 General response actions (GRAs) were selected to satisfy the remedial action objectives and
17 PRGs by either reducing concentrations of hazardous substances or by reducing the
18 likelihood of contact with hazardous substances. They include actions such as treatment,
19 containment, collection, disposal, and institutional controls. Although one response action
20 may meet the goals, a combination of response actions may meet the goals more effectively.

21 The technology types and process options available for remediation of both soil and
22 groundwater were identified and screened for suitability to eliminate those technologies
23 that are clearly not applicable for remediation. Technology types and process options
24 considered are based on professional experience, published sources, computer databases,
25 and other available documentation for the identified GRAs. GRA's that remained following
26 screening were developed into remedial action alternatives.

27 Remedial Alternatives for Soil

28 Six alternatives were developed for soil at the site SS003 (S-1) sump area:

- 29 • Alternative 1 - No Further Action
- 30 • Alternative 2 - Monitored Natural Attenuation
- 31 • Alternative 3 - Source Control
- 32 • Alternative 4 - Soil Vapor Extraction (SVE)
- 33 • Alternative 5 - Excavation and Off-Base Disposal
- 34 • Alternative 6 - Ex Situ Biological Treatment

35 Four alternatives were developed for the site SS003 (S-1) smear zone:

- 36 • Alternative 1 - No Further Action
- 37 • Alternative 2 - Monitored Natural Attenuation

- 1 • Alternative 3 - SVE
- 2 • Alternative 4 - Dual Phase Groundwater Recovery and SVE

3 Remedial Alternatives for Groundwater

4 Seven remedial alternatives were developed for groundwater contaminant plumes:

- 5 • Alternative 1 - No Further Action
- 6 • Alternative 2 - Monitored Natural Attenuation
- 7 • Alternative 3 - Source Control
- 8 • Alternative 4 - Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base
- 9 Control
- 10 • Alternative 5 - Source and Perimeter Control
- 11 • Alternative 6 - Targeted Source and Perimeter Control
- 12 • Alternative 7 - Source Ex Situ and In Situ Treatment and Perimeter Control

13 Detailed and Comparative Analyses of Alternatives

14 The detailed analysis of alternatives presents the relevant information needed to compare
15 the remedial alternatives assembled for site SS003 (S-1) soils and for groundwater
16 contaminant plumes. Provisions of the National Contingency Plan require that each
17 alternative be evaluated against nine criteria listed in 40 CFR 300.430(e)(9), as follows:

- 18 • Overall protection of human health and the environment
- 19 • Compliance with ARARs
- 20 • Long-term effectiveness and permanence
- 21 • Reduction of toxicity, mobility, or volume through treatment
- 22 • Short-term effectiveness
- 23 • Implementability
- 24 • Cost
- 25 • Community acceptance
- 26 • State acceptance

27 State and community acceptance will be assessed at the conclusion of the public comment
28 period. In addition, because this document also serves to satisfy the Kelly AFB obligations
29 under NEPA, the detailed analysis considers potential environmental impacts that are not
30 otherwise addressed by CERCLA criteria. The results of the detailed analyses for each
31 individual alternative are used to provide a basis for comparison of the relative performance
32 of each of the alternatives and to identify their relative advantages and disadvantages. This
33 approach is intended to provide sufficient information to adequately compare the

1 alternatives and to allow Kelly AFB, the regulatory agencies, and the public to eventually
2 select the most appropriate alternative or combination of alternatives for implementation at
3 the site as remedial actions.

4 **Comparative Analysis for Site SS003 (S-1) Sump Area Alternatives**

5 **Overall Protection of Human Health and the Environment**

6 Except for the No Further Action Alternative, all alternatives are protective of public health
7 and the environment. The Excavation and Offsite Disposal and Ex Situ Biological Treatment
8 Alternatives are most protective of public health and the environment because the physical
9 removal of the CB, 1,2-DCB, and 1,4-DCB that exceed PRGs eliminates the risk of the
10 contaminants from leaching to the groundwater. Other alternatives that either allow
11 contaminants to remain in place or treat them in situ are less certain in their ability to
12 prevent leaching in the long term.

13 The SVE Alternative is protective of public health and the environment because the CB,
14 1,2-DCB, and 1,4-DCB that exceed PRGs are reduced through both physical removal and
15 enhanced aerobic biodegradation. The No Further Action, Monitored Natural Attenuation,
16 and Capping Alternatives rely on the operation of the existing groundwater collection and
17 treatment system to be protective to capture the groundwater exceeding MCLs and/or
18 medium-specific concentrations as a result of leaching. Even under continued operation of
19 the existing groundwater collection system, the water table may rise in the future causing
20 remobilization of the contaminants in soils immediately above the water table. Because the
21 soils in the smear zone directly above the current water table are the most contaminated
22 soils at the site, monitoring and operation of the groundwater collection system are much
23 more important under these alternatives that leave contaminated soils in place.

24 **Compliance with ARARs**

25 Except for the No Further Action Alternative, all alternatives would meet ARARs. The
26 Excavation and Disposal and Ex Situ Biological Treatment Alternatives would meet ARARs
27 because the risks associated with the leaching of CB, 1,2-DCB, and 1,4-DCB to the
28 groundwater that would result in concentrations exceeding drinking water MCLs or Texas
29 groundwater medium-specific concentrations would be eliminated with the removal of the
30 soil. For the Ex Situ Biological Treatment Alternative, *Clean Air Act* ARARs would be met
31 because treatment piles would be either located inside an existing building or be covered.

32 The No Further Action, Monitored Natural Attenuation, and Capping Alternatives would
33 meet ARARs provided that the existing treatment system remains in operation. State
34 ARARS would be met under the first two alternatives when Texas Risk Reduction Standard
35 (RRS) 3 groundwater protection medium-specific concentrations for CB, 1,2-DCB, and
36 1,4-DCB are met; however, this may take decades. The Capping Alternative meets the RRS 3
37 for engineering controls once it is constructed. ARARs would be met using the SVE
38 Alternative because, within less than 5 years the contaminants would be reduced to
39 concentrations below those, that would result in exceedance of groundwater standards. Air
40 treatment for the emissions would be implemented if required to meet *Clean Air Act* ARARs.

1 **Long-Term Effectiveness and Permanence**

2 The long-term effectiveness and permanence of the Excavation and Off-Site Disposal and
3 the Ex Situ Biological Treatment Alternatives are better than the other alternatives because
4 the soil posing the potential risk would be removed. The Monitored Natural Attenuation,
5 Capping, and SVE Alternatives require reliance on continued operation of the groundwater
6 treatment system. If turned off, because groundwater medium specific concentrations are
7 met, heavy reliance on continued monitoring will be important because of the potential for
8 an elevated water table remobilizing contaminants in soil. The long-term effectiveness of
9 monitoring is diminished because site SS003 (S-1) is slated to be transferred to a private
10 entity and access for monitoring may be more difficult. Also, assurance of the institutional
11 controls being followed is less certain once the Air Force is no longer the property owner.
12 There is no significant change in the magnitude of residual risk for the No Further Action,
13 Monitored Natural Attenuation, and Capping Alternatives because no action with respect to
14 the reduction of the contaminants to below PRGs is taken by these alternatives.

15 **Reduction of Toxicity, Mobility, or Volume through Treatment**

16 The SVE, Excavation and Offsite Disposal, and Ex Situ Biological Treatment Alternatives
17 offer the best reductions in toxicity, mobility, or volume for the soil. For the other three
18 alternatives, active treatment is not used. Reduction in toxicity, mobility, or volume through
19 natural biodegradation would occur for the No Further Action and Monitored Natural
20 Attenuation Alternatives, but the degradation rate is slow and could take decades. Natural
21 degradation would be considerably slower under the Capping Alternative because oxygen
22 and moisture needed for biological growth would be diminished .

23 **Short-Term Effectiveness**

24 All alternatives have minimal impacts with respect to the protection of workers during
25 remedial construction, protection of community during remedial action, and environmental
26 impacts of remedial action. The No Further Action and Monitored Natural Attenuation
27 Alternatives have no impacts because both alternatives involve no remedial construction.
28 The Capping and SVE Alternatives have little impacts because the contamination exceeding
29 PRGs is located 14 ft or greater below ground surface and would not be disturbed during
30 construction. For the Excavation and Offsite Disposal and Ex Situ Biological Treatment
31 Alternatives, the risk assessment showed risk to construction workers to be less than
32 acceptable levels.

33 The short-term effectiveness with respect to the time until the remedial action objectives are
34 achieved is shortest for the Capping, Excavation and Off-Site Disposal and Ex Situ
35 Biological Treatment Alternatives because these alternatives would be completed within 1
36 to 2 years. The next shortest time of about 5 years is the SVE Alternative. The slowest is the
37 No Further Action and Monitored Natural Attenuation Alternatives, which would take
38 decades until remedial action objectives are achieved.

39 **Implementability**

40 Technical or administrative implementability problems are not expected for any of the
41 alternatives.

42

1 Cost

2 A summary of the estimated costs for each of the sump area alternatives is presented in
3 Table ES.1. The No Further Action Alternative has no cost, while the Ex Situ Biological
4 Treatment Alternative has the highest cost. Of the active remediation alternatives, all the
5 costs are within order-of-magnitude comparison. Final project costs will vary from the cost
6 estimates. The specific details of remedial actions and cost estimates would be refined
7 during final design. Project feasibility and funding needs must be reviewed carefully before
8 specific financial decisions are made or project budgets are established to help ensure
9 proper project evaluation and adequate funding.

10 Comparative Analysis for Site SS003 (S-1) Smear Zone Alternatives**11 Overall Protection of Human Health and the Environment**

12 Except for the No Further Action Alternative, all alternatives are protective of public health
13 and the environment. Both the SVE and Dual-Phase Groundwater Recovery and SVE
14 Alternatives are protective of public health and the environment because the CB, 1,2-DCB,
15 and 1,4-DCB that exceed PRGs are reduced through physical removal and enhanced aerobic
16 biodegradation. The No Further Action and Monitored Natural Attenuation Alternatives
17 rely heavily on continued operation of the existing treatment system to capture the
18 groundwater exceeding MCLs and/or medium-specific concentrations as a result of
19 leaching.

20 Compliance with ARARs

21 All alternatives would meet ARARs. The No Further Action and Monitored natural
22 attenuation alternatives may not meet the Texas RRS 3 soil medium-specific concentrations
23 for protection of groundwater for decades. The actual duration can be estimated more
24 precisely once an ongoing natural attenuation study is completed. ARARs for both the SVE
25 and Dual-Phase Groundwater Recovery and SVE Alternatives would be met because the
26 contaminants would be reduced in about 5 years to the Texas RRS 3 soil medium-specific
27 concentrations for protection of groundwater. Air treatment for the emissions may be
28 required to meet *Clean Air Act* ARARs.

29 Long-Term Effectiveness and Permanence

30 The long-term effectiveness and permanence of the SVE and Dual-Phase Groundwater
31 Recovery and SVE Alternatives are better than the other two alternatives because
32 contaminant leaching is reduced through the reduction of contaminant concentrations in the
33 subsurface. The No Further Action and Monitored Natural Attenuation Alternatives require
34 reliance on continued operation of groundwater collection and treatment system. There is
35 no significant change in the magnitude of residual risk for the No Further Action or
36 Monitored Natural Attenuation Alternatives because no action with respect to the reduction
37 of the contaminants to below PRGs was taken.

38 Reduction of Toxicity, Mobility, or Volume Through Treatment

39 The SVE and Dual-Phase Groundwater Recovery and SVE Alternatives offer the best
40 reductions in toxicity, mobility, or volume for the soil. About 80 percent of the estimated
41 amount of CB, 1,2-DCB, and 1,4-DCB are reduced during the SVE and Dual-Phase
42 Groundwater Recovery and SVE Alternatives. For the other alternatives, reduction in

1 toxicity, mobility, or volume is not applicable because active treatment is not performed.
2 Treatment via natural degradation could take decades for the No Further Action and the
3 Monitored Natural Attenuation Alternatives.

4 **Short-Term Effectiveness**

5 All alternatives have minimal impacts with respect to the protection of workers during
6 remedial construction, protection of community during remedial action, and environmental
7 impacts of remedial action. The No Further Action and Monitored Natural Attenuation
8 Alternatives have no impacts because both alternatives involve no remedial construction.
9 The other alternatives have little impacts because the contamination exceeding PRGs is
10 located 20 ft or greater below ground surface. They will also have limited short-term
11 installation and some operational impacts due to noise. The short-term effectiveness with
12 respect to the time until the remedial action objectives are achieved is shortest for both SVE
13 and Dual-Phase Groundwater Recovery and SVE Alternatives because both alternatives
14 involve the physical removal and enhanced aerobic degradation of the contaminants
15 exceeding PRGs. The slowest is for the other two alternatives, which would take decades
16 until remedial action objectives are achieved.

17 **Implementability**

18 No technical or administrative implementability problems are expected for all of the
19 alternatives.

20 **Cost**

21 A summary of the estimated costs for each of the smear zone alternatives is presented in
22 Table ES.2. The table breaks down the estimated capital, O&M, and present net worth cost.
23 The No Further Action Alternative has no cost, while the Dual-Phase Groundwater and SVE
24 Alternative has the highest cost. Of the active remediation alternatives, the costs are within
25 order-of-magnitude comparison. Final project costs will vary from the cost estimates. The
26 specific details of remedial actions and cost estimates would be refined during final design.
27 Project feasibility and funding needs must be reviewed carefully before specific financial
28 decisions are made or project budgets are established to help ensure proper project
29 evaluation and adequate funding.

30 **Comparative Evaluation for Groundwater Remediation** 31 **Alternatives**

32 **Overall Protection of Human Health and Environment**

33 Except for the No Further Action Alternative, all of the alternatives are protective of human
34 health and the environment and prevent the use of contaminated groundwater by using
35 administrative controls to restrict the use of the on base shallow groundwater.

36 Except for the No Further Action Alternative, all of the alternatives substantially reduce or
37 eliminate further migration of contaminants through the groundwater by intercepting or
38 eliminating contaminants in the groundwater at various locations both on and off base.

39 In off base areas, the time frame to restore groundwater contamination concentrations to
40 PRG levels is difficult to estimate because the fate and transport model does not extend

1 more than 1,500 ft off base. The Source Ex Situ and In Situ Treatment, Perimeter Control and
2 Off Base Control, Source and Perimeter Control, Targeted Source and Perimeter Control,
3 and Source Ex Situ and In Situ Treatment and Perimeter Control Alternatives (Alternatives 4
4 through 7) would restore the groundwater contaminant levels in this region in about 25
5 years. Capping would achieve this result in 25 to 30 years, and the No Further Action and
6 Monitored Natural Attenuation Alternatives would require more than 40 years to achieve
7 this result.

8 In areas subject to base closure (essentially the area east of the runway), the Source Control,
9 Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base Control, Source and
10 Perimeter Control, Targeted Source and Perimeter Control, and Source Ex Situ and In Situ
11 Treatment and Perimeter Control Alternatives (Alternatives 3 through 7) would restore
12 groundwater contaminant concentrations to PRGs in the least amount of time (25 to 30
13 years) while the No Further Action and Monitored Natural Attenuation Alternatives would
14 achieve this objective over the longest time frame (40 years or more).

15 In areas that will remain under Department of Defense control, the Capping, Source Ex Situ
16 and In Situ Treatment, Perimeter Control and Off Base Control, Source and Perimeter
17 Control, and Source Ex Situ and In Situ Treatment and Perimeter Control Alternatives
18 (Alternatives 3, 4, 5, and 7) would reduce contamination levels to PRGs in about 25 to 30
19 years. The No Further Action, Monitored Natural Attenuation, and Targeted Source and
20 Perimeter Control Alternatives (Alternatives 1, 2, and 6) would take 30 to 40 years to achieve
21 this result.

22 Source control and upgrade of the existing perimeter pump and treat systems as necessary
23 (Source Control, Source and Perimeter Control, and Source Ex Situ and In Situ Treatment
24 and Perimeter Control Alternatives [Alternatives 3, 5, and 7]) would be effective at reducing
25 off base contaminant levels in a reasonable time frame (remedial action objectives 4 and 5).
26 Of those alternatives, only the Source and Perimeter Control and Source Ex Situ and In Situ
27 Treatment and Perimeter Control Alternatives would be effective at reducing on base
28 contaminant levels (remedial action objective number 4).

29 **Compliance with ARARs**

30 Except for the No Further Action Alternative, all alternatives would comply with ARARs by
31 meeting National Pollution Discharge Elimination System permit discharge limits. Air
32 emissions (if any) would meet concentration and volume limits for discharge of VOCs
33 under the state standard exemption for remediation.

34 **Long-Term Effectiveness**

35 All alternatives would be effective in the long term, although each alternative would vary in
36 the time frame needed to meet the objectives. The active remediation alternatives (Source
37 Control, Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base Control,
38 Source and Perimeter Control, Targeted Source and Perimeter Control, and Source Ex Situ
39 and In Situ Treatment and Perimeter Control Alternatives [Alternatives 3 through 7])
40 achieve the PRGs in shorter time than the passive remediation alternatives (No Further
41 Action and Monitored Natural Attenuation [Alternatives 1 and 2]).

1 All of the alternatives, including the passive remediation alternatives) involve remediation
2 mechanisms that are generally irreversible. There is no residual risk once the concentrations
3 have been reduced to acceptable levels.

4 **Reduction of Toxicity, Mobility, or Volume Through Treatment**

5 The No Further Action and Monitored Natural Attenuation Alternatives do not include
6 active treatment to reduce the toxicity, mobility, or volume of contaminants. VOCs
7 occurring in the plumes would attenuate naturally over time.

8 The Source Control, Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base
9 Control, Source and Perimeter Control, Targeted Source and Perimeter Control, and Source
10 Ex Situ and In Situ Treatment and Perimeter Control Alternatives (Alternatives 3 through 7)
11 include active treatment that would reduce toxicity, mobility, and volume of contaminants
12 in the groundwater. Each of the active remediation alternatives would remove or destroy
13 about the same amount of VOCs over the life of the remediation activity. The Targeted
14 Source and Perimeter Control Alternative would remove or destroy the least (about 440 lb)
15 while the Source Ex Situ and In Situ Treatment, Perimeter Control and off Base Control
16 Alternative would remove or destroy the most (about 530 lb).

17 **Short-Term Effectiveness**

18 There would not be any significant effects on workers, the community, or the environment
19 during remediation for any of the seven alternatives.

20 The No Further Action and Monitored Natural Attenuation Alternatives would require the
21 longest remediation time because they rely on no action and natural attenuation for
22 remediation. For remediation of contaminated groundwater on base, the Source Ex Situ and
23 In Situ Treatment, Perimeter Control and Off Base Control and Source Ex Situ and In Situ
24 Treatment and Perimeter Control Alternatives may achieve remedial action objectives faster
25 than Alternatives 3, 5, and 6 because they use in situ treatment which may eliminate
26 contamination faster.

27 **Implementability**

28 All alternatives can be implemented, however, there are technical issues associated with the
29 alternatives that involve active remediation (Source Control, Source Ex Situ and In Situ
30 Treatment, Perimeter Control and Off Base Control, Source and Perimeter Control, Targeted
31 Source and Perimeter Control, and Source Ex Situ and In Situ Treatment and Perimeter
32 Control Alternatives [Alternatives 3 through 7]) related to the heterogeneous nature of the
33 aquifer. The relatively low hydraulic conductivity and heterogeneities may make it difficult
34 to extract groundwater in the area. The Source Ex Situ and In Situ Treatment, Perimeter
35 Control and Off Base Control and Source Ex Situ and In Situ Treatment and Perimeter
36 Control Alternatives, which include an in situ bioremediation component may have some
37 difficulties in achieving uniform dispersion of substrates and/or nutrients into the aquifer.
38 Alternative injection systems (such as dual-phase, horizontal two-pipe systems or
39 recirculating wells) are not considered feasible because of the difficulty of reinjecting water
40 into the low permeability subsurface.

41 In general, the Source Control, Source Ex Situ and In Situ Treatment, Perimeter Control and
42 Off Base Control, Source and Perimeter Control, Targeted Source and Perimeter Control,

1 and Source Ex Situ and In Situ Treatment and Perimeter Control Alternatives (Alternatives 3
2 through 7) all involve technologies, services, and materials that are readily available. In situ
3 bioremediation (Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base
4 Control and Source Ex Situ and In Situ Treatment and Perimeter Control) is a relatively new
5 and innovative technology, and most applications of this technology to date have been at
6 relatively small remediation sites, and has not been proven on larger sites.

7 The Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base Control
8 Alternative requires the installation of wells located in off base areas and this could be
9 difficult. The eastern section of Plume A is widely dispersed and is currently in a residential
10 area. Because the plume is in a residential area, it will become increasingly difficult to install
11 sampling wells. As the plume continues to disperse, this shortage of sampling wells will
12 make it difficult to define the plume. Without a clear plume definition, properly installing
13 off base recovery wells could become a problem.

14 Cost

15 Table ES.3 presents the capital cost present worth for the seven alternatives. These cost
16 estimates have been developed strictly for comparing the seven proposed alternatives. Final
17 project costs will vary from the cost estimates. The specific details of remedial actions and
18 cost estimates would be refined during final design. Project feasibility and funding needs
19 must be reviewed carefully before specific financial decisions are made or project budgets
20 are established to help ensure proper project evaluation and adequate funding.

21 The No Further Action Alternative has no cost. The cost for the Monitored Natural
22 Attenuation Alternative is \$1,760,000. The cost estimates for active remediation, the Source
23 Control, Source Ex Situ and In Situ Treatment, Perimeter Control and Off Base Control,
24 Source and Perimeter Control, Targeted Source and Perimeter Control, and Source Ex Situ
25 and In Situ Treatment and Perimeter Control Alternatives (Alternatives 3 through 7), range
26 between \$6.86 and \$12.0 million (Total project present worth).

27 NEPA Values

28 NEPA normally considers the environmental impacts of an action, such as impacts to
29 environmental media, cultural resources, the ecosystem, and threatened and endangered
30 species, as well as the cumulative impacts and any potential issues related to environmental
31 justice. As indicated below, none of the alternatives would be expected to have significant
32 environmental impacts:

- 33 • Kelly AFB is located in an attainment area for all pollutants with established national
34 and state air quality standards (per the Air Quality Control Region 13 of the Air Quality
35 Division of the TNRCC); none of the alternatives are anticipated to generate air
36 emissions sufficient to jeopardize the federal attainment status of the region.
- 37 • There are no known or suspected archaeological sites on Kelly AFB, and none of the
38 alternatives would impact any structures, buildings, or objects eligible for listing on the
39 National Register of Historic Places, and subject to the National Historic Preservation
40 Act (36 CFR part 800).
- 41 • Due to the urban development in the project area, there is very little natural habitat to
42 support wildlife. Therefore, none of the alternatives would have a significant impact on

- 1 sensitive, protected, threatened or endangered species. Zone 5 is also located outside of
2 the 100-year flood plain; and there are no wetlands in or around the proposed project
3 site.
- 4 • Because the construction activity related to these alternatives is extremely small and in
5 an already industrialized area, and because no effects to cultural or ecological resources
6 are anticipated, no significant cumulative impacts are anticipated from any of the
7 remedial action alternatives.
 - 8 • None of the alternatives would increase Kelly AFB's draw from the Edwards Aquifer,
9 and, therefore, would not impact the threatened and endangered species associated with
10 this sole source aquifer. NEPA requirements for public involvement are similar to those
11 for remedial actions, and thus are covered under the standard IRP public comment
12 process.

- 1
- 2
- 3
- 4
- 5
- 6
- 7
- 8
- 9
- 10
- 11
- 12
- 13
- 14
- 15
- 16
- 17

This page intentionally left blank.

EXECUTIVE SUMMARY

This report documents the removal and assessment of an oil/water separator (OWS) at Building 1418, Kelly Air Force Base (AFB), San Antonio, Texas. The subject unit was not registered in the Kelly AFB Notice of Registration (NOR). It was located using maps and geophysical survey. The Building 1418 OWS was constructed to collect washwater from an adjacent C-5 washrack and was located within Installation Restoration Program (IRP) Zone 5 at Kelly AFB.

Field activities associated with this assessment included: (1) removal and disposal of the concrete OWS; (2) removal of tank contents and rinsate water; (3) collection of screening samples to assess media-specific concentrations in the unit cavity; (4) soil assessment to evaluate potential risk to human health and to native groundwater; (5) collection and analysis of closure verification samples; (6) backfilling of the tank cavity; (7) resurfacing with soil; and (8) surveying of excavation boundaries for deed recordation.

Due to the location of unit drainage pipes, chemical concentrations and closure criteria were evaluated for subsurface soils only. Exposure scenarios for other potentially impacted media (e.g., surface soils, groundwater, surface water, air, fauna) were evaluated and eliminated from further consideration for this report.

Total petroleum hydrocarbon (TPH) soil screening results ranged from 27.5 parts per million (ppm) to 7,840 ppm in the excavation. Benzene, toluene, ethylbenzene, and xylene (BTEX) concentrations ranged from 12.85 ppm to below detection limits in two sampling events.

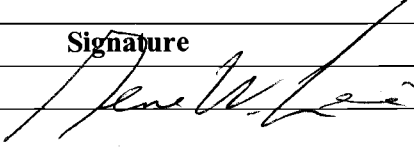
Based upon screening sample results, the following analyses were performed: volatile organic compounds (VOC), semivolatile organic compounds (SVOC), and total metals. Results of those analyses were evaluated against Health Risk Reduction Standard No. 2 (HRR2) concentration limits. HRR2 limits are defined in this report as the larger numbers from a comparison of established background levels (HNUS 1994) vs. Nonresidential Soil-to-Groundwater Cross-Media Protection Concentrations (GWP-Ind).

VOCs and SVOCs were below compliance limits established by the TNRCC. Arsenic ranged from 9.8 ppm to 51.1 ppm, cadmium ranged from 0.2 ppm to 1.8 ppm, lead ranged from <1.0 ppm to 109.0 ppm, barium ranged from 94.5 to 214.0 ppm, and mercury ranged from <0.2 to 0.481 ppm. The upper point in each of those ranges exceeds the HRR2 limit. Therefore, chemicals of concern (COC) established for this assessment were arsenic, cadmium, lead, barium, and mercury. Samples exhibiting concentrations of arsenic, cadmium, lead, barium, and mercury in excess of GWP-Ind values were additionally analyzed for these metals using the Synthetic Precipitation Leaching Procedure (SPLP). Those results were compared with the promulgated nonresidential medium specific concentration (MSC) for groundwater (GW-Ind), in accordance with TNRCC 30 Texas Administrative Code (TAC) Section 335.559 Subsection (g)(2)(B). All concentrations were below GW-Ind values for HRR2 closure of the Building 1418 OWS.

Building 1418 OWS associated COC concentrations pose no threat to human health as defined by 30 TAC Chapter 335, Subchapter S.

Sample results indicate an increase in TPH soil concentrations with distance from the OWS in the north wall area. These TPH concentrations were noted to be associated with a historic service line patch adjacent to the OWS unit. Although conditions for closure of the Building 1418 OWS under HRR2 have been met, as indicated by this assessment report, closure of this unit will not be sought until further delineation of the contamination is accomplished. TPH analysis was used by Kelly AFB solely for economic purposes. At the time of this investigation, TPH was not a promulgated requirement of 30 TAC Chapter 335.

**REPORTS
FOR
ST MARY'S**

	REPORTS LISTED BELOW WERE TAKEN TO THE ST. MARY'S LIBRARY & BCT ON 8 MAR 2000	Date	Status	ADM
549A	Corrective Measures Study for Zone 5/Feasibility Study	Jan 00	Draft Final	Inf
101A	Closure Report for Zone 1 IRP Site LF018	Feb 00	Final	Inf
100A	Closure Report for Zone 1 IRP Site SS041	Feb 00	Final	Inf
199A	Closure Report for Zone 1 IRP Site WP020	Feb 00	Final	Inf
280A	RCRA Closure Report Unit SA-2	Feb 00	Final	Inf
906A	Oil/Water Separator Removal & Assessment Report Building 1418	Feb 00	Final	Inf
Date:	Signature			
3/8/2000				

BCT Meeting 8 March 2000

The meeting was held on Wednesday, 8 March 2000 at 9:00 am in the WPI Office, 12th floor conference room.

Members Present and Support Personnel:

Name	Organization	Present	Absent
Brown, Leslie	AFBCA/DK	X	
Buelter, Don	AFBCA/DK	X	
Callaway, Laurie	BCA (KPMG)	X	
Carrillo, Mike	EPA	X	
Farrell, Philip	GKDA	X	
Landez, Norma	AFBCA/DK	X	
Meshako, Chuck	AFBCA/DK	X	
Neff, Richelle	UNITEC	X	
Power, Abigail	TNRCC	X	
Price, Lisa Marie	EPA		X
Rohne, Russell	AFBCA/DK	X	
Ryan, William	AFBCA/DK	X	
Sassaman, Captain Brian	AFBCA/DK	X	
Stankosky, Laura	EPA	X	
Underwood, Tim	BCA (KPMG)	X	
Weegar, Mark	TNRCC	X	
Wehner, Ellie	TNRCC		X

Dates for upcoming meetings:

April 11, 2000
 May 9, 2000
 June 13, 2000
 July 11, 2000
 August 8, 2000
 September 12, 2000
 October 10, 2000
 November 14, 2000
 December 12, 2000

BCT Minutes
8 March 2000

Item #	Lead	Support	Discussion Topic	Comments	How will we know it's done?	Disposition
1.	Underwood, T.	BCT Members	Redevelopment Update	Update the BCT regarding redevelopment status at Kelly AFB.	Team receives update.	Closed. GKDA and Boeing are continuing discussions for construction of a hanger on the NE side of the runway. Building 360 interior demolition is almost complete. Equipment is currently being moved out of Building 301. An interested party is looking at Building 171. The building may be sold with an associated ground lease.
2.	Hampton, R.	Landez, N.	Zone 2 and 3 Risk Assessments	Discuss the applicability of the Zone 2 and 3 RI risk assessments to the Zone 2 and 3 CMS.	Discussion is complete.	Closed. The Air Force reviewed the Zone 2 & 3 RIs. The Zone 2 RI, completed in 1991, focused on specific sites. The Zone 3 RI, completed in 1993, focused on the IWCS. These baseline RIs are not applicable to the zonewide CMS. The Zone 2 and 3 FSs calculated cleanup goals for RRS 3 for soil and soil to ground water. The cleanup goals could be recalculated for the CMS. The Air Force will schedule a meeting with the EPA and TNRCC to discuss baseline risk assessment requirements. The Air Force will also try to coordinate the ecological risk assessment and CMS schedules.
3.	Ryan, W.	Buelter, D. Landez, N. Rohne, R.	MitreTek Report	Kelly AFB will present the MitreTek report findings.	Discussion is complete.	Closed. The MitreTek report findings were presented. The Air Force, EPA, and TNRCC will meet to discuss the off-base plumes in greater detail after the regulators have reviewed the report.
4.	Rohne, R.	Crowell, S.	Zone 5 CMS	Discuss the Zone 5 CMS submitted to the EPA and TNRCC in February 2000.	Discussion is complete.	Closed. Provided an overview of the Zone 5 CMS. Identified the plumes addressed in the CMS and discussed the alternatives evaluated for each plume. TNRCC requested that data supporting monitored natural attenuation be clearly presented in the CMS.
5.	Ryan, W.	Buelter, D. Sassaman, B. Rohne, R.	Zone Updates	Provide team with update of current activities in Zones 2, 3, 4 and 5.	Team receives updates.	Closed. Distributed the Zone 4 and 5 updates.
6.	Ryan, W.	Weegar, M. Carrillo, M.	List of Future Deliverables (Regulators/RAB)	Each month, provide a list of upcoming documents for review.	Team receives list of upcoming documents for review.	Closed. Distributed the list of documents to be submitted to the EPA and TNRCC over the next 60 days.
7.	Ryan, W.	BCT Members	BCT Teleconference Scheduling	Each month, establish the coming schedule of teleconferences.	Teleconference schedule adopted by the team.	Closed. The following teleconferences were scheduled: Ecological Risk Assessment 20 March MitreTek Report 24 March
8.	Ryan, W.	BCT Members	Begin April Agenda	Each month, begin to establish the next month's agenda at the end of the BCT meeting.	Team approves agenda items.	Closed. Proposed agenda items for the April BCT meeting include the following: ■ B258 RFI presentation

BCT AGENDA
8 March 2000

Item #	Lead	Support	Discussion Topic	Comments	How will we know it's done?	Disposition
1.	Underwood, T.	BCT Members	Redevelopment Update	Update the BCT regarding redevelopment status at Kelly AFB.	Team receives update.	
2.	Hampton, R.	Landez, N.	Zone 2 and 3 Risk Assessments	Discuss the applicability of the Zone 2 and 3 RI risk assessments to the Zone 2 and 3 CMS.	Discussion is complete.	
3.	Ryan, W.	Buelter, D. Landez, N. Rohne, R.	MitreTek Report	Kelly AFB will present the MitreTek report findings.	Discussion is complete.	
4.	Rohne, R.	Crowell, S.	Zone 5 CMS	Discuss the Zone 5 CMS submitted to the EPA and TNRCC in February 2000.	Discussion is complete.	
5.	Ryan, W.	Buelter, D. Sassanian, B. Rohne, R.	Zone Updates	Provide team with update of current activities in Zones 2, 3, 4 and 5.	Team receives updates.	
6.	Ryan, W.	Weegar, M. Carrillo, M.	List of Future Deliverables (Regulators/RAB)	Each month, provide a list of upcoming documents for review.	Team receives list of upcoming documents for review.	
7.	Ryan, W.	BCT Members	BCT Teleconference Scheduling	Each month, establish the coming schedule of teleconferences.	Teleconference schedule adopted by the team.	
8.	Ryan, W.	BCT Members	Begin April Agenda	Each month, begin to establish the next month's agenda at the end of the BCT meeting.	Team approves agenda items.	

**ZONE FOUR
RECENT PROGRESS/DEVELOPMENTS UPDATE
08 March 2000**

ZONE-WIDE ACTIVITIES:

OU-1 RI - Due to regulator comments on previous RFI effort, investigation of two areas of concern near MW125 and MW160 will also be required as will further investigation of the metals concentrations in Yard 68, near the now closed SS009 site. Award of additional funding for the required field effort has been accomplished. A Draft Workplan has been submitted by the contractor and field sampling efforts are scheduled for April 00. A revised RFI report is expected in Aug 00.

OU-2 RI - The final item of field work, the soil/vapor pathway sampling, has been completed. Test results are expected to be forwarded to ATSDR by the end of March 00 for evaluation. Preparation of the RFI report is expected to resume in April with submission in Aug 00.

IRA Boundary Control. The installation of horizontal wells No 1 through 8 have been completed and the drilling of No 9 is currently in progress. Well No 10 (last well) should be complete by the end of March. Work on the treatment plant continues toward an April completion. Installation of the collector pipe system is currently underway and progressing rapidly. Start up plant expected in early May 00.

Shallow Aquifer Assessment - Response to comments on SAA Phase III Final were forwarded to regulators. SAA Phase IV Draft completed--expected in March 2000 from contractor. Report will be forwarded to appropriate agencies.

San Antonio River Sampling - USGS and SARA fieldwork completed during June 1999. The final ITIRs have been received. ITIRs forwarded to regulators and are awaiting any comments. EPA has provided comments; awaiting comments from TNRCC. Once comments received and reviewed, reports can go final.

DRMO FACILITIES:

Bldg 3096 - Closure report completed and forwarded 12 Oct 99. Response received from the TNRCC on 20 Dec 99. A response was submitted on 25 Jan 00. Additional required information is anticipated to be provided by the end of March 00.



Yard N - No change. Closure requested, Oct 98. TNRCC review date projected as 30 Sep 99.

Bldg 3065 - Approval of Closure report received in November. Survey and deed recordation was accomplished and submitted to the TNRCC in January 00.

Lot Z04 - Final Closure Report submitted to the TNRCC on 23 Nov 99. Awaiting approval.

Yard 13 - The review of the draft data review study has been conducted and the final report is expected approximately 17 Mar 00. Award of CMS now expected in April 00, subject to receipt of funding from DRMS.



ATSDR: -- Continuing to provide the ATSDR additional information on groundwater, soil and air to complete the Public Health Assessment.



Kelly Air Force Base IRP Zone 5

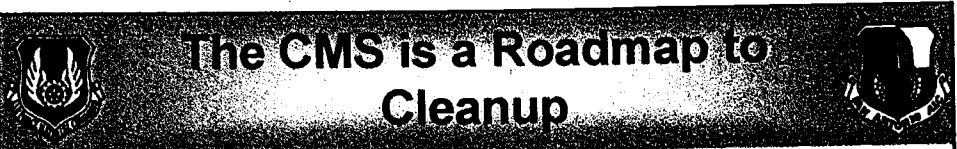
Corrective Measures Study

Presented to
BRAC Cleanup Team
March 8, 2000



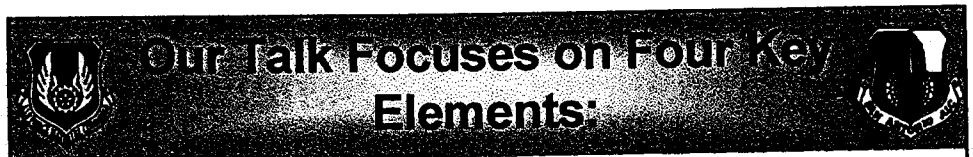
Objectives of Today

- Give the BRAC Cleanup Team an update on the Zone 5 Corrective Measures Study (CMS)
- Preview CMS for TNRCC and EPA





The CMS is a Roadmap to Cleanup

- Develop and evaluate final remedial alternatives for on-base soil/groundwater and off-base groundwater in Zone 5
- Integrate all available soil and groundwater characterization data and interim action
- Protect human health and the environment
- Provide basis for recommended alternative





Our Talk Focuses on Four Key Elements:

- Site Description
- Risk Assessment
- Remedial Alternatives
- Schedule



Steps in the Corrective Measures Study


- Characterize Site
- Develop Remedial Action Objectives (RAOs)
- Develop Preliminary Remediation Goals (PRGs)
- Develop Remedial Action Alternatives
- Evaluate Alternatives
- Recommend Alternatives




We Assess Cleanup Alternatives According to Nine Criteria

- Protection of human health/environment
- Compliance with applicable or relevant and appropriate requirements (ARARs)
- Long-term effectiveness and permanence
- Reduction of toxicity, mobility, or volume (TMV) through treatment
- Short-term effectiveness
- Implementability
- Cost
- Community acceptance
- State acceptance

Note: Elements of the CMS are consistent with CERCLA and correlated to RCRA in accordance with the Compliance Plan.



Previous Studies Contribute to our Understanding of Zone 5



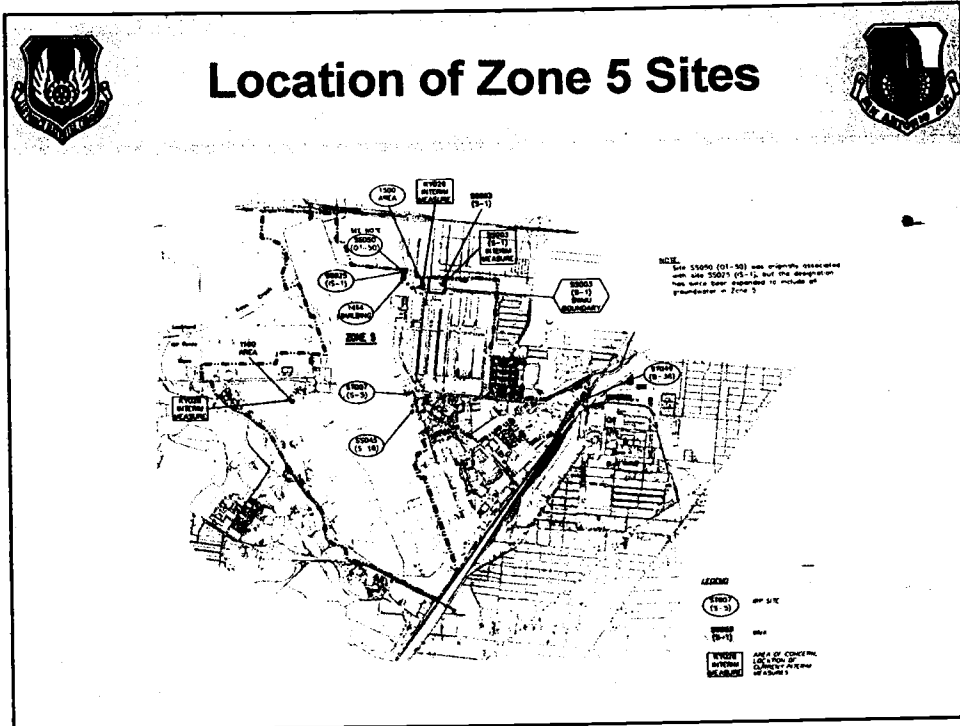
- Site S-1 Investigations - Phase 1 (1983) to Soils Focused Feasibility Study (1998)
- Final Remedial Investigation/RCRA Facility Investigation (RI/RFI) - 1999
- Basewide Remedial Assessment
- Natural Attenuation Studies
- Seismic/sanitary sewer/sampling activities



Some Cleanup Has Begun (Interim Remedial Actions)




- Site S-1: Groundwater treatment/Soil Vapor Extraction (SVE) and soil removal
- 1100 Area: Groundwater treatment/SVE
- 1500 Area: Soil bioventing




Soil Contamination at Site S-1 is Consistent with Past Operations at Kelly AFB


- Chlorobenzene (CB)
- 1,2-dichlorobenzene (1,2-DCB)
- 1,4-dichlorobenzene (1,4-DCB)
- Trichloroethene (TCE)
- Tetrachloroethene (PCE)
- Benzene
- Polychlorinated Biphenyls (PCBs)
- TCE and PCE levels are low




Contaminants Have Leached from Soil to Groundwater

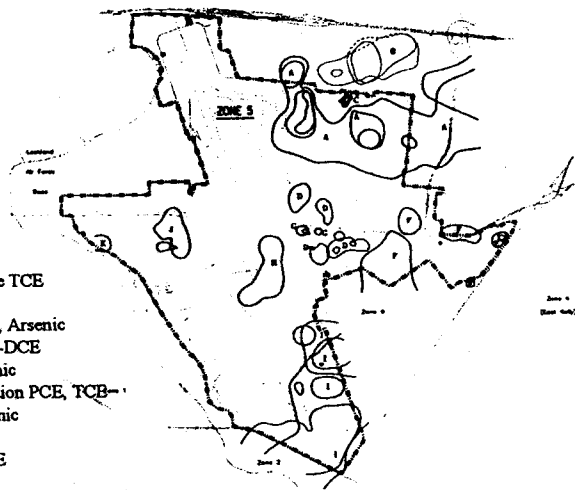


- Tetrachloroethene (PCE)
- Trichloroethene (TCE)
- cis 1,2-dichloroethene (cis 1,2-DCE)
- 1,1-dichloroethene (1,1-DCE)
- Chlorobenzene (CB)
- Arsenic
- Benzene
- Total Xylenes




Zone 5 Groundwater Plumes







Plume A - On and off base TCE
 Plume B - Off base PCE
 Plume C - Chlorobenzene, Arsenic
 Plume D - TCE, PCE, 1,2-DCE
 Plume E - Benzene, Arsenic
 Plume F - Low concentration PCE, TCE
 Plume G - Benzene, Arsenic
 Plume H - TCE
 Plume I - PCE, TCE, DCE
 Plume J - PCE, TCE
 Plume K - Chlorobenzene




A 1995 Study Considered Risks





- Kelly AFB is Committed to Protect
 - Off-base residents
 - On-base military and civilian personnel
 - Maintenance workers, groundskeepers
- The study found no unacceptable risks from soil
 - Ingestion, dermal contact, inhalation of particulates and VOCs
- There is no known consumption of shallow groundwater
 - Extensive surveys were performed on and off-base.
 - Direct ingestion and inhalation of VOCs would present an unacceptable risk (carcinogenic and systemic)
 - No other unacceptable risk results from groundwater



Remedial Action Objectives are Designed to be Protective of Human Health and the Environment





- Objectives for soil
 - Prevent migration of soil contaminants to groundwater
 - Prevent exposure to surface soil via ingestion, inhalation or contact
- Objectives for groundwater
 - Prevent use of on and off-base groundwater with contaminants in excess of Maximum Contaminant Levels (MCLs)/Media-Specific Concentrations(MSCs)
 - Reduce or prevent further migration of contaminated groundwater
 - Restore on and off-base groundwater to MCLs/MSCs




**Preliminary Remediation Goals
Established for Zone 5 are Based on:**

- Acceptable concentrations for each COC/exposure setting
 - Risk-based values
 - Chemical specific ARAR values
 - Background concentrations
- More stringent of:
 - Risk Reduction Standard 2 Appendix II Media Specific Concentrations OR...
 - TNRCC Compliance Plan
- Remediation focus on areas exceeding Preliminary – Remediation Goals




**Plume Specific Remedial Controls were
Developed for Zone 5:**

- Source area
- Perimeter
- Off base



Remedial Controls Were Combined to Develop Alternatives for the Groundwater Plumes



- Options include
 - No further action
 - Monitored Natural Attenuation
 - In situ remediation by enhanced biodegradation
 - Containment by hydraulic barriers (i.e. pump and treat) at source and perimeter areas
- Alternatives range from low to high control
- Alternatives consider a range of remediation time frames



The Following Remedial Alternatives were Evaluated



- No further action (Alternative 1)
- Monitored natural attenuation (Alternative 2)
- Source control (Alternative 3)
- Source ex situ and in situ treatment, perimeter control and off base control (Alternative 4)
- Source and perimeter control (Alternative 5)
- Targeted source and perimeter control (Alternative 6)
- Source ex situ and in situ treatment and perimeter control (Alternative 7)

Evaluation of Alternatives

	Protective	ARAR Compliance	Long Term Effectiveness	Reduction of TMV by Treatment	Short Term Effectiveness	Implementability	Cost
1. NFA			X			X	None
2. MNA	X	X	X			X	Low (2 M)
3. Source Control	X	X	X	X		X	Moderate (7 M)
4. Source Treatment, Perimeter & Off base Control	X	X	X	X			High (12M)
5. Source & Perimeter Control	X	X	X	X		X	Moderate (8 M)
6. Targeted Source & Perimeter Control	X	X	X	X		X	Moderate (7M)
7 Source Treatment & Perimeter Control	X	X	X	X			High (9M)

Source Control Provides the Best Balance between Economics and Effectiveness



PLUME	Source	Perimeter	Off Base
A	Pump and Treat	MNA	MNA
B	Off-base	Off-base	Off-base
C	Pump and Treat and Soil Vapor Extraction	N/A	N/A
D and G	Pump and Treat	MNA	N/A
E	UST Closure		
F	MNA	MNA	N/A
H	MNA	MNA	N/A
J	MNA	MNA	N/A
K	MNA	MNA	N/A

The Results of Groundwater Modeling of Proposed Alternatives for Plume A are

Alternative	Time to MCL (years)					
	TCE (5 ppb)		DCE (70 ppb)		VC (2 ppb)	
	On Base	Off Base	On Base	Off Base	On Base	Off Base
Baseline	20	20	13.6	0	25	26
Source Area Trench	20.5	20	10.5	0	22	26
Perimeter Trench	26	17	13	0	28	18
Perimeter Wells	26	18	13	0	27	18
Off Base Wells	26	18	13	0	27	18
Source Area Trench and Perimeter Wells	20	19	10.2	0	21	21
Source Area Trench, Perimeter Wells and Off Base Wells	20	19	10.2	0	21	21

The following remedial alternatives were considered for Site S-1 Soils

- Sump Area
 - Alt 1 - No Further Action (NFA)
 - Alt 2 - Monitored Natural Attenuation (MNA)
 - Alt 3 - Source Control
 - Alt 4 - Soil Vapor Extraction (SVE)
 - Alt 5 - Excavation & off base disposal
 - Alt 6 - Ex situ biological treatment
- Smear Zone
 - Alt 1 - NFA
 - Alt 2- MNA
 - Alt 3 - SVE
 - Alt 4 - Dual phase groundwater recovery and SVE



Schedule

- CMS Submittal - Feb 00
- Public meeting - Late March 00
- Public comment [45 days] - Early May 00
- CMS Approval - Aug 00
- Corrective Measures Implementation (CMI) Work Plan - Jun 00 - Feb 01
- CMI - FY 01
- Remediation In Place - FY02
- Recommended Alternative -Operation - FY04 to FY27

DRAFT

Risk Assessment White Paper

This report is intended to accomplish the following objectives:

1. Describe the current requirements for risk assessment under RRS 3 closure
2. Detail previous risk assessment work accomplished in Zones 2 and 3
3. Propose additional work needed to accomplish RRS 3 risk assessment requirements.

Regulatory Requirements

Closure under RRS 3 requires:

1. Baseline Risk Assessment (BRA) - The BRA must describe the potential adverse effects under both current and future conditions caused by the release of contaminants in the absence of any controls, and the degree of uncertainty associated with the BRA.
2. Calculating media cleanup levels required to achieve risk goals at the point of exposure (RRS 3 values).

The BRA should be conducted using EPA guidance as well as the Consistency memo. Guidance for determining RRS 3 values is provided in the RRS as well as the consistency memo. Calculation of RRS 3 values include inputs for all applicable exposure scenarios as well as risk levels (10-6).

Previous Risk AssessmentsRemedial Investigations

A BRA was conducted for the Zone 3 RI (June 1993). At that time the IWCS line was thought to be the major source. The sampling effort and risk assessments were conducted accordingly. The BRA conducted for the Zone 2 RI (January 1991) included site specific risk assessments for S-9, FC-2, E-3, IWTP, CS-2, E-1, SA-2, SA-3, SA-4, SD-2, SD-1, S4-A, S-3, and the Berman Road Ditch. Most of these risk assessments were conducted with little data. For example, the BRA for E-1 was conducted on 2 soil samples and 9 groundwater samples.

Feasibility Studies

Risk assessment work was also accomplished in the FSs for Zones 2 and 3. The approach significantly changed between the RI and FS. The following bullets provide the methodology of the FSs.

- All chemicals with at least one detection in database at the time were considered COCs
- Risk Based Concentrations (RBCs) and Groundwater Protection Concentrations (GPCs) were developed. The Remediation Goals (RGs) were selected as the lower of the RBC or GPC, and the higher of PQL and background.
- RBCs were calculated based on RAGs Part A and B
- GPCs were calculated in 3 Phases
 - **Phase 1** – Compared zone-wide soil detections to the GPC
 - $GPC = K_d \times C_{gw}$
 - $K_d = f_{oc} \times K_{oc}$ (for organic chemicals, inorganic K_d 's were developed in a separate study)
 - The f_{oc} values were taken from the 1994 background study and were an average of 14 samples.
 - Inorganic K_d values were accepted by the TNRCC in an October 16, 1995 letter.
 - **Phase 2** – Considered mixing of the contaminants by including mixing depth, annual recharge, hydraulic gradient, length of the source, and the Darcy velocity.
 - $GPC = \{C_{leachate} \times K_d\} \times \{[C_{gw} - ((V_d \times M)/(Q \times L))] \times [C_u - C_{gw}]\}$
 - **Phase 3** – Fate and Transport Modeling to determine acceptable groundwater concentrations in the aquifer beneath the source area assuming MCL at the point of exposure or at the base boundary.
 - Phase 3 included washout from the unsaturated zone, zone-specific contaminant decay rates, and constant or time varying concentration in the unsaturated zone.

DRAFT

Conclusions

Baseline Risk Assessments

The BRAs previously accomplished are not applicable to the Zone 2 and 3 CMS. The Zone 3 BRA was focused on the IWCS line which is not a part of this CMS and the BRA for the Zone 2 RI was conducted on limited data in 1990.

RRS 3 Cleanup Levels

The methodology for calculating cleanup values for closure under RRS 3 that was presented in the Zone 2 and 3 FSs is still considered valid. The methodology was based on RAGs Part A and B as well as the Texas Risk Reduction Standards. However, there have been additional data collected, additional sources identified and new regulatory guidance developed which warrants revising these cleanup goals.

Recommendations

RRS 3 Cleanup Levels

Recalculate the RRS 3 cleanup goals with the following assumptions:

- The risk level would be 10-6 with a cumulative risk not to exceed 10-4
- The HI would not exceed 1
- Residential criteria for areas where contamination may impact off-base areas
- Industrial criteria for areas where contamination will not impact off-base areas
- GWP values would be calculated using the FS GPC methodology while incorporating additional site specific information.

Baseline Risk Assessments

Developing a BRA for the Zone 2 and 3 CMS is not recommended. Calculating cleanup values based on the above assumptions would ensure cleanup protective of human health and the environment. The intent of the BRA is to "describe the potential adverse effects under both current and future conditions caused by the release of contaminants" if the site were cleaned up to RRS 3 values there would be no adverse effects to describe.

Acronym	Meaning
BRA	Baseline Risk Assessment
C _{g_{gw}}	Groundwater Remediation Goal
C _{leachate}	Acceptable leachate concentration in groundwater
CMS	Corrective measures study
COC	Chemical of Concern
C _u	Groundwater concentration upgradient of site
EPA	Environmental Protection Agency
f _{oc}	Fraction of organic carbon
FS	Feasibility Study
GPC	Groundwater Protection Concentration
GWP	Groundwater protection standard
HI	Hazard index
IWCS	Industrial Waste Collection System

Acronym	Meaning
K _d	Distribution Coefficient
K _{ow}	Organic Partition Coefficient
L	Length of source parallel to groundwater
M	Mixing depth in aquifer
MCL	Maximum concentration level
PQL	Practical Quantitation Limit
Q	Annual recharge rate
RAG	Risk Assessment Guidance
RBC	Risk Based Concentration
RG	Remediation Goal
RI	Remedial Investigation
RRS 3	Risk Reduction Standard 3
V _d	Darcy groundwater velocity

Mar 8 00

TRS:

- 1. AGENDA
- 2. ACTION ITEMS
- 3. DOCUMENTS
- 4. SPILL REPORT
- 5. SHARE DRIVE: J:SHARE/EM/RAS ITEMS/TRS
- 6. MINUTES
- ~~7. CV Follow up meeting - set for 9 Mar 1500~~

1. AGENDA:

DONE SEND OUT AT LEAST 1 WEEK IN ADVANCE - ENTIRE RAB
 DONE COORD W/ WILLIAM & OTHER PMS OR BRANCH CHIEFS
 DONE COORD & APPROVE W/ DR. LENE'
 DONE MAINTAIN CONTINUITY:
 good Mitrochuk + Admin items - STANDARD
 + ONE (TO TWO) DOCUMENT REVIEWS (PRESENTATIONS)
 → DECIDED AT PREVIOUS MONTHS
 - TRY TO END NLT 8:30 PM

DONE BRING EXTRAS TO TRS & EMAIL OUT TO TNVCC/EPA BEFORE (AND SA & DICK WALTERS)

2. ACTION ITEMS:

DONE ASSIGN OPR TO EACH
 MAIL OUT WITH MINUTES
 FOLLOW UP W/ OPRS
 - ADDRESS AT NEXT MEETING

3. DOCUMENTS:

Wendy & SONIA WILL PROVIDE YOU WITH COPIES AS DOCUMENTS
 ✓ COME INTO EMIR
 ✓ SONIA WILL COMPIL A LIST FOR TRS (REMIND HER 2 DAYS PRIOR)
 ✓ - USE LIST TO CHOOSE DOCUMENT/PRESENTATION FOR THE NEXT MEETING
 ✓ DELIVER DOCS TO TRS ON DAY OF MEETING (DR. LENE')

4. SPILL REPORT:

DONE OBTAIN FROM JENNY PANTOJA / CHARLES WILLIAMS (REMIND HIM 2 DAYS PRIOR)
 - READ @ TRS PER AGENDA

3-0236 50 SHEETS 5 SQUARES
3-0236 100 SHEETS 5 SQUARES
3-0237 200 SHEETS 5 SQUARES

GOLD KEY

Mar 8 80

5. SHARE DRIVE:

- MAINTAIN ALL MINUTES, AGENDAS, AND OTHER HANDOUTS IN RESPECTIVE DIRECTIONS
- PROVIDE MINUTES ~~AND~~ TO PAULA MONTHLY FOR WEB PAGE

6. MINUTES:

- MAIL OUT w/ AGENDA AT LEAST 1 WEEK PRIOR (ENTIRE TAB)
- INCLUDE ALL HANDOUTS
- HAVE DR. LENE'S APPROVAL FIRST (EMAIL)
 - WILLIAM SHOULD REVIEW BEFORE DR. LENE'S
 - TRY TO KEEP UNDER 1 PAGE

7. CV FOLLOW UP MEETING:

GET ON CV CALENDAR VIA DEE GIBERSON @ 5-6916 ?
 AT LEAST 1 MONTH BEFORE TRS - NORMALLY THE DAY AFTER THE TRS MEETING -- 30 MINUTES

- ATTENDEES:
- LESLIE
 - WILLIAM
 - WILSON

PREPARE 3 PART FOLDER - USE PREVIOUS MEETING FOLDERS AS AN EXAMPLE FOR FORMAT

- * one file
- * one ga
- * one m.m.c.

-- INCLUDE AN INDEX*

NORMALLY, MINUTES WILL NOT BE READY YET, BUT IF SO, FANTASTIC ... MARK "DRAFT" IF NOT APPROVED

WILLIAM CAN BRIEF, BUT CONTRIBUTE AS APPROPRIATE

3-0235 50 SHEETS 5 SQUARES
 3-0236 100 SHEETS 5 SQUARES
 3-0237 200 SHEETS 5 SQUARES

GOLD KEY

FINAL PAGE

ADMINISTRATIVE RECORD

FINAL PAGE