INSTALLATION RESTORATION PROGRAM PHASE II
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DCN 84-212-027-04-02 Volume II

AD-A160 094

INSTALLATION RESTORATION PROGRAM

PHASE II - CONFIRMATION/QUANTIFICTAION

STAGE 1

**APPENDICES** 

FOR

TINKER AFB, OKLAHOMA

AIR FORCE LOGISTICS COMMAND WRIGHT-PATTERSON AFB, OHIO

SEPTEMBER, 1985

PREPARED BY

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CONTRACT NO. F33615-83-D-4001

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PREPARED FOR

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OCCUPATIONAL AND ENVIRONMENTAL HEALTH LABORATORY (OEHL)
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#### APPENDIX A

#### Definitions, Nomenclatures and Units

- AFB Air Force Base
- Aquifer geologic unit capable of storing and transmitting significant quantities of water.
- DOD Department of Defense
- EPA Environmental Protection Agency
- GC Gas Chromatography
- GC-MS Gas Chromatography-Mass Spectrometry
- Indurated rendered hard, as by heat, pressure or cementation
- IRP Installation Restoration Program
- mg/1 milligrams per liter
- POL Petroleum, oil and lubricants
- PVC Polyvinyl Chloride
- RCRA The Resource Conservation and Recovery Act
- RWDS Radiological Waste Disposal Site
- μg/L Micrograms per liter
- USAF United States Air Force



APPENDIX B

Scope of Work



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Distribution/
Availability Codes

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#### APPENDIX A

Definitions, Nomenclatures and Units

# INSTALLATION RESTORATION PROGRAM Phase IIB Field Evaluation Tinker AFB, Oklahoma

#### I. Description of Work

The purpose of this task is to determine if environmental contamination has resulted from waste disposal practices at Tinker AFB OK to provide estimates of the magnitude and extent of contamination, should contamination be found; to identify potential environmental consequences of migrating pollutants; to identify any additional investigations and their attendant costs necessary to identify the magnitude, extent and direction of movement of discovered contaminants.

Ambient air monitoring of hazardous and/or toxic material for the protection of contractor and Air Force personnel shall be accomplished when necessary, especially during the drilling operation.

The presurvey report (mailed under separate cover) and Phase I IRP report (mailed under separate cover) incorporated background and description of the sites for this task. To accomplish the survey effort, the contractor shall take the following steps:

#### A. General

- 1. The areal extent of each zone shall be determined by reviewing available aerial photos of the base, both historical and the most recent panchromatic and infrared.
- 2. All water samples collected shall be analyzed on site by the contractor for pH, temperature and specific conductance. Sampling, maximum holding time and preservation of samples shall strictly comply with the following references: Standard Methods for The Examination of Water and Wastewater, 15th Ed. (1980), pp. 35-42; ASTM, Part 31, pp. 76-86, (1980), Method D-3370; and Methods for Chemical Analysis of Waters and Wastes, EPA Manual 600/4-79-020, pp. xiii to xix (1979). All pesticide analyses shall be performed according to Standard Methods. Minimum detection limits for analysis are shown in Attachment 1.
- 3. Wells shall be of sufficient depth to collect samples representative of aquifer quality and to intercept contaminants present in the aquifer being investigated. The average depth of shallow aquifer wells is anticipated to be approximately 30 feet deep. The average depth of the deep aquifer wells is anticipated to be approximately 125 feet.
- 4. All contractor installed wells shall be developed, water levels measured, and locations recorded on a project map and for Zones 1 and 2 on a specific zone map.
- 5. Field data collected for each zone shall be plotted and mapped. The nature, magnitude and potential for contaminant flow within each zone to receiving streams and groundwaters shall be estimated. Upon completion of the sampling and analysis, the data shall be tabulated in the next R&D Status report as specified : Item VI below.

- B. In addition to items delineated in A above, conduct the following specific actions at sites identified on Tinker AFB:
  - 1. Zone 1 Landfill No. 1, Landfill No. 2, Landfill No. 3, Landfill No. 4, Fire Training Area No. 1 and RWDS-1030W
- a. Install a maximum of three deep aquifer monitoring wells and a maximum of one deep exploratory boring (150 deep maximum depth) around the perimeter and downgradient of the zone. Collect one sample from each well.
- b. Collect one water sample from each of the eight existing groundwater monitoring wells along Crutcho Creek.
- c. Collect a maximum of four leachate samples from seeps discharging from landfills within the zone.
- d. Collect one sample from each of four locations in the impoundment overlying the sites Landfill No. 2 and RWDS-1030W, and composite the samples into a single composite sample. Split the composite sample into two portions. Ship one portion to the USAF OEHL for radionuclide analysis. Ship the other portion to the contractor laboratory for analysis.
- e. Perform the following analyses on samples collected within this zone: oils and greases (IR), total organic halogen (TOX), total organic carbon (TOC), iron, manganese, heavy metals (cadmium, chromium, nickel, copper, zinc, lead and mercury), cyanide, phenol, and the following pesticides—DDT isomers, 2,4-D, 2,4,5-T, aldrin, dieldrin, lindane, methoxychlor, heptachlor, heptachlor epoxide. Analyze one (1) sample from each new well [total of three (3)] and two (2) selected samples from the existing wells by GC/MS (modified EPA Method 625).

#### 2. Zone 2 - Landfill No. 5 and Landfill No. 6

- a. Install two deep aquifer monitoring wells, one downgradient of each landfill. Collect two groundwater samples, one from each well.
- b. Collect one sample from the leachate stream discharging from landfill No. 5.
- c. Analyze samples for oils and greases (IR), total organic carbon(TOC), total organic halogen (TOX), pesticides listed in I.B.1.e., cyanide, phenol and heavy metals (cadmium, chromium, nickel, copper, zinc, lead and mercury, iron and barium. Analyze one (1) sample from each new well by GC/MS (modified EPA Method 625).

#### 3. Zone 3 - Industrial Waste Pit 2

- a. Perform geophysical testing using <u>electro magnetics</u> (EM) to define subsurface conditions and site boundaries.
- b. Install five soil borings 30 feet deep within the site boundary. Collect soil samples at five foot intervals and <u>select up to ten</u> (10) <u>samples for analysis</u>. Two of the borings shall be completed as shallow monitoring wells.

- c. Install one deep aquifer monitoring well immediately adjacent to and downgradient of the site.
- d. Collect water samples from each of the two shallow monitoring wells. Collect one water sample from the deep aquifer well.
- e. Analyze the samples for O&G (IR), TOC, TOX, cyanide, phenol and heavy metals (cadmium, chromium, nickel, copper, zinc, lead and mercury). Analyze one (1) sample from each well by GC/MS (modified EPA Method 625). Analyze one (1) field-selected soil sample by GC-MS (modified EPA Method 625). Conduct a seven-day, distilled water extraction of a sample of the PVC well casing and analyze the extract by GC-MS (modified EPA Method 625).

#### 4. Zone 4 - Industrial Waste Pit 1

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- a. Perform geophysical testing using <u>electro magnetics</u> (EM) to define subsurface conditions and site boundaries.
- b. Install five soil borings 30 feet deep within the site boundary. Collect soil samples at five foot intervals and <u>select up to ten</u> (10) <u>samples for analysis</u>. Two of the borings shall be completed as shallow monitoring wells.
- c. Install one deep aquifer monitoring well immediately adjacent to and downgradient of the site.
- d. Collect water samples from each of the two shallow monitoring wells. Collect one water sample from the deep aquifer well.
- e. Analyze the samples for O&G (IR), TOC, TOX, cyanide, phenol and heavy metals (cadmium, chromium, nickel, copper, zinc, lead and mercury).

  Analyze one (1) sample from each well by GC/MS (modified EPA Method 625).

  Analyze one (1) field-selected soil sample by GC-MS (modified EPA Method 625).
  - 5. Zone 5 Base Water Supply Wells.
- a. Collect one (1) sample from each base water supply well (27 wells).
- b. Analyze all samples for volatile hydrocarbons by GC (EPA Method 601) and total organic carbon (TOC).
- c. Based on the above results, analyze up to fourteen (14) samples for volatile organic priority pollutants by GC-MS (EPA Method 624) and up to fourteen (14) samples for extractable organic priority pollutants (modified EPA Method 625).

#### 6. Zone 6 - Building 3001 Production Wells

a. Inspect the two contaminated wells and their immediate surroundings. Review the results of previous Air Force investigations. These results shall be provided under separate cover.

- b. Inventory past and present nearby industrial operations for possible TCE sources. Evaluate the possibility of an off-base source of contamination. Evaluation shall be performed by reviewing available data, provided under separate cover, and by field reconnaissance.
- c. Test the wellheads and surrounding areas for cracks or other failures, using steam-cleaning and probing, as appropriate.
- d. Test-pump and sample the contaminated wells. Analyze a maximum of 40 samples for TCE by EPA Method 601.
- e. Develop a work plan and cost estimates for follow-on (including subsurface) investigations. Submit this information in the monthly R & D Status report (Item VI below) prepared after the analyses in Item I.B.6.d. above are completed.

#### C. Well Installation and Cleanup

Well and boring locations shall be cleaned following the completion of the well. Drill cuttings shall be removed from the boring/shallow well areas and the general area cleaned up.

#### D. Data Review

Results of all sampling and analysis shall be tabulated and incorporated in the Informal Technical Information report (Sequence 3 Atch 1 and Sequence 2 Atch 3 as reflected in Item VI below) and forwarded to USAF OEHL/CVT for review. Results shall also be forwarded as available in the next monthly R&D status report.

#### E. Reporting

- 1. A draft report delineating all findings of this field investigation shall be prepared and forwarded to the USAF OEHL as specified in Item VI below for Air Force review and comment. This report shall include a discussion of the regional hydrogeology, well logs of all project wells, data from water level surveys, water quality analysis results, EM survey results and maps, available geohydrologic cross sections, groundwater surface and gradient vector maps, and Laboratory quality assurance information. The report shall follow the USAF OEHL supplied format (mailed under separate cover).
- 2. Estimates shall be made of the magnitude, extent and direction of movement of contaminants discovered. Potential environmental consequences of discovered contamination must be identified. Where survey data are insufficient to properly determine or estimate the magnitude, extent and direction of movement of discovered contaminants, specific recommendations, fully justified, shall be made for additional efforts required to properly evaluate contamination migration and included in a separately bound appendix to the draft final report (see F below).
- 3. Specific requirements, if any, for future groundwater and surface water monitoring must be identified.

#### F. Cost Estimates

Production of the second

Detailed cost estimates for all additional work recommended to properly determine or estimate the magnitude, extent and direction of movement of discovered contaminants at sites being investigated shall be provided along with an estimate of the time required to accomplish the proposed effort. This information shall be provided in a separately bound appendix to the draft final report.

II. Site Location and Dates

Tinker AFB OK
USAF Clinic/SGB
Dates to be established

III. Base Support: None

IV. Government Furnished Property: None

V. Government Points of Contact

1. Dr Dee Ann Sanders
 USAF OEHL/CVT
 Brooks AFB TX 78235
 (512) 536-2158
 AV 240-2158

2. Col Harry Russell
HQ AFLC/SGPB
Wright-Patterson AFB OH 45433
(513) 257-6210
AV 787-6210

3. Capt Darrel Cornell USAF Hospital/SGB Tinker AFB OK 73145 (405) 734-7844 AV 735-7844

VI. In addition to sequence numbers 1, 5 and 10 which are applicable to all orders, the reference numbers below are applicable to this order. Also shown are data applicable to this order.

Sequence No.	Block 10	Block 11	Block 12	Block 13	Block 14
Atch 1					
4	ONE/R	9 MAC	9.5 MAC	14 MAC	*
3	ONE/T	##	**		2
Atch 3					
2	<u>ONE/T</u>	**	**	•	2

Force comments concerning the first draft report, the contractor shall supply the USAF OEHL with a second draft report. The report shall be forwarded to the applicable regulatory agencies for their comments. Contractor shall supply the USAF OEHL with 25 copies of each draft report and 50 copies plus the original camera ready copy of the final report.

<sup>\*\*</sup>Upon completion of analysis.

# ATTACHMENT 1 REQUIRED SAMPLE DETECTION LIMITS

*Total Organic Halogen (TOX)	5 micrograms/L
*Total Organic Carbon (TOC)	1 milligram/L
Oils and Grease IR Method 412.3	0.1 milligram/L (water);
	100 microgram/gram (soil)
GC/MS (EPA Methods 624 β	* <u>*</u>
modified 625)	
Pesticides Analyses	***
Specific Conductance	1 micromho
Total Dissolved Solids	1 milligram/L
TCE (Trichloroethylene)	***

#### Chemicals

Nicke1	100	milligrams/L
Copper	50	micrograms/L
Lead	20	micrograms/L
Zinc	50	micrograms/L
Chromium	50	micrograms/L
Cadmium	10	micrograms/L
Phenol	1	microgram/L
Cyanide	10	micrograms/L
Mercury	1	microgram/L
Total Iron	100	micrograms/L
Manganese	50	micrograms/L
Barium	200	micrograms/L

\*Detection levels for TOC and TOX must be 3 times the noise level of the instrument. Laboratory distilled water must show no response; if it shows a response, corrections of positive results must be made.

\*\*Detection limits for volatile organics and acid and neutral extractable compounds shall be as specified for compounds listed in EPA Methods 624 and Modified 625.

\*\*\*For waters, analyze samples for chlorinated hydrocarbon and organophosphate type insecticides. Analyze for the following specific pesticides.

#### \*\*\*\*As specified in EPA Method 601.

aldrin	.02 microgram/L
DDT isomer	.02 microgram/L
dieldrin	.02 microgram/L
endrin	.02 microgram/L
heptachlor	.02 microgram/L
heptachlor epoxide	.02 microgram/L
lindane	.01 microgram/L
methoxychlor	.02 microgram/L
2,4-D	.06 microgram/L
2,4,5-T	.06 microgram/L

# REPORT FORMAT FOR IRP PHASE IIB AND IIC EFFORT (ATCH 1, SEQ 4)

Table of Contents

List of Figures

List of Tables

Summary

- I. INTRODUCTION
- II. ENVIRONMENTAL SETTING
- III. FIELD PROGRAM
- IV. DISCUSSION OF RESULTS AND SIGNIFICANCE OF FINDINGS
- V. ALTERNATIVE MEASURES
- VI. RECOMMENDATIONS

Appendices (when applicable, not necessarily in the following order)

- A. Definitions, Nomenclatures and Units of Measurement
- B. Scope of Work
- C. Well Numbering System
- D. U.S. Geological Survey Well Logs, Well Completion Logs, and Geological Drilling Logs
  - E. Field Raw Data
- F. Sampling and Analytical Procedures including field and laboratory QA/QC plans utilized for this project.
  - G. Chain of Custody Forms
  - H. Analytical Data
  - I. Correspondence with Federal, State and/or Local Regulatory Agencies
  - J. References
  - K. Biographies of Key Personnel
  - L. Geophysical Tracings
  - M. Safety Plan utilized on this project.

#### SUMMARY

This is a brief, executive-type summary of IRP Phase II results including overall summary tables. After reviewing the summary, a reader should know if the particular IRP Phase II results are of interest, and are applicable to his particular needs. Specific items included in the summary are:

- 1. Location of sites
- 2. Type and number of tests conducted
- 3. Number of related tests (e.g., ground penetrating radar)
- 4. Summary of final results in applicable units
- 5. Comparison with applicable standards, if any
- 6. Conclusions
- 7. Recommendations (see recommendations section for detail), in tabular form. such as the following:

Problem Area or Site No	Recommended Action	Rationale
1		
2		
3	-	

#### I. INTRODUCTION

This section should answer who, what, where, when and why type questions concerning the program. Specific information in the introduction includes:

- 1. Purpose of program
- 2. Duration of program
- 3. Brief history of base and sites including history of contamination
- 4. Description of sites including site-scaled drawings/photographs (using care for securities)
  - 5. Identification of the pollutants sampled
  - 6. Identification of the field team
- 7. Other pertinent information which should be called to the reader's attention. For example: Base overlies sole source aquifer.

#### II. ENVIRONMENTAL SETTING

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A detail environmental setting is necessary to enable the reader to review the reported program in a proper perspective. Dividing the base into different disciplinary systems and/or subsystems is required. Specifically, this section should include applicable discussion of the following settings:

- 1. Physical geography
- 2. Regional geology and hydrogeology
- 3. General hydrogeology
- 4. Historic disposal and storage areas including site descriptions and site specific geology and geohydrology
  - 5. Historic groundwater problems
  - 6. Location of wells on and off base
  - 7. Any other pertinent information applicable for the particular program.

#### III. FIELD PROGRAM

This section should include applicable experimental designs including quality assurance/quality control plans concerning field tests in addition to the field work. Information in this section includes:

- 1. Details of development of the field program
- 2. Implementation of field program
- 3. Details of instrumentation and/or system used, including schematic diagrams.
- 4. Sampling procedures and sample preservation, including referenced methods.
- 5. A discussion of pertinent facts and conclusions pertaining to the reliability of the sampling procedures, sample representation and sample integrity.
  - 6. When applicable, cross-reference this to other sections of the report.

### IV. DISCUSSION OF RESULTS AND SIGNIFICANCE OF FINDINGS

This section should be divided into two subsections:

1. <u>Discussion of Results</u>: This subsection should include tabular surmaries of pertinent test results and test parameters. Comparison to allowable compliance standards and/or limits should be stated.

A discussion of pertinent facts and conclusions pertaining to the reliability of the results and their relation to the contaminants should be presented. Comparison to normal background levels should be mentioned.

This subsection should be as concise as possible. However, important comments and observations should be fully expressed and should not be limited in favor or brevity.

- 2. <u>Significance of Findings</u>: The highest technical capabilities and a broad range of experience are needed to derive the information needed in this subsection. The subsection should be introduced with a paragraph stating that based on the results of the effort, the following information can be derived:
- a. Extent of Contamination: Extensive discussion and graphic displays of actual or estimated contamination of each site, or group of sites, should be provided. Contaminated areas, depth of contamination, movement of contamination (plume movement) and total volume of contaminated naterial exceeding applicable standards and/or guidelines should be tabulated in detail.
- b. Evaluation of Contamination: The basis for evaluation, assumption used, and when possible calculated health risk assessments should be summarized. If deducible, health risk ratings should be clearly stated.

#### V. ALTERNATIVE MEASURES

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This section should detail all the major possible options by site excluding migration and/or cleanup measures and including monitoring actions

For identified sites requiring future monitoring, proposed monitoring requirements including method(s) and duration should be discussed.

#### VI. RECOMMENDATIONS

This multidisciplinary section should provide the highest technical conclusions for the completed program. When applicable, future monitoring recommendations shall be discussed here and tabulated in the Summary section.

Recommendations, whether they are straightline extrapolations of either obvious results or highly complicated nonlinear mathematical modeling, should be precise, clear and technically defendable.

This section should clearly define the base from which IRP future phases, if any, will be initiated. Hence, prioritizing the sites for the next phase should be recommended.



#### APPENDIX C

#### Well Numbering System

The wells drilled and cores taken for the Tinker Air Force Base Installation Restoration Program, Phase IIB, were designated by Zone Number and sequential letters within zones. Designators were assigned in the order in which the drilling locations were established. For example, Well 1A is the first well drilled at Zone 1. Table C-1 contains a list of all wells and cores for the project, listed by zone of investigation.



TABLE C-1. LIST OF WELLS AND CORES

Zone 1 Well Well Exist " " " Core Zone 2 Well Well Zone 3 Well Well	1B 1C cing Well "" "" "" "" ID	1 2 3 4 5 6 7 8	3A 3A(A) 3B, 3B(A) 3C 3D 3F(A)
Zone 4 Well Well	4 <b>F</b>	Core "	4C
Well		11	4D 4E



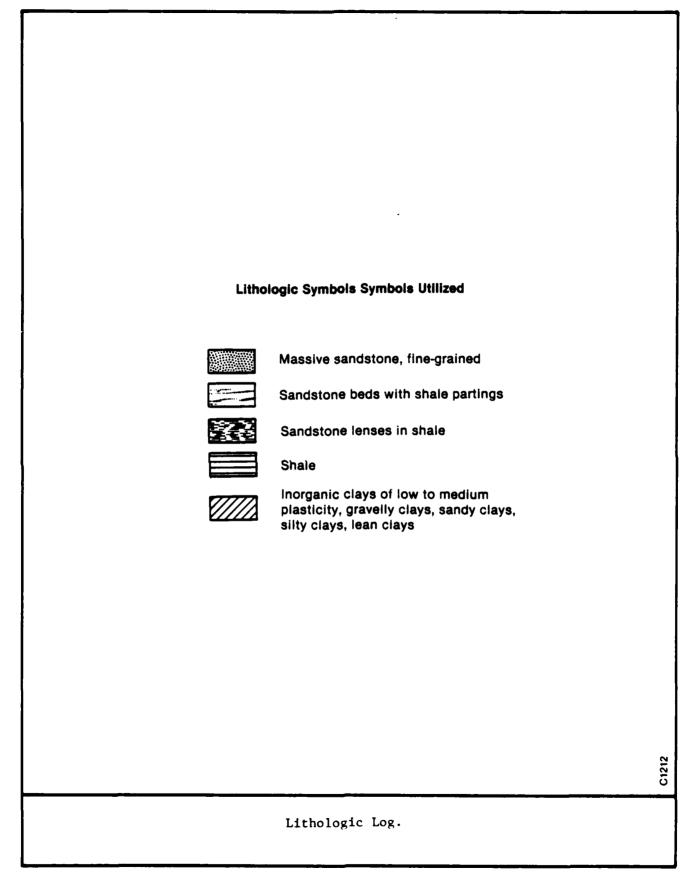
#### APPENDIX D

#### Well Logs

This Appendix contains the logs of drilling and well completion activities for the project. Table C-1 (Appendix C) contained a list of all wells and cores for the project, listed by zone of investigation.



Logs of Drilling Operations



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Sheet  $\frac{1}{}$  of  $\frac{1}{}$ 

### Log of Drilling Operations

Boring or Well No.			1.	A			
				of	Landfill	1	
Log Becor	ded By		L.N.	Fre	nch		_

Project Tinker AFB IRP Phase IIB

Beginning 10 November 1983 and end
10 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250
Jim Winnek, Inc.

				<del></del>	STA WINNER, THE.
Depth (ft)	Graphic	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
		N/A	grab	CLAY, brown-red, slightly plastic	;
1 [			at dis-	with silt, trace fine to coarse sand.	
I L				Decreasing moisture at 3', clay	
1 -				grades to shale at 3-5'.	
5 —					<b>[</b>
<b>I</b> ⊢			}	SHALE, red-brown, silty, dry;	
<b>!</b> ⊢				interbedded with thin sandstone	
<b>!</b> -			,	layers.	
-					
10 —					
<b> </b>		1			
<b> </b>					]
1 F			<b>[</b> '	CANDOMOND	ļ
15				SANDSTONE, fine-medium grained, light orange, moist, friable;	
1 12 T		1		some silt lenses.	Driller reports
1 E				000 0212 10000	water (mist in dis-
I E		1	1	SHALE, red-brown, soft; some	charge) at 17.8'.
		1		fine-medium sand in clay matrix;	
20				increasing moisture.	
1 +					
1 -					
i					
1 <b>-</b>		1			
25		1	i		
1 <b>-</b>	***********				Water produced in
<b> </b> -				SANDSTONE, fine-medium grained,	discharge, approx.
<b>!</b>			1	red-brown, friable, saturated.	2 gpm at 26'.
1,0					
30					
1					
					Tougher drilling at
E		1	1	Increasing indurated sandstone	33'.
35				fragments.	
T				END OF BORING - 35'.	
1			]		
1 -	ł	l	1		
I., -		ļ		D-7	
40		<u> </u>			1

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	_			_	

Sheet \_1 \_ of \_ 2

### Log of Drilling Operations

Boring or Well No.	18			
Location Zone 1,		of	Landfill	4
Log Recorded By	I. N.	Fre	nch	

Project Tinker AFB IRP Phase IIB

Beginning 14 November 1983 and end

14 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5		N/A	grab at dis- charge		
25				SANDSTONE, light orange-white, fine grained, soft; interbedded with thin layers of shale.  SHALE, red-brown; trace fine sand, indurated with occasional	
35				friable zones. D-8	

RA	DI	Δ	N
			_

Sheet \_\_\_\_2\_ of \_\_\_2\_

### Log of Drilling Operations

Boring or Well No. 1B

Location Zone 1, south of Landfill 4

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 14 November 1983 and end

14 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

ID No. of Sample Taken Depth Stratigraphy Remarks (ft) SANDSTONE, light gray, fine grained, friable, dry sandstone 50 changes color to orange-brown, increasing moisture @ 52'. 55 Increasing moisture, silt content. 60 -65. No return of cuttings, driller blows out water. No cuttings return past 68'. 70 -75 -80 -END OF BORING - 81'. D-9 85

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			_	

Sheet 1

1 of 2

### Log of Drilling Operations

Boring or Well No. 1C
Location Zone 1, west of Landfill 4
Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 16 November 1983 and end

16 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —		N/A	grab at dis- charge	CLAY, dark brown, slightly plastic; some silt and fine sand; few organic fragments; moist; grades to SHALE/SILTSTONE, red-brown, soft; some fine to coarse sand. Decreasing moisture, occasional zones of fine sand.	
10				Shale is thinly stratified.	
20				1' layer of sandstone at 16'; fine-grained, red-brown, dry.	
25					
30				SANDSTONE layer at 31-33'; fine grained, light gray-white, dry.	
35				inundated sandstone), slightly	Easy drilling; driller reports soft sand. Drill reports small quantity of we er @ 40'.

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CORRO	PATIO	•	

### Log of Drilling Operations

Boring or Well No. 1C

Location Zone 1, west of Landfill 4

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 16 November 1983 and end

16 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Orill Rig and Operator Failing 1250

Jim Winnek, Inc.

Sheet \_\_\_2\_\_ of \_\_\_

Depth (ft)	Graphic Log	ID No. of Sarr.ple Taken	Type of Sample Taken	Stratigraphy	Remarks
40				Some shale lenses at 43'.	
45 —					Increasing water at 45-46'.
50 —					Drilling stopped at 50'; water level recovers in borehole, drill to 55'.
55					Driller produces water at 1-2 gpm. No gases detected.
- - -					
<del>-</del>					
+					
			<b>,</b> }		
			:	D-11	

RA	D	AN

### Log of Drilling Operations

Boring or Well No. 1D\*

Location Zone 1, east of Reserve Road

Log Recorded By L.N. French

Project <u>Tinker AFB IRP Phase IIB</u>

Beginning 14 February 1984 and end

14 February 1984 of drilling operation

Sampling Interval (Estimated) <u>variable</u> (ft)

Type Drill Rig and Operator <u>Failing 1500</u>;

Jim Winnek, Inc.

Sheet \_1\_\_ of \_\_5\_

				Jim	Winnek, Inc.
Depth (ft)	G <b>räph</b> ic Lóg	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
		N/A	Grab at dis- charge	CLAY, medium brown, plastic, moist; some silt. Rock fragments at surface.	4-inch drag bit
5				Grades to red-brown silty clay by 5 ft., decreasing moisture.	
10					Water noted at 8 ft; saturated interval is probably several feet thick. Dry conditions below 15 ft.
15				SHALE, red-brown, dry; with some silt and fine sand. Occasional zones of thin, indurated sandstone.	
20				scone.	
25					
30					
35				D 10	
		3		D-12	

<sup>\*</sup>Borehole was grouted to surface.

RA	D	A	N
		-	

Sheet 2\_\_\_ of \_\_\_5

### Log of Drilling Operations

Boring or Well No. 1D\*

Location Zone 1, east of Reserve Road

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 14 February 1984 and end

14 February 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1500;

Jim Winnek, Inc.

	7==	==			williek, Ilic.
Depth (ft)	Graphic Lőg	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				SANDSTONE, gray-white, friable, fine grained; some silt; trace coarse sand.  Grades to red sandstone at 44 ft. increasing thin shale layers with indurated calcite-cemented sand-	
50				stone.	
60				SHALE, red-brown, few sandstone layers.	
70 —				D-13	

RADIAN	ı

Sheet 3

### Log of Drilling Operations

Boring or Well No. 10\* Location Zone 1, east of Reserve Road L.N. French Log Recorded By \_

Project \_\_\_Tinker AFB IRP Phase IIB Beginning 14 February 1984 14 February 1984 of drilling operation variable Sampling Interval (Estimated), Type Drill Rig and Operator Failing 1500;

Jim Winnek, Inc

Jim Winnek, Inc.					Winnek, Inc.
Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
75				SANDSTONE, fine-medium grained, red-brown.	Increased water production, est. 15 gpm.
80					
90				Interbedded layers (1-3 ft) of red shale.	
95 —					
100				·	
105				D-14	

R	ND	IA	N

### **Log of Drilling Operations**

Boring or Weil No. 10\* Location Zone 1, east of Reserve Road L.N. French Log Recorded By \_

Project \_ Tinker AFR IRP Phase IIR Beginning 14 February 1984 14 February 1984 of drilling operation Sampling Interval (Estimated) variable \_(ft) Type Drill Rig and Operator Failing 1500;

Jim Winnek, Inc.

Sheet

4 of 5

					O Till	winner, inc.
	Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
1:					Indurated sandstone from 108 ft. to 117 ft.	
	25				Lenses/layers of shale.	Increase in water production, est. 20-25 gpm. Decreasing silt in water.
13	35-4-					
14	<u> </u>				D-15	

RA	DI	

Sheet \_5 \_\_ of \_\_ 5

### Log of Drilling Operations

Boring or	Well No	1D*				
Location_				Reserve	Road	8
Log Reco	rded By	L.	N. 1	French		

Project \_\_\_\_\_Tinker\_ AFB IRP Phase IIB

Beginning \_\_\_\_\_14 February 1984 \_\_\_\_\_\_and end
\_\_\_\_\_\_14 February 1984 \_\_\_\_\_\_of drilling operation

Sampling Interval (Estimated) \_\_\_\_\_\_\_variable \_\_\_\_\_\_(ft)

Type Drill Rig and Operator \_\_\_\_\_\_Failing 1500;

Jim Winnek, Inc.

ID No. of Sample Taken Graphic Log Depth Stratigraphy Remarks (ft) 145 SANDSTONE, white-gray, trace Increased production silt. of water at 148 ft., 150\_ water is clear. END OF BORING - 150 ft. 155 NOTE: Water level measured at 55 ft. below land surface 3 hours after completion of hole. D-16

R	Δ	D	Δ	N

### Log of Drilling Operations

Sheet	1	of	2	

Boring or Well No. 2A

Location Zone 2, south of Landfill 6

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 17 November 1983 and end

17 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
-		4	grab at dis- charge	CLAY, dark brown, moderately plastic; some silt and fine sand, moist. SHALE/SILTSTONE, red-brown, soft; trace fine to coarse sand	
5 —				and fine gravel.  Decreasing moisture below 5'.	
10					
15				Thin sandstone (approx. 6") at 13'; light gray-white, fine grained, dry.	
20					
25				SANDSTONE, light gray-white, friable(with some indurated fragments), fine grained; some	
				silt and clay, dry.  Grades to red sandstone, then pink sand at 28'.	Fast drilling from 28 to 35'.
30				المراب	
35				Sandstone is interbedded with shale at 38'; sandstone is indurated, red-brown.	
40				D-17	

R	A	D	4	N
===	-		 	

## Log of Drilling Operations

Sheet  $\underline{\phantom{a}}$  of  $\underline{\phantom{a}}$ 

Boring or Well No. 2A

Location Zone 2, south of Landfill 6

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 17 November 1983 and end

17 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40 _					Driller reports small amount of water at 42'.
45				END OF BORING - 45.5'.	Stop drilling at 45.5'; water blown from borehole; water level remains to 37.5'.
50					
-					
‡					
<del> </del>					
-				D-18	

RA	DI	A	N
		-	

Sheet \_

### Log of Drilling Operations

Boring or Well No. Location Zone 2, south of Landfill 5 L.N. French Log Recorded By \_

Project Tinker AFB IRP Phase IIB Beginning 20 November 1983 20 November 1983 of drilling operation variable Sampling Interval (Estimated) Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
-		N/A	grab at dis- charge		
5 —				SHALE, red-brown, moderately plastic, slightly moist; some silt (weathered zone to 8') unweathered, dry, shale/silt-stone at 8'.	
15					
20				Increasing silt and fine sand (white) at 18'.	Fast drilling from 18-20'.
25				SANDSTONE, fine with some medium to coarse grains, red- brown with zones of white-light gray sand, friable with some	Driller reports water at 26'.
30 —				indurated pieces; some lenses of shale.	
35					Stop drilling at 35' not much water accumulates.
40				D-19	

R	A	D	A	N
			 -	

Boring or Well No. \_\_\_\_2B

Location Zone 2, south of Landfill 5

Log Recorded By L.N. French

### Log of Drilling Operations

Project Tinker AFB IRP Phase IIB

Beginning 20 November 1983 and end
20 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Sheet \_\_2\_

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
40				Increasing silt content.	
50					Slower drilling; fewer cuttings return to surface. Driller blows out
55					water at 50'; relatively low yield. Increased water at 52.5'.
<u> </u>					
+					
+					
Ė				D 20	

D-20

RA	DI	A	N

Boring or V	Vell No	3A	
Location_	Zone	No. 3	
Log Book	dod By	Rick Belan	

Project Tinker AFB IRP Phase IIB Beginning 21 November 1983 21 November 1983 \_ of drilling operation Sampling Interval (Estimated). Type Drill Rig and Operator Mobile B-50 Bobby Holland/Jim Winnek, Inc.

Sheet  $\underline{\phantom{a}}^1$ 

Graphic Type of Sample Taken Depth Stratigraphy Remarks (ft) F Ι CLAY, fill, brown, sandy. CLAY, fill, sandy, gray, soft, slight odor. CLAY, brown & red, hard, dry. BC\* = 14/30/33.SS 3Aa

ЗАЪ SS CLAY, red (brighter), hard, dry. BC = 28/55/9210 Shale, bright red, hard, dry. TD-Augered to refusat. Open hole dry 11/28/\$3. 15

20 25

> \*BC-Denotes split-spoon blow counts each 6" with standard

Open hole grouted using 3/4" tremie pipe 11/30/83.

7-83-13718

D-21

140 lb. weight.

	HAN	
CORPORAT	IOM	

Sheet \_

\_(ft)

7-83-13718

### Log of Drilling Operations

Boring or Well No. 3A (A)	Project Tinker AFB IRP Phase IIB
	Beginning 29 November 1983 and end
Log Recorded By Rick Belan	29 November 1983 of drilling operation
	Sampling Interval (Estimated)5(ft)

Type Drill Rig and Operator Mobile B-50
Don Clements/Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5	F I L L	3Aa(A)	SS	CLAY FILL, red.  WASTE/CLAY FILL, dark grayish red, soft, water, odor.  CLAY (fill?)	BC*=2/5/10 TD
10					
15					11/30/83 Water level in open
20					hole @ 1.5' BGL.
25 —					
30 -					
35				*BC-Denotes split-spoon blow counts each 6" with standard 140 lb. weight.	Open hole grouted using 3/4" tremie pipe 11/30/83.
				D-22	

RA	DI	AN	
		<b>™</b>	

3B and 3B(A) Boring or Well No. 3B

Location Zone No. Location\_ Rick Belan Log Recorded By.

Project Tinker AFB IRP Phase IIB Beginning 22 November 1983 and end 22 November 1983 of drilling operation Sampling Interval (Estimated). Type Drill Rig and Operator Mobile B-50 Bobby Holland/Jim Winnek, Inc.

Sheet  $\underline{\phantom{a}1}$ 

\_ of  $\frac{1}{}$ 

				BODDY HOIIand/Jim	winner, Inc.
Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —	FILL	3Ba	ss	CLAY FILL, sandy, reddish brown. CLAY fILL, gray brown, soft. CLAY, red, hard, dry.	BC*=6/16/27, partial recovery.
10		3 <b>B</b> b	SS	CLAY, rust red, hard, dry.	BC=30/47/72 Hollow stem auger- ing very difficult.
15		3Bc	SS	SHALE, red, hard, dry.	BC=38/100 for 3".  Moved forward to location 3B(A)/
20		3Bd 3Be	SS SS	SHALE, dark red, hard, dry. SHALE, dark red, hard, dry.	switched to solid stem augers. BC= 40/100 for 2". BC=47/100 for 5".
25					TD
					Both open holes dry 11/28/83.
				*BC-Denotes split-spoon blow counts each 6" with standard 140 lb. weight.	Open holes grouted using 3/4" tremie pipe 11/30/83.
				D-23	

RA	DI	A	N

Boring or Well No. 3C Location Zone No. 3 Location\_\_\_ Rick Belan Log Recorded By \_

Project Tinker AFB IRP Phase IIB Beginning 22 November 1983 and end 22 November 1983 \_ of drilling operation Sampling Interval (Estimated) \_ \_(ft) Type Drill Rig and Operator Mobile B-50 Bobby Holland/Jim Winnek, Inc.

Sheet \_\_1

of <u>1</u>

				BOODY HOTTAND/JIM	winnex, inc.
Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —	F I L	3Ca	SS	CLAY FILL, brown.  WASTE/CLAY FILL, sandy, dark gray, plastic, wet, odor-	BC*=8/6/12.
10		3СЪ	SS	CLAY, dark rust red, hard, dry. SHALE.	BC=30/70/100 for 4" TD
15					11/28/83 Water level in open hole @ 1.2' BGL, grab sample pH= 7.57 (12/7/83) Cond=7.4x10 <sup>4</sup> µmhos/cm @ 25°C. (12/7/83)
				*BC-Denotes split-spoon blow counts each 6" with standard 140 lb. weight.	Open hole grouted using 3/4" tremie pipe 11/30/83.
<b> </b>				D-24	

AE	11	N

Boring or Well No		3	D	
Location	Zone	No.3		
Log Recorded	B <sub>V</sub>	Rick	Belan	

Project Tinker AFB IRP Phase IIB Beginning 22 November 1983 and end 22 November 1983 of drilling operation Sampling Interval (Estimated) Type Drill Rig and Operator Mobile B-50
Bobby Holland/Jim Winnek, Inc.

Sheet \_1

\_ of <u>l</u>

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —		3Da	SS	CLAY (fill?), dark reddish brown, hard, dry, no odor.	*BC=14/30/08.
10		ЗДЪ	SS	SHALE (?) and sandstone, dark reddish brown, hard, dry.	BC=60 for 5". TD
15					11/28/83 Water level in open hole @ 7.7' BGL.
25				*BC-Denotes split-spoon blow counts each 6" with standard 140 lb, weight.	Open hole grouted using 3/4" tremie pipe, 11/30/83.
				D-25	

R	A	D	1/	A	N
COR	-		~=		

Sheet 1 of \_\_\_\_

#### Log of Drilling Operations

Boring or Well No. 3E

Location Zone 3, southwest of IWP 3

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 22 November 1983 and end

22 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —		N/A	grab at dis- charge	CLAY, dark brown, grading to red-brown at depth, moist, plastic, organic matter near surface; some silt with zones of fine sand and sandstone fragments.  SHALE/SILTSTONE, red-brown, dry,	
10				friable, soft; some fine to coarse sand in thin zones.	"ammonia" odor at 8'; stopped drilling air tests negative
15					Easy drilling from 10-20'.
20					
25					
30 —				SANDSTONE, white-light gray, friable with some indurated fragments, dry; some thin shale layers/lenses from 32-42'.	
35 —				Grades to soft, red-brown sand- stone.	D <b>-</b> 26

R	A	D	1	A	N
	===		==		

Sheet \_\_\_2 of \_\_2

#### Log of Drilling Operations

Boring or Well No.	3E
Location Zone 3	3, southwest of IWP 3
Lon Boonsdod By	I N French

Project Tinker AFB IRP Phase IIB

Beginning 22 November 1983 and end
22 November 1983 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Failing 1250

Jim Winnek, Inc.

Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
-				Occasional indurated sandstone fragments, increasing moisture at 43'.	
45				Grades from red to pink-white sandstone from 46 to 50'.	
50 —					
55 —				Abrupt change in color; red-	
60				brown sandstone (partially indurated).  SHALE, red-brown, soft, slightly moist; some fine sand.	
				SANDSTONE, red-brown (mottled), fine-medium grained, some SHALE fragments, moist.	Driller reports small amounts of water at 63 and 68';
65					few cuttings.
70					Pause in drilling; water recovers 3-4' in borehole, but at
75					a slow rate. No cuttings returned from 71-80'.
80				END OF BORING - 80'.	D-27

RA	DI	A	N
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Sheet \_

Boring or Well No3F	Project Tinker AFB IRP Phase IIB
ocation Zone No. 3	Beginning 23 November 1983 and end
og Recorded By Rick Belan	23 November 1983 of drilling operation
	Sampling Interval (Estimated) N/A (ft)
	Type Drill Rig and Operator Failing-1250
	Type Drill Rig and Operator Failing-1250

	<del>-</del>				
Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —				CLAY, red, moist.	4 3/4" test hole w/air rotary rig; completed 11/29/83 as a monitor well w/6 3/4" bit.
10					No direct evidence of ground water.
				SHALE, silty to sandy, red, dry.	
15				SANDSTONE, white.	
20					
25				SHALE, sandy, red, hard, dry.	
30					TD 11/28/83 W.L. in
35					open hole @ 16.3' BGL, bailed; next day W.L. back to ∿16' BGL, grab sam- ple from 11/28/83. pH=7.10 (12/7/83).
				D-28	Cond=910 μmhos/cm @ 25°C (12/7/83).

RI	1D	IAI	N
CORR	COATIO	<b>7.64</b>	

Boring or Well No. 3F(A) Location Zone No. 3 Log Recorded By Rick Belan

#### **Log of Drilling Operations**

	se IIB	Pha	FB II	r /	inke	Project _
and end	3	198	vemb	N	29	Beginnin
peration	of drilling	•	r 19	mb	Nove	29
(ft)	5	ed)	(Estin	val	Inter	Sampling

Sheet 1 of 1

Type Drill Rig and Operator Mobile B-50

•	<b></b>	,	<b>-</b>			
	Don	Cleme	ents/	Jim	Winnek,	Inc.

		Don Clements/Jim Winnek, Inc.				
Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks	
	F <sub>IL</sub>					
F	******	3Fa(A)	ss	CLAY, fill & waste(?), reddish	*BC=8/13/83.	
5 🕂		3Fb(A)	SS	brown. CLAY, rust red, sandy, hard, dry	*BC=27/50/80.	
E		3Fc(A)	SS	CLAY, rust red, sandy, hard, dry.	TD	
F						
10						
·  -						
F		•	i			
15	1	r.				
T						
20						
<sup>20</sup> T						
E						
_						
25						
-						
30						
F				*BC-Denotes split-spoon blow	Open hole grouted	
Ŀ				counts each 6" with standard 140 lb. weight	using 3/4" tremie pipe 11/30/83.	
35				2.0 10. WCZ6.1C	1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 - 1 -	
-				D 20		
40_		<u> </u>		D-29		

RA	Di	A	N
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Sheet \_

#### Log of Drilling Operations

Boring or	Well No	4A				
Location	Zone 4,	Ind.	Waste	Pit	1	_
Log Recorded By _		L.N	. Fren	ch		

Project \_ Tinker AFB IRP Phase IIB Beginning 10 February 1984 10 February 1984 Sampling Interval (Estimated) as appropriate (ft) Type Drill Rig and Operator Failing 1500; Winnek, Inc.

Der (fi		Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5 —	1 1 1 1			Grab @ dis- charge	CLAY, medium brown, plastic, moist, some silt with organic fragments; grades to red-brown clay with decreasing organic material.	
10 —	-				SHALE, red, dry, uniform texture; some silt and fine sand.	
15 —					Thin sandstone strata at 15 ft. and 17 ft.	
20 <b>–</b>	1 1 1 1				SANDSTONE, white, fine to medium grained, quartz and feldspar grains, slightly moist. White sandstone grades to orange silty sand.	
25 —						
30 —					Thin lenses of shale.	
35 -					Indurated sandstone.  Increasing moisture, silt content.  D-30	Rig vibration at 34 ft.

	_	-

Sheet 2 of 2

#### **Log of Drilling Operations**

Boring or Well No. 4A

Location Zone 4, Ind. Waste Pit 1

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 10 February 1984 and end

10 February 1984 of drilling operation

Sampling Interval (Estimated) as appropriate (ft)

Type Drill Rig and Operator Failing 1500:

Jim Winnek, Inc.

				J	In winner, Inc.
Depth (ft)	Graphic Log	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
50	Gra	I OI Sa		Poorly consolidated sand, with shale fragments.  End of boring - 51 ft.	Few cuttings returned below 40 ft. due to water. Water level after drilling measured at 39' 8½" below land surface.
+					
			į		
<u> </u>				D-31	

RA	DI	A	N
		_	

Boring or Well No. 4B

Location 125'W. 100'S of 0.0

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 8 February 1984 and end
9 February 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Mobile B-50;

Jim Winnek, Inc.

Sheet \_

1\_\_ of \_\_\_

					williek, Ilic.
Depth (ft)	N- blows/ft	ID No. of Sample Taken	Type of Sample Taken *	Stratigraphy	Remarks
5	2/5/11 2/3/4 3/5/8 5/13/24	4B.5 4B.6	SS SS SS	CLAY, dark brown with isolated zones of light brown-gray silt, soft, plastic, roots. Grades to mottled-red clay at 4 ½ ft.	Samples (4B.4-6) collected in shallow borehole ∿5 ft. south of deeper samples.
10				Clay becomes red, decreasing moisture.	
15	29/61/ 100	4B.2	SS	SHALE, red, hard, massive.	Driller notes "soft
20	100	4B.3	SS	End of boring - 20 ft.	layer" at 15 ft.
25	(3 in	<b>}</b>			
30—					
35					
40				D-32	

\*SS - split spoon.

P		IA	N

Sheet \_1\_\_ of \_1

#### **Log of Drilling Operations**

Boring or Well No. 4C

Location 175 E and 200 S of 0,0

Log Recorded By L.N. French

Project <u>Tinker AFB IRP Phase IIB</u>

Beginning 9 February 1984 and end
9 February 1984 of drilling operation

Sampling Interval (Estimated) <u>variable</u> (ft)

Type Drill Rig and Operator Mobile B-50;

Jim Winnek, Inc.

Depth (ft)	N- blows/ft	ID No. of Sample, Taken	Type of Sample Taken	Stratigraphy	Remarks
-	1/3/7 3/8/7	4C.1 4C.2	SS SS	CLAY, brown to red, mottled, roots; with variable amounts of silt, sand, and gravel. Gravel clasts up to 1-inch in size.	Continuous sampling to 4 1/2 ft.
5—	4/7/13	4C.3	SS		
-	4/10/13	4C.4 4C.5		Grades to medium brown silt, with some sand and gravel.	
10		}			
15	12/25/ 43	4C.6	SS	Clay grades to red, plastic, with small organic fragments; little silt, slightly moist.	
20 —	22/42/ 63 (4")	4C.7	SS	SHALE, reddish-brown, blocky tex- ture, massive; some silt	
25 —	51/51/ (3")	4C.8	ŀ	Shale mixed with sandstone; white, fine-grained. End of boring - 24 ft.	
30					
35—					
40				D-33	

RA	DI	A	N

Sheet  $\underline{1}$  of  $\underline{1}$ 

#### **Log of Drilling Operations**

Boring or Well No. 4D

Location 100'N and 125'W of 0,0

Log Recorded By L.N. French

Project Tinker AFB IRP Phase IIB

Beginning 9 February 1984 and end
9 February 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Mobil B-50;

Jim Winnek, Inc.

Depth (ft)	N- blows/ft	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
5	2/6/8 3/4/7	4D.1 4D.2 4D.3	SS SS SS	CLAY, medium-dark brown to red, moist, plastic; some silt, roots. Charred framents (wood?) in thin black layer at 1 ft. Asphalt and gravel from 2-4 ft., underlain by red clay.	,
10	13/27/ 43	4D.4	SS	Clay becomes reddish brown, moist, uniform texture.	
15	26/70/ 85	4D.5	SS	Decreasing moisture. SHALE, red, hard, dry.	
20	32/79	4D.6	SS	End of boring - 22 ft.	Hard drilling below 20 ft.; no progress past 22 ft.
25					
30					
35					
[				D-34	

\*SS - split spoon

RA	Di	AN	

#### Sheet $\frac{1}{}$ of $\frac{1}{}$

#### **Log of Drilling Operations**

Boring or Well No. 4E

Location 200'E and 175'S of 0,0

Log Recorded By

Project <u>Tinker AFB IRP Phase IIB</u>

Beginning 10 February 1984 and end

10 February 1984 of drilling operation

Sampling Interval (Estimated) <u>variable</u> (ft)

Type Drill Rig and Operator <u>Mobile B-50</u>;

Jim Winnek, Inc.

					Jill Williek, Ilic.
Depth (ft)	N- blows/ft	ID No. of Sample, Taken	Type of Sample Taken	Stratigraphy	Remarks
5	2/3/7 3/3/4 6/9/16	4E.1 4E.2 4E.3	SS SS SS	CLAY, brown, abundant roots; underlain by red-brown plastic clay with some silt, trace fine gravel and coarse sand. Fine grained light brown-gray sand @ 4 ft.; some organic debris and coarse gravel.	Continuous sampling to 4½ ft.
10-	5/11/ 15	4E.4	SS	Medium brown clay grades to red clay.	
15-	15/35/ 37			SHALE, red-brown, hard, few sandstone clasts.	
20 —				End of boring - 18 ft.	Driller reports tough drilling at 18 ft.; probably sandstone.
25 —					
- - -				D-35	

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CORE	-	-	

Boring or Well No. 4F
Location 100'S of 0.0
Log Recorded By L.N. French

Project <u>Tinker AFB IRP Phase IIB</u>

Beginning 10 February 1984 and end
10 February 1984 of drilling operation

Sampling Interval (Estimated) variable (ft)

Type Drill Rig and Operator Mobile B-50:

Jim Winnek, Inc.

Sheet  $\frac{1}{}$  of  $\frac{1}{}$ 

Depth (ft)	N- blows/ft	ID No. of Sample Taken *	Type of Sample Taken	Stratigraphy	Remarks		
5	2/3/4 2/3/5 5/9/9	4F.1 4F.2 4F.3	SS SS SS	CLAY, red-brown mottled, moist, plastic, abundant organic materia (roots); much silt with some zones of fine sand. Black silt (char or sludge?) in 6 in. layer at 2 ft.	Continuous sampling lto 4½ ft.		
10	7/17/ 27	4F.4	SS	SHALE, red, hard, abundant black (organic?) partings.			
15—	36/69	4F.5	SS	Occasional fine-coarse gravel.			
20	43/68 for 5"	4F.6	SS	End of boring - 20 ft.	Auger refused.		
25				NOTE: After completion of 4F, rig was moved east 5 ft. to auger an 8 ft. bore- hole 4G.			
30							
35				D-36			

RA	DI	AN

Boring or	Well No.		4G		 
Location.	100'	s.	of	0.0	
Log Reco					

Project Tinker AFB IRP Phase IIB Beginning 10 February 1984 and end 10 February 1984 of drilling operation Sampling Interval (Estimated) variable Type Drill Rig and Operator <u>Mobile B-50</u>.

Jim Winnek, Inc.

Sheet \_\_1\_\_ of \_\_1\_

Depth (ft)	Sampling Interval	ID No. of Sample Taken	Type of Sample Taken	Stratigraphy	Remarks
				No log, same as 4F.	
5 —					
10					
15					
20					
25					
30					
35					
40					



Well Completion Logs

TABLE D-1. SPECIFICATION SHEET FOR GRAVEL PACK USED

	Typical	Grading	Effective	Size (mm)	Uniformity Coefficient	
Screen	Average	Range	Average	Range		
6	0%	0	1.25	1.18-1.30	1.53	
8	3.7%	2.1-5.1				
10	22.9%	18.0-25.6				
12	51.4%	45.6-62.3				
14	72.8%	66.5-79.0				
16	94.6%	89.8-99.4				
20	98.4%	96.0-99.9				
25	98.6%	96.5-99.9				

Boring or Well No. 1A	Project Tinker AFB IRP Phase IIB  Log Recorded By L.N. French
Boring or Well No. 1A  Location Zone No. 1, west of Patrol Rd.	Log Recorded By L.N. French
and Landfill (	
Construction started 11/11/83	completed11/11/83
Development started11/14/83	completed11/14/83
Hole diameter 6 3/4 in.	
Drilling method Air rotary	
Problems encountered during drilling None	<del></del>
Water source for drilling and completion procedures	s_N/A
Number and type of samples collected Samples	collected from discharge; not retained.
Samc = aterval (ft-ft) Variable	
Stora : = method(s) N/A	
Casir : type PVC Schedule 80	Diameter 4 in.
Depth of casing (ft) 0-25 ft.	
Screen type PVC Schedule 80	_ Diameter4_in
Slot sizeSc	reen interval (ft-ft) 25-35 ft.
Type(s) of glue used to join casing $N/A$ ; threaded	casing
	<del></del>
Amount of gravel pack used (see next page)	<del></del>
Grain size distribution of gravel pack see speci	fication sheet
Lithology of gravel pack Quartz, trace rock fr	agments
Source (company and quarry/pit) Arkhola San	d & Gravel, Fort Smith, Arkansas
Interval of gravel pack (ft-ft) 22-24 ft.	
interval of bentonite seal (It-It)	
Interval of grouting (ft-ft) 0-22 ft.	
Description of security measures 8-in. steel	protective casing and lid; secured by padloc
Padlock ID No. P5	Location of key(s)
	2-42

R	Д	D	Ø	N

Boring or Well	I No. <u>1A</u>			Project Tin	ker AFB IRP	Phase	≥ IIB	
	Zone No. 1, w	vest of Pat	rol Rd.	Log Recorde	ed By L.N.	Frenc	h	<del></del>
		and Landi	fill l	-	•			
<u> </u>	n Schematic							
(ft)*		Static leve	el of water be 8'9 3/4"	fore e	est. 8'7"	ent		(ft)* and
		Dovolon	ant started	11/14/8	33			
-	clive	Developm	ent ended	11/14/8	33			
5+	profe	Quantity	of water disc	harged durin	ng developm <del>e</del>	nt1	50 gal.	. (est.)
-	and .	Type, size	capacity of	pump or bail				<del></del>
1 E 1	riser	Air III	ft at varia	ble rate.				
	cave in, height of riser, and protective	Depth of	open hole ins	ide woll				
10+  =	n, het	11	•					
-	Cave	ll .	•					_ , ,
- 4" - PVC	Grout		·					` ,
Casing	GIOUL G					<del></del>		
15+	seals and		T	<del>, ·</del>	Lithology and	2	1,2	Γ
	o uo	Time	Clarity and Color of	Odor of	Grain Size of Removed	Ph	Conduc-	Remarks
1 [ ]	scripti		Discharge	Discharge	Sediment		1000	
-	backlili, description of	915	Cloudy;	None	Trace			"Film" on surface of
20+	backi		red-brown		fine sand some silt	•		water
	nular						,	
	Bento-	1030	Clear- trace	None	No sedi-			Very little "film"
	nite ≗ Seal º		cloudy	-				
25	Seat of only							
	dnoo							
	Gravel control of Pack						Ì	
	en loc							
30- PVC	, screen							
Casing	boring and b							
	m of m						}	)
	Polito grout,							1
35—	on of s							
<del> </del>	uld inc							
1  -	short s							
[	emate so note							
40-	n sch gn Ats							
<del> </del>	Construction schematic should include bollom of boring, screen l			1				
1	Consti	1. Use EPA	120 1-Methods for Che			<u>.                                    </u>	<u></u>	1
45		11	nents to be taken in feet and tenths D-		minuté intervals durinç	developme	int	

Boring or Well No. 1B	Project Tinker AFB IRP Phase IIB
Boring or Well No. 1B  Location Zone No. 1, south of Landfill 4	Project Tinker AFB IRP Phase IIB  Log Recorded By L.N. French
Location	Log Recorded by
11/15/83	11/15/83
Construction started 11/15/83	completed
Development started11/16/83	completed
Total depth drilled (ft) 81 ft.	
Hole diameter 6 7/8 in.	
Drilling method Air rotary	
Problems encountered during drilling None	
Wate arce for drilling and completion procedures	N/A
Number and type of samples collected Samples co	ollected from discharge; not retained.
Samp: nterval (ft-ft) Variable	
Storage method(s) N/A	
Casing type PVC Schedule 80	Diameter 4 in.
Depth of casing (ft) 0-65 ft.	Diameter 4 in.
Screen type PVC Schedule 80	Diameter 4 in.
Statistica 0.010 Sara	Diameter 4 in. een interval (ft-ft) 65-75 ft.
Type(s) of glue used to join casing N/A; threaded	casing
Type(s) of give used to join casing	
Turn of providing above and 9-12 gand	
Type of gravel pack used 8-12 sand  Amount of gravel pack used (see next page)	
Amount of graver pack used See specifi	cation sheet
Grain size distribution of gravel pack tracerock_from	emonts
Lithology of gravel pack Quartz, trace rock fra	S Consul Fort Crith Arkenses
Source (company and quarry/pit) Arkhola Sand	& Graver, Fort Smith, Arkansas
Interval of gravel pack (ft-ft) 62-80 ft.	
Interval of bentonite seal (ft-ft) 60-62 ft.	
Interval of grouting (ft-ft)0-60_ft.	
Description of security measures 8-in. steel p	rotective casing and lid; secured by padlock.
<del></del>	
75	
Padlock ID No. P5	ocation of key(s)
ח	-44

	<del></del>		···					<del></del>			
60	RAD		<b>U</b>	Wei	Cor	mpletion	Log: She	et 2/2			
Во	ring or \	Veli N	o1B				Project <u>Tin</u>	ker AFB IRP	Phase	e IIB	
								ed By L.N			
	Construc	ction S	chematic								
(ft)*	- -		<b>4</b>	a Deve	fter_	50'8 3/4" ent started_		t)* developme 33	ent		(ft)* and
10-	-		ol riser, and prolect	Quai Type <u>Air</u>	ntity o , size <i>i</i>	f water disc	harged durir pump or bail	ng developme ler used for de	evelopr	nent —	
20_	4" PVC Casing		D O O T Dackfill, description of seals and grout, cave.in, height of riser, and protective	Dept E	efore	developmer	nt				(ft)*
30-	Casing		als an				Develop	ment Record			
30	-		ription of se	Tim	е	Clarity and Color of Discharge	Odor of Discharge	Crain Size of Removed Sediment	2 Ph	1,2 Conduc- tivity	
40-			Grout ar packlill, desc	7:	30	Turbid; red- brown	None	Silt, some fine sand			Slight "fil on water surface
	-		location, granular	8:	45	Cloudy; red- brown	None	Trace silt			Slight film
50_	- - -	₹	Bento.	10:	15	Slightly cloudy	None	No sedi- ment			Slight film
60-			nite g	seats and backfill us							
70_	T4" TPVC Screen		Grave For Pack	composition of grout.							
80-	- -	AMMIN'S	Citon schemalic	sing design. Also nute							
	L		Š			0.1-Methods for Che	emical Analysis or Ed	Tuivalent. Tilbute intervals during			

and on 30 minute intervals during development

Measurements to be taken b (Express in feet and tenths o D-45

90

Boring or Well No. 1C	Project Tinker AFB IRP Phase IIB
Location Zone No. 1, west of Landfill 4	Project Tinker AFB IRP Phase IIB  Log Recorded By L.N. French
2004(10112	
Construction started 11/17/83	completed11/17/83
	completed 11/18/83
Total depth drilled (ft)55 ft.	
Hole diameter 6 7/8 in.	
Drilling method Air rotary	
Problems encountered during drilling None	
Water cource for drilling and completion procedures	N/A
0. 1	allocal from dischange are marked
Number and type of samples collected Samples co	collected from discharge; not retained.
Samula interval (4) (4) Variable	
	<del></del>
Storage method(s) N/A	
Casing type PVC Schedule 80	Diameter 4 in.
Depth of casing (ft) $0-45$ ft.	
Screen type PVC Schedule 80	Diameter 4 in.
	een interval (ft-ft) 45-55 ft.
Type(s) of glue used to join casing N/A; threaded	casing
Type of gravel pack used 8-12 sand	
Amount of gravel pack used (see next page)	
	ication sheet
Lithology of gravel pack Quartz, few rock fra	gments
Source (company and quarry/pit) Arkhola Sand	& Gravel, Fort Smith, Arkansas
Interval of gravel pack (ft-ft) 38-55 ft.	
Interval of bentonite seal (ft-ft) 36-38 ft.	
Interval of grouting (ft-ft) 0-36 ft.	
Description of security measures 8-in. steel p	protective casing and lid; secured by padlock
Padlock ID No. P5	Location of key(s)
n.	-46

Boring or Well	No. 1C			Project Tin	ker AFB IRP	Phase	e IIB	
Location	Zone No. 1,		ndfill	Log Recorde	ed By L.N	. Fren	ch	
Construction	n Schematic		_					
(rt) -		after_		(f	t)* developme	ent		(ft)* and
10 - 4"	and protective	Developm Quantity of Type, size	ent ended of water disc /capacity of	11/1 harged durin pump or bail	8/83 ig developme er used for de	nt		
PVC Casing	Grout to white		with vari		arge.			
20	seals and groul, cave in, he	Before	developmer	nt		<del></del>		(ft)*
30 +	san			Develop	ment Record			
	cription of se	Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	2 Ph	1,2 Conduc- tivity	
40	Bentonite	11:30	Turbid, red- brown	Slight hydrocar- bon?	Silt			Small yield; noticeable film on water
50 4"	Gravel 60 Pack Pack Pack Pack Pack Pack Pack Pack	12:00	Cloudy, red- brown	No odor	Silt			
- PVC Casing					eting with No sedi-		1	als. Film visibl
60	of Doving, screen loca	3.00	cloudy faint brown	hydrocar- bon	ment			on water
70	should include bottom compusition of grout. s							
80—	Construction schematic should include bottom of boring, screen foca	1 Use EPA 1	20.1-Methods for Ghe	mical Analysis of En				
90	ប់ ថី	II a	20.1-Methods for Challents to be taken by a feet and tenths of ${ m I}$		ninute intervals durinç	g developme	mt	

### Well Completion Log: Sheet 1/2

Boring or Well No. 2A Project Tinker	AFB IRP Phase IIB
Boring or Well No. 2A Project Tinker Location Zone No. 2, south of Landfill 6 Log Recorded B	yL.N. French
Location Log Necolded B	<i>y</i>
Construction started 11/18/83 completed	11/18/83
Development started completed_	
- Solid Started Completed _	
Total depth drilled (ft) 45.5 ft.	
Hole diameter6 7/8 in.	
Drilling method Air rotary	
Problems encountered during drilling None	
Water source for drilling and completion procedures N/A	
Number and type of samples collected Samples collected from c	ischarge; not retained.
Sample interval (ft-ft) Variable	
Storage method(s) N/A	
Casing type PVC Schedule 80 Diameter 4	in.
Depth of casing (ft) 0-35.5 ft.	
Screen type PVC Schedule 80 Diameter 4	in.
Screen type PVC Schedule 80 Diameter 4 Slot size 0.010 Screen interval (ft-ft)	35.5-45.5 ft.
Type(s) of glue used to join casing N/A; threaded casing	
Type(s) of gide used to join casing	
Type of gravel pack used 8-12 sand	
(acc next nace)	
Grain size distribution of gravel pack see specification sheet	
Lithology of gravel pack Quartz, few rock fragments	
Source (company and quarry/pit) Arkhola Sand & Gravel, Fort	
, , , , , , , , , , , , , , , , , , ,	-
Interval of gravel pack (ft-ft) 34-45.5 ft.	
Interval of bentonite seal (ft-ft) 32-34 ft.	
Interval of grouting (ft-ft) 0-32 ft.	<del></del> _
3 3 ( )	
Description of security measures 8-in. steel protective casir	ng and lid; secured by padlock.
Padlock ID No Location of key(s).	
n-48	

RADIAI corporation  Boring or Well N			mpletion	_		Phase	e IIB	
Location								
Construction	Schematic	<u></u>					<del>-</del>	
(ft)*	Groot per projective	after _ Developn Developn Quantity	37.5 finent started_ nent ended_ of water disc	21 Nov 21 Nov harged durin	prox. 37 ft. ft)* developme ember 1983 ember 1983 ng developme ler used for de	ent ntai	r lift	
-4" _PVC _Casing	grout, cave in,	Befor	e developmei	nt	5.5 feet		<del></del> -	(ft)*
	be slees			Develo	pment Record			
20 +		Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	2 Ph	1,2 Conduc- tivity	Remarks
30 -	nular backlili, description of	11:45a (1 hr. after start)	Slightly cloudy	Slight odor	Little silt			Flow less than 1 gpm
-4" -PVC 40 Casing	seal 5	1:00p	Slightly cloudy		Little silt, fine sand			Very low yield; wel pumped dry & allowed to recover
50	of boring, screen location als and backfill used.	2:30p	Slightly cloudy		Trace silt			
60	TO S S S Construction schematic should include bottom of boring, screen location, coupling to casing design. Also note composition of grout, seals and backfill used.							
70-	Construction schemal	1. Use EPA	120 1-Methods for Ch	emical Analysis or E	Quivalent			

THE REPORT OF THE PROPERTY OF

Use EPA 120.1-Methods for Chemical Analysis or Equivalent Measurements to be taken by  $$^{\rm 100}$ nm on 30 minute integrates in feet and tenths or <math display="inline">$D\!=\!49$$ and on 30 minute intervals during development

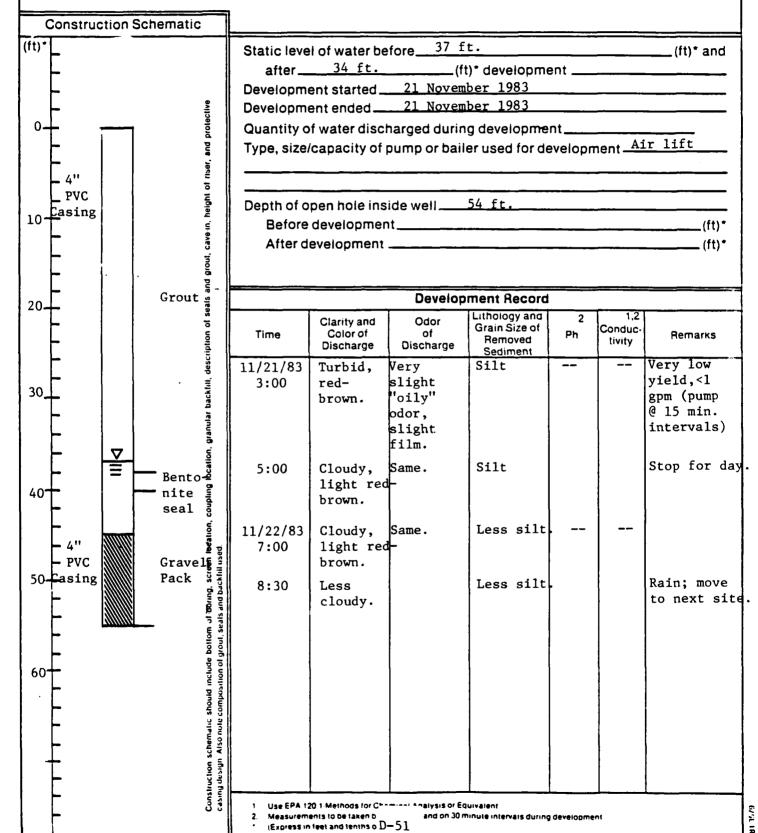
Boring or Well No. 2B Project Location Zone No. 2, south of Landfill 5 Log Re	t Tinker AFB IRP Phase IIB
Location Zone No. 2, south of Landfill 5 Log Re	ecorded By L.N. French
Construction started	mpleted 11/20/83
11 /21 /02	mpleted11/22/83
Total depth drilled (ft)55	
c 0 / / 11	
Drilling method Air rotary	
Problems encountered during drilling None	
Water source for drilling and completion procedures N/A	
Samples callents	d from discharges not watering
	d from discharge; not retained.
Casing type PVC Schedule 80 Diameter	r 4 in.
Depth of casing (ft) 0-45	
Screen type PVC Schedule 80 Diameter	
Slot size 0.010 Screen interv	val (ft-ft) 45-55
Type(s) of glue used to join casing N/A; threaded casing	
Type of gravel pack used 8-12 sand	
Amount of gravel pack used (see next page)	
Grain size distribution of gravel pack see specification	sheet
Lithology of gravel pack Quartz, trace rock fragments	
Source (company and quarry/pit) <u>Arkhola Sand &amp; Grav</u>	vel, Fort Smith, Arkansas
Interval of gravel pack (ft-ft) 40-55 ft.	
38-40 ft	
Interval of grouting (ft-ft)0-38 ft.	
Description of security measures 8-in. steel protection	ve casing and lid; secured by padlock.
Padlock ID No. P5 Location	of key(s)
D. SO	·

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#### Well Completion Log: Sheet 2/2

Boring or Well No. 2B Project Tinker AFB IRP Phase IIB

Location Zone No. 2, south of Landfill 5 Log Recorded By L.N. French



Boring or Well No. 3E	Project Tinker AFB IRP Phase IIB
Location Zone No. 3, southwest of IWP2	Log Recorded By L.N. French
200411011	
<del> </del>	
Construction started 11/22/83	completed11/22/83
Development started 11/23/83	completed
6 3/4 in	
Problems encountered during drilling None	<del></del>
Water source for drilling and completion procedures	s N/A
realization directly be of campion concerns	collected from discharge; not retained.
Storage method(s) N/A	
Casing type PVC Schedule 80	Diameter 4 in.
Depth of casing (ft) 0-4.5 ft.	
Screen type PVC Schedule 80	Diameter 4 in.
Slot size 0.010 Sc	reen interval (ft-ft) 64.5-74.5 ft.
	casing
Type of gravel pack used 8-12 sand	
Amount of gravel pack used (see next page)	
Grain size distribution of gravel pack <u>see speci</u>	fication sheet
Lithology of gravel pack Quartz, trace rock fr	agments
Source (company and quarry/pit) Arkhola Sand	d & Gravel, Fort Smith, Arkansas
44 mm m m	
Interval of gravel pack (ft-ft) 64-75.5 ft.	
Interval of bentonite seal (ft-ft) 62-64 ft.	
Interval of grouting (ft-ft)0-62_ft.	
Description of security managers 8-in. steel	protective casing and lid; secured by padlock
Description of security measures	protective costing and 110, other of padden
Padlock ID No. P5	Location of key(s)
	p. 52

Well Completion Log: Sheet 2/2 Project Tinker AFB IRP Phase IIB Boring or Well No.\_ Zone No. 3, southwest of IWP 2 Log Recorded By L.N. French Location\_\_\_\_ Construction Schematic (ft)\* 60.08 Static level of water before\_ \_(ft)\* and after\_ \_\_\_(ft)\* development \_\_\_\_\_ 23 November 1983 Development started \_\_\_\_\_ 28 November 1983 Development ended \_\_\_ Quantity of water discharged during development\_ Type, size/capacity of pump or bailer used for development \_\_\_\_\_ Air lift 75.5 ft. Depth of open hole inside well \_\_\_\_\_ 10 Before development\_\_\_ (ft)\* After development \_\_\_ \_ (ft)\* Grout **PVC** Casing **Development Record** 20 Lithology and Clarity and Grain Size of Conduc Time Color of of Ph Remarks Removed tivity Discharge Discharge Sediment 8:40a Reddish-Silt, Very low yield (.25 brown, some fine 30 cloudy sand gpm) 9:30a Cloudy Trace silt Continued development until mid-day; resumed development and completed on 28 November. 50 60 Bentonite -PVC Gravel 70-Gasing Pack

Use EPA 120.1 Methods for Ch

Measurements to be taken bi

(Express in feet and tenths of  $D\!-\!53$ 

alvais or Equivalent

and on 30 minute intervals during development

Boring or Well No. 3F	Project Tinker AFB IRP 212-027-04
Location Zone No. 3	Log Recorded By Rick Belan
	,
Construction started 23 November 1983	29 November 1983
Construction started	completed completed
Development started	completed
Total doubt drilled (ft) 30.4	
Total depth drilled (It)	
	test hole 11/23/83
	50)
Problems encountered during drilling None	
Water source for drilling and completion procedures.	Base potable supply, and distilled
	e pellets.
Number and type of samples collected None.	
Number and type of samples conected	
Sample interval (ft-ft)	
Storage method(s)	
Casing type Robintech 2" PVC Sch. 80	Diameter 2-inch
Depth of casing (ft) 30.4	• • •
Screen type Robintech 2" PVC Sch. 80	
	een interval (ft-ft)* 15.4-30.4
Type(s) of glue used to join casing Nonethreaded	flush joint couplings.
Type of gravel pack used #8-12 sand	
Amount of gravel pack used \( \sigma 28 \) gallons.	
Grain size distribution of gravel pack see specific	cation sheet
	, ∿3% potassium oxide,
Source (company and quarry/pit)Arkhola sand &	
Interval of groups mark (ft ft) 1/ 22 /	
Interval of gravel pack (ft-ft) 14-33.4	12 12 (hudgated pollets)
Interval of bentonite seal (ft-ft) 13-14 (pellets); Interval of grouting (ft-ft) 0-12	12-13 (Hydrated Perfects)
Interval of grouting (ft-ft) 0-12	
· · · · · · · · · · · · · · · · · · ·	el guard pipe and 3 protective posts set in
Portland cement grout; locking cap and ste	el padlock.
NOTE: Final M.P. is top of 2" PVC = 2.9' A	GL.
- ID 1206	
Padlock ID NoFE 1206	_ocation of key(s)
ת	-54

Location Zo					ker AFB IRF		127-04	
Construction So		1		Log Necolde	ы Бу		<u> </u>	
5	orotective	after_ Developm Developm	ent started_ ent ended_	(f1	3.3 BGL t)* developme g developme	ent		
2" PVC Casing	Groon beight of risef, and g	Depth of c	open hole ins	ide well	er used for do			(ft)
.5—	Benton				ment Record			
-	7	Time	Clarity and Color of Discharge	Odor of Discharge	Lithology and Grain Size of Removed Sediment	2 Ph	1,2 Conduc- tivity	Remarks
20	S pu allon, granular backfill, description	Formation dry. Fu	was low pather devel	roducer an opment occ	d the moni urred duri	or wel	11 was ind-wat	completed er sampli
25-	cation, coupling loc				·			
30-	     Construction schemalic should include bollom of boring, screen lo							
35-	hould include							

Use EPA 120.1 Methods for Children in siys or Equivalent and on 30 minute intervals during development (Express in feet and tenths or D=55

5 81 3579

Boring or Well No. 3G	ProjectTinker AFB IRP Phase IIB Log Recorded By L.N. French
Location Zone No. 3	Log Recorded By L.N. French
	•
12 7 1 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2 2	12.7.1
	completed 13 February 1984
Development started	completed
Table desired (a) 8 ft.	
Total depth drilled (ft) 8 ft.  Hole diameter 6 inches	<del></del>
Drilling method Hollow-stem auger	
Drilling methodNone	
Problems encountered during drilling None	
Water source for drilling and completion procedures	None
Number and type of samples collected No samples	at 3G; refer to geologic log of Well 3C
(adjacent	to 3G)
Sample interval (ft-ft) N/A	
Storage method(s) N/A	
PVC Sahadula 40	Diameter 2-inch
Casing type PVC Schedule 40	
Depth of casing (ft) 3 ft.	
Screen type PVC Schedule 40	een interval (ft-ft) 3 ft8 ft.
Type(s) of glue used to join casing N/A; threaded	casing
Type(s) of give used to join casing	
Type of gravel pack used	
Grain size distribution of gravel pack N/A	
Lithology of gravel pack Silica, trace rock f	
Source (company and quarry/pit) Local source	
Interval of gravel pack (ft-ft) 2 ft8 ft.	
<u> </u>	
0 1 1/0 6	
3 (4444)	
Description of security measures 8-in. steel p	rotective casing and lid; secured by padlock
Padlock ID No. P5	Location of key(s)
D.	- 54

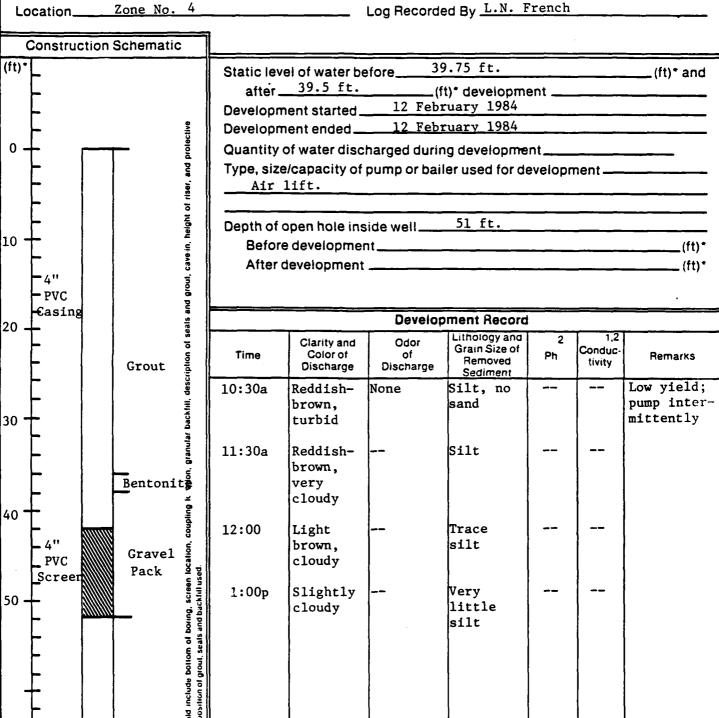
RADIAN	Well Completion Log: Sheet 2/2	
Boring or Well No. 3G	Project Tinker AFB IRP Phase IIB	
	3 Log Recorded By L.N. French	
Construction Schematic		
(ft)*  O Grout PVC	Static level of water before	
Bentonite Casing	Submersible pump	
	Depth of open hole inside well 8 ft.	
5 — Gravel	Before development	(ft)
Screen	After development	(ft
	and groun	
0 +	Development Record *	
	Time Color of Of Removed Sediment Conductivity Rem	narks
	Time Clarity of Color of Discharge Discharge Sediment  * Well developed by purging low production rate noted.  * Well of the transport of the	
	1. Use EPA 120 1-Methods for Chemical Access or Equivalent 2. Measurements to be taken betc 3 on 30 minute intervals during development (Express in feel and tenths of fe	

Boring or Well No. 4A	Project Tinker AFB IRP Phase IIB
Location Zone No. 3	Log Recorded By L.N. French
	•
Construction started 11 February 1984	
Development started 12 February 1984	completed 12 February 1984
· · · · · · · · · · · · · · · · · · ·	
	<del></del>
Problems encountered during drilling	
Water source for drilling and completion procedures	s None required.
Number and type of samples collected	
Sample interval (ft-ft)	
Storage method(s)	
Oction BUC Schodulo 80	Diameter 4 In.
Casing type PVC Schedule 80  Depth of casing (ft) 0-41 ft.	
Screen type PVC Schedule 80	_ Diameter 4 in.
Slot size 0.010-inch Sc	Diameter
Type(s) of glue used to join casing N/A; threaded	casing
,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	
Type of gravel pack used	
	ragments
Source (company and quarry/pit) Local sour	ce .
Interval of gravel nack (ft.ft) 39 ft51 ft.	
·	
3,111,	
Description of security measures 8-in. steel	protective casing and lid; secured by padlock
De discisión Dans DS	
Padiock IU No	Location of key(s)

R	A	D	I.	A	N
			~	•	

## Well Completion Log: Sheet 2/2

Project Tinker AFB IRP Phase IIB Boring or Well No ... Zone No.



- alysis or Equivalent
- Measurements to be taken b and on 30 minute intervals during development

(Express in feet and tenins o D-59

# RADIAN

# Well Completion Log: Sheet 1/2

Boring or Well No. 4F	Project Tinker AFB 1RP Phase 11B			
Location Zone No. 4	Log Recorded By L.N. French			
	•			
Construction started 10 February 1984	completed 10 February 1984			
Development started	completed			
Total depth drilled (ft) 19.5 ft.				
Hole diameter6 in.				
Drilling method Hollow-stem auger				
Problems encountered during drilling None				
	<del></del>			
Water source for drilling and completion procedures	s None			
Ci.,1i+	anaan aanniaa			
Number and type of samples collected SIX SPILL	-spoon samples			
Sample interval (ft-ft) 5 ft. (continuous from	surface to 4.5 ft.)			
Sample interval (ft-ft) 5 ft. (continuous from s	on® lined lids; samples held at ambient tem-			
perature except for analytical samples.	one lined litts, samples held at amplent tem			
Casing type PVC Schedule 40	Diameter 2 in.			
<b>~</b>	Diameter			
Screen type PVC Schedule 40	_ Diameter 2 in.			
Screen type PVC Schedule 40 Slot size 0.010 in. Sc	veen interval (ft ft) 5.75 ft-15.75 ft.			
Type(s) of glue used to join casing N/A: threaded	casing			
Type(s) of give used to join casing				
Type of gravel pack used				
- · · · · · · · · · · · · · · · · · · ·				
Grain size distribution of gravel pack N/A				
	agments			
Source (company and quarry/pit) local sour				
Doubles (company and quarry/pit)				
Interval of gravel pack (ft-ft) 4.75 ft15.75 f	t.			
Interval of bentonite seal (ft-ft) 3.75 ft4.75				
Interval of grouting (ft-ft) 0-3.75 ft.				
interval of grouting (it-it)				
Description of security management 8-in. steel	protective casing and lid; secured by padlock			
Description of security measures	protective casing and its, secured by padrock			
Padlock ID No. P5	Landing of Landin			
Padlock ID No. P5	1 contion of key(s)			
	D-60			

RADIA	1N
Boring or Wel	l No
Location	7.c

## Well Completion Log: Sheet 2/2

				Well Col	mpietion	Lug. Sile	C1 2/2			
Boring	or Weil I	No	4F			Project Tink	cer AFB IRF	Phase	IIB	
Locatio	onn	Zone No.	. 4		!					
Cons	truction	Schemati	С							
(tt)•			9,	after_ Developm	el of water be  ent started_ ent ended	(ft	)* developm	ent		(ft)* and
0 -2"-PV	I	Grout	of riser, and protective	Quantity	of water disch /capacity of p	narged durin oump or baile	-	evelopn	nent	
5 +		Bentonit	eğ eğ		pen hole ins					
ľŢ		4	ve-in							(ft)*
-			rout, ca	Atterd	evelopment					(ft)*
l F			and o			Davidas	O			·
10 ±2"	c Allilli		Seals		Clarity and	Odor	ment Record		1,2	<del></del>
Scr	FILLIAN	Gravel	ription o	Time	Color of Discharge	of Discharge	Grain Size of Removed Sediment	Ph	Conduc- tivity	Remarks
15 -			een location, coupling locatlon, granular backfull, description of seals and grou! . cave-in, Il used.	Well was Well 4G.	dry; compl	eted to se	rve as a c	ompari	son to	adjacent
			Construction schematic should include bottom of boring, screen location casing design. Also nute composition of grout, seals and backfill used.		20 1-Methods for Che		uivalent	o developme		

5 81 3579

# RADIAN

# Well Completion Log: Sheet 1/2

Boring or Well No. 4G  Location Zone No. 4	Project Tinker AFB IRP Phase IIB  Log Recorded By L.N. French
Construction started 12 February 1984	completed 12 February 1984
Development started 14 February 1984	completed 14 February 1984
Total depth drilled (ft) 8 ft.	
<b>▼</b>	
Problems encountered during drilling None	
Water source for drilling and completion procedures	s_None
Number and type of samples collected None; refe	
Storage method(s)	
Casing type PVC Schedule 40	Diameter2 in.
Depth of casing (ft)0-3 ft.	
Screen type PVC Schedule 40	Diameter 2 in.
Slot size 0.010 in. Sc	reen interval (ft-ft) 3 ft8 ft.
Type(s) of glue used to join casing $N/A$ ; threaded	casing
Type of gravel pack used	
Grain size distribution of gravel pack N/A	
Lithology of gravel pack Silica, some rock frag	
Source (company and quarry/pit) Local sou	rce
Interval of gravel pack (ft ft) 2 ft8 ft.	
,	
Description of security measures 8-in. steel	protective casing and lid; secured by padlock.
Padlock ID No. P5	Location of key(s)
	D-62

RADIAN	Well Completion Log: Sheet 2/2	
Boring or Well No. 4G	Project Tinker AFB IRP Phase IIB	
Location Zone No. 4	Log Recorded By L.N. French	-
Location	Log recorded by	_
Construction Schematic		
(ft)*	Static level of water before approx. 1 ft. (ft)* and	=== 1
1 [	after 1.5 ft. (ft)* development	•
	Development started 14 February 1984	•
live e	Development ended 14 February 1984	_
Description of the court of the	Quantity of water discharged during development	
F   Group &	Type, size/capacity of pump or bailer used for development	_
2" Bentonite	Bailer	_
Cocinc		_
F2"	Depth of open hole inside well 8 ft.	_
5 PVC Gravel g	Before development(ft)	•
Screet Pack	After development(ft)	•
l loot		
Screen Pack Pack Pack Pack Pack Pack Pack Pack		
10 -	Development Record *	
	Clarity and Odor Lithology and 2 1.2 Grain Size of Conduct	
	Time Color of of Removed Ph Conduct Remarks Discharge Discharge Sediment	
Descr.	Sediment	
	*Well developed by bailing as part of purging operation	
15 <del>                                     </del>	before sampling.	
l C l ooi e		
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1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		
uction schematic should include bottom of boring, screen location, coupling design Also nute composition of grout, seals and backfill used.		

Use EPA 120.1-Methods for Chamina: \*-3lysis or Equivalent. Measurements to be taken be perfectly and on 30 minute intervals during development (Express in feet and tenths or 10-63

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APPENDIX E

Raw Field Data



## **CALCULATION SHEET**

CALC. NO	· ———
	11/22/83

SIGNATURE R. A. Belan RAB DATE 11/22/83 CHECKED -- DATE 11/22/83 PROJECT Tinker Air Force Base, IRP Phase IIB JOB NO. 212-027-04

SUBJECT Sample Log - Zone 3 Soils SHEET 1 OF 1 SHEETS

Sample Number	Sample Type	Depth	Date	Sample	Comment
3Aa	Soil	(3.5-4.5)	11/21/83	SS	For Chem. Analysis
ЗАЪ	Soil	(8.5-10.0)	11/21/83	SS	For Chem. Analysis
3Ba	Soil	(3.5-3.7)	11/22/83	SS	
3Bb	Soil	(8.0-9.5)	11/22/83	SS	For Chem. Analysis
3Вс	Soil	(13.0-14.1)	11/22/83	SS	
3Bd	Soil	(18.0-14.1)	11/22/83	SS	For Chem. Analysis
3Ca	Waste?	(3.0-4.4)	11/22/83	SS	For Chem. Analysis
3Съ	Soil	(8.0-9.4)	11/22/83	SS	For Chem. Analysis
3Da	Soil	(3.0-4.5)	11/22/83	SS	
ЗDЪ	So <b>i</b> l	(8.0-8.5)	11/22/83	SS	
3A(Spec)	Waste?	-	11/22/83	Grab	
3Be	Soil	(20.5-21.5)	11/22/83	SS	For Chem. Analysis
3Fa(Alt)	Waste?	(2.5-3.8)	11/29/83	SS	
3Fb (Alt)	Waste?	(4.5-4.8)	11/29/83	SS	For Chem. Analysis
3Fe(Alt)	Soil	(5.4-5.8)	11/29/83	SS	For Chem. Analysis
3Aε (Alt)	Waste/soil	(2.5-3.8)	11/29/83	SS	For Chem. Analysis
3C-	Water	Open hole	11/28/83	Bail	Cond-74,000; pH 7.6
3F-	Water	Open hole	11/28/83	Bail	Cond-910; pH 7.1
3PVC	PVC Casing		11/30/83	N/A	Section of new 2" PVC casing
			E-3		



CALC. NO.		
-----------	--	--

SIGNATURE.	L.N. French	DATE	CHECKED	DATE
PROJECT	Tinker Air Force Base	IRP Phase IIB	JOB NO. 212-027-04	

SUBJECT Sample Log SHEET OF SHEETS

Sample Number	Sample Type	Depth (ft)	Date	Sample	Comment
B.1	Soil	5-6.5	2/8/84	SS	
B.2	Shale	10-11.5	2/8/84	SS	
в.3	Shale	18-19.5	2/9/84	SS	t ·
B.4	Soil	0-1.5	2/9/84	ss	
B.5	Soil	1.5-3	2/9/84	SS	For Chem. Analysis
B.6	Soil	3-4.5	2/9/84	SS	For Chem. Analysis
C.1	Soil	0-1.5	2/9/84	ss	
C.2	Soil	1.5-3	2/9/84	SS	
C.3	Fill	3-4.5	2/9/84	SS	†
C.4	Fi11	6	2/9/84	Grab	
C.5	Soil	8.5-10	2/9/84	SS	For Chem. Analysis
C.6	Soil	13.5-15	2/9/84	ss	1
C.7	Shale	18.5-20	2/9/84	ss	
C.8	Shale/Sand.		2/9/84	ss	
D.1	Fill	0-1.5	2/9/84	SS	
D.2	Fill	1.5-3	2/9/84	SS	For Chem. Analysis
D.3	Fi11	3-4.5	2/9/84	SS	100 0
	Soil	8-9.5	2/9/84	SS	
D.4	1	13-14.5	2/9/84	SS	
D.5	Shale		2/9/84	SS	
D.6	Shale	18-19.5		SS	
E.1	Soil	0-1.5	2/10/84	•	For Chem. Analysis
E.2	Fill	1.5-3	2/10/84	SS	For Chem. Analysis
E.3	Fill	3-4.5	2/10/84	SS	
4E.4	Soil	8-9.5	2/10/84	SS	For Chem. Analysis
4E.5	Shale	13-14.5	2/10/84	SS	For Chem. Analysis
4F.1	Soil	0-1.5	2/10/84	SS	
4F.2	Fill	1.5-3	2/10/84	SS	For Chem. Analysis
4F.3	Fill	3-4.5	2/10/84	SS "	For Chem. Analysis
4F.4	Shale	8-9.5	2/10/84	SS	
4F.5	Shale	13-14.5	2/10/84	SS	
4F.6	Shale	18-19.5	2/10/84	SS	
				1	
		1			
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## **CALCULATION SHEET**

			· ·	UNEO. 110.
SIGNATURE_	F.B. Blood/K.A.	Ferland DATE	CHECKED	DATE
PROJECT	Tinker Air Force	e Base, IRP Phase IIB	JOB NO	

Sample Log - Zones 1-4
SUBJECT\_\_\_\_\_\_ SHEET\_\_\_\_\_ OF\_\_\_\_\_SHEETS

UBJECT				<del></del>		SH	EET	OF.	SHEETS
Well Number	Depth to Water	Depth to Bottom	Stickup (inches)		Field pH	Field Cond.	Temp.	Sampler	Comments
1A	14'8"	41'2"	36"	2/13/84	6.5	1100	22	FBB/KAF	
1B	52 '4½"		31"	2/13/84	7.1	600	24	11	
1C	40'5"	58'1½"	35"	2/14/84	6.8	650	17	11	
	41',8½"	52'6"	26½"	2/14/84	7.3	900	16	11	
4 F	Dry	18'8"	29½''	2/14/84	<b>!</b>				
4G	315"	10'2"	23½"	2/15/84	7.0	1200	14	! 1	
			•	2/16/84	8.0	600	12	11	Took many trips to fill bottles - slow recovery
3E	62'1½"	77'1"	31½	2/15/84	6.5	400	16	; <b>11</b>	
<b>3</b> G	6'11½"	9 ' 5½''	28	2/15/84	8.0	4000	11	<b>81</b>	Took several trips to fill bottles -
3F	13125	33'7½"	35 <sup>1</sup> ∕2	2/15/84	7.0	600		11	slow recovery
2A	39'2"	48'512"	32½	2/15/84	6.5	650	17	11	
1	32 '1"	42 '10½''	34 <sup>1</sup> 2	2/15/84	6.5	600	15 <sup>1</sup> 2	<b>"</b>	Well 1 pumped dry at night (2/14) sampled next morn- ing
2	11 ' 7½"	42 ' 7½''	35 <sup>1</sup> ∕2	2/15/84	6.5	900	_	**	Wells 2-7 pumped dry 2/15 - sample following day, 2/16
3	7'7"	34 ' 4 "	31	2/15/84	6.5	850	-	<b>19</b>	2/10
4	6'10 <sup>1</sup> 2''	40'3½"	39	2/15/84	7.0	1000	14	.,	
5	8'6"	32 ' 3"	35 <sup>1</sup> 2	2/15/84	6.8	750	13	"	
2В	46'10 <sup>1</sup> 2"	58'1"	31	2/15/84	6.8	800	18	**	Pumped 3 pore volumes, following day 1 pore volume and sampled
6	7'11"	32 ' 3"	35 <sup>1</sup> ₂	2/15/84	7.0	700	15	**	
7	14'10 <sup>1</sup> 2'	25'8½"	32	2/15/84	7.0	600	19	,,	
8	20'2"	22'11"	30½	2/16/84	NOT ME	ASURED		"	Pumped dry in a.m
Pond	-	-	-		6.0 E-5	190	10	"	had not recovered in p.m 5 hours Sample collected 3/26 - DLR

# RADIAN

## **CALCULATION SHEET**

							CALC. NO.	
SIGNATUR	<u>К. А</u>	. Ferland		DATE		CHECKED	DATE	
PROJECT_	Tinker	Air Force	Base, I	RP Phase	IIB	JOB NO. 212-027-04		

SUBJECT Sample Log - Zone 5, Base Water Supply Wells 1 OF SHEET

Sample Number	Well Number	Date Sampled	Field pH	Field Cond. (umhos)	Field Temp. (°F)	Sampler	Comments
	_			200	<i></i>		
75-001	1	2/9/84	6.8	200	54	KAF ''	
002	2	2/9/84	7.0	225	60	"	
-	3	OUT OF SE		240	5.0	,,	
004	4	2/9/84	6.5	240	58		
005	5	2/9/84	7.0	210	60	11	
006	6	OUT OF SE					
007	7	OUT OF SE	1				
-	8	OUT OF SE	ł				
009	9	2/8/84	7.4	200	50	**	Ran 5 mins. only
-	10	PLUGGED A	1	1 1			
011	11	2/8/84	7.0	240	58	11	Ran 30 mins.
-	12	OUT OF SE					
013	13	2/8/84	6.6	250	62	"	
014	14	2/8/84	7.0	270	60	"	
015	15	2/8/84	6.6	270	60	"	Duplicate samples
016	16	2/8/84	6.6	290	60	***	
-	17	OUT OF SE	RVICE			ł	
018	18	2/9/84	6.5	4 30	<b>6</b> 6	88	Ran 5 mins. only
018r	18	2/17/84	6.5	550	61	11	Ran 5 mins. only (resample)
019	19	2/9/84	6.1	260	64	"	Ran 5 mins. only
019r	19	2/17/84	6.0	300	58	"	Ran 5 mins. only (resample)
020	20	2/8/84	6.8	260	50	**	Duplicate samples
021	21	2/7/84	7.1	260	64	"	
022	22	2/7/84	7.0	250	64	11	
023	23	2/7/84	5.5	190	60	11	
024	24	2/9/84	6.5	275	64	11	Air in discharge
025	25	2/7/84	6.9	270	60	***	Air in discharge
026	26	2/7/84	5.9	250	60	11	Duplicate samples
027	27	2/7/84	6.5	220	66	11	
028	28	OUT OF SE		E-6			1

81-3361



									UALO, 110	
SIGNATURI	W.	М.	Little		DATE_	3/6/84	CHECK	D	DATE	
PROJECT	Tink	er.	Air Force	Base,	IRP Ph.	ase IIB	IOR NO	212-027-04		

SUBJECT Sample Log - Well 18 Test Pump SHEET OF SHEETS

Sample Number	Sample Type	Location					·	
			İ	Date	Sampler	Comment		
				5 Man 9/			pump on - C	806 hrs
	Groundwater	Well 18	l	5 Mar 84	WML	10 mins.	0816	
2	1				}	20	0826	
3	11	"	1	11	"	30	0836	
4	. "	"		11	"	45	0851	
5	"	11		11	11	1:00 hr	0906	
5	"	**	l	***	"	1:15	0921	
7	"	11	ļ	**	''	1:35	0941	
8	"	**	]	**	"	2:00	1006	
9	"	11	]	*1	,,,	2:30	1036	
10	"	17	Ì	11	11	3:00	1106	
11	, "	11	[	11	."	3:35	1140	
12	, ,,	11	l	**	''	4:15	1220	
13	"	**		11	۱۰ ا	5:00	1305	
14	"	11	. ]	11	11	6:00	1405	
15	,,,	11	[	11	"	7:00	1505	
16	"	11	· · · · · · · · · · · · · · · · · · ·	**	"	8:10	1615	
17	11	**	l	11	"	9:35	1740	
18	] "	11	ì	**	<b>.</b>	11:00	1905	
19	"	F1	Ì	11	"	13:00	2105	
20	"	11			"	16:00	2400	
21	••	11		11	"	7:00 (625	sample)	
T6-022	n .	11	,	5 Mar 84	**	Trip Blan	-	
10 022				) Mar 84				
				E-7				

81-3361



# DEPARTMENT OF THE AIR FORCE USAF HOSPITAL, TINKER (AFLC) TINKER AIR FORCE BASE, OKLAHOMA 73145

ATTN OF SGB

29 MAR 1984

SUBJECT. Monitoring Well Elevations

Radian Corporation P.O.Box 9948 Austin,TX 78766 Attn: William Little

1. Well elevations measured by 2854 CES in support of Phase II of Tinker AFB Installation Restoration Program are provided per your request:

Elevation(ft)
1219.16
1222.09
1223.37
1225.10
1227.78
1243.63
1247.63
1241.82
1223.09
1256.03
1242.49

- 2. Well head or floor elevations are enclosed as attachment one for the base's drinking water wells.
- 3. If this is insufficient data please feel free to contact me at (405-734-7844).

DARREL R. CORNELL, Capt, USAF, BSC Bioenvironmental Engineering Div

l Attachment Water Level Data



## APPENDIX F

Sampling and Analytical Procedures



Field Procedures



#### QUALITY ASSURANCE

The bulk of the field sampling procedures were presented in Section 3.0 of the report. The purpose of this Appendix Section is to describe the quality control and quality assurance aspects of the field program.

Many of the traditional quality assurance techniques (duplicate or spiked samples, for instance) are designed to test instrument or analyst performance and do not address the needs of a field program of monitoring well installation. In lieu of such techniques, field practices are built around a principal of "do it right the first time", and procedures are developed to insure this. The three main elements of the field QA program are:

- Record-keeping;
- Peer review; and
- Technical staff management review.

Eash is discussed below.

#### Record-Keeping

Each supervising geologist kept field notes as the coring and well installation activities progressed. In addition, the drilling subcontractor's team chief also kept field notes. These two sets of notes were compared to develop the logs of drilling activities shown in Appendix D. Discrepancies were resolved by reference to the geologic samples collected.

Ground-water samples were collected in accordance with a written list. The servicing laboratory prepared sample containers and provided them to the field team, who were working from the same list. After the samples were logged into the laboratory, the log-in sheets were compared against the original analytical schedule. All samples were shipped or hand-carried to the laboratory, accompanied by chain-of-custody forms (Appendix G).



#### Peer Review

Each of the supervising geologists served overlapping tours of duty in the field. This provided all with the opportunity to participate in broad portions of the study, rather than focusing on a single zone. Each person overlapped with his successor to insure a smooth transition. Once the field effort was concluded, the supervising geologists were assigned to write up separate zones. These writing assignments provided for close coordination with other members of the field team, so that observations during drilling and sampling were incorporated into the text. After the drilling logs and report text were prepared, they were reviewed for completeness and accuracy by other members of the field team. Thus, each portion of the report was subjected to peer review before entering the formal review process.

#### Technical Staff Management Review

After the complete report was finalized by the Project Director, it was formally reviewed by a senior member of Radian's technical staff management. This review focused on quality of presentation and soundness of discussion and recommendations.

#### FIELD EQUIPMENT CALIBRATION

This program utilized very little in the way of field instrumentation. The four items of equipment were:

- pH meter (Corning Model 610A with a combination electrode),
   standardized daily against pH 7.00 and 10.00 or 4.00 buffers.
- Conductivity meter (YSI Model 33), calibrated before deployment against an 800 µmho standard and daily internal calibration check ("red line"):



- Water level probe (Soiltest Model 762A), no calibration required; and
- Threshold Limit Value Detector "TLV meter" (Bacharach Model 23-7231), zeroed with organic-free air and spanned with hexane standards. Not used for emissions level data determinations, but only for field drilling safety.



Laboratory Quality Assurance Program

Quality Assurance/Quality Control
Program
for
Radian Analytical Services



# THE QUALITY ASSURANCE/QUALITY CONTROL PROGRAM FOR RADIAN ANALYTICAL SERVICES

Radian Analytical Services' (RAS) objective is to provide high quality chemical analyses to all clients regardless of the size of the analytical task. To aid in achieving this goal, a strong quality assurance program and rigid quality control practices are integral parts of all analyses. This document describes these quality assurance/quality control protocols for the Radian Analytical Services laboratories.

The basic quality control program includes procedures for sample handling, calibration, spiking and replicate analyses, analysis of QC test samples, equipment maintenance, and supplies control. These procedures can be integrated with a client's additional requirements, such as spiking studies, analysis of replicate samples, linearity determinations, and stability studies.

The quality assurance program consists of the frequent submission of blind QA samples, duplicates, and spiked sample splits. Also included are personnel training, analytical methodologies, sample control procedures, data handling, and equipment maintenance and calibrations.



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#### 1.0 QA Organization/Policy

The objective of Radian's quality assurance/quality control program is to assure, assess, and document the precision, accuracy, and adequacy of data obtained from chemical analysis and to assure the technical accuracy of the results obtained for all samples.

Radian has organized the quality assurance function within the company to allow complete independence of program review. Radian's Quality Assurance Director reports directly to the Vice President of the Technical Staff. This position provides independent reviews at all levels of the technical staff and laboratory organization and allows immediate access to Radian's top management on QA-related matters.

The QA Director's involvement may be limited to a review of quality control practices or as extensive as active development and implementation of quality control procedures and statistical data analysis. The QA Director may be asked to contribute expertise and assistance when a need is perceived by either the client, the technical staff, or the management staff.

Because of the large number of samples analyzed by RAS, a QA coordinator has been assigned to monitor and maintain an effective QA/QC program for these laboratories. The RAS Quality Assurance Coordinator, directly responsible to the Corporate QA Director, serves as an independent auditor of all RAS laboratories. The responsibilities of the RAS QA Coordinator are as follows:

- Monitor QA/QC within RAS laboratories,
- Supervise the preparation of blind audit samples,



- inform the Director of RAS and the corporate QA Director of quality assurance problems,
- summarize and report QA activities in the laboratories,
- document all QA and QC procedures within RAS,
- act as liaison between the corporate QA Director and RAS,
- provide QA data to the corporate QA Director for inclusion in the corporate QA reports.

The RAS laboratory managers function as the quality control coordinators in each particular analytical area. Their efforts are coordinated and monitored by the QA Coordinator.

Quality control coordinators serve as a focal point for all QC activities pertaining to each RAS laboratory. They work as a committee coordinated by the RAS Quality Assurance Coordinator. Their activities include the following:

- monitor the QA/QC activities of the laboratory area,
- inform the Director of Analytical Services and the QA coordinator of QC problems and needs.
- summarize, document, and report quality control activities
   and data generated in the laboratory,



- provide documentation of all QC procedures in the laboratory,
- maintains summaries of QC activities and data in a form suitable for client review upon request.

## 2.0 Quality Control for Laboratory Analyses

Radian Analytical Services has developed and implemented quality control procedures for all of the analyses performed in the laboratory. The laboratory quality control program provides an effective and efficient laboratory protocol for QC regardless of the size or scope of the analytical requirements. Approved analytical methods are used whenever available. When approved methods are not available, a method is developed by the Radian technical staff, and a technical note written describing the method. The quality control procedures are designed to insure that the standard operating procedures and quality control protocols are being followed and accurate results are obtained.

The general quality control program utilized in each laboratory includes consideration of the following areas:

- personnel training and certification.
- analytical methodology documentation,
- sample handling and control,
- laboratory facilities and equipment,
- calibration and standards,
- data handling and documentation,
- quality control check samples,

The general approach to quality control in each of these areas is discussed in the remainder of this section.



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#### 2.1 Personnel Training and Certification

The successful implementation of any QA/QC program is determined by the training and dedication of the laboratory personnel. The quality and consistency of data should be independent of the analyst. With the proper training and supervision, an analyst will be able to obtain quality data by the use of proven methodology. Periodic assessment of training requirements and certification are performed to maintain a high level of laboratory awareness.

The training and certification methods employed in the RAS laboratories are briefly described below:

- study of laboratory standard operating procedures,
- study of QA manual,
- observation of experienced operators/analysts,
- study of operating manuals,
- instruction by the laboratory manager on all aspects of the analysis,
- perform the analysis under the direct supervision of the laboratory manager,
- perform analysis under supervision of experienced personnel,
- analysis of blind QC samples prepared by laboratory QC coordinator,
- participation in in-house seminars on laboratory methods and procedures.



## PERSONNEL TRAINING RECORD

Employee	-		<del></del>				
Employee Numb	er _						
Date of Emplo	yment _						
Laboratory Or	ientatio	n:					
Upo and Laborator	n comple y Manage	tion of ea r will ini	ch pha tial a	se of person nd date the	nnel traini step compl	ing the emp	loyee
•		S laborato ead and un		ndard Opera	ing Proced	lures have	
				Employee 1	Lab Mgr.	Date	
•	the pr		or the	nce manual l laboratory ined.			:e
				Employee 1	Lab Mgr.	Date	
•	employ	ee perform ocedures f	s anal	instruments yses have be ration and n	en studied	and	
Instrument E	mployee	Lab Mgr.	Date	Instrument	<b>Employee</b>	Lab Mgr.	Date
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Test Specific Training:

Each specific test performed in the RAS laboratories involves procedures which may be unique. The steps involved in training an employee are:

- <u>Instruction</u> by the Laboratory Manager on all aspects of the analysis,
- Observation of experienced operators/analysts,
- Perform the analysis under supervision of the laboratory manager,
- Perform analysis of QA samples submitted by the QA coordinator, and
- Participation in in-house <u>seminars</u> on laboratory methods and procedures.

The following table is to be completed by dating and initialing by the employee and Laboratory Manager upon completion of each step.

Method	Instruction	Observation	Perform the Analysis	Analysis of QA samples	Seminars
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					<del></del>

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JNCLA:	SSIFIE	TX RAD	D FI	5ANDER 84-212	5 ET F	L. SEF 14-02-1	/OL-2			F/G :	13/2	NL	
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		_	_	_					_	-	_		-
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MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A



All RAS personnel must complete a quality control training program. This system includes motivation toward producing data of acceptable quality and involves "practice work" by new employees. New personnel are made aware of the quality standards established by RAS and the reasons for those standards. They are made aware of the various ways of achieving and maintaining quality data. After an employee has been trained to use a method and the work validated by the laboratory manager, the employee is certified to perform the analysis. As these people progress to higher degrees of proficiency, their accomplishments are reviewed and then documented. Documentation of proficiency training is maintained by the QC Coordinator for each laboratory technician using the two-page form shown in Figure 2-1.

#### 2.2 Analytical Methodologies

All analytical procedures followed in the RAS laboratories are documented in a methods manual for the specific laboratory. A set of standard operating procedures (SOP) has been established for each analysis to insure consistency. Most methods used are directly from an approved analytical manual, e.g., EPA methods, APHA Standard Methods for Water and Wastewater, ASTM, etc.

Methodologies may contain the following information:

- method title,
- scope of method,
- summary of interferences, and applications,
- concentration ranges and detection limits,
- safety precautions,
- required equipment and materials,
- standardization directions,
- detailed analytical procedure,
- calculations, with examples,
- reporting method,
- precision and accuracy statement,
- references.



#### 2.3 Sample Control and Record Keeping

The Radian Analytical Services Sample Control Center is a controlled access area. Only employees of the Sample Control Center have access to sample receiving, sample storage, documentation files, and the computer terminals. Analysts check out samples under the supervision of the sample control personnel. All samples are stored in locked storage areas. Sample tracking is maintained by a computerized laboratory management system and a sample checkout logbook. The RAS Sacramento laboratory is linked to the central processing unit of the computer in Austin via a dedicated phone line. This insures that the laboratories are in constant communication. All sample information and data entries can be immediately accessed at either location.

Detailed record keeping and control of samples are essential for effective laboratory operation. All samples received for analysis in the Radian Analytical Service laboratories are processed through the Sample and Analysis Management System (SAM). Radian Corporation's SAM is a software and hardware system for controlling and handling information for the analytical laboratory. SAM provides a dynamic, easy-to-use method for tracking, scheduling, reporting, and laboratory management. The system has been designed to accommodate and promote good laboratory management practices by providing high visibility of the information laboratory managers need to make good decisions regarding schedules and priority. The system is designed around a Data General Nova-IV computer with a 64K-byte memory. It also includes a 65M-byte disk drive and a line printer with plotting capabilities. Data is entered via a TEC terminal and CRT. All data stored on the disk is backed up on magnetic tape to prevent loss in the event of a system malfunction. The system is designed so that an individual designated as the principal operator can process the required paperwork for a large laboratory with little difficulty. The approach centralizes information input and data retrieval, and provides the mechanism for organized, up-to-date laboratory performance monitoring.



SAM maintains complete client information files, generates laboratory status reports, flags sample analyses which are overdue, accepts analysis results manually or automatically, and generates reports and invoices.

The Sample Control Center and SAM have six basic functions:

- sample receipts and logging,
- sample storage and maintenance of sample integrity,
- laboratory status reporting,
- document control,
- data compilation and reporting, and
- invoicing.

In order to assure the integrity of a sample and the accompanying documentation, a security plan has been established. This plan consists of three parts:

- chain of custody,
- secured refrigerated storage, and
- document control.

The progression of samples and documentation through the Sample Control Center and the analytical laboratories is presented in Figure 2-2. Detailed descriptions of each sample control function are presented below:

- Samples are received from the commercial carrier at Radian's shipping and receiving facilities by the receiving clerk.
- Within one hour of arrival, the samples are accepted by RAS sample control personnel.



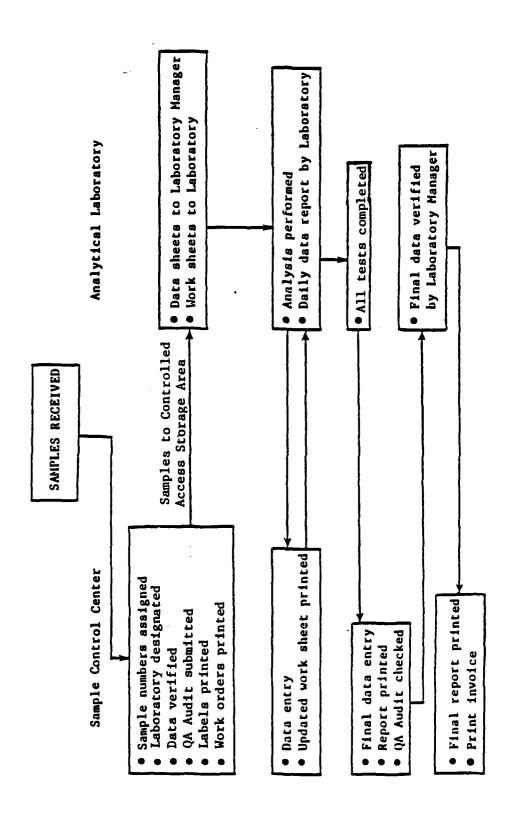


Figure 2-2. SAM Laboratory Management System



- All shipping containers and security seals, when appropriate,
   are inspected for physical damage or evidence of tampering.
- The samples are unpacked in the sample receiving area by the RAS sample custodian. The method of shipment, shipping container integrity, condition of samples, the number of samples/container, integrity of the security seal, and accompanying documentation are noted. Sample identification is verified against custody documents. The enclosed chain-of-custody forms, Figure 2-3, when required, are completed and filed with the shipping and receiving documentation. In the event that peculiarities are noted, the project officer or client is immediately advised of the irregularity.
- Samples are logged into a bound sample logbook, Figure 2-4.
   Again, sample identity is verified. All discrepancies are noted in the logbook.
- The handwritten logbook and all documentation are transferred to the Sample Control Center.
- The samples are logged into the SAM system. Each batch of samples is assigned a consecutive work order number by the system. Analytical requirements for each sample are entered into the computer.
- Hard copy of the work order and other information is printed and filed with the received documentation in the Sample Control Center.
- Labels are printed and secured to each sample. Label information includes sample number, identification, storage location, and analytical requirements.



#### CHAIN OF CUSTODY RECORD

•	Fiel	d Sample No
Company Sampled/Address		
Sample Point Description		
Stream Characteristics:		
Temperature	Flow	pH
Collector's Name	Date/Time Sampled	
Amount of Sample Collected		
Sample Description		
Store at: Ambient 5°C -	10°C Dother	
☐ Caution - No more sample available	☐ Return unused portion of sample ☐	Discard unused portions
Other instructions - Special Handling -	Hazards	
☐ Hazardous sample (see below)	☐ Non-hazardou:	
□ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	□ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
C Other		
Sample Allocation/Chain of Possessio	on:	
Organization Name		
•	Date Received	
• —	Lab Sample No	
	<del></del>	
Inclusive Dates of Possession		
Organization Name		
	Date Received	
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		



Lab	No.		

Company	Q	uoted \$	Contact	_
Facility	S	ample \$	Received	
-		Misc \$	Date Due	
		Total	Samples	
Phone	I	nv by (CPR)	Keep for	
Report		Surcharge	Keep til	
	%	Surcharge Disc: All	Disp (RD)	
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Expires				
	L	ocation:		
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Figure 2-4. Sample Log Sheet



- Data sheets and work sheets are printed for each batch of samples and distributed to the appropriate laboratory managers. The work sheets list sample numbers, sample identification, storage location, and analytical requirements. Data sheets are for results and contain only the parameters to be determined by a given laboratory.
- Following sample logging, the samples are placed in the designated locked storage area.
- Subsequent sample custody is documented and all transactions witnessed by sample control personnel.
- The analyst retrieves the samples from the Sample Control Center by sample number and storage location.
- The Sample checkout log (Figure 2-5) is completed by the analyst, noting the laboratory to which the sample is being removed.
- After analysis, or when the required aliquot is removed, the sample is returned to the Sample Control Center and return is noted in the sample checkout log.
- The sample is returned to the designated storage location.
- When requested, addition chain-of-custody documentation can be provided using a SAM-generated document (Figure 2-6). This document can be retained by sample control to provide a more easily retrievable record of sample custody within the analytical laboratory.
- The sample is stored until the assigned time or written permission is given to either properly dispose of or return the sample to the client.

RAS SAMPLE CHECK OUT LOG

	****	7S/196 (Water and	Prep. Labs)	78/194	(Extraction & Water Labs	78/180	(ICP and AA Labs)		7S/191 (TOX, TCC)	78/195	(Technician)	78/171	
MATION	INITIALS												
URN INFORM	TIME INIT							-					
RE	DATE												
	INITIALS												
INFORMATION	TIME DESTINATION												
CHECK-OUT	TIME												
	DATE										•		
	SPLITS REMOVED												
_	WORK ORDER												

Figure 2-5. Sample Checkout Log

PAGE 1 ' RADIAN RCVD: 02/26/83 DUE: 03/19/83

Analytical Serv CHAIN OF CUSTODY 04/21/83 09:56:49

LAB # 83-02-A67 KEEP: 05/09/83

	A PH_A				NA_E		HG_CA	NA TOS A	•		
	A_ONG_A				A MO_E		FE_E	S04_NA			MBERS.
	HCO3_A MHO_A				₩_E03H		CR_E	PH_A	•		FRACTION NUMBERS.
	1				FE E		CD_E SE_HA	A EON			FRA
	HARD_B TANNIN				C03_A 8_E		BA_E PB_GA	MHOA		RA_TOT	DATE
	C03_A S03_TA			- 0 1 7 5 6	CL_TA SO4_NA	C_MET	AS_HA	F_SIEA	PIRCRA	BETA	Val
TESTS	CAUSTY PO4_B	ACFS	ICP_40	ANFS	CAE PE	BMET	A A E	CL_TA	HIRCRA	ALPHA	
LOCATION	ત	7	CN .	a	a	Shelf 13	023	023	023	023	RETURNED TO
7307	3. 3.	Ref	Ref	Ref	Ref		Ref.	Ref.	Ref.	Ref.	
CATION			•	**************************************	OI.			•	•		DATE
SAMPLE IDENTIFICATION	201	302	302	) <u>i</u> l	scale 222	•	#164	#164	1164	1164	ا ا
SAMPLE	Number 001	Number 002	Number 002	Super soil	Boiler scale	Sample AV56	Water 4	Water	Water 4	Water	RECEIVED BY
DASH	01A-B	02A	02B	03A	04A	05A	06A	06B	<b>390</b>	0 <b>9</b> D	

FRACTION NUMBERS.					
DATE					
RETURNED TO					
DATE					
RECEIVED BY					

F-29

Leboratory Chain of Custody Figure 2-6.

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• All documentation, including shipping documents, field sampling documents, computer-generated log sheets, chain-of-custody forms, laboratory data sheets, final computer reports, and other documents, are maintained in the sample control area. All reports are kept in locked filing cabinets. As with the sample storage area, the document storage area is limited-access.

All storage areas are within the Sample Control Center and are locked when not in use. Access to the storage area is limited to sample control personnel or other RAS employees accompanied by sample control personnel. There are four storage locations that are used depending on the sample and the required analyses. They are:

- ambient storage for samples that do not require refrigeration,
- 4°C storage for most samples requiring water quality analysis and extractable organics,
- 4°C storage for samples requiring volatile organic analysis, and
- -20°C storage for extracts and samples that require freezing.

A temperature log is maintained to monitor the cold storage facilities.

## 2.4 Laboratory Facilities and Equipment

A clean well-lighted, and well maintained laboratory is essential for accurate analytical results. Each laboratory is well-lighted, air conditioned and equipped with chemical fume hoods. Instrumentation that may emit noxious odors is vented externally.



## Quality Control of Equipment and Supplies

Each laboratory QC program includes detailed requirements for equipment and supplies. Reagents, solvents, and standards with specific levels of purity are used as specified by the analytical protocol. Specific GC column materials, glassware and sample handling equipment are also specified. The quality control procedures for equipment and supplies generally include the following items:

- operator checklists for required supplies,
- documentation and reporting of all deviations from specified instrument performance,
- procedures for testing for purity of reagents,
- tolerances for calibrated glassware where applicable,
- monitoring of refrigerated storage space,
- maintenance logbooks,
- service contracts on analytical instrumentation.

Quality control procedures during sample preparation include the preparation of reagent or solvent blanks. Additional quality control techniques implemented in sample preparation include:

- deionized water piped into all laboratories, monitored daily,
- purchasing high purity distilled-in-glass solvents in large quantities from a single lot,



- use of Ultrex acids in trace metal digestion,
- cleaning of organic glassware with chromic acid or firing in a kiln at 450°C.
- cleaning of trace metal glassware with nitric acid,
- use of organic-free water prepared at Radian by distillation over alkaline permanganate under nitrogen atomsphere in allglass still,
- use of volatile-free water prepared by purging organic-free water with nitrogen,
- sample preparation performed by experienced technical personnel under the supervision of senior level analysts.

## 2.5 Quality Control for Standards and Calibration

The quality of all test results is greatly impacted by the calibration procedures used. Calibration procedures and standards should be specified for all equipment and supplies used in the test procedure. Traceability to common standards is essential for test procedures to be used in multiple laboratories. Quality control procedures for standards and calibrations include the following considerations:

- written, detailed calibration instructions,
- preparation procedures for secondary standards, when applicable,
- requirements for frequency of calibration,
- recordkeeping of all calibrations and standards used,



- quality control charts for recording results from multiple calibrations,
- evaluation of internal standards, and
- tolerances for calibration requirements.

All calibration standards are prepared from NBS-traceable, EPA certified, or primary standard materials. Daily logs are maintained to monitor instrument response to a given standard.

#### Quality Control Test Samples

Routine quality control samples to be analyzed concurrently with client samples are a significant portion of the RAS laboratory quality control programs. The purpose of these checks is twofold: 1) to assure that samples being analyzed satisfy predetermined standards of accuracy, and 2) to measure and document achieved levels of accuracy and precision.

There are many different types of quality control samples which could be used for these purposes. The correct combination of these will depend on the complexity of the test method and the desired degree of accuracy. The following quality control parameters are general considerations for Radian's quality control for test methods.

#### Interferences

The analytical results of a test method might be affected by interferences from the glassware, solvents, reagents, or the sample matrix. Blank samples which are subjected to conditions similar to samples being analyzed are used to evaluate the purity of laboratory reagents. The frequency of blank analysis is method dependent. For example, a laboratory or field blank is analyzed after each GC/MS volatile organic analysis with high levels for any of the pollutants. Ten percent of the samples from a



given sample batch are spiked with a known standard. Spike recovery data are calculated to determine matrix interference.

#### Precision

The precision or repeatability of a test method is required for proper interpretation and weighting of the data. Replicate samples or standards are used to determine the precision on a regular basis. The precision of multiple analyses are compared against predetermined precision limits to determine their acceptability. The precision is usually reported as a standard deviation or repeatability statistic and often depends on the concentration of the parameters analyzed. Replicate analyses are defined as separate digestions or extractions of the same sample, when possible. The percentage difference or range between replicate analyses is also used to monitor precision.

### Reproducibility

The reproducibility of a test method refers to the repeatability over a period of time. How well will analytical results repeated a month later agree with today's results? Reproducibility can be measured by the repeated analysis of samples from a previous time period or by analysis by more than one laboratory or laboratory technician.

#### Qualitative Specificity

In the analysis of complex sample matrices containing multiple components, the use of a single method can lead to misidentification of compounds. The misidentification can be detected by repeated analysis of standards containing the compounds of interest or by independent analysis by a more specific method. For example, mass spectral confirmation can be used to evaluate misidentification problems in the GC laboratory.



## 2.6 Documentation and Data Handling

Documentation of methods, procedures, and results is an essential aspect of a QA/QC program.

Adequate documentation is required for an instrument maintenance system. RAS laboratories use an individual logbook, which is kept at each instrument, to record all calibration and maintenance activities. This logbook gives a chronology of that instrument's installation, operation, calibrations, maintenance, malfunction, and repairs. An accompanying binder includes all pertinent manufacturing information, service manuals, and similar reference materials.

Directions for calibrations and maintenance, along with appropriate forms and checklists, are maintained in a manual accompanying the logbook. The directions specify the required frequency for calibrations and maintenance, the tolerances for calibrations, and the action to be taken when calibration requirements are not met.

In this system, there is a single source for reference purposes as well as record keeping. All the instrument logbooks are reviewed periodically by the quality assurance coordinator and laboratory manager. A record of these logbook checks is maintained by the QA coordinator.

Work sheets have been developed to insure consistent laboratory data entry for most parameters determined in the laboratories. These sheets are designed to organize the data in a clear and logical manner, and to simplify calculations. The work sheets are divided into various sections including a section for reporting calibration standards and blank values and a section for plotting calibration curves. These work sheets are usually a standard data entry form which the laboratory technician enters in his/her bound lab notebook. When automated calibration is not applicable, electronic calculators are available in the laboratories to generate calibration curves by the method of least squates. Thus errors in reading calibration curves and calculating data are minimized. After an analysis



is completed and a data sheet filled out, the laboratory manager checks the data for completeness and approves the data sheet. After the data have been entered into the SAM system, an updated data sheet is issued to the laboratory manager. When the work is complete, a preliminary report is printed and distributed to the contributing laboratory managers for the final data check and approval. A final report is printed, certified by the laboratory manager, and forwarded to the client.

Proper documentation of quality assurance and quality control activities is an essential requirement. Documentation is needed to demonstrate that quality control activities were completed as scheduled and to communicate the results of the QC tests to laboratory managers and clients. Documentation of QA results is required to provide feedback for improvement of quality control programs.

Quality control documentation should be timely in order for feed-back to occur. Daily reporting to laboratory managers is mandatory. Forms are designed to organize the QC data in a clear and logical manner, and to simplify calculations. Control charts are another excellent tool for summarizing quality control test results.

As part of Radian's QA audit program weekly reports summarizing audit results in the laboratories are prepared and distributed to QC coordinators.

#### 3.0 Quality Assurance Audits

The quality assurance audit program of the RAS laboratories is conducted by the RAS QA Coordinator in conjunction with the corporate QA Director. The program consists of the following:

 QA standards are prepared using EPA certified standards, NBS standards, primary standard materials, and NBS-traceable compounds. All standards preparations are recorded in the QA Sample logbook (Figure 3-1).



		Standard No. QAS
QA type		
Prep date	Prepared by	Verified bv
Standard source		
		<u> </u>
Parameters		·
		<del></del>
	•	
Preparation method		Final vol

Figure 3-1. Standards preparation logbook

R	A	D	1	A	N
			-	_	_

QAS _			_
	Prep	method	(con't)

Calculations

Sample Distribution							
Date	SAM No.	Client	Remarks				
	<del></del>						

Figure 3-1. (Cont.)



- An inventory of stock standards is maintained within the limits of published stability data. This decreases the time required for daily standard preparation.
- Duplicate samples are requested from clients. These are blind to the laboratory and the client is not billed for the duplicate.
- Blind QA samples are submitted through the Sample Control
   Center to all laboratories. The parameters and concentration
   levels are selected by the RAS Quality Assurance Coordinator.
- Laboratory managers submit, via a "QA Alert Form" (Figure 3-2).

  a list of the types of QA samples needed the following week.

  This insures that the parameters with which there have been problems are included in the sample.
- Monthly reports are issued from the RAS QA Coordinator (Fig. 3-3). These are submitted to the corporate QA Director, laboratory managers and Director of RAS. Managers are notified immediately of major problems with the results of analysis of a QA sample.
- The results of the program are summarized on a quarterly basis for Radian's management.

In addition to the continuous audit program, provisions for third party review are made with each client's work. Radian Analytical Services welcomes onsite audits, performance samples, and independent evaluations.



# QA ALERT FORM

	QA standard for the week of
NPDES Form A water Form B water metals	RCRA metals pesticide OC OP herbicide
Form C water metals organics	EPA 601 _ 624 _ 625 _
TOC TOX	B/N Acids A/N MS VOA GC VOA
Matrix requirements:	PCB
Concentration requirements:	
Special Standards/	Instructions   Individual Parameters
	·
Data Man	

Figure 3-2. QA alert form



# ANALYTICAL SERVICES MONTHLY QA REPORT

QA	prep	report	for	the	month	of	
----	------	--------	-----	-----	-------	----	--

Order No.	Lab	Parameter	Certified Value	Analyzed Value	% Recovery	Date Reported
		<u> </u>				
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	<u> </u>		<u> </u>			L

Figure 3-3. Monthly QA Report



#### 3.1 Data Review and Validation

All analysis results are entered into the SAM computer system. Following completion of the analyses, a preliminary report is printed and returned to the appropriate laboratory manager for review and validation. A final report is printed after the certification by the manager. This report is signed and approved by the laboratory manager before being forwarded to the client. The following diagram (Fig. 3-4) illustrates the data flow for a typical sample analysis.

Upon completion of the analysis and before the final data are issued, the results of the QA audit samples are compared to the certified values. These results are plotted on control charts. Separate control charts are maintained for each analysis. If results are outside the accepted control limits, the analytical results are held until the problem is resolved.

#### 3.2 Control Charts

Quality control charts are maintained for both accuracy and precision. Both charts are structured as shown in Figure 3-5. The main portions of the chart are the center line and the two control limits. The center line is the 100% or total recovery/total agreement of analytical results. The upper and lower control limits are calculated from historical data.

Control charts for accuracy are constructed as follows:

Precent recovery of standards  $(P_{ST})$ :

 $P_{ST} = 100 \times \frac{\text{analyzed value}}{\text{certified value}}$ 

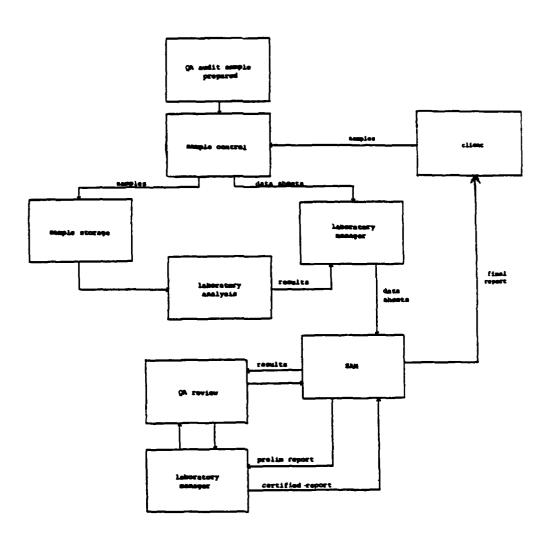


Figure 3-4. Data Flow

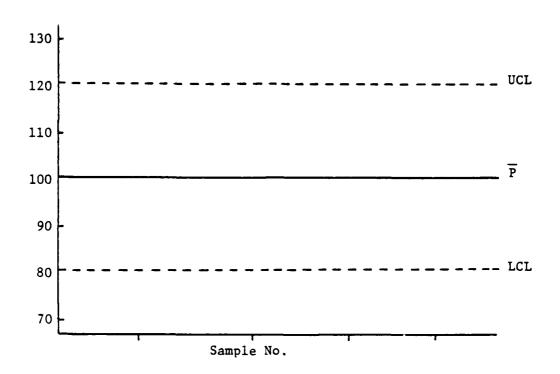


Figure 3-5. Control Chart



Percent recovery of spikes in samples (PSP):

$$P_{SP} = 100 \times \frac{\text{analyzed value - background value}}{\text{spike}}$$

From a set of analyses, the average percent recovery  $(\overline{P})$ :

$$\overline{P} = \underbrace{\sum_{i=1}^{n} P_{i}}_{n}$$

The standard deviation for percent recovery  $(S_R)$ :

$$S_{R} = \sqrt{\frac{\sum_{i=1}^{n} P_{i}^{2} - \left(\sum_{i=1}^{n} P_{i}\right)^{2}/n}{n-1}}$$

The upper and lower control limits are therefore

$$UCL = \overline{P} + 3S_R$$

$$LCL = \overline{P} - 3S_R$$

An analysis is out of control when either of the two conditions apply:

- 1) Any results outside the control limits
- 2) Seven successive results on the same side of the control line.

Control charts for precision are also constructed. Precision is a function of the concentration range of the analyte. The closer the result is to the analytical detection limit, the more imprecise the data become on a percentage scale. Figure 3-6 illustrates the relationship between detection limit and precision for a typical methodology. Because of this concentration dependence, precision control charts need to be developed for specific concentration ranges for each analyte. For duplicate samples A and B, the ratio of the values of A and B are plotted.

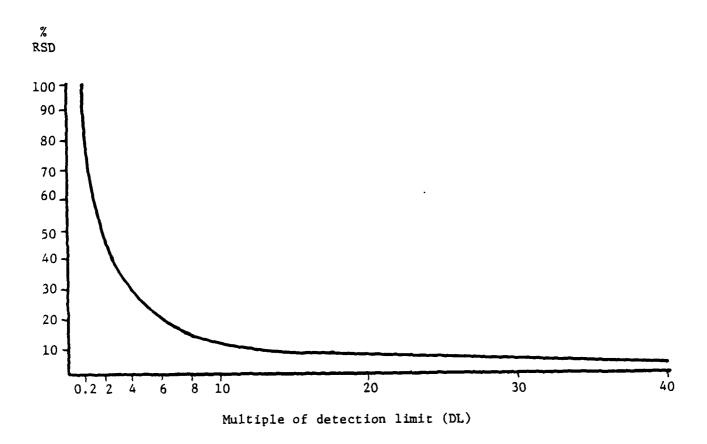


Figure 3-6. Relationship between Detection Limit and Precision



## 3.3 Concurrent Review

Upon review of analytical results of QA audit samples, the QA Coordinator will schedule a meeting with the laboratory manager if there are any tests out of control or which are deviant from an expected precision/accuracy norm. The purpose of this meeting is to:

- review raw data and determine if there is an explanation for the deviance.
- outline analyses of quality control and/or quality assurance samples to further define the problem and its solution.
- establish a schedule for monitoring the analysis after a solution is implemented, to assure that the problem does not recur.

Involvement of the laboratory manager in the problem assessment and solution is essential to a mutual committment to a quality analytical laboratory.



APPENDIX G

Chain of Custody Forms



PYROPHORIC LACHRYMATOR SHOCK SENSITIVE			FIELD SAMPLE No. 222
TEMPERATURE  FLOM  PH  VISUAL OBSERVATIONS/COMMENTS  SOLVEL STATE  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR SOLVE STATE  AND LECT SAMPLE  COLLECTOR SOLVE STATE  AND LECT STORE AT:  CAMPILE DESCRIPTION  COLLECTOR SOLVE STATE  CAMPILE DESCRIPTION  SOLVE STORE AT:  CAMPILE AND LING - HOLD SOLVE STATE  CAMPICATION - NO MORE SAMPLE AVAILABLE  COLLECTOR SOLVE STATE  CAMPICATION - NO MORE SAMPLE AVAILABLE  COLLECTOR STATE  COLLECTOR STATE  COLLECTOR SAMPLE  COMMENTS	COMPANY SAMPLED/ADDRESS	oken AFB OKland	me
TEMPERATURE  FLOM  PH  VISUAL OBSERVATIONS/COMMENTS  SOLVEL STATE  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR'S NAME  COLLECTOR SOLVE STATE  AND LECT SAMPLE  COLLECTOR SOLVE STATE  AND LECT STORE AT:  CAMPILE DESCRIPTION  COLLECTOR SOLVE STATE  CAMPILE DESCRIPTION  SOLVE STORE AT:  CAMPILE AND LING - HOLD SOLVE STATE  CAMPICATION - NO MORE SAMPLE AVAILABLE  COLLECTOR SOLVE STATE  CAMPICATION - NO MORE SAMPLE AVAILABLE  COLLECTOR STATE  COLLECTOR STATE  COLLECTOR SAMPLE  COMMENTS	SAMPLE POINT DESCRIPTION	ZONE-3 test	hales
TEMPERATURE    FLOW			
COLLECTOR'S NAME RICK BELRN DATE/TIME SAMPLED 1/21/23 4/1/22/22  AMOUNT OF SAMPLE COLLECTED, 7 OFT Gars  SAMPLE DESCRIPTION SO/ CAL DOTTO. 3 AMOUNT OF SAMPLE  STORE AT: AMBIENT 5°C 1-10°C OTHER  CAUTION - NO MORE SAMPLE AVAILABLE RETURN ALL PORTIONS RETURN UNUSED PORTION OF SAMPLE  OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS POSSION OF SAMPLE  TOXIC SKIN IRRITANT FLAMMABLE (FP 40°C)  PYROPHORIC SKIN IRRITANT FLAMMABLE (FP 40°C)  PYROPHORIC SHOULD ACCESSION ORGANIZATION NAME RECEIVED PROSSESSION  ORGANIZATION NAME RACK BELRN GROWN DATE RECEIVED  ORGANIZATION HAME RACK BELRN GROWN DATE RECEIVED  ORGANIZATION HAME RACK DELAN GROWN DATE RECEIVED  ORGANIZATION HAME RACK DELAN GROWN DATE RECEIVED  ORGANIZATION HAME RACK DELAN DATE RECEIVED  ORGANIZATION HAME RACK DELAN DATE RECEIVED  ORGANIZATION HAME RACK DATE OF POSSESSION  ORGANIZATION HAME  RECEIVED BY  LAB SAMPLE NO.  ORGANIZATION NAME  COMMENTS  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  OPPORTS		From	pH
COLLECTOR'S NAME RICK BELRN DATE/TIME SAMPLED 1/21/23 4/1/22/22  AMOUNT OF SAMPLE COLLECTED, 7 OFT Gars  SAMPLE DESCRIPTION SO/ CAL DOTTO. 3 AMOUNT OF SAMPLE  STORE AT: AMBIENT 5°C 1-10°C OTHER  CAUTION - NO MORE SAMPLE AVAILABLE RETURN ALL PORTIONS RETURN UNUSED PORTION OF SAMPLE  OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS POSSION OF SAMPLE  TOXIC SKIN IRRITANT FLAMMABLE (FP 40°C)  PYROPHORIC SKIN IRRITANT FLAMMABLE (FP 40°C)  PYROPHORIC SHOULD ACCESSION ORGANIZATION NAME RECEIVED PROSSESSION  ORGANIZATION NAME RACK BELRN GROWN DATE RECEIVED  ORGANIZATION HAME RACK BELRN GROWN DATE RECEIVED  ORGANIZATION HAME RACK DELAN GROWN DATE RECEIVED  ORGANIZATION HAME RACK DELAN GROWN DATE RECEIVED  ORGANIZATION HAME RACK DELAN DATE RECEIVED  ORGANIZATION HAME RACK DELAN DATE RECEIVED  ORGANIZATION HAME RACK DATE OF POSSESSION  ORGANIZATION HAME  RECEIVED BY  LAB SAMPLE NO.  ORGANIZATION NAME  COMMENTS  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  OPPORTS	VISUAL OBSERVATIONS/COMMENTS	Several Somler h	are odeni
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CAUTION - NO MORE SAMPLE AVAILABLE RETURN ALL PORTIONS RETURN UNUSED PORTION OF SAMPLE  OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS POSSIBLE CARPET TO A CAPES TO	SAMPLE DESCRIPTION 501	and Weste (2) SAMP	
OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS	STORE AT: AMBIENT	5°C 7 -10°C 0THER	
OTHER INSTRUCTIONS - SPECIAL HANDLING - HAZARDS	CAUTION - NO MORE SAMPLE	AVAILABLE N RETURN ALL PORTIONS N	RETURN UNUSED PORTION OF SAMPLE
HAZARDOUS SAMPLE   SKIN IRRITANT   FLAMMABLE (FP 40°C)     TOXIC   SKIN IRRITANT   FLAMMABLE (FP 40°C)     PYROPHORIC   LACHRYMATOR   SHOCK SENSITIVE     ACIDIC   BIOLOGICAL   CARCINOGENIC - SUSPECT     CAUSTIC   PEROXIDE   RADIOACTIVE     OTHER   SAMPLE ALLOCATION / CHAIN-OF POSSESSION:   ORGANIZATION NAME   ALCK   BELAW   AROUSEN   COMMENTS     LAB SAMPLE NO.   COMMENTS     DATE RECEIVED   ALCK   CARCINOGENIC     COMMENTS   DATE RECEIVED   LAB SAMPLE NO.   COMMENTS     INCLUSIVE DATES OF POSSESSION   DATE RECEIVED     LAB SAMPLE NO.   COMMENTS     DATE RECEIVED   DATE RECEIVED     LAB SAMPLE NO.   COMMENTS     LAB SAMPLE NO.   COMMENTS     LAB SAMPLE NO.   COMMENTS     LAB SAMPLE NO.   COMMENTS     DATE RECEIVED   DATE RECEIVED     LAB SAMPLE NO.   COMMENTS			\
HAZARDOUS SAMPLE   SKIN IRRITANT   FLAMMABLE (FP 40°C)   PYROPHORIC   LACHRYMATOR   SHOCK SENSITIVE   ACIDIC   BIOLOGICAL   CARCINOGENIC - SUSPECT   CAUSTIC   PEROXIDE   RADIOACTIVE   OTHER			GARIE SKMPLES
TOXIC SKIN IRRITANT FLAMABLE (FP 40°C)  PYROPHORIC - LACHRYMATOR SHOCK SENSITIVE  ACIDIC BIOLOGICAL CARCINOGENIC - SUSPECT  CAUSTIC PEROXIDE RADIOACTIVE  OTHER  SAMPLE ALLOCATION / CHAIN. OF POSSESSION:  ORGANIZATION NAME RICK BELAN GROEN DAP.  RECEIVED BY RECEIVED W/2/-? 2/23  LAB SAMPLE NO. COMMENTS  DATE RECEIVED  ORGANIZATION HAME RADIUM DUALUTUAL GROEN  ORGANIZATION HAME RADIUM DUALUTUAL GROEN  COMMENTS  DATE RECEIVED  ORGANIZATION NAME  RECEIVED BY AND MANUAL GROEN  ORGANIZATION NAME  RECEIVED BY DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  COMMENTS		UNICHOUN	
PYROPHORIC  ACIDIC  BIOLOGICAL  CARCINOGENIC - SUSPECT  CAUSTIC  PEROXIDE  RADIOACTIVE  OTHER  SAMPLE ALLOCATION / CHAIN. OF POSSESSION:  ORGANIZATION NAME  RECEIVED BY  COMMENTS  INCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY  COMMENTS  DATE RECEIVED  COMMENTS  INCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY  COMMENTS  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  ORGANIZATION NAME  RECEIVED BY  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  ORGANIZATION NAME  RECEIVED BY  DATE RECEIVED  DATE RECEIVED	HAZARDOUS SAMPLE	Non-HAZARDO	US SAMPLE
ACIDIC  CAUSTIC  PEROXIDE  RADIOACTIVE  OTHER  SAMPLE ALLOCATION / CHAIN. OF POSSESSION:  ORGANIZATION NAME  RECEIVED BY  CK BELAN GROSSESSION:  COMMENTS  DATE RECEIVED  ORGANIZATION NAME  RECEIVED BY  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  DATE RECEIVED  COMMENTS	Toxic	SKIN IRRITANT	FLAMMABLE (FP 40°C)
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CAUSTIC PEROXIDE RADIOACTIVE  OTHER  SAMPLE ALLOCATION / CHAIN. OF POSSESSION:  ORGANIZATION NAME RICK BELAW RECEIVED DATE RECEIVED ///2/-? = //-  LAB SAMPLE NO. COMMENTS  ORGANIZATION NAME RADIUM AUGUSTA STATE	Acidic	BIOLOGICAL	CARCINOGENIC - SUSPECT
OTHER  SAMPLE ALLOCATION / CHAIN. OF POSSESSION:  ORGANIZATION NAME	CAUSTIC	PEROXIDE	RADIOACTIVE
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RECEIVED BY	ORGANIZATION NAME RICA	E BELAN BERNA	CDAP.
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ORGANIZATION NAME			
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LAB SAMPLE NO COMMENTS			DATE RECEIVED
The verve Care of Poecesion	LAB SAMPLE NO	COMMENTS	
INCLUSIVE HATES HE PROSESSION	Inches Page of Baccook		



	•	FIELD SAFFLE NO
COMPANY SAMPLED/ADDRESS	TINKER AFS	
SAMPLE POINT DESCRIPTION _SOIL	SAMPLES FOO.	M TINKER AFR ZONES
STREAM CHARACTERISTICS:	isis; Water sample	not to analysis.
TEMPERATURE	FLOW	PH
VISUAL OBSERVATIONS/COMMENTS		ide
COLLECTOR'S NAME RICK 100		
	4 Orts Solide;	~ 2 Orts liquid for reference
SAMPLE DESCRIPTION		onty
STORE AT: AMBIENT 5°C	-10°C OTHER -	2
CAUTION - No MORE SAMPLE AVAILABE	LE RETURN ALL PORTIONS	RETURN UNUSED PORTION OF SAMPLE
OTHER INSTRUCTIONS - SPECIAL HANDLII	7	•
	10 - INALARUS	
HAZARDOUS SAMPLE (SEE BELOW)	Non-Hazardo	DUS SAMPLE
Toxic	Skin TRRITANT	FLAMMABLE (FP 40°C)
Pyrophoric -	LACHRYMATOR	SHOCK SENSITIVE
ACIDIC	BIOLOGICAL	CARCINOGENIC - SUSPECT
CAUSTIC	PEROXIDE	RADIOACTIVE
OTHER LINKNOWN		
		`
SAMPLE ALLOCATION / CHAIN OF POSSESS	DAY R KALAN	RADIAN CORPORATION
RECEIVED BY CANCELLY AND		DATE RECEIVED 11-30-53
LAB SAMPLE NO. 34-01-171()	COMMENTS	DATE RECEIVED
INCLUSIVE DATES OF POSSESSION		
ORGANIZATION NAME		
		DATE RECEIVED
LAB SAMPLE No.		
INCLUSIVE DATES OF POSSESSION		
ORGANIZATION NAME		DATE RECEIVED
LAB SAMPLE No.		
INCLUSIVE DATES OF POSSESSION		



		FIELD SAMPLE No. OF
COMPANY SAMPLED/ADDRESS Inker	AFB Oklah	one
SAMPLE POINT DESCRIPTION Sample	of puc (2-11	ich) from stick up at A
Well F' Stream Characteristics:		•
<u> </u>	_ FLOW	PH
/ISUAL OBSERVATIONS/COMMENTS		
COLLECTOR'S NAME Rick Belay	DATE/TIM	E SAMPLED 11/30/83 085
AMOUNT OF SAMPLE COLLECTED	1 feet	
SAMPLE DESCRIPTION 2-10/CH	PYC CASI	76
STORE AT: 🔀 AMBIENT 🗌 5°C 📗	] -10°C 📈 OTHER 🔑	RAPED IN Aluminum Fo
CAUTION - NO MORE SAMPLE AVAILABLE	RETURN ALL PORTIONS	RAPED IN Aluminum For Dull Sich out TRETURN UNUSED PORTION OF SAMPLE
OTHER INSTRUCTIONS - SPECIAL HANDLING	- HAZARDS	8
HAZARDOUS SAMPLE (SEE BELOW)	Non-HAZA	RDOUS SAMPLE
Toxic	SKIN IRRITANT	FLAMMABLE (FP 40°C)
~ ~		<del>-</del> .
Pyrophoric	☐ LACHRYMATOR	SHOCK SENSITIVE
PYROPHORIC  ACIDIC	E BIOLOGICAL	·
Acidic		GARCINOGENIC - SUSPECT
Acidic Caustic	BIOLOGICAL	CARCINOGENIC - SUSPECT
Acidic Caustic Other	BIOLOGICAL PEROXIDE	CARCINOGENIC - SUSPECT
Acidic Caustic Other Sample Allocation / Chain of Possessing	BIOLOGICAL PEROXIDE	CARCINOGENIC - SUSPECT
Acidic Caustic Other Sample Allocation / Chain of Possessin	BIOLOGICAL PEROXIDE	CARCINOGENIC - SUSPECT
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION ORGANIZATION NAME  RECEIVED BY	BIOLOGICAL PEROXIDE	CARCINOGENIC - SUSPECT
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION ORGANIZATION NAME  RECEIVED BY	BIOLOGICAL PEROXIDE	CARCINOGENIC - SUSPECT RADIOACTIVE  Date Received //Ja/ry
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION ORGANIZATION NAME  RECEIVED BY LAB SAMPLE No. 84-01-172	BIOLOGICAL PEROXIDE  ON:  Comments	CARCINOGENIC - SUSPECT RADIOACTIVE  Date Received //Ja/y
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE No.  UNCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  ORGANIZATION NAME  ORGANIZATION NAME	BIOLOGICAL PEROXIDE  ON:  COMMENTS	CARCINOGENIC - SUSPECT RADIOACTIVE  Date Received //Ja/ry
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE NO.  UNCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY  RECEIVED BY  RECEIVED BY	BIOLOGICAL PEROXIDE  COMMENTS	CARCINOGENIC - SUSPECT RADIOACTIVE  Date Received //3-/47
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE NO.  UNCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY  RECEIVED BY  RECEIVED BY	BIOLOGICAL PEROXIDE  COMMENTS	CARCINOGENIC - SUSPECT
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE No. 84-01-172  INCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY	BIOLOGICAL PEROXIDE  COMMENTS  COMMENTS	CARCINOGENIC - SUSPECT RADIOACTIVE  DATE RECEIVED //Ja/YY  DATE RECEIVED
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE NO.  UNCLUSIVE DATES OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE NO.	BIOLOGICAL PEROXIDE  COMMENTS  COMMENTS	CARCINOGENIC - SUSPECT RADIOACTIVE  DATE RECEIVED //Ja/ry  DATE RECEIVED
ACIDIC  CAUSTIC  OTHER  SAMPLE ALLOCATION / CHAIN OF POSSESSION  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE NO.  ORGANIZATION NAME  RECEIVED BY LAB SAMPLE NO.  ORGANIZATION NAME  CHAIN OF POSSESSION  ORGANIZATION NAME  ORGANIZATION NAME  ORGANIZATION NAME	BIOLOGICAL PEROXIDE  COMMENTS  COMMENTS	CARCINOGENIC - SUSPECT RADIOACTIVE  DATE RECEIVED //Ja/ky  DATE RECEIVED



		Field Sample No. 48.5
Company Sampled / Address	Tinker AFB	
Sample Point Description	Tinker AFB Zone 4, B rehole B	
Stream Characteristics:		
Temperature	Flow	pH
/isual Observations/Comme	rts	
Collector's Name / A	French Date/Time Sample	2-9-84
Amount of Sample Collected	guart jar	
Sample Description	1 0	
Store at: Ambient 5°	C	
•	·	
Caution - No more sample a	vailable 🗆 Return unused portion of sampl	● □ Discard unused portions
	andling · Hazards	
<b>G.</b>		
Hazardous sample (see bei	ow) □ Non-haza	rdous sample
☐ Toxic	☐ Şkin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic \	ected at Site of former	Radioactive
Other Cou	ected at Site of former	industrial waste for
Sample Allocation/Chain of P	oeeeeion:	•
Organization Name RAUL	n analytical Services	
Received By MWXWW.AS	(4) Date Received	2-14-8884 Time 9.30
Transported By Ful W	Lab Sample No. 94	
Comments		
nclusive Dates of Possession	J	
Organization Name		
	Date Received	
	Lab Sample No	
	·	
Organization Name		
_	Date Received	
•	Lab Sample No	
•		
	·	



		Field Sample No. 48.6
$T_{i}$	inker AFB	•
Company Sampled/Address <u>Tu</u> Sample Point Description <u>Fone</u>	4 Bore halo B	
	7, 0010.00	
Stream Characteristics:	_	
Temperature		pH
Visual Observations/Comments		
LN FACE	a cha	1-0-84
Collector's Name LN File Amount of Sample Collected 9	Date/Time Samp	oled
Amount of Sample Collected 4	au gar	<del></del>
Sample Description <u>Soil</u> Store at:   Ambient   5°C	4000 F Other	
Store at: Li Ambient Li 5°C y	-10°C U Other	
Caution - No more sample availab	e 🖂 Return unused portion of sam	ole   Discard unused portions
, •		
Other Instructions - Special Handling	j - Hazards	· · · · · · · · · · · · · · · · · · ·
		· · · · · · · · · · · · · · · · · · ·
Hazardous sample (see below)	□ Non-her	cardous sample
, -		<u> </u>
Toxic 7	Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric		☐ Shock sensitive
□ Acidic /	□ Biologica <del>l</del>	☐ Carcinogenic - suspect
□ Caustic \	☐ Peroxide	□ Radioactive
Other College	at site of former	industrial waste for
		•
Sample Allocation/Chain of Possess Organization Name <u>PAUAM (IM</u>	ion:	
Received By <u>AWW XWW AWW</u>	William Sowies	nd 3-14-84 Time 9:30
Heceived by Covic Macon	Date Receive	$\frac{1}{2} \frac{3}{2} \frac{1}{2} \frac{3}{2} \frac{1}{2} \frac{3}{2} \frac{1}{2} \frac{3}{2} \frac{1}{2} \frac{3}{2} \frac{3}{2} \frac{1}{2} \frac{3}{2} \frac{3}$
Transported By Flu 4	Lab Sample No	70,051,02
Comments	<del></del>	
Inclusive Dates of Possession		
Organization Name		
•		d Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
		d Time
_		
Comments	•	
Inclusive Dates of Possession		



		Field Sample No. 40,5
Company Sampled / Address	sher AFB	·
Sample Point Description	4, Borshole C	
Stream Characteristics:	_	pH
Collector's Name LN French Amount of Sample Collected Sample Description Soil O Store at:   Ambient   5°C   4 -		
Caution - No more sample available Other Instructions - Special Handling		
Hazardous sample (see below)	□ Non-haza	rdous sample
□ Toxic □ Pyrophoric □ Acidic □ Caustic □ Other Collected	□ Skin irritant □ Lachrymator □ Biological □ Peroxide  At sile of former is	☐ Flammable (FP< 40°C) ☐ Shock sensitive ☐ Carcinogenic - suspect ☐ Radioactive
Sample Allocation/Chain of Possession Organization Name	on: alidical Arrives	2-14-84 Time 9:30
Organization Name Received By Transported By Comments Inclusive Dates of Possession	Date Received	Time
Organization Name  Received By  Transported By  Comments	Date Received	Time



		Field Sample No. 4D, 2
<b>0</b>	Timber AER	•
Company Sampled / Address	Tinher AFB ne 4, Borehole D	
Sample Point Description	Me t, Boi e.a.c.	
Stream Characteristics:		
-	Flow	pH
Visual Observations/Comments		
Colleged Name / N FA	ench , Date/Time Sample	1 2-9-84
Semple Description _ Soul	quart gar	
	Å-10°C □ Other	
	g. = 10 0 12 0 mer.	
😾 Caution - No more sample ava	ilable 🔲 Return unused portion of sample	☐ Discard unused portions
^	diling - Hazards	
A.I		
M Hazardous sample (see below	) 🗆 Non-hazar	dous sample
□ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic - suspect
□ Caustic	. □ Peroxide	Radioactive
□ OtherColle	ted at site of formes	rdustrial Waste for
	• •	
Sample Allocation/Chain.of Pos	unalitual Services	
Organization Name <u>Nawww</u> Received By <u>NAW NAW ACU</u>	Bota Basalward	2-14-84 Time 9.30
Transported By TLA W	Lab Sample No. 840	
Comments	Lab Sample No	ND31-01
Inclusive Dates of Possession _		
	Date Received	
	Lab Sample No	
	Date Received	
•	Lab Sample No	
	<del></del>	
Inclusive Dates of Possession		<u> </u>



		Field Sample No. 4E, 2
Company Sampled / Address	La AFR	,
Sample Point Description	4. Boschole E	
Stream Characteristics:		
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name LN Frend	Date/Time Sam	pled 2-10-84
Amount of Sample Collected	uset sar	
Semple Description Soil 0	0	
Store at: 🗆 Ambient 🗆 5°C 🙇 🗕	10°C	
💢 Caution - No more sample available	☐ Return unused portion of sam	ple   Discard unused portions
Other Instructions - Special Handling -		
one manachona - opecial mananny -		
X Hazardous sample (see below)	□ Non-he	zardous sample
		·
□ Toxic	Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	□ Blological	☐ Carcinogenic · suspect
Caustic Collected	t site of former in	Austria Dura To Don A
Other Collicies as	Total of Journal street	waste fora
Sample Allocation/Chain of Possessio	المانية	
Sample Allocation/Chain of Possessio Organization Name <u>PALIAM UMA</u>	lixual Gerviers	
Received By AMU XMWM	Date Receive	nd 2-14-54 Time 9:30
Transported by Fld. Wi()	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
		ed Time
Transported By	Lab Sample No	<u></u>
Comments		
Inclusive Dates of Possession		
Organization Name		
		ed Time
-		
	•	



		Field Sample No. 4E, 3
Company Sampled / Address	her AFB	·
Sample Point Description	4, Borehole E	
Stream Characteristics:	Flow	pH
Collector's Name LN French Amount of Sample Collected Sample Description Store at: Ambient 5°C	art gar	<u> </u>
Caution - No more sample available		
Other Instructions - Special Handling -	Hazards	
A Hazardous sample (see below)	□ Non-haza	rdous sample
□ Toxic □ Pyrophoric □ Acidic □ Caustic □ Other collected a	□ Skin irritant □ Lachrymator □ Blological □ Peroxide at site of formes	☐ Flammable (FP< 40°C) ☐ Shock sensitive ☐ Carcinogenic · suspect ☐ Radioactive ☐ industrial wash poi
Sample Allocation/Chain of Possessic Organization Name PATAM UMA Received By AMA TUMMAN Transported By ALA W.  Comments Inclusive Dates of Possession	Date Received	2-14-84 Time 9:30
Organization Name  Received By  Transported By  Comments  Inclusive Dates of Possession	Date Received Lab Sample No	Time
Organization Name Received By Transported By Comments	Date Received Lab Sample No	
Includive Dates of Passaccion		



		Field Sample No. 4E14
Company Sampled Address	when AFB	•
Company Sampled/Address	. 4, Borehole E	
Stream Characteristics:		
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name LN Fren	Date/Time Sample	d 2-10-84
Amount of Sample Collected	iait ju	
Sample Description Soil O	0	
Store at: Ambient 5°C 💢	-10°C □ Other	
Caution - No more sample availab	ie □ Return unused portion of sample	■ □ Discard unused portions
•	g - Hazards	
	· · · · · · · · · · · · · · · · · · ·	
A Hazardous sample (see below)	☐ Non-hazaı	dous sample
☐ Toxic _	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	Shock sensitive
☐ Acidic \	☐ Biological	☐ Carcinogenic · suspect
□ Caustic \/ \/ \/ \/ \/ \/ \/ \/ \/ \/ \/ \/ \/	Peroxide	, Radioactive
Cother V Collected	at site of former	industrial waste
	·	pond
Sample Allocation/Chain of Possess Organization Name Ladiam and	AVITICAD CALADIDA	·
Organization Name Nautow WW	2) 70 (CO)	2-14-04 9:30
Received By AMI TIMOUS		2-14-84 Time 9:30
Transported By TIAW	Lab Sample No. <u>\$40</u>	2001-01
Comments		
Inclusive Dates of Possession	<del></del>	
Organization Name		
	Date Received	<del>- '</del>
	Lab Sample No	
inclusive Dates of Possession		
-	Date Received	
	Lab Sample No	
Inclusive Dates of Possession		



		Field Sample No. 4515
Company Sampled/Address	inher AFR	
Sample Point Description	e 4 Bonchole E	<del></del>
	,	
Stream Characteristics:		
Temperature	* *	pH
Visual Observations/Comments	<u> </u>	
Collector's Name LN Fren	eh Date/Time Sam	pled 2-10-84
Amount of Sample Collected	Date/Time Sam	
Sellible pascribitori " " " A A A T T T T T T T T T T T T T T	<del> </del>	
Store at: 🗆 Ambient 🗆 5°C 🎉	L - 10°C □ Other	
Courter No more comple quelle		unle C Discord versed partiens
·	ble   Return unused portion of sam	
Other Instructions - Special Handlir	ng - Hazards	
Hazardous sample (see below)	☐ Non-ha	zardous sample
	☐ Şkin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic \	☐ Biological	☐ Carcinogenic - suspect
□ Caustic Vo allowers	Peroxide	Radioactive
Other Coccie	Peroxide  at site of former	maissing waste
Sample Allocation / Chain of Posses	ssion: ~ . ^ -	ponce
Sample Allocation/Chain of Posses Organization Name Laulim (1)	nativical Services	
Received By All Amideus	Date Recoiv	ed 2-14-84 Time 9.30
Transported By Fld 91	Lab Sample No. <u>9</u>	402087-05
Comments		
inclusive Dates of Possession		
Organization Name		
Received By		red Time
· · · · · · · · · · · · · · · · · · ·	·	
Inclusive Dates of Possession		
<del>-</del>		
		ed Time
•	· ·	
Inclusive Dates of Possession		



		Field Sample No. 47,2
Company Sampled/Address	her AFB 4, Borehole F	
Stream Characteristics: Temperature Visual Observations/Comments	Flow	pH
Amount of Sample Collected Sample Description	Date/Time Sample	
Caution - No more sample available Other instructions - Special Handling		
A Hazardous sample (see below)	□ Non-hazi	ardous sample
□ Toxic □ Pyrophoric □ Acidic □ Caustic □ Other Callacted (	Skin irritant  Lachrymator  Biological  Peroxide  State of former in	☐ Flammable (FP< 40°C) ☐ Shock sensitive ☐ Carcinogenic - suspect ☐ Radioactive ☐ Lustria C waste pond
Sample Allocation/Chain of Possession Organization Name	Ion: MUXULAL SAVALLA  Date Received  Lab Sample No. 34	1 <u>2-14-84</u> Time 9:30 02087-09
	Date Received	d Time
<del>-</del>	Date Received	d Time



\_ == =

		Field Sample No. 4F, 3
Time	he AFB	·
Company Sampled/Address Time Sample Point Description	4 Bricholo E	
	, , ,	
Stream Characteristics:		
Temperature		pH
Visual Observations/Comments		<del></del>
Collector's Name LN Freu	Data/Time Sample	1 2-10-84
Amount of Sample Collected 9	unt sin	
Semple Description >01/		
Store at: Ambient 5°C X-	10°C	
•		
人Caution - No more sample available	☐ Return unused portion of sample	☐ Discard unused portions
Other Instructions - Special Handling -	Hazards	
<del>-</del>	<del></del>	
Hazardous sample (see below)	□ Non-hazan	dous sample
□ Toxic	Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric		☐ Shock sensitive
□ Acidic \	☐ Biological	☐ Carcinogenic - suspect
Other Collected a	- Peroxide forme in	Sustrial waste Pond
	0	
Sample Allocation/Chain of Possessic	on:,	
Sample Allocation/Chain of Possession Organization Name	alixical services	
Received By AM TAMAN	Date Received	2-14-84 Time 9:30
Transported By FLA 4	Lab Sample No. 840	3087-10
Comments		
Inclusive Dates of Possession		
Organization Name	·	
Received By	Date Received	Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Comments	**************************************	
Inclusive Dates of Possession	·	



L	<b>,</b> , ,	Field Sample No. 4
· · · · · · · · · · · · · · · · · · ·	inker AFB.	212-027-04
Company Sampled / Address	his 00	212 027 -07
Sample Point Description	www.	
Stream Characteristics:		
		pH
Visual Observations/Comments	<del></del>	
Collector's Name F 13 B	Date/Time Sa	mpled 7/14 M/200
Collector's Name	7 iars	
Sample Description Store at: □ Ambient △ 5°C □ −1	10°C	
Caution - No more sample available	☐ Return unused portion of sa	mple   Discard unused portions
Control of the more sample available		Discard unused portions
Other Instructions - Special Handling -	Hazards	
<del></del>		
	1/	
☐ Hazardous sample (see below)	Non-t	nazardous sample
□ Toxic	Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chain of Possessio	n:	
Sample Allocation/Chain of Possessio Organization Name Philippe (MA)	Ustical Services	
Received By Saw Tundsus	Date Rece	ived 2-15-54 Time 4:30
Transported By 7 2d Eq	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		· · · · · · · · · · · · · · · · · · ·
Received By	Date Rece	ived Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Rece	ived Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		

# RADIAN

$\geq A$	
3 E, 3 F,	36

		Field Sample No. 4 G	
Company Sampled/Address	Tinker AFR	3 212-027-04	
Sample Point Description	well		
Stream Characteristics:			
Temperature	Flow	pH	
Visual Observations/Comments	· · · · · · · · · · · · · · · · · · ·		
Collector's Name	<b>B</b> 内 Date/Time Samp	10d 2/15/84 6 bottles 3F, 4 bottles 4 mod H20	
Amount of Sample Collected 7 bo# b	s 2A: 6 bottles 3E,	6 bottles 3F. 4 bottles 4	
Sample Description	1 boffle 3G groc	md H20	
Store at: 🗆 Ambient 💢 5°C 🗆 -	10°C □ Other		
Caution - No more sample available	☐ Return unused portion of samp	ile. 🗆 Discard unused portions	
Other Instructions - Special Handling -			
Other Instructions - Special Handling -	Hazards TT() CT		
□ Hazardous sample (see below)	Non-haz	Non-hazardous sample	
□ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)	
☐ Pyrophoric	☐ Lachrymator	□ Shock sensitive	
□ Acidic	☐ Biological	☐ Carcinogenic · suspect	
□ Caustic	☐ Peroxide	☐ Radioactive	
□ Other			
Sample Allocation/Chain of Possessio			
Organization Name KARLIN WW	lyucal services		
Received By Alli Alli AMA	Date Receive	d 2-16-84 Time 9:15	
Transported By 712 4	Lab Sample No. $\underline{\$90}$	<u>2107, 3402108, 5402109</u>	
Comments			
Inclusive Dates of Possession		7 10 11	
Organization Name			
Received By			
Transported By	Lab Sample No		
Comments			
Organization Name	<u></u>		
Received By	Date Receive	d Time	
Transported By	Lab Sample No		
Comments	- 2		
Inclusive Dates of Possession			



	CHAIN OF CUSTODY RECORD	<u> </u>
		Field Sample No.
Company Sampled/Address	Tunkan A	T-G
	_	<del>=</del>
Sample Point Description	<del></del>	o well
Stream Characteristics:	9	
Temperature	- · · · · · · · · · · · · · · · · · · ·	pH
Visual Observations/Comments		
Collector's Name	= BB Date/Time Samp	led
Amount of Sample Collegied		well 1
Amount of Sample Collected  Sample Description 46: To Co  Store at: Ambient 5°C -	1625; gone 1, zuell 2:	est of orgin gone 147 jan
Store at: Ambient 5°C -	10°C	3,0,,
Caution - No more sample available	☐ Return unused portion of samp	Discard unused portions
∕ \ Other Instructions - Special Handling -	HazardsTTO Cy	0 625
☐ Hazardous sample (see below)	Non-haz	ardous sample
	☐ Skin irritant	☐ Flammable (FP< 40°C
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic - suspec
□ Caustic	☐ Peroxide	☐ Radioactive
Other		
Sample Allocation/Chain of Possession	an:	
Sample Allocation/Chain of Possession Organization Name	ultical Genrees	
Received By CANLYMANA	Date Receive	d 3.2084 Time 5:30
Transported By 7204	Lab Sample No.	
Comments		
Inclusive Dates of Possession		
Organization Name		. <u>.</u>
Received By		d Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Receive	d Time
Transported By		
Comments		
Inclusive Dates of Possession		

RADIAN

	:016 Past	metal CN
Zone1	102/p	• /
Javea 4	, 10k	لمسبر

	100	Field Sample No. 3,4,5,6
		DK
Company Sampled / Address	ore 1 , croundwat	
Sample Point Description	or oundwer	<u></u>
Stream Characteristics:	,	
Temperature	Flow	pH
Visual Observations/Comments		
691	rt to L	1561 00
Collector's Name	Kuthy Fertual Date/Time Samples	1/R609
Amount of Sample Collected		
Stem et Ambient	-10°C □ Other	<del></del>
Store at:   Ambient   15°C	-10°C U Other	
☐ Caution - No more sample availab	ole 🗆 Return unused portion of sample	☐ Discard unused portions
Other Instructions - Special Handlin	g - Hazards	·
	g - 11425143	
☐ Hazardous sample (see below)	Non-hazaro	lovo comple
•	//	
☐ Toxic	Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic - suspect
□ Caustic	☐ Peroxide	☐ Radioactive
Other		
Sample Allocation/Chain of Posses	sion:	
Sample Allocation/Chain of Posses Organization Name Flater W	nalitical Services	
Received By ALLU KAMAOMA	Date Received	2-20-34 Time 5:30
Transported By Full (1)	Lab Sample No. 340	(140
Comments		
Inclusive Dates of Possession		
Organization Name		
_	Date Received	Time
Transported By	Lab Sample No.	
Comments		
Organization Name		
	Date Received	Time
	Lab Sample No	
Comments		



Inclusive Dates of Possession \_\_

	CHAIN OF CUSTODY RECORD	T5-018
Company Sampled / Address Sample Point Description	Tinker AFB 21	Field Sample No. Zone Z, well  (2-027-04 Zone Z,
Stream Characteristics: Temperature Visual Observations/Comments	Flow	
Collector's Name  Amount of Sample Collected \( \textstyle{15} \cdot 0 \)  Sample Description  Store at: \( \textstyle{15} \) Ambient \( \textstyle{15} \) 5°C \( \textstyle{1} \)  Caution · No more sample available  Other Instructions · Special Handling ·	☐ Return unused portion of sam	pled
☐ Hazardous sample (see below)	<i>,</i> •	zardous sample
	☐ Skin Irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic □ Caustic □ Other	□ Biological □ Peroxide ─────	☐ Carcinogenic - suspect ☐ Radioactive
Sample Allocation/Chain of Possessic Organization Name Received By AMAMA Transported By Fill Vi. Comments Inclusive Dates of Possession	Date Receive	
Organization Name		
		ed Time
·	Lab Sample No.	
Organization Name		
<u> </u>		ed Time
Transported By	Lab Sample No	



	CHAIN OF CUSTODY RECORD	/ EXCHATE
	•	J Sample No. 36
Company Sampled / Address	HEB	
Sample Point Description	rounderate	
Stream Characteristics:		
remperature	Flow	pH
Visual Observations/Comments	· · · · · · · · · · · · · · · · · · ·	
Collector's Name PRK/K	Date/Time Sampled	Gies / 17/196
Amount of Sample Collected		
Sample Description		
Store at: Ambient 5°C 2 -	10°C Other	
	☐ Return unused portion of sample ☐	
•	Hazards	
Hazardous Sample (see below)	Non-hazardo	ue comple
A lazardous sample (see below)	/\	
Toxic	Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☑ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic · suspect
□ Caustic	☐ Peroxide	☐ Radioactive
☐ Other		
Sample Allocation/Chain of Possession Organization Name LAWA WA	on: 1 Classica	
Organization Name Eduli (M)	wxuau Tovilles	20 (11/2)
Received By ANU KINDAU	Date Received 🔬	30-34 Time 4:30
Transported By 711 W	Lab Sample No. 3402	173
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
	Lab Sample No	
•		
Organization Name		
	Date Received	Time
	Lab Sample No.	
•		
Including Dates of Becausing	<del></del>	



	,	Field Sample No. 15-00
Company Sampled / Address	Tinker AFR &	212-027-04
Sample Point Description	to well	
Stream Characteristics:	<i>y</i>	
Temperature	Flow	pH
Visual Observations/Comments		•
Collector's Name	Date/Time Sample	ed 2/9 9,00
Amount of Sample Collected	Tayart 3 VD	A 1 10C
	• // //	<u> </u>
Sample Description	10°C Other	
Caution - No more sample available	☐ Return unused portion of sample	le, 🗆 Discard whused portions
/ \ Other instructions - Special Handling -		024/625
☐ Hazardous sample (see below)	Non-hazz	ardous sample
	$\square$ Skin irritant $^{\prime}$ $\vee$	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
Other		
Sample Allocation/Chain of Possessio	on: T - 1 Ca.	•
Sample Allocation/Chain of Possession Organization Name	alistical Services	
Received By AMI XMAXIA	Date Received	2-10-84 Time 10:00
Transported By 714. (1)	Lab Sample No. <u>340</u>	32061-01
Comments		· · · · · · · · · · · · · · · · · · ·
Inclusive Dates of Possession		· · · · · · · · · · · · · · · · · · ·
Organization Name		
Received By	Date Received	i Time
Transported By	Lab Sample No	
Comments		
inclusive Dates of Possession		
Organization Name		— · · · · · · · · · · · · · · · · · · ·
Received By	Date Received	1 Time
Transported By	Lab Sample No	200
Comments		
Inclusive Dates of Possession		



		Field Sample No. 5 - 00
		212-027-04
Sample Point Description	well	
Stream Characteristics:		
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name	D.A. 171	11 2 19 184 10 132
Amount of Sample Collected/	Date/Time Samp	1 +0 C
Sample Description	who H-1	
Store at: ☐ Ambient ☐ 5°C ☐ -		
•		
Caution - No more sample available	☐ Return unused portion of same	ple Discard unused portions
Other Instructions - Special Handling -	Hazards	24/625
The state of the s	· · · · · · · · · · · · · · · · · · ·	
☐ Hazardous sample (see below)	Non-haz	zardous sample
□ Toxic _	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
□ Caustic	☐ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chain of Possessio	in: A .	
Sample Allocation/Chain of Possessio Organization Name RANGA UMA	listical Services	
Received By AWAUNAMA	Date Receive	nd 2-10-84 Time 10:00
Transported By Fld 94		02061-02
Comments	·	
Inclusive Dates of Possession		
Organization Name		
Received By	Date Receive	od Time b
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Receive	od Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		



		Field Sample No.
Company Sampled / Address	Ker AFB 212.	-027-04
Sample Point Description		
Stream Characteristics:	•	
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name KAF	Date/Time Sample	od
Amount of Sample Collected		oc
Sample Description	moundwater	
Store at: Ambient 5°C -	10°C □ Other	
` '		
∠ Caution - No more sample available	11 /	
Other Instructions - Special Handling -	Hazards	24/625
	<del></del>	
☐ Hazardous sample (see below)	Non-hazar	rdous sample
	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric		☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic · suspect
□ Caustic	□ Peroxide	□ Radioactive
☐ Other		□ vadioactive
Sample Allocation/Chain of Bosessin	in'	
Sample Allocation/Chain of Possessic Organization Name <u>LANIAN OM</u>	ilutical Struces	
Received By QUITUMANUS	Date Received	2-10-34 Time 10:00
Transported By Oak (	Lab Sample No. 9402	2061-03
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By		
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		



	CHAIN OF CUSTODY RECORD	
	`	Field Sample No.
<del></del>	- La Atta	rield Sample No.
Company Sampled / Address	INKER APB 212	-027-04
Sample Point Description/	well	Field Sample No
Stream Characteristics:		
Temperature	Flow	nH
Visual Observations/Comments	<del>-</del>	•
Collector's Name	Date/Time Sampled	2/9/84 11:00
Amount of Sample Collected		7:1 toc
Sample Description	around H. D'	
Store at: ☐ Ambient ☐ 5°C ☐ -	10°C Other	
Caution - No more sample available Other Instructions - Special Handling -	☐ Return unused portion of sample	□,Discard unused portions
Other Instructions - Special Handling -	Hazards #OLD	624/625
	<b>i</b> _	
☐ Hazardous sample (see below)	Non-hazard	ous sample
☐ Toxic	Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
☐ Other		
Sample Allocation/Chain of Possession	on: Outrail Chairm	
Organization Name RACIAM O	Miliaucal Terres	2 10 64
Received By Tank Tundaya	Date Received	
Transported By 414 4	Lab Sample No <u>\$40</u> 3	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received _	Time
Transported By	Lab Sample No	
Comments	· · · · · · · · · · · · · · · · · · ·	
Inclusive Dates of Possession		
Organization Name		
Received By		
Transported By		
Comments	•	
Inclusive Dates of Possession		



	, <b></b>	Field Sample No. 15-007
Company Complet Middleson	Tinker AFB	212-027-04
Company Sampled / AddressSample Point Description		
Stream Characteristics:		
Temperature	•	• T
Visual Observations/Comments		
Collector's Name KAF	Date/Time Sample	ed 300 2/8/84
Amount of Sample Collected	1 QUALT 3 V()A	1 TOO
Sample Description	groundwate	<u> </u>
Sample Description Store at:   Ambient   5°C   -	10°C Other	
Caution - No more sample available	Heturn unused portion of sample	e U Discard unused portions
Other Instructions - Special Handling -	Hazards TOP U	024/625
☐ Hazardous sample (see below)	Non-haza	rdous sample
□ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
□ Caustic	□ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chain of Possessic	on: altral Galinian	
Organization Name	Malinear Davies	0 10 616
Received By CAML TUMBER	Date Received	2-10-84 Time 10:00
Transported By Hully	Lab Sample No. <u>34</u>	03061-00
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	I Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession	<del></del>	
Organization Name		
Received By		
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		



	CHAIN OF CUSTODY RECORD	
		15-01
<del></del>	, ATD	Field Sample No
Company Sampled / Address	Inker ATB-	22-027-04
Company Sampled / Address	well	
Stream Characteristics:		
Temperature		
Visual Observations/Comments		
- KAE		d 2/8/84 1000
Collector's Name/_//	Date/Time Sample	d 2/0/17 10
Amount of Sample Collected	Guar Con	<u>s, / / OC</u>
Sample Description	groundwaren	
Collector's Name	10°C 🗆 Other	
Caution · No more sample available Other instructions · Special Handling ·	☐ Beturn unused portion of complete	□ Dispard unused portions
Cadnon - No more sample available	# O/ T	Discard unused portions
Other instructions - Special Handling -	Hazards VOLO Q	024/625
☐ Hazardous sample (see below)	Non boson	dous sample
- nazardous sample (see below)	S Non-nazar	dons samble
	☐ Skin irritant ´	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic · suspect
□ Caustic	☐ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chain of Possessio	n: 0 til caribea	
Organization Name RALIAN W		4 0 111
Received By AMI TUMANUS	Date Received	3-10-54 Time 10:00
Transported By Ald 94	Lab Sample No. 340	2061-06
Comments	· · · · · · · · · · · · · · · · · · ·	
Inclusive Dates of Possession		
Organization Name		
Received By		
Transported By	·	
Comments	-	
Inclusive Dates of Possession		
Organization Name		
Received By		
Transported By	-	
Comments		
Inclusive Dates of Possession		



	_	Field Sample No. 15-0/-
0	INKOD AFR	212-027-04
Company Sampled / Address	1 1 - / /	J- UZT-UT
Sample Point Description		· · · · · · · · · · · · · · · · · · ·
Stream Characteristics:		
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name KA-F	Dete/Time S	ampled 2/8/84 1100
Amount of Sample Collected	1 quart 3 VOI	45 1700
Sample Description	anginduater	
Collector's Name	-10°C □ Other	
Caution - No more sample availal	ole Return unused portion of s	sample Discard unused portions
Other instructions - Special Handlin	ig · Hazards	D 624/625
☐ Hazardous sample (see below)	Non	-hazardous sample
• • •	•	·
	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	□ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	□ Carcinogenic · suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
Other		
Sample Allocation/Chain of Posses	sion: . —	
Sample Allocation/Chain of Posses Organization Name	malurcal services	
Received By AM MMANUS	Date Rec	elved <u>A-IO-S+</u> Time <u>10:00</u>
Transported By Fld EN	Lab Sample No	<del>9402061-07</del>
Comments	,	
Inclusive Dates of Possession		
Organization Name		
Received By	Date Rec	eived Time
Transported By	Lab Sample No	
Comme nts		
Inclusive Dates of Possession	<del></del>	
Organization Name		
•		eived Time
Transported By	Lab Sample No	
Inclusive Dates of Possession		



	CHAIN OF CUSTODY RECORD	
Company Sampled / Address	Inker AFB 212	ield Sample No. 15-0/4 027-04
Stream Characteristics:	•	
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name KAF	Date/Time Sampled	2/2/24 900
Amount of Sample Collected	auert, 3 VOAs 1	700
		7
Sample Description	109C - Other	<del></del>
Store at: C Ambient A 3°C C -		
Caution - No more sample available	☐ Return unused portion of sample (	Discard unused portions
Other Instructions - Special Handling -	1101D (0)	
Cine mandetions - Special Handling .	nazarus	y coa
☐ Hazardous sample (see below)	Non-hazardo	eus sample
□ Toxie		·
	□ Skin irritanť	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
□ Other		<del></del>
Sample Allocation/Chain of Possessio	in:	
Organization Name RADIAN W	nalutical Services	
Received By CAN TUN AXIA	Date Received 2	-10-34 Time 10:00
Transported By Fld Gd	Lab Sample No. 34030	061-08
Oceanno de		
Inclusive Dates of Possession		
Organization Name		
Received By		T
Transported By		
-	•	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By		
Transported By	•	
Comments		
Inclusive Dates of Possession		



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	<b>.</b>	Field Sample No. 75-0/3
Company Complet (Address	Inker AFB	212-027-04
Company Sampled / Address Sample Point Description	1001	0/2 007 0/
Stream Characteristics:		•
Temperature	Flow	pH
Visual Observations/Comments		
Collector's NameKAF	Date/Time Şar	mpled 2/8/84 100
Amount of Sample Collected	aught & VOAS	2+hc.
Sample Description	armendunter	
Store at: Ambient 5°C -	- 10°C	
Caution - No more sample available	Partial Unused portion of Sai	mple Discard unused portions
Other Instructions - Special Handling	· Hazards HOLD (	24/625
		···
☐ Hazardous sample (see below)	Non-h	azardous sample
	Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	□ Carcinogenic - suspect
□ Caustic	☐ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chain of Possessi	on:	
Organization Name	nalitical Services	
Received By Call XIII AXIA	Date Recei	ved 3-10-84 Time 10:00
Transported By Fld GN	Lab Sample No	3402062-01 and-02
Comments		
Inclusive Dates of Possession		and the second of the second o
Organization Name	2000	
		ved Time
Comments		
Organization Name		
		ved time



		Field Sample No. 50/6
Company Complet Middle	Tinker AFB-21	12-027-04
Company Sampled/Address Sample Point Description	14.19.11	a var of
Stream Characteristics:	Ele	
Temperature		pH
Collector's Name	Date Time Sam	ipled 2/8/84 2/30
Amount of Sample Collected	, / Quate, &	1045 1 toc
	round H. O	
Store at: ☐ Ambient 5°C	□ ~10°C □ Other	
, , , , , , , , , , , , , , , , , , ,	ilable 🗆 Return unused portion of sam	
Cardion - No more sample avail	LO	D / Discard unused portions
Other instructions - Special Hand	lling - Hazards	004/00
☐ Hazardous sample (see below)	Non-ha	zardous sample
☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	□ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chain of Bose	ession:	
Sample Allocation/Chain of Poss Organization Name PARISM (	Indutical Services	
Received By COULTUNATON		ed 2-10-84 Time 10:00
Transported By Fld W.	Lab Sample No. 4	
Comments	<i></i>	
Inclusive Dates of Possession		
Organization Name		
•		ed Time
Comments		
Inclusive Dates of Possession		
	·····	
Received By	Date Receiv	ed Time
Transported By	Lab Sample No	
Inclusive Dates & Possession		



		Field Sample No. <u>TS-0/8</u>
Company Sampled / Address	oker AFB 2	12-027-04
Sample Point Description		
Stream Characteristics:	Elew	ali
Temperature		рп
O-Washarda Marra	Data/Time Car	malad
Amount of Sample Collected	I quart, SVO	4 1 toc
Sample Description	BUNG TILL	<del></del>
Store at: Ambient 5°C 0-	10°C Other	
Caution · No more sample available	☐ Return unuşed portion of sa	mple 🗀 Discard unused portions
Other Instructions - Special Handling -	Hazards HOLD 62	4/625
	•	
☐ Hazardous sample (see below)	Non-h	azardous sample
☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric		☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	□ Radioactive
Other		
Sample Allocation/Chain of Possessi	on:	
Organization Name	MULTURAL FEBRUS	2 10 44 - 12 00
Received By AM AMA		ived 2-10-84 Time 10:00
Transported By Tea. 74	Lab Sample No4	DIOXUUX U)
Inclusive Dates of Possession		
Organization Name		
Received By	Date Rece	ived Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
		ived Time
•		
Inclusive Dates of Possession		



#### Field Sample No. Company Sampled / Address \_\_\_ Sample Point Description \_\_\_\_\_ Stream Characteristics: Temperature \_\_\_\_\_ \_\_\_\_\_ Flow \_ Visual Observations/Comments \_\_\_\_ Collector's Name Date/Time Sampled Amount of Sample Collected \_\_\_ Sample Description \_\_\_ Store at: ☐ Ambient 💢 5°C ☐ - 10°C ☐ Caution · No more sample available ☐ Return unused portion of sample ☐ Discard unused portions ☐ Hazardous sample (see below) Non-hazardous sample ☐ Skin irritant ☐ Taxic ☐ Flammable (FP< 40°C) ☐ Pyrophoric ☐ Lachrymator Shock sensitive ☐ Acidic ☐ Biological ☐ Carcinogenic - suspect ☐ Caustic ☐ Peroxide ☐ Radioactive ☐ Other Sample Allocation/Chain of Possession: Organization Name RADIAN ameliatical Grunces \_ Time \_\_10:00 Received By AML TUMANU Date Received \_A-10-84 Transported By 414 54 / Lab Sample No. 9402063-6 Comments Inclusive Dates of Possession Organization Name \_\_\_\_\_ Received By \_\_\_\_\_\_ Date Received \_\_\_\_\_ Time \_\_\_\_\_ Transported By \_\_\_\_\_\_ Lab Sample No. \_\_\_\_\_ Comments \_\_\_ Inclusive Dates of Possession Organization Name \_\_\_\_\_ Received By \_\_\_\_\_ Date Received Time Transported By \_\_\_\_\_ Lab Sample No. \_\_\_\_\_ Comments \_\_\_\_ Inclusive Dates of Possession

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	CHAIN OF COSTOD! RECORD	- X)(
Company Sampled / Address Sample Point Description	Tinker AFB 2	d Sample No.   5 0 2
Stream Characteristics: Temperature Visual Observations/Comments	Flow	pH
Collector's Name  Amount of Sample Collected  Sample Description  Store at:   Ambient 5°C	Date/Time Sampled_ (Lants to UDAS 2 TOC 3000000000000000000000000000000000000	2/8/84 8:00
Caution · No more sample availab Other Instructions · Special Handling	g - Hazards	Discard unused portions
☐ Hazardous sample (see below)	Non-hazardou	s sample
☐ Toxic	□ Sķin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic · suspect
☐ Caustic ☐ Other	□ Peroxide	☐ Radioactive
Sample Allocation/Chain of Possess Organization Name	Malytical German	10.44
Transported By Ald W. Comments	Lab Sample No. 4403.06	10-84 Time 10:00
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Inclusive Dates of Possession		
•		
	Date Received	
•	Lab Sample No	
Inclusive Dates of Possession		



Company Sampled / Address	TIKOL A FR	Field Sample No. 13-02
Sample Point Description	vel	=, = 027 - 07
Stream Characteristics: Temperature		рн <u>7./</u>
Collector's Name KA Amount of Sample Collected Sample Description Store at:   Ambient   5°C   -	guart, 3 VOA+	pled 2/7/84 3:30 + 1 TOC -R
Caution - No more sample available Other Instructions - Special Handling -	□ Return unused portion of sam Hazards	ple Discard unused portions  24/625
☐ Hazardous sample (see below)	Non-ha	zardous sample
☐ Toxic ☐ Pyrophoric ☐ Acidic ☐ Caustic ☐ Other	☐ Skin irritant ☐ Lachrymator ☐ Biological ☐ Peroxide	☐ Flammable (FP< 40°C) ☐ Shock sensitive ☐ Carcinogenic · suspect ☐ Radioactive
Sample Allocation/Chain of Possession Organization Name	Lab Sample No.	ed <u>R-10-64</u> Time <u>10:00</u> 402062-08
Organization Name Received By Transported By Comments Inclusive Dates of Possession	Date Receiv	red Time
Organization Name  Received By  Transported By  Comments  Inclusive Dates of Possession	Date Receiv	red Time



	T.1/-	Field Sample No. 15-00
Company Sampled / Address	INKEKA	FB 212-027-0
Sample Point Description	Well	
Stream Characteristics:		
emperature	Flow	рН
/isual Observations/Comments	· · · · · · · · · · · · · · · · · · ·	
Collector's Name Amount of Sample Collected Sample Description Store at:   Ambient 5°C   -	Date/Time Sample	nd 2/7/84 3:00
Amount of Sample Collected	augst. 3 VOA'S	ITOC
Sample Description	around H	<u>6</u>
Store at: 🗆 Ambient 🗘 5°C 🗆 🗕	10°C - Other	
Caution - No more sample available	Return unused portion of sample	Discard unused portions
∕ ∖ Other instructions - Special Handling -	Hazards	624/625
<del> </del>		<del></del>
☐ Hazardous sample (see below)	Non-haza	rdous sample
□ Toxic _	☐ Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	□ Shock sensitive
□ Acidic	🗆 Biological 🏢	☐ Carcinogenic - suspect
□ Caustic	☐ Peroxide	☐ Radioactive
Other		
Sample Allocation/Chain of Possessio	on: , , , , -	
Organization Name RANAM W	ratifical genries	
Received By AMU XWW AMA	Date Received	2-10-84 Time 10:00
Transported By FLA W	Lab Sample No. <u>440</u> 2	2063-01
Comments		
nclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Comments		
nclusive Dates of Possession		
Organization Name		
Received By		
Fransported By	<del></del>	
Comments	•	
Inclusive Dates of Possession		



	Fie	ld Sample No. 15-02
- Company Sampled / Address	TINKER AFB	
ample Point Description	well	
tream Characteristics:		2.2.18
emperature <u>60°F</u>	Flow	pH
Isual Observations/Comments	Flow COND /90	
collector's Name KAE	Date/Time Sampled	2/7/84 1100
mount of Sample Collected / Q	unt 3 VOAS 1 TOC	3
sample Description	Groundwater	
itore at: 🗆 Ambient 🎜 5°C 🗆 🗕	yort 3 VOAS 1 TOO groundwater  10°C 0 Other	
A 4		
	☐ Return unused portion of sample ☐	
Other Instructions - Special Handling -	Hazarda HOLD 62	-4/625
		<u> </u>
	\/	
☐ Hazardous sample (see below)	Non-hazardou	s sample
□ Toxie	☐ Skin irritant	☐ Flammable (FP< 40°C
□ Pyrophoric	☐ Lachrymator	□ Shock sensitive
□ Acidic	☐ Biological	Carcinogenic - suspect
□ Caustic	☐ Peroxide	☐ Radioactive
☐ Other		
Sample Allocation/Chain of Possessio	on: 1. 4: 1 Carrier	
	valitical Grunces	10 411
Received By AM XMANIA	Date Received &	10-84 Time 10:00
Transported By Tea Sy	Lab Sample No. 44020	<u>03-02</u>
Comments	<u>,                                      </u>	
Inclusive Dates of Possession		
Received By	Date Received	Time
Fransported By	Lab Sample No	
nclusive Dates of Possession		***************************************
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		



	_	Field Sample No. 15-02
Company Sampled / Address	inker AFR	212-027-04
Company Sampled / Address	well	
Stream Characteristics:		
Temperature	Flow	рН
Visual Observations/Comments		pn
Collector's Name	Date/Time Sa	mpled 300 2/9/84
Amount of Sample Collected		
Sample Description	groundwater	<u> </u>
Store at: 🗆 Ambient 🍕 5°C 🗀 -	· 10°C 🔲 Other	
Caution · No more sample available	□ Return unused portion of sa	mple C Discard unused portions
Other instructions · Special Handling	·· · · · · · · · · · · · · · · · · · ·	1.04 //.05
Other Instructions - Special Handling	- Hazards	621/625
	<del></del>	<del></del>
	1/	
☐ Hazardous sample (see below)	Non-t	nazardous sample
□ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
□ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
□ Acidic	☐ Biological	☐ Carcinogenic - suspect
□ Caustic	☐ Peroxide	□ Radioactive
☐ Other		
Sample Allocation/Chaig of Possessi	00'	
Organization Name <u>KARUM</u>		Ces
Received By AM MMAY		ived A-10-84 Time 10:00
Transported By Hed Sy	Lab Sample No	
Comments	)	
Inclusive Dates of Possession		
Organization Name		
		ived Time
_		
	•	
Organization Name		
•		ived Time
	•	

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		Field Sample No. 15-02
Company Sampled / Address	TINKER AFB	212-027-04
Sample Point Description	_ Well	
Stream Characteristics:		
	Flow	pH
Visual Observations/Comments	<del></del>	
Collector's Name KAF	Date/Time Ser	mpled 2/7/84 1000
Amount of Sample Collected 2	quarts 6 VOA	2 TOC
Sample Description 9YOU	Wowater	
Store at: ☐ Ambient ☐ 5°C ☐	-10°C 🗆 Other	
Caution - No more cample evallab	le.   Return unused portion of ea	mple   Discord unused portions
Caution - No more sample availab Other Instructions - Special Handling	ie is neturn unused portion of sai	imple di Discard unused portions
Other Instructions - Special Handling	j · Hazarda <u>NO10</u>	27 \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
☐ Hazardous sample (see below)	Non-h	azardous sample
☐ Toxic	☐ Sķin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	□ Radioactive
Other		
Sample Allocation/Chain of Possess	tion:	-
Organization Name RALIA	ntimalistical ceru	TLEN
Received By	Data Recei	lved <u>2-10-34</u> Time 10:∞
Transported By (Flu W)	Lab Sample No. $\underline{\mathscr{G}}$	402063-04 and -05
Comments	<u> </u>	
Inclusive Dates of Possession		<del></del>
_		
·		ived Time
•	•	
Comments		
		ved Time
	•	
Inclusive Dates of Possession		



		Field Sample No. 15-016
Company Sampled/Address	INKER AFB	212-027-04
Sample Point Description	Well	·
Stream Characteristics:		
Temperature	Flow	pH
Visual Observations/Comments		
Collector's Name KAT	Date/Time Same	pled 2/7/84 900
Amount of Sample Collected 1 au	art. 3 VOA.	toc
Sample Description		
Store at: ☐ Ambient ► 5°C ☐ -	10°C	
Coulter Names and available		
Caution - No more sample available	Heturn unused portion of samp	DISCARD UNUSED PORTIONS
Other Instructions - Special Handling -	Hazards <u>HOLD</u>	624/625
☐ Hazardous sample (see below)	Non-haz	ardous sample
	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
□ Other		
Sample Allocation/Chaig of Rossessio	on: 1 A-c 1 A	
Organization Name RACUAM	analytical Services	<u>)</u>
Received By WWW WAY	Date Receive	d 2-10-84 Time 10:00
Transported By 700 W	Date Receive Lab Sample No	102063-06
Comments	·	
Inclusive Dates of Possession		
Organization Name		
Received By	Date Receive	od Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Receive	d Time
Transported By		
Comments		
Inclusive Dates of Possession		



	-	Field Sample No. 15-027
Company Sampled / Address	well AFB	212-027-04
Stream Characteristics: Temperature Visual Observations/Comments		
Collector's Name	WP Water	
Caution · No more sample available Other Instructions · Special Handling ·	Hazards HOLD	ie Discard unused portions 624/625
☐ Hazardous sample (see below)	Non-haza	ardous sample
□ Toxic □ Pyrophoric □ Acidic □ Caustic □ Other	☐ Skin irritant ☐ Lachrymator ☐ Biological ☐ Peroxide	☐ Fiammable (FP< 40°C) ☐ Shock sensitive ☐ Carcinogenic - suspect ☐ Radioactive
Sample Allocation/Chain of Possessic Organization Name	malistica Gerries	1 2-10-34 Time 10:00 02063-07
Organization Name  Received By  Transported By  Comments  Inclusive Dates of Possession	Date Received	d Time
Organization Name Received By Comments	Date Received	1 Time
Inclusive Dates of Possession		



	<b>-</b> ',	Field Sample No.
Company Sampled / Address	Tinker AFR	212-027-04
Sample Point Description	A A 11 //	
·		
Stream Characteristics: Temperature	Flow	au .
Visual Observations/Comments		
Collector's Name  Amount of Sample Collected 7	EBB Date/Time Sam	npled 2/13 100;2/14
Amount of Sample Collected	rars. +4 VOAS	
Sample Description Crucu	NG BIOSCI	
Store at: ☐ Ambient ☐ 5°C ☐ -	10°C 🗆 Other	
Caution - No more sample available	☐ Return unused portion of sen	noie   Discard unused portions
Other Instructions - Special Handling -	HALD.	LIS & VOAS
Other instructions - Special Handling -	nazards	701(3
	17	
☐ Hazardous sample (see below)	Non-ha	zardous sample
☐ Toxic	Sķin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Sadioactive
□ Other		<del></del>
Sample Allocation/Chain of Bossessia	a.	
Sample Allocation/Chain of Possession Organization Name Padam Williams	lutical Generices	
Received By Aut Many	Date Receiv	red 2-15-84 Time 9:30
Transported By Fld Sv.	Lab Sample No. 3	
Comments		
Inclusive Dates of Possession		
Organization Name		
Received By	Date Receiv	ved Time
Transported By	Lab Sample No	
Comments		
inclusive Dates of Possession		
Organization Name		
Received By	Date Receiv	/ed Time
Transported By	Lab Sample No	
Comments		
Inclusive Dates of Possession		



#### **CHAIN OF CUSTODY RECORD** Field Sample No. Company Sampled Address Tinker AFB 212-027-04 Sample Point Description \_\_\_\_\_ Stream Characteristics: \_\_\_\_\_\_ Flow \_\_\_\_\_\_ pH \_\_\_\_\_\_ Temperature \_\_\_\_\_ Visual Observations/Comments \_\_\_ Date/Time\_Sampled 2/13 2/ Collector's Name \_\_\_\_ Amount of Sample Collected \_\_\_\_ Sample Description \_\_\_ Store at: ☐ Ambient ★5°C ☐ -10°C ☑ Caution - No more sample available 🔲 Return unused portion of sample 🗀 Discard unused portions Other Instructions - Special Handling - Hazards Non-hazardous sample ☐ Hazardous sample (see below) ☐ Skin irritant ☐ Flammable (FP< 40°C) ☐ Toxic ☐ Shock sensitive ☐ Pyrophoric ☐ Lachrymator ☐ Carcinogenic - suspect ☐ Biological ☐ Acidic ☐ Radioactive ☐ Peroxide ☐ Caustic ☐ Other \_ Sample Allocation/Chain of Possession: Organization Name PARIAN AMUNICAL Grucus Date Received 2-15 84 Time 9.30 Received By Saw Timasus Transported By 714 W () Lab Sample No. 8402102-02 Comments Inclusive Dates of Possession \_\_\_\_\_ Organization Name \_\_\_\_\_ Received By \_\_\_\_\_\_ Date Received \_\_\_\_\_ Time \_\_\_\_\_ Transported By \_\_\_\_\_\_ Lab Sample No. \_\_\_\_\_ Comments

Received By \_\_\_\_\_\_ Date Received \_\_\_\_\_ Time \_\_\_\_\_

Transported By \_\_\_\_\_\_ Lab Sample No. \_\_\_\_\_

Inclusive Dates of Possession \_\_\_\_\_\_

Organization Name \_\_\_\_\_

Inclusive Dates of Possession \_\_\_\_

Comments \_\_\_\_



	CHAIN OF CUSTODY RECORD	1 0
	`	ald Complete
		eld Sample No.
Company Sampled / Address	inker AFB 212	2-027 -04
Sample Point Description	annual a well	
Stream Characteristics:		
	· Elem	<b>~</b> !!
	Flow	
Visite Observations/Comments	<del></del>	
Collector's Name	Date/Time Sampled	2/14/84 900
Amount of Sample Collected 7 10	ars	
Sample Description	pound H20	
Store at: Ambient 5°C -	10°C 🗆 Other	
,		
Caution - No more sample available	☐ Return unused portion of sample ☐	Discard unused portions
Other Instructions - Special Handling -		0 625
	-1/	
☐ Hazardous sample (see below)	Non-hazardo	us sample
☐ Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	□ Lachrymator	☐ Shock sensitive
☐ Acidic	☐ Biological	☐ Carcinogenic - suspect
□ Caustic	□ Peroxide	□ Radioactive
□ Other		
		•
Sample Allocation/Chain of Possession Organization Name RAMAN CWA	Mitigal Car Frag	
Organization Name KAWAN WWA	axual govillo	16 (11)
Received By All Temaster	Date Received 2	-15.84 Time 9:30
Transported By 314 W	Lab Sample No. 840	
Inclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
Transported By	Lab Sample No	
Inclusive Dates of Possession		
Organization Name		
·- · · ·	Date Received	Time
•	Lab Sample No	
•		



**Stream Characteristics:** 

A Hazardous sample (see below)

Temperature \_\_\_\_

## **CHAIN OF CUSTODY RECORD** 76-001 Field Sample No. 6hm - 022 Company Sampled/Address Tinker AFB OK, Zone 6, 212-027-04 Sample Point Description \_\_\_\_\_\_\_\_ Visual Observations/Comments\_ Collector's Name W.M. Little . Date/Time Sampled 5 6 Amount of Sample Collected 20 VOA vials, 4 try blanks 1-11+ 7 lass Sample Description time series samples Store at: ☐ Ambient ♣ 5°C ☐ -10°C ☐ Other \_ ☑ Caution · No more sample available ☐ Return unused portion of sample ☐ Discard unused portions Other Instructions: Special Handling · Hazards VOAs For 601 (TCE + tetrachloric thylen) annot for Modified 625 (A/N)-

☐ Non-hazardous sample

□ Acidic □ Biological □ Carcinogenic □ Caustic □ Peroxide □ Radioactive □ Other □ Sample Allocation/Chain of Possession: □ Organization Name □ Attitus □ Lab Sample No. □ Stc 3C+3 □ Time □ Transported By □ □ Lab Sample No. □ Date Received □ Time □ Transported By □ □ Date Received □ Time □ Transported By □ Date Received □ Time □ Transported By □ Lab Sample No. □ Comments □ Inclusive Dates of Possession □ Organization Name □ Lab Sample No. □ Comments □ Inclusive Dates of Possession □ Organization Name □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Transported By □ Transported	- 5	Flammable (FP<		☐ Skin irritant☐ Lachrymator	☑ Toxic □ Pyrophoric
□ Caustic □ Peroxide □ Radioactive □ Other □ Other □ Other □ Other □ Sample Allocation/Chain of Possession: □ Organization Name □ Attitus □ Lab Sample No. □ S+C→S+□ Time □ Transported By □ Lab Sample No. □ S+C→S+□ Time □ Organization Name □ Lab Sample No. □ □ Comments □ Inclusive Dates of Possession □ □ Lab Sample No. □ □ Organization Name □ Lab Sample No. □ □ Organization Name □ Date Received □ Time □ Organization Name □ □ Date Received □ Time □ Transported By □ □ Date Received □ Time □ Transported By □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Transported By □ Lab Sample No. □ □ Date Received □ Time □ Date Received □ Date Rec	1			<del>-</del>	· ·
Sample Allocation/Chain of Possession:  Organization Name		-		_	
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Transported By 111 90 Lab Sample No. 8403042  Comments inclusive Dates of Possession  Organization Name	2	Time 10 Ci	ed 3-4-84	2 C) Boto Bookwad	Booking By Will Till My
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Comments				•	•
Inclusive Dates of Possession					
		<u> </u>			



		ield Sample No. 1915 - 8
Company Sampled / Address	125 4FB	<del></del>
Sample Point Description	· <u>8</u>	
Stream Characteristics:		<i>y</i> .
Temperature <u>17° C</u>	Flow	pH <i>_</i>
Visual Observations/Comments <u>Cf</u>	ar no profer or visi	Dle is dence of
contamination	Plow Plow Plow Plow Plow PRAY OF VISC.	
Collector's Name DL. Mich	nan Date/Time Sampled	3/36/34 10:45
Amount of Sample Collected $\underline{\hspace{1cm} 7}$	amples water	
Sample Description <u>Grand-</u>	water	
Store at: □ Ambient 🗹 5°C 🗆 🗕	10°C 🗆 Other	
<del>-</del>		7.01
	☐ Return unused portion of sample ☐	
Other Instructions - Special Handling -	Hazards	
□ Hazardous sample (see below)	☐ Non-hazardo	eus sample
_] Toxic	☐ Skin irritant	☐ Flammable (FP< 40°C)
☐ Pyrophoric	☐ Lachrymator	□ Shock sensitive
∟i Acidic	☐ Biological	Carcinogenic - suspect
☐ Caustic	☐ Peroxide	☐ Radioactive
☐ Other		
Sample Allocation/Chain of Possessio	n; —	
Organization Name <u>Clitifi VIII</u>	ilixulal Scruces	
Received By Alli MIN MIN	Date Received 3	37 34 Time <u>3 30 </u>
Transported By - DLK	Lab Sample No	3179
Comments	·	
nclusive Dates of Possession		
Organization Name		
Received By	Date Received	Time
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Organization Name		
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Comments		
Inclusive Dates of Possession		



#### APPENDIX H

#### Analytical Data

All samples for chemical analysis were submitted to Radian Analytical Services' laboratory in Austin. The samples were logged in, and the data reported out, in "batches". The following pages contain the analytical data reports for the various batches of samples. Table H-1 is a key for assigning the samples to the proper batch. Table H-2 is a cross-reference between zones and corresponding laboratory sample batches.

Also included in this Appendix are data submitted by the Oklahoma State Department of Health.

#### TABLE H-1. LABORATORY BATCH BREAKOUT KEY

- Lab #84-01-171. November 30, 1983
  Zone 3 soils
- Lab #84-01-172. January 30. 1984
  PVC casing for extraction
- Lab #84-02-061, February 10, 1984 T5-001, T5-002, T5-004, T5-005, T5-009, T5-011, T5-013, T5-014
- <u>Lab #84-02-062</u>, <u>February 10, 1984</u> T5-015, T5-015dup, T5-016, T5-018, T5-019, T5-020, T5-020dup, T5-021
- <u>Lab #84-02-063</u>, <u>February 10, 1984</u> T5-022, T5-023, T5-024, T5-025dup, T5-026, T5-027
- Lab #84-02-087, February 14, 1984
  Zone 4 soils
- Lab #84-02-102. February 15, 1984 1A, 1B, 1C
- <u>Lab #84-02-103. February 15. 1984</u> 4A
- Lab #84-02-107, February 16, 1984 2A
- Lab #84-02-108, February 16, 1984 3E, 3F, 3G
- Lab #84-02-109, February 16, 1984 4G
- Lab #84-02-140. February 20, 1984 Existing wells 1-6

- Lab #84-02-141, February 20, 1984 Existing Well 7, Landfill 4 leachate, pond
- <u>Lab #84-02-142</u>, February 20, 1984 2B
- Lab #84-02-143, February 20, 1984
- Lab #84-02-144, February 20, 1984 4G, same split as 84-02-109
- Lab #84-02-145. February 20. 1984 T5-018, T5-019, trip blank
- Lab #84-02-162, February 23, 1984 3C(A) soil for mod 625
- <u>Lab #84-02-163. February 23. 1984</u> T5-005, T5-014, T5-016, T5-018, T5-019 (resubmission for mod 625)
- Lab #84-02-209. February 28, 1984 4E.3 soil for mod 625
- Lab #84-03-042, March 8, 1984 T6-001 to T6-021, trip blank
- <u>Lab</u> #84-03-130, March 20, 1984 Existing Well 2, 4 (mod 625)
- <u>Lab #84-03-179. March 27. 1984</u> Existing Well 8

TABLE H-2. CROSS REFERENCE

Phase II (Stage 1) Wells	Lab #84-
Zone 1A	02-102
В	02-102
C	02-102
	V
Zone 2A	02-107
В	02-142
Zone 3E	02-108
F	02-108
G	02-143
Zone 4A	02-103
G	02-109, 144
Zone 5 001 (Base Wells)	02-061
002	02-061
004	02-061
005	02-061, 163
009	02-061
011	02-061
013	02-061
014	02-061, 163
015, dup	02-062
016	02-062, 163
018	02-062, 163, 145
019	02-062, 163, 145
020, dup	02-062
021	02-062
022	02-063
023	02-063
024	02-063
025, dup	02-063
026	02-063
0 27	02-063
Existing Wells	00.1/0
1	02-140
2 3	02-140, 03-130
	02-140
4	02-140, 03-130
5	02-140
6	02-140
7 8	02-141
O	03-179

(Continued)

TABLE H-2. (Continued)

Landfill 4 leachate	02-141	
Pond	02-141	
Zone 3 (soils)	01-171	
Zone 4 (soils)	02-087	
Zone 3 (625 soil)	02-162	
Zone 4 (625 soil)	02-209	
PVC Casing	01-17 2	
Zone 6	03-042	



23d ...

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Analytical Serv

Serv REPORT 07/23/84 09:14:42

LAB # 84-01-171

PREPARED <u>Radian Analutical Services</u> BY <u>8501 MoPac Blvd.</u>

Austin, Texas 78766 (512) 454-4797 Box 9948 0 PHONE ATTEN

SAMPLES 10

ATTEN William Little

Austin

REPORT Radian

Tinker AFB

COMPANY FACILITY CL IENT

TINKER

CONTACT CONDVER

WORK ID soil samples zone 3 212-027-04-05 2658 hand TRANS TAKEN P. D. Analytical Serv TEST CODES and NAMES used on this report CD E

SAMPLE IDENTIFICATION

3Aa (alt)

3Ab 386 384 3Be 30

10888888888 1088888888

쉾 SF B

ICPES Total Cuanide opper, ICPES Chromium,

Infrared Mercury, Cold Vapor Nickel, ICPES and Grease, low leve ONG IR PB GA HG CA

Special Digestion Method Special Digestion Method Total Phenolics PREP W PHEN A

rox Single Analysis Zinc, ICPES TOX 1

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Analytical Serv REPORT RESULTS BY TEST

LAB # 84-01-171

TEST CODE   default units	Sample 01	Sample 02	Sample 03	Sample 04 (entered units)	Sample 05 (entered units)
CD E	ლ ლ	O Ci	0.49	0.25	0. 20
ng/m1	6/60	6/5n	6/60	5/6n	6/6n
CNTOTA	CN	<b>~</b> ↓	cu V	ر نرچ	نر
39/L	6/60	6/65 6/7	9/60 <b>4</b>	6 CC	6/67 6
. ug/m1	6/6n	5/5n	6/60	5/6n	6/6n
. CU_E		चर्मा वर्षा		5.6	5.6
HG CA	6/60 <b>4</b>	2 4 2 7	ug/g	9/80 8/8	6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6, 6
	6/65 6/65	5/6n	6/6n	6/6n £	6/6n 5
	6/6n	6/5n	5 / 5 / 5 / 5 / 5 / 5 / 5 / 5 / 5 / 5 /	6/60 4:-	5/53
ONG IR	5000	2000	2200	200	1200
	9 9 9 9 9	ر و ال	2 2 2 5	6 6 6 6	6/6n 1
Cg/al	6/6n	6/60	6/60 6/3	6/60 50 >	6/6n
	5/65	6/67	5/57	5/6n	6/63
PREP_W	02/02/84	02/02/84	02/08/84	02/08/84	02/08/84
PACP X	02/02/84	02/02/84	02/02/84	02/02/84	02/02/84
100 complete	0.11	0.32	0.02	0.05	0.05
1 TOX 1	, D	12 %	X V	,   	Ţ
: mg/L : 7N E	6/6n :	6/6n	6/6n	6/6n	6/6n
1 4 L L L L L L L L L L L L L L L L L L	7.5	0, C 6/60	9 (8) 0 (8)	6, 5n	0/6n

## Analytical Serv REPORT RESULTS BY TEST

LAB # 84-01-171

CDE         (15         23         1.2         0.24         (020)           US/ALL         (22<	TEST CODE	Sample 06	Sample 07 (entered units)	Sample 08 (entered units)	Sample 09	Sample 10 (entered units)
(2)       (2)       (2)         (2)       (2)       (2)         (2)       (2)       (2)         (2)       (2)       (2)         (3)       (2)       (2)         (4)       (2)       (2)         (5)       (2)       (2)         (6)       (2)       (2)         (6)       (2)       (2)         (6)       (2)       (2)         (7)       (2)       (2)         (8)       (2)       (2)         (1)       (2)       (2)         (2)       (2)       (2)         (2)       (2)       (2)         (1)       (2)       (2)         (2)       (3)       (2)         (3)       (2)       (3)         (4)       (2)       (3)         (3)       (3)       (3)         (4)       (3)       (3)         (4)       (3)       (3)         (6)       (3)       (3)         (6)       (3)       (3)         (6)       (3)       (3)         (6)       (3)       (4)         (6)       (6)       (	CD E	< 15	23	1.2	0.24	<.020
4.0 750 5.7 15 15 15 15 15 15 15 15 15 15 15 15 15	; ug√ml ! CNTOTA	5/53 	6/50 C >	5/5n	6/6n	6/6n
4.0 750 5.7 15  130 133 5.1  5.7 130  133 5.1  130 133  5.1 130  133 5.1  130 133  5.1 130  130 133  5.1 130  130 133  5.1 130  130 133  5.1 130  130 130  130 130  130 130  130 130  140 111  111 7,11  111 7,11  121 7	: mg/L	6/6n	6/6n	6/6n	6/6n	6/60
5.7 130 133 5.11  5.7 130 133 5.11  4.0 3.5 3.5 3.8  6.0 40 11 7.11  1.9 40 1100  500 6000 1000 1500  1.9 41 3.3 9.2  4.05 6.05 6.05 6.05  6.05 6.05 6.05  6.05 6.05 6.05  6.05 6.05 6.05  6.05 6.05 6.05  6.05 6	- CR_E	4.0	750	5.7	15	0 4
4.0 4.0 3.5 3.5 3.5 3.5 3.6 4.0 6.0 40 40 11 7.1 11 7.1 19 41 3.3 41 3.3 41 1.9 41 3.3 41 41 41 41 41 41 41 41 41 41 41 41 41	: ug/m] : CU E	6/6n	130	5/50 E	6/60 E. E.	9 Cg 6 CD
4.0 4.0 3.2 3.3 4.0 6.0 40 111 7.11 7.11 8.2 6.00 6000 1000 1000 1500 1500 1500 1500 15	[m/67]	5/50	5/65 6/65	5/50	6/6n (	5/5n
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1.9° 41 3.3 9, 29°9 41 3.3 9, 29°9 41 6.05 6.05 6.05 6.05 6.05 6.05 6.05 6.05	- ONG_IR	200		1000	1200	1000
C. 05       C. 06       C. 06 <td< th=""><th>- mg/L - PB GA</th><th>6/60</th><th></th><th>9 C)</th><th>و/وي رح (م</th><th>6/6n</th></td<>	- mg/L - PB GA	6/60		9 C)	و/وي رح (م	6/6n
(.05       (.05	. ug/m1	6/60		5/5n	6/6n	5/5n
02/08/84 02/08/84 02/08/84 02/08/84 02/08/84 02/02/84 02/	: PHEN_A	: ° 02		<.05 <.05	<.05	<. 05
02/02/84 02/02/84 02/02/84 02/02/84 02/02/84 0.03 0.19 2 0.03 0.19 2 2 0.03 2 0.19 2 2 0.979 2 0.979 2 0.979 2 0.979 2 0.979 2 0.979 2 0.979	mg/L PREP W	02/08/84		02/08/84	02/08/84	02/08/84
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0.04 0.52 0.03 0.19 0. 6 1	PREP X	02/02/84		02/02/84	02/02/84	02/02/84
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ნ/ნი ნ/ნი ნ/ნი ნ/ნი ;	ZNE	cu coi	200	7.6	16	,
	l ug/ml	6/60 ;	5/50	5/5n	5/60	6/6n

CORPORATION	:	C	
PAGE 1 RECEIVED: 01/30/84	Analytical	Serv REPURI 03/20/84 12:15:36	LAB # 84-01-1/2
REPORT Radian TO B1. 4 Austin		PREPARED <u>Radian Analytical Services</u> BY 8501 MoPac Blvd. P. O. Box 9948	
ATTEN William Little	ittle	ATTEN AS4-4797	CONTACT CONDUER
CLIENT TINKER COMPANY Tinker AFB FACILITY	SAMPLES 1		
WORK ID PVC pipe			
TRANS hand			
P.O. # 212-027-04-05 INVOICE under separate	04-05 parate cover		
SAMPLE IDENTIFICATION	CATION	Analytical Serv TEST CODES and NAMES used on ANFS Method 625 Acid/Neutrals	f on this report

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Analytical Serv REPORT Results by Sample

LAB # 84-01-172

trals	BY CKT ED 1	EPA	2	S	2	S	S	2	2	S	2	Ž	S	S	QN .	2	S	QN
Acid/Neutr Dry EXTRACT	VERIFIED BY DS DETECTED		racene A	benzo(a)pyrene	nthene *	nthene *	chrysene A	acenaphthylene	acene B	perylene	fluorene	hrene B	thracene	2, 3-cd)pyrene	pyrene	rophenol	m-cresol	2-chlorophenol
NAME Method 625 Acid/Neutrals d Category EXTRACT	VE COMPOUNDS		benzo(a)anthracene	benzo(	3,4-benzofluoranthene	benzo(k)fluoranthene	chr	acenap	anthracene	benzo(ghi)perylene	r	phenanthrene	dibenzo(a, h)anthracen	(1, 2, 3-c		2, 4, 6-trichloropheno	p-chloro-m	2-chlor
NAME Me	MSF		ben		3, 4-ber	benzo (				Ģ			diben	indeno(1,		2, 4, 6		
ODE ANFS Not specified	ANALYST	Z	72B	738	74B	758	768	778	788	798	808	818	828	838	848	21A	22A	24A
TON O1B TEST CODE & Time Collected not	AINST	NPDES SCAN	<b>SB</b>	<b>89</b>	78	98	188	2B	38	88	328	44B	19B	37B	45B	114	8 A	4
O1B me Co	03/07/84 03/16/84		일	 일	일	 덩	 9	 일	 2	 일	의	위	 일	 덹	 일	 임	9	Q
SI	83/8	RESULT																
FRACTION O1B Date & Time C		RES	aphthene	obenzene	obenzene	roethane	ther	hthalene	obenzene	zene	zene	ydrazine	ranthene	yl ether	ether	ther	hane	utadiene
FRACTION Date & Ti	DATE EXTRACTED 03/ DATE INJECTED 03/		acenaphthene			hexachloroethane	ther	:hloronaphthalene		zene	zene		fluoranthene	phenyl e	phenyl ether	ther	hane	
FRACT	DATE EXTRACTED DATE INJECTED	COMPOUND	acenaphthene	1, 2, 4-trichlorobenzene	hexachlorobenzene	hexachloroethane		2-chloronaphthalene	1,2-dichlorobenzene			1,2-diphenylhydrazine	fluoranthene	phenyl e	phenyl ether	ther	hane	hexachlorobutadiene
FRACT	A17201AN DATE EXTRACTED 980 DATE INJECTED	EPA COMPOUND	1B acenaphthene			12B hexachloroethane	ther	20B 2-chloronaphthalene		zene	zene		39B fluoranthene	ø	ether			
SAMPLE ID PVC well casing FRACTION Date & Ti	DATE EXTRACTED DATE INJECTED	COMPOUND	acenapht	1,2,4-trichloroben	hexachloroben	hexachloroet	bis(2-chloroethyl)ether	2-chloronaphtha	1,2-dichloroben	1, 3-dichlorobenzene	1, 4-dichlorobenzene	1,2-diphenylhydra	fluorant	4-chlorophenyl phenyl e	4-bromophenyl phenyl ether	bis(2-chloroisopropyl)ether	bis(2-chloroethoxy)methane	hexachlorobutad

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		CORPORATION				
PAGE 3 RECEIVED:	PAGE 3 RECEIVED: 01/30/84	Analytical	Serv Results by Sample	REPORT Samp le		LAB # 84-01-172 Continued From Above
SAMPLE ID	SAMPLE ID PVC well casing		DN O1B	FRACTION OIB TEST CODE ANFS N	ANES NAME	NAME Method 625 Acid/Neutrals
358	538	wave w hexachlorocyclopentadiene	TOO DIET	2A 1104	31A	2, 4-dichlorophenol ND
388 372	2 54B	isophorone	3.7	A.	34A	2, 4-dimethylphenol ND
398	558	naphthalene	Q	<b>6A</b>	57A	2-nitrophenol ND
13B	999 p	bis(2-ethylhexyl)phthalate	QV	7.4	SBA	4-nitrophenol ND
15B	878	butyl benzyl phthalate	Q	5A	59A	2, 4-dinitrophenol ND
268	889	di-n-butyl phthalate	QN	44	40A 4	4, 6-dinitro-o-cresol ND
29B	869	di-n-octyl phthalate	S.	9A	64A	pentachlorophenol ND
24B	708	diethyl phthalate	QN	104	65A	phenol
25B	718	dimethyl phthalate	Q			

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in uq/1

ND = not detected at EPA detection limits

=3.4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benza(a)anthracene and chrysene co-elute.

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Analytical Serv REPORT Results by Sample

LAB # 84-01-172 Continued From Above

SAMPLE ID PVC well casing

FRACTION O1B TEST CODE ANFS NA Date & Time Collected not specified

NAME Method 625 Acid/Neutrals ed Category EXTRACT

B = anthracene and phenanthrene co-elute.

PAGE 5 RECEIVED: 01/30/84

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FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

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Sample 02 Sample 03	₽.	Sample 07 Sample 02 (entered unit	U
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	ce & lime Collected not specified Category	VOT NOT NOTE COMPOUNDS DESTRECTED BY AND	COMPOUND GNUOD GNU	Trichloroeth-ne RD	Dibromochloromethane 135	1, 1, 2-frichloraetaane Mg	cis-1,3-Dichluropropene R	2-Chloroethylvingl Ether 340	Bromeroes (4)	1, 1, 2, 2-Tetrachiorogiasna Mi	Tetrachlaroethy/ene 1988	Chlaraben, and 115	1.3-Dicklorabackers [1.4]	1. 2. Bichlarobantene Be
REPORT Sample	TEST CUDE Lected not	ANALYST	SCAN		2	· can do a de a de car.	and the control designation of the Control of the C	Section	to commence of the second	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	and have believed to	a com - Ar de Ara	* * * * * * * * * * * * * * * * * * *	
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FRACTION OTB TEST CUDE OF BOTTER EPA Method SOL OF BALLS I Take Collected not specified

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not detected it and detection that method 601, (Federal Register, 12/3/79)

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	) BLVu — A	. B. PC (EB) <u>G2 (1<b>2</b>/<b>24</b>)</u>	1127億4	AMALYET INSTRUMENT	CONTRACTOR ALBERTA	
·		3	RESULT	SCAN	COMPOURTS	RESULT
	Salar	Chlorene Grane	QN		Trichloruschene	Ž.
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PRACTICAL COMPETER CONF. OF MAME FPA Method 501 30 Pare & Time Collected not specified

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not detected at new detection limit method 601, (Federal Kegister, 12/3/77)

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HERINI CAN BANDLE	SEACH LON 04B FEST CUDE GO EXT NAME EFA Method aCT CO.	219784 ANALYST MOL VERTFIED BY COMPOUNDS DUTECTED	RESULT SCAN COMPOUND REFORM	ND   Trichloraethene   Mg	ND   Dibromochloromethane   147	NO 1 1.2-Trichloroethane HE	NE   cis-1, 3-Dichloropropend Mi	MD   S-Chloroethylvingl Char	ND   Bromationa	ND   1.1.2.2-Tetrachloroetness	MD   Tetrachloroethylene	1.7   Chlorobenzene	MO 1 Dichlorobenzene	100 l L. S. Wichlorobenzene	III 1 4 Dichlorabene		
		6818180 (3118284)	(38) (38(C)) (38(C))	- ras dame to too	Bromonethane	Vingl Galarida	Calorosthans	Methylane Chlorida	Treforationsmethers.	- indichloroethane	no vero en la constituiro en l	anaugeological ( ) - () - () - () - () - () - () - ()		1000年,1000年	The standard of the standard o		

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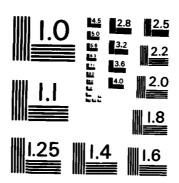
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For any activities and as and agreement and method 50% (Federal Registor, 12/3/79).

INSTALLATION RESTORATION PROGRAM PHASE II
CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN
TX DA SANDERS ET AL. SEP 85
RAD-DCN-84-212-927-94-92-VOL-2
F/G 13/2 3/6 AD-A168 894 UNCLASSIFIED NL



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<u>.</u> 	HOUSE CONTRACTOR CONTRACTOR NOT	Hested not spe	Specified Category	
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	(This is the second of the sec	SCAN	COMPOUND GREALL	
	GRATING A STATE OF THE STATE OF		Trichloroethene	11
	STeremothane Mi	***************************************	Uibromochloromethane	7
	ON Perferrence	1	(, 1,2-Trichlaroethane	
	Grantenant Cristian	ame and the last	cis-1,3-Dichloropropene	딀
T	GD TO PROPERTY WORLD COME		2-chioroathylvinyl Ethor	2
2 · · · · · · · · · · · · · · · · · · ·	ON The section of the contract	water to the second	Sramotorm	3
	(in the second access and a	**************************************	1.1.2.2-Tetrachloroeth:neH	2
	The Proposition of the National Williams	: :	Tatrachloroethylane	=
**************************************	· · · · · · · · · · · · · · · · · · ·	# !	Chlarobenzene	2
		i	1. S-Pichlorobanzene	2
		:	Elektrobensene	7
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CAN FICH (5B TEST CODE GC 501 NAME EPA Method 601/9C Category

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KEPUN	of Sample

146 # 84-02-051

A Method 601769 Category	VERIFIE COMPOUNDS DETE
Fire ion oob TEST CODE GC 601 NAME FFA Method 601769	ANAL N ST NGL INSTRUMENT
FERTION OOF LOIN	23 ff 12 a catabres 92219784

1, 4-DichlorobenieneND	•	977	Lorente Brook made	
1, 2-Dichlorobeni-ne		Z	est and high properties	
1,3-Dichlorobenzene ND		QZ .	Shiototorm	
Chlorobenzene NE		- QN	one Wichlersethere	1
Tetrachloroethylene ND		GFT .	1, 1 Distributoround	
1, 1, 2, 2-Tetrachloroethane NB	•	GIZ.	i. rescoloresthens	;
Bramaform ND		92	Trich Lorofleoramethana	4.
2-Chloroethylvinyl Ether [4]		QN	Metaylene Chloriae	ì
cis-1,3-Dichloropropene [48]		gN.	Chloroethane	i ,
1, 1, 2- Trichloroethane [N]		an	Vingl Chloride	
Dibromochlovomethane NE		1415	Brandmethane	<b>1</b>
Trichloroethene Mg		QN	Chlaronethana	
COMPOUND	SCAN	FESULT	driftig-tiges	No.
VE NGC VERTHED BY 196	ANALYST INSTRUMENT	CHD 92/19/84		

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LAB # B4-02-04; Centinged From Adove

note that the collected not specified category

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	No Editor of Controls	REPURT Sample	190-20-48 4 561
	00 BUL 4 BUT	TEST CODE 90 601	PACIFICA C/B TEST CODE OF EOI NAME EPA Method 601/GC Dise to Time Collected not specified Category
	DAGE IMAGNER 02/19/84	ANALYST INSTRUMENT	VERIFIED BY JSG COMPOUNDS DETECTED COMPOUNDS
#1 g	THISTER	SCAN	COMPOUND
	Calaromethane	Annual to the contract of	frichloroethene <u>ND</u>
÷	bromomethane ND		Dibromochloromethane HD
	Singl Chloride MD		1,1,2-frichloraethane NE
	On the thanks	C. The state of th	cis-1,3-Dichloropropene MD
	Marchiere Chlorite Harry		2-Chloroethylvinyl Ether MB
	(vichisseriogramethane		Bramoform (40
	la Cichlerastione ND		1,1,2,2-Tetrachloroethane NU
	1. Case harmana NE		TetrachloroethyleneMC
	transki i Grabteroethene - MD 1	**	Chloroben ene MD
	Sheararan ND 1	The second of th	1) 3-Bichlerobeacene
	ON surrepresentation of the		i Z-Bichloroben vine i SB
		; ; ;	1.4-Dishioroben.che
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HERITAL DELY REPUBLISHED Sample

LAB # 84-02-val Continued From Above

FRACTION 07B FEST CODE SC 601 NAME EPA Method 601/60

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the a publication of GPA detection limit method 601, (Federal Register, 12/3/79)

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190-20-58 # 381

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	1109 986 MUTH 4 986 COLI	TEST COOK Gy of ected not spec	FERTIUM ONB TEST CODE GO OUT NAME EPA Method 601/60
	48781.28 1 450 0 1 FO 1 92.19284	AMELLST PRSTRUMENT	0 BY 25
	d Tables	<b>ਘ</b> ಳ ३%	COMPOUND RESULT
	To the state of th	~)	Trichloroethene 0.7
	Franchistane MD	• : • : • : • : • : • : • : • : • : • :	Bibromoch Loromethane
	I GM — apriology fibut		1, 1, 2-TrichloroethaneND
	Cal Properhane NO 1		cis-1, 3-Dichloropropene
	i <u>Gu</u> and and and the sale	**************************************	S-Chloroethylvinyl Ether ND
:	ON and the office one that he are		Bromoform NB
:	GM - anadraconthat a s	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	1, 1, 2, 2-Tetrachloroethane ND
	I (IN enema-classification )	ui i	Tetrachloroethylene 03
	A SM Section of the Small section of the section of		Chlorobenzene MD
			1, 3-Dichlorobencene http://doi.org
	1 014 The Hade Area of Charles Transfer of the Charles	\ : :	M. 2. Dichturobenzene
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(34) (34) (37) (37) (47) (47) (47) (47) (47)

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LAU # 84-02-061 Continued From Above

nacijum veb 1651 cube oc adi name EPA Method 601/60 Nate & inme collected not specified Category

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PAGE 1 RECEIVED: 02/10/84

LAB # 84-02-062

Analytical Serv REPORT 02/22/84 09:41:34

PREPARED Radian Analytical Services Austin, Texas 78766 8501 MoPac Blvd Box 9948

CERTIFIED BY

ATTEN

ATTEN William Little

REPORT Radian TO B1. 4

Austin

Tinker AFB

TINKER

CLIENT

COMPANY

FACILITY

SAMPLES

CONTACT CONOVER

(512) 454-4797 PHONE

1, 1, 2, 2-tetrachloromethane and tetrachloroethulene

coelute

WORK ID zone 5 groundwater Fed Ex TRANS TAKEN

212-027-04-05 TYPE

INVOICE under separate cover

Analytical Serv TEST CODES and NAMES used on this report occor EPA Method 601/GC Total Organic Carbon

SAMPLE IDENTIFICATION 15-020 15-020 dup 15-021 5-015 dup 5-018 5-019 T5-015 5-016

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PAGE 2 RECEIVED: 02/10/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-062

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TEST CODE	Sample 01	Sample 02	Sample 03	Sample 04	Sample 05	
i default units	: (entered units)	(ent	(entered units)	(entered units)	(entered units)	,
100	<b>₽</b>	$\Box$	₽	₽	₽	
: mg/L						
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Sample <u>08</u> (entered units)	₽
Sample 07 (entered units)	Q
Sample 06 (entered units)	Ţ)
TEST CODE default units	TDC mg/L

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PAGE 3 RECEIVED: 02/10/84		Analytical Serv Results by Sample	REPORT Sample	LAB # 84-02-062
SAMPLE ID 15-015		FRACTION OIB TEST C Date & Time Collected	TEST CODE GC 601 N lected not specified	NAME EPA Method 601/GC ed Category
DATA FILE	B DATE	DATE INJECTED <u>02/19/84</u>	ANALYST INSTRUMENT	MCL VERIFIED BY JSG
SCAN	COMPOUND	RESULT	SCAN	COMPOUND
	Chlore	Chloromethane ND		Trichloroethene ND
	Втом	Bromomethane ND		Dibromoch loromethane ND
	Vinyl Chlor	hloride ND		1, 1, 2-Trichloroethane ND
	Chlor	Chloroethane ND :		cis-1,3-Dichloropropene ND
	Methylene Chlor	thloride ND		2-Chloroethylvinyl Ether ND
	Trichlorofluoromethane	methane ND I		Bromoform
	1, 1-Dichloroeth	oethene ND	-	1, 1, 2, 2-Tetrachloroethane ND
	1,1-Dichloroethane	oethane ND		Tetrachloroethylene ND
	trans-1,2-Dichloroethene	oethene ND	ŀ	Chlorobenzene ND
	Ch	Chloroform ND i		1, 3-Dichlorobenzene ND
	1,2-Dichloroethane	oethane ND		1,2-Dichlorobenzene ND
	1,1,1-Trichloroeth	oethane ND		1, 4-Dichlorobenzene ND
	Carbon Tetrachlor	hloride ND		
	Bromodichlorometh	methane ND !		
	1,2-Dichloropropane	propane ND		
н-38	trans-1,3-Dichloroprop	propene ND:		

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PAGE 4 RECEIVED: 02/10/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE ID 15-015

FRACTION 01B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

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PAGE 5 RECEIVED: 02/10/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-062

SAMPLE ID T5-015 dup

FRACTION 02B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

ST MCL VERIFIED BY JSQ NT a COMPOUNDS DETECTED 0	COMPOUND RESULT	Trichloroethene ND	Dibromochloromethane ND	1, 1, 2-Trichlorcethane ND	cis-1,3-Dichloropropene ND	2-Chloroethylvinyl Ether ND	Bromoform ND	1, 1, 2, 2-Tetrachloroethane ND	Tetrachloroethylene ND	Chlorobenzene ND	1, 3-Dichlorobenzene ND	1,2-Dichlorobenzene ND	1,4-Dichlorobenzene ND				
ANALYST	SCAN	ļ							ļ								
A DATE INJECTED 02/19/84	COMPOUND	Chloromethane ND i	Bromomethane ND	Vinyl Chloride ND	Chloroethane ND	Methylene Chloride ND	Trichlorofluoromethane ND	1,1-Dichloroethene ND	1,1-Dichloroethane ND	trans-1,2-Dichloroethene ND	Chloroform ND	1,2-Dichloroethane ND	1, 1, 1-Trichloroethane ND	Carbon Tetrachloride ND	Bromodichloromethane ND	1,2-Dichloropropane ND	
DATA FILE _ CONC. FACTOR _	SCAN									1							ŀ

trans-1,3-Dichloropropene

PAGE 6 RECEIVED: 02/10/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE ID 15-015 dup

FRACTION 02B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in ug/L unless otherwise specified

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

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trans-1,3-Dichloropropene PAGE 7 RECEIVEI SAMPLE DATA CONC. F H-42

/ /ED: 02/10/84	Analytical Serv REP Results by Sample	REPORT y Sample	LAB # 84-02-062
10 15-016	FRACTION 03B Date & Time Co	ACTION O3B TEST CODE GC 601 Note & Time Collected not specified	I NAME EPA Method 601/GC Fied Category
FACTOR	B DATE INJECTED 02/20/84	4 ANALYST INSTRUMENT	RGS VERIFIED BY JSQ COMPOUNDS DETECTED 3
SCAN	COMPOUND	SCAN	COMPOUND
1	Chloromethane ND	24	Trichloroethene 2.2
1	Bromomethane ND		Dibromochloromethane ND
-	Vinyl Chlaride ND		1, 1, 2-Trichloroethane ND
	Chloroethane ND		cis-1,3-Dichloropropene ND
,	Methylene Chloride ND		2-Chloroethylvinyl Ether ND
	Trichlorofluoromethane ND		Bromoform ND
	1, 1-Dichloroethene ND		1, 1, 2, 2-Tetrachloroethane ND
İ	1, 1-Dichloroethane ND	eq 	Tetrachloroethylene 0.7
	trans-1, 2-Dichloroethene 1.2		Chlorobenzene ND
	Chloroform ND		1, 3-Dichlorobenzene ND
1	1, 2-Dichloroethane ND		1, 2-Dichlorobenzene ND
1	1, 1, 1-Trichloroethane ND		1, 4-Dichlorobenzene ND
1	Carbon Tetrachloride ND		
	Bromodichloromethane ND		
1	1, 2-Dichloropropane ND		
		_	

CORPORATION

PAGE 8 RECEIVED: 02/10/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE 10 15-016

15-016

FRACTION 03B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

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rage y Received:	rase 7 RECEIVED: 02/10/84	Analytica	<b></b>	Serv Results by Sample	nerun i nple	LAD # 04-V2-V02	
SAMPLE ID 15-018	15-018		FRACTION 04B Date & Time	Coll	TEST CODE <u>GC 601</u> Nected not specified	NAME EPA Method 601/6C ed Category	
DATA FILE CONC. FACTOR	TLE B	DATE INJECTED <u>02/20/84</u>	CTED <u>02/</u>		ANAL YST INSTRUMENT	NEGS VERIFIED BY JE COMPOUNDS DETECTED	786
SCAN	Z.	COMPOUND	REG	RESULT	SCAN	COMPOUND	ULT
	ı	Chlorometh	hane	2	7	Trichloroethene 17	1750
	ı	Bromome th	:hane	QN .		Dibromochloromethane	QN
1	ı	Vinyl Chlor	ride	Q		1, 1, 2-Trichloroethane	N
ļ	1	Chloroeth	thane	2		cis-1,3-Dichloropropene	Q
		Methylene Chlor	ride			2-Chlaroethylvinyl Ether	N
	_ Tric	Trichlorofluorometh	hane	Q		Bromoform	Q
	<b>CI</b>	1, 1-Dichloroeth	hene	28	1,	1, 1, 2, 2-Tetrachloroethane	ON
	ଜା	1,1-Dichloroeth	hane	4	8	Tetrachloroethylene 30.	30. 1
	4 trans-	trans-1,2-Dichloroeth	9 29	31.7	6	Chlorobenzene 7.	7.9
ļ	1	Chlorof	form	Q		1, 3-Dichlorobenzene	2
•	ın	1,2-Dichloroeth	ane	25.8		1, 2-Dichlorobenzene	QN
	1,1	1,1,1-Trichloroeth	hane	1.8		1, 4-Dichlorobenzene	Q
	rg)	Carbon Tetrachlor	ride	<b>Q</b>			
1	l FØ	Bromodichlorom <b>e</b> th	hane	 일			
	<b>-</b>	1,2-Dichloroprop	pane	<b>2</b>			
H-44	trans-1	trans-1,3-Dichloroprop	pene	Q			

PAGE 10 RECEIVED: 02/10/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE 10 15-018

FRACTION 04B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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Analytical Serv REPORT Results by Sample

LAB # 84-02-062

FRACTION 05B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified SAMPLE 1D 15-019

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		nate (	k ime colle	Date & IIME COTTECTED HOL SPECIFIED	חבובת יפובלתול
DA CONC.	DATA FILE	B DATE INJECTED 02/20/84	02/20/84	ANALYST INSTRUMENT	MCL VERIFIED I
_ • , • .	SCAN	COMPOUND	RESULT	SCAN	COMPOUND
		Chloromethane	S		Trichloroethene
, e .		Bromomethane	Q.		Dibromochloromethane
ن در در		Vinyl Chloride	Q		1, 1, 2-Trichloroethane
<u>.</u> .	1	Chloroethane	QN		cis-1,3-Dichloropropene
. • • • • • •	7	Methylene Chloride	9.6		2-Chloroethylvinyl Et'er
ere ere		Trichlorofluoromethane	Q		Bromoform
en en e		1, 1-Dichloroethene	QN		1, 1, 2, 2-Tetrachloroethane
·		1,1-Dichloroethane	2	CI	Tetrachloroethylene
		trans-1,2-Dichloroethene	Q.		Chlorobenzene
الم الم		Chloraform	QN		1,3-Dichlorobenzene
· w Zan · ·		1,2-Dichloroethane	QN		1,2-Dichlorobenzene
مراد مراد در		1, 1, 1-Trichloroethane	Q		1,4-Dichlorobenzene
		Carbon Tetrachloride	Q		

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trans-1, 3-Dichloropropene

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1, 2-Dichloropropane

Bromodich loromethane

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Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE ID 15-019

FRACTION 05B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

## Analytical Serv REPORT Results by Sample

LAB # 84-02-062

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02/10/84	
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FRACTION 06B TEST CODE GC 601 NAME EPA Method 601/GC	Collected not specifie	DATE INJECTED 02/21/84 ANALYST RGS VERIFIED BY JSG INSTRUMENT A COMPOUNDS DETECTED 0	RESULT SCAN COMPOUND RESULT	ane ND   Trichloroethene ND	ane ND i Dibromochloromethane ND	pride ND i 1, 1, 2-Trichloroethane ND	ane ND   cis-1,3-Dichloropene ND	bride ND   2-Chloroethylvinyl Ether ND	thane ND i Bromoform ND	thene ND i 1, 1, 2, 2-Tetrachloroethane ND	thane ND i Tetrachloroethylene ND	thene ND : Chlorobenzene ND	orm ND i 1,3-Dichlorobenzene ND	thane ND i 1,2-Dichlorobenzene ND	thane ND : 1, 4-Dichlorobenzene ND	i de ND	thane ND :	. !
FR	Dat	DATE INJECT	COMPOUND	Chloromethane	Bromomethane	Vinyl Chlori	Chloroethane	Methylene Chlori	Trichlorofluorometha	1,1-Dichloroethe	1,1-Dichloroetha	trans-1,2-Dichloroethe	Chloroform	1,2-Dichloroetha	1,1,1-Trichloroetha	Carbon Tetrachloride	Bromodichlorometha	
SAMPLE ID 15-020		DATA FILE CONC. FACTOR	SCAN		}		1						1					

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Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE 10 15-020

FRACTION 06B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L unless otherwise specified

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LAB # 84-02-062

REPORT

Analytical Serv

Results by Sample

COMPOUNDS DETECTED VERIFIED BY Trichloroethene Bromoform 1, 4-Dichlorobenzene 1, 1, 2-Trichloroethane Tetrachloroethylene Chlorobenzene 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene Dibromoch loromethane cis-1, 3-Dichloropropene 2-Chloroethylvinyl Ether 1, 1, 2, 2-Tetrachloroethane TEST CODE GC 601 NAME EPA Method 601/GC Category COMPOUND RGS o Date & Time Collected not specified ANALYST INSTRUMENT SCAN DATE INJECTED 02/21/84 FRACTION 07B 2 밁 윋 밁 S 밁 밁 2 윋 밁 일 윋 윋 윋 月 9 RESULT Chloroform Vinyl Chloride Chloromethane Bromomethane Chloroethane Methylene Chloride 1, 1-Dichloroethane trans-1, 2-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane Carbon Tetrachloride 1,2-Dichloropropane trans-1, 3-Dichloropropene Trichlorofluoromethane 1, 1-Dichloroethene **Bromodichloromethane** COMPOUND SAMPLE ID 15-020 dup DATA FILE CONC. FACTOR SCAN

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RESULT

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Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE ID 15-020 dup

FRACTION O7B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified

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PAGE 17

Serv REPORT Results by Sample Analytical Serv

LAB # 84-02-062

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RESULT VERIFIED BY COMPOUNDS DETECTED **Frichlorgethene** Bromoform 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene 1, 4-Dichlorobenzene cis-1, 3-Dichloropropene 1, 1, 2, 2-Tetrachloroethane Tetrachloroethylene Chlorobenzene Dibromoch loromethane 1, 1, 2-Trichloroethane 2-Chloroethylvinyl Ether NAME EPA Method 601/GC Category COMPOUND RGS FRACTION OBB TEST CODE GC 601 No Date & Time Collected not specified ANALYST INSTRUMENT SCAN DATE INJECTED 02/21/84 2 S 밁 2 S 2 2 2 밀 2 밁 S 2 RESULT Chloromethane Chloroform Bromome thane Vinyl Chloride Chloroethane Methylene Chloride 1, 1-Dichloroethane trans-1, 2-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane Carbon Tetrachloride 1, 1-Dichloroethene Trichlorofluoromethane COMPOUND ∢ SAMPLE 1D 15-021 CONC. FACTOR DATA FILE SCAN

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trans-1, 3-Dichloropropene

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1, 2-Dichloropropane

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Bromodichloromethane

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Analytical Serv REPORT Results by Sample

LAB # 84-02-062 Continued From Above

SAMPLE ID 15-021

FRACTION OBB TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>uq/L</u> unless otherwise specified

REPORT Work

RECEIVED: 02/10/84  RECEIVED: 02/10/84  RACTION AND TEST CODES FOR WO  SEC : DUP 601 01D : LDG_IN  DAC : DUP 601 02D : LDG_IN  DAC : DUP 601 03D : LDG_IN  DAC : DUP 601 05D : LDG_IN  DAC : DUP 601 05D : LDG_IN  DAC : DUP 601 05D : LDG_IN	Analytical Serv NonReporte MORK NOT REPORTED ELSEWHE IN O1E   LOG_IN IN O3E   LOG_IN IN O4E   LOG_IN IN O5E   LOG_IN
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LAB # 84-02-063

PREPARED Radian Analutical Services Austin, Texas 78766 <u>8501 MoPac Blvd</u> P.O. Box 9948

(512) 454-4797 PHONE ATTEN SAMPLES

William Little

ATTEN

Tinker AFB

TINKER

CLIENT COMPANY

FACILITY

CONTACT CONDVER

CERTIFIED BY

WORK ID zone 5 groundwater 212-027-04-05 Fed Ex TAKEN TRANS TYPE

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INVOICE

Analytical Serv TEST CODES and NAMES used on this report GC 601 EPA Method 601/GC Total Organic Carbon

SAMPLE IDENTIFICATION 15-025 dup 15-023 15-024 15-025 T5-022 **988888** 

T5-026 T5-027

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PAGE 2 RECEIVED: 02/10/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-063

TEST CODE	Sample 01   (entered units)	Sample 02 (entered units)	Sample 03	Sample 04 (entered units)	Sample 02 Sample 03 Sample 04 Sample 05 (entered units) (entered units)
TDC mg/L	1)	(1	T)	CI	(1
TEST CODE   default units	Sample 06   (entered units)	Sample <u>07</u> (entered units)			
10C mg/L	D	₽			

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PAGE 3 RECEIVED: 02/10/84	Analytica	tical Serv Results by Sample	REPORT Sample	LAB # 84-02-063
SAMPLE ID 15-022		FRACTION OIB TEST CODE Date & Time Collected not	TEST CODE GC 601 N	NAME EPA Method 601/GC ed Category
DATA FILE CONC. FACTOR	B DATE II	DATE INJECTED <u>02/21/84</u>	ANALYST INSTRUMENT	RGS VERIFIED BY JSG COMPOUNDS DETECTED 0
SCAN	COMPOUND	RESULT	SCAN	COMPOUND
İ	Chloro	Chloromethane ND		Trichloroethene ND
	Bromo	Bromomethane ND		Dibromochloromethane ND
ļ	Vinyl Chlor	hloride ND		1, 1, 2-Trichloroethane ND
	Chlor	Chloroethane ND		cis-1,3-Dichloropropene ND
	Methylene C	Chloride ND		2-Chloroethylvinyl Ether ND
1	Trichlorofluoromethane	nethane ND		Bromoform ND
	1,1-Dichloroethene	Dethene ND	1	1, 1, 2, 2-Tetrachloroethane ND
1	1,1-Dichloroethane	nethane ND		Tetrachloroethylene ND
	trans-1,2-Dichloroethene	Dethene ND		Chlorobenzene ND
1	Chl	Chloroform ND		1,3-Dichlorobenzene ND
	1,2-Dichloroethane	bethane ND		1, 2-Dichlorobenzene ND
	1, 1, 1-Trichloroeth	bethane ND		1, 4-Dichlorobenzene ND
1	Carbon Tetrachlor	nloride ND		
1	Bromodich lorometh	nethane ND		
-	1,2-Dichloropropane	propane ND		
H-57	trans-1,3-Dichloropropene	oropene ND		

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

**SAMPLE ID 15-022** 

FRACTION 01B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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COMPOUNDS DETECTED VERIFIED BY **Frichloroethene** Dibromoch loromethane 1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene 2-Chloroethylvinyl Ether Bromoform 1, 1, 2, 2-Tetrachloroethane Tetrachloroethylene 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene 1, 4-Dichlorobenzene Chlorobenzene TEST CODE GC 601 NAME EPA Method 601/GC LAB # 84-02-063 Category COMPOUND RGS Date & Time Collected not specified ANALYST INSTRUMENT REPORT SCAN Results by Sample DATE INJECTED 02/21/84 FRACTION 02B 윋 9 9 2 9 S 2 月 밀 月 묏 2 月 RESULT Analytical Serv Chloromethane Vinyl Chloride Chloroform **Bromomethane** Chloroethane Methylene Chloride 1, 1-Dichloroethane 1, 2-Dichloroethane Carbon Tetrachloride **Trichlorofluoromethane** 1, 1-Dichloroethene trans-1, 2-Dichloroethene 1, 1, 1-Trichloroethane COMPOUND PAGE 5 RECEIVED: 02/10/84 SAMPLE 1D 15-023 DATA FILE CONC. FACTOR SCAN

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RESULT

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**Bromodichloromethane** 

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1, 2-Dichloropropane

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trans-1, 3-Dichloropropene

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

SAMPLE 10 15-023

FRACTION 02B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>vg/L</u> unless otherwise specified

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ALCEL VED. OE. 10/ 07	Resu	Results by	by Sample	
SAMPLE ID T5-024	FRAC	FRACTION O3B TEST CODE Date & Time Collected not	TEST CODE GC 601 N lected not specified	NAME EPA Method 601/GC
DATA FILE	A DATE INJECTED 02/21/84	D 02/21/84	ANALYST	RGS VERIFIED BY JSG COMPOUNDS DETECTED 0
SCAN	COMPOUND	RESULT	SCAN	COMPOUND
	Chloromethane	QN		Trichloroethene ND
	Bromomethane	QN		Dibromoch loromethane ND
	Vinyl Chloride	QN		1, 1, 2-Trichloroethane ND
	Chloroethane	a ON		cis-1,3-Dichloropropene ND
	Methylene Chloride	QN		2-Chloroethylvinyl Ether ND
	Trichlorofluoromethane	QN		Bromoform ND
	1,1-Dichloroethene		-	1, 1, 2, 2-Tetrachloroethane ND
	1,1-Dichloroethane			Tetrachloroethylene ND
tr.	trans-1,2-Dichloroethene			Chlorobenzene ND
	Chloroform	Q 2		1, 3-Dichlorobenzene ND
1	1,2-Dichloroethane	QN		1, 2-Dichlorobenzene ND
	1,1,1-Trichloroethane	QN		1, 4-Dichlorobenzene ND
1	Carbon Tetrachloride			
	Bromodichloromethane	QN		
ļ	1,2-Dichloropropane	e ND		
1-61	trans-1,3-Dichloropropene	GN GN		

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

**SAMPLE 1D 15-024** 

FRACTION 03B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063

SAMPLE ID 15-025

FRACTION 04B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified

COMPOUNDS DETECTED BY JSG COMPOUNDS DETECTED O  Trichloroethene ND  Trichloroethene ND  Trichloroethene ND  Cis-1,3-Dichloroethene ND  Bromoform ND  1,1,2,2-Tetrachloroethene ND  Tetrachloroethylene ND  Tetrachloroethylene ND  Tetrachloroethylene ND  Tetrachloroethylene ND  Tetrachlorobenzene ND  1,3-Dichlorobenzene ND  1,2-Dichlorobenzene ND	ANALYST INSTRUMENT SCAN  SCAN  1,	COMPOUND COMPOUND Chloromethane ND Vinyl Chloride ND Chloroethane ND Trichlorofluoromethane ND 1,1-Dichloroethane ND 1,2-Dichloroethane ND 1,2-Dichloroethane ND 1,2-Dichloroethane ND 1,2-Dichloroethane ND 1,1-Trichloroethane ND 1,1-Trichloroethane ND 1,1-Trichloroethane ND 1,1-Trichloroethane ND 1,1-Trichloroethane ND
1, 4-Dichlorobenzene ND		r i de
		hane
	-	hane
	-	
	1	hene
	1,1,5	hene
		hane
Ether	2-ch	Chloride
	Cis	hane
		hane
	SCAN	
VERIFIED BY COMPOUNDS DETECTED	ANALYST	

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trans-1,3-Dichloropropene

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

SAMPLE ID 15-025

FRACTION 04B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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Serv REPORT Results by Sample Analytical Serv

LAB # 84-02-063

SAMPLE ID 15-025 dup

FRACTION 05B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified

Category

DATE INJECTED 02/21/84 DATA FILE CONC. FACTOR

ANALYST INSTRUMENT

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**Frichloroethene** 

RESULT

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Dibromochloromethane

COMPOUND SCAN

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SCAN

RESULT

RGS

COMPOUND

COMPOUNDS DETECTED

Chloromethane Bromomethane

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Vinyl Chloride

Chloroethane

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Methylene Chloride Trichlorofluoromethane

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1, 1-Dichloroethene

月

1, 1-Dichloroethane

2

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trans-1, 2-Dichloroethene

Chloroform

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1, 2-Dichloroethane

1, 1, 1-Trichloroethane

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Carbon Tetrachloride

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**Bromodichloromethane** 

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1,2-Dichloropropane

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외

trans-1, 3-Dichloropropene

1, 1, 2-Trichloroethane

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cis-1, 3-Dichloropropene

2-Chloroethylvinyl Ether

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2 2 Bromoform 1, 1, 2, 2-Tetrachloroethane

2 **Tetrachloroethylene** 

밀 1, 3-Dichlorobenzene

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Chlorobenzene

일 1, 2-Dichlorobenzene 밁 1, 4-Dichlorobenzene

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

SAMPLE ID 15-025 dup

025 dup FRAC

FRACTION 05B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in \_\_\_\_\_uq/L unless otherwise specified

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SAMPLE ID T5-026
CONC. FACTOR

Analytical Serv REPORT Results by Sample

LAB # 84-02-063

FRACTION 06B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

BY JSG	RESULT	QN	ON	Q	ON	DN	Q	Q	DN	QN	QN	Q	QN			
 VERIFIED BY COMPOUNDS DETECTED	COMPOUND	Trichloroethene	Dibromochloromethane	1, 1, 2-Trichloroethane	cis-1,3-Dichloropropene	2-Chloroethylvinyl Ether	Bromoform	1, 1, 2, 2-Tetrachloroethane	Tetrachloroethylene	Chlorobenzene	1,3-Dichlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene			
ANALYST	SCAN							-								
DATE INJECTED 02/21/84	COMPOUND	Chloromethane ND :	Bromomethane ND :	Vinyl Chloride ND	Chloroethane ND i	Methylene Chloride ND	Trichlorofluoromethane ND	1,1-Dichloroethene ND i	1,1-Dichloroethane ND	trans-1,2-Dichloroethene ND	Chloroform ND	1,2-Dichloroethane ND	1,1,1-Trichloroethane ND	Carbon Tetrachloride ND	Bromodichloromethane ND	1, 2-Dichloropropane ND i
DATA FILE CONC. FACTOR	SCAN															}

trans-1, 3-Dichloropropene

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

SAMPLE 1D 15-026

FRACTION 06B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063

	BY JSG	RESULT	QN	Q	Q	S	QN	S	S	QN	8	Q	9	Q			
NAME EPA Method 601/GC ied Category	MCL VERIFIED BY COMPOUNDS DETECTED	COMPOUND	Trichloroethene_	Dibromochloromethane	1, 1, 2-Trichloroethane	cis-1,3-Dichloropropene	2-Chloroethylvinyl Ether	Bromoform	1, 1, 2, 2-Tetrachloroethane	Tetrachloroethylene _	Chlorobenzene	1, 3-Dichlorobenzene	1, 2-Dichlorobenzene	1, 4-Dichlorobenzene			
TEST CODE GC 601 N lected not specified	ANALYSTINSTRUMENT	SCAN			1					1							
FRACTION O7B TEST CODE Date & Time Collected not	B DATE INJECTED 02/21/84	COMPOUND	Chloromethane ND	Bromomethane ND	Vinyl Chloride ND	Chloroethane ND	Methylene Chloride ND	Trichlorofluoromethane ND	1, 1-Dichloroethene ND	1, 1-Dichloroethane ND	trans-1, 2-Dichloroethene ND	Chloroform ND	1,2-Dichloroethane ND	1, 1, 1-Trichloroethane ND	Carbon Tetrachloride ND	Bromodichloromethane ND	1,2-Dichloropropane ND :
SAMPLE ID 15-027	DATA FILE CONC. FACTOR	SCAN						1		ļ			1				

trans-1,3-Dichloropropene

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Analytical Serv REPORT Results by Sample

LAB # 84-02-063 Continued From Above

SAMPLE 1D 15-027

FRACTION O7B TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>uq/L</u> unless otherwise specified.

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Analytical Serv REPORT NonReported Work

OR WORK NOT REPORTED ELSEWHERE	01E :	LOG_IN O2E : LOG_IN	03E :	04E :	05E 1	06E :	07E :
TEST CODES	010	020	qeo	040	020	Q90	070
AND TE	DUP 601	<b>DUP601</b>	<b>DUP601</b>	<b>DUP601</b>	<b>DUP601</b>	<b>DUP601</b>	<b>DUP601</b>
				••			
FRAC	010	050	030	04C	030	090	070

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Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-087

Sample VI entered units)	Sample UZ (entered units)	Sample US (entered units)	(entered units)	Sample UD (entered units)
	<.20 <.20	1.7	17	7.7
	6/60 	6/6n	9/60 13/	2 2 2
	6/65	5/50	5/6n	5/50
			्राप्ता । जि	7.7
	7.1		16.97	
	6, 05 (, 05	. 05 . 05	6, 05 6, 05	6. 05 6. 05
	6/60	8, 8, 8 8, 8, 8	09/90 11	2 65 14
		6/6n 540	206 206	1070
	6,4	5/ 5/ <del>1</del> 00	6/6°	
		6/6n 5.>	9 / 65 /	
	02/16	02/16/84	02/16/84 02/16/84	02/16/84
		02/16/84	02/16/84	
	0.10	0.08	0.15	0.10
	<.10 €	₹ 10	₹ 10	. 10 ∴ 10
	9,4	09/8 7.4	6/6n 2 <u>7</u>	9/9/9
	5/50	5/6n	6/6n	6/60

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-087

default units	(entered units)	Sample U/ (entered units)	(entered units)	Sample UY (entered units)	Sample 10 (entered units)
CD 	340	√	 (3)	7.3	5.0
t ug/m1	5/50	i	5/50	6/60	5/50
: CNTDTA	~	abla	<b></b>	$\Box$	$\overline{}$
1 mg/L	6/60	6/6n	5/5n	6/6n	6/6a
خ	æ,		7) <sup>°</sup>	ر م	, S.
[8/6]	6/50	ور م م	5 5 5 6 7	ත ගේ ගේ	5/50 C
. ug/m1	6/6n		6/60	6/6n	6/6n
HG_CA	<ul><li>&lt; 02</li></ul>	<. 05 <. 05	<.05 <.05	<. 05 <. 05	< 05
1 ug/ml	6/60		5/5n	5/6n	6/50
1	- CO		7. 0		) i
	140	240	, 000 000 000	200	
mg/L	6/6n		6/60	6/60	
PB GA	099		0. 44	120	
: ug/m]	5/6n		5/5n	5/5n	
PEP	02/16/84	02/16/84	02/16/84	02/16/84	
date complete	02/16/84		02/16/84	02/16/84	02/16/84
date_complete			i		
700	0.13	0. 10	0.12	0.08	0.05
1 ZOZ 1	, 01 >	× 10 ×	, 01 V	, 01 >	<. 10 ×
1 mg/L	6/6n	5/5n	6/6n	6/60	6/50
1 N7	7041	o o	100°,	6/20	\ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \ \
1 m / h	51 × 51 × 51 × 51 × 51 × 51 × 51 × 51 ×	ñ / ñ o	7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 . 7 .	50 C T T T T T T T T T T T T T T T T T T	31 71 71

Analytical Serv REPURT 03/14/84 08:33:22

Park 1. RECEIVED: 02/19784

LAB # 84-02-102

PREPARED Radian Analytical Services  BY 8501 MoPac Blvd  P. O. Box 9948  Austin, Taxas 78744	ATTEN ATTEN CHARGE (512) ASA-A797	SAMPLES 3	MORK IN Zone 1 aroundwater TAKEN FUB, 1F TRANS Fed Ex TYPE TYPE TO B 010-077-04-09
			RK 1D zene 1 groundwater TAREN FULL IF TRANS Fed Ex TYPE
FLPCRI MAGAZE 10 61 4 AUSTIE	ATTEN WILLIAM LITTLE	CLIENT TINKER COMPANY TINKET GEB	IORK 11/2-ne 1 acound TAKEN FUB, 1F TRANS Fed Ex 1YPF

MVDICE under separate cover

ER

Analytical Serv TEST CODES and NAMES used on this report Method 625 Acid/Neutrals Oil and Grease, Infrared Lead, low level
EPA 408 Pesticides by Elutil Phenolins
Total Urganic Carbon Mersury, Cold Vapor Manganese, ICPES Ni: Fel. ICPES Total Cyanide Chrumium, ICPES Cadmium, ICPES Copper, ICPES Iron, ICPES Herbicides EC ANFS CD E ONG IR PB GA PESTES PHEN A FE E HERGES 교 전 대 대 SAMPLE INENTIFICATION

TOX SINGLE ANDLUSIS

REPORT LAB # 84-02-102	Sample (V.)	₹.002	0.01	<001	<.001	0.017	0.0005	0.007	€.003	<b>▽</b>	€005	< 000		<b>200</b>	
cal Serv RESULTS BY	Sample (2 (entered units) (e	€ 005	< 01	0.007	€.001	000	0.0006	0.013	€003	J	₹ 005	003	<i>\(\sigma\)</i>	3) 0	577
The Bear	Cample ();	0.008	0.01	0.008	600 0	0.025	0.0005	0, 23	0. 008	eend Need	₹ 005	(00)	. 9	03 0	7.91 2
	(E) COSE			ا (العاديد) المراجع (العاديد) المراجع (العاديد)			<b>5</b>		T (La) 3 / (1) (1) (1) (1) (1) (1) (1) (1) (1) (1)			-17.	in the second se		

FASE STATE OZZIDZBA	11 / 12 / 18 / 18 / 18 / 18 / 18 / 18 /	7:3-	Analytical So Ro	Serv Results by	NEPURT Samp le		LAB # 84-02-102
E THE THE			FRACT Date	FRACTION OIF TEST Date & Time Collected	TEST CODE lected not	ANFS SPECIFIE	NAME Method 625 Acid/Neutrals ed Category
THE EAST FILE		<u>B10201AN</u>	BATE EXTRACTED DATE INJECTED	<u>02/29/84</u> 03/12/84	ANALYST INSTRUMENT	ANAL YST TRUMENT	COMPOUNDS DETECTED O
NATES SEAM	EPA	-l00	COMPOUND	RESULT N	NPDES SCAN		EPA
<u> </u>	1.13		acenaphthene	Ä	នា	72B	benzo(a)anthracene A NE
83 <u>7</u>	ឧទ	1, 2, 4-t	1, 2, 4-trichlorobenzene	Q	된9	73B	benzo(a)pyrene [4]
(2 25 4)	ឧ	e u	hexachlorobenzene	Q	7B	748	3,4-benzofluoranthene *
<u> 1</u> 125	128	£	hexachloroethane	QN	86	75B	benzo(k)fluoranthene * ND
917	168	tis(2~ch	bis(2~chloroethyl)ether	QN	188	7.6.B	chrysene A
(10) (10)	208	्य -	2-chloronaphthalene	QN	87.C	7.7B	acenaphthylene NE
800	報告で	-5'1	1,2-dichlorobenzene	9	ឧខ	788	anthracene B <u>NO</u>
	852	m 'T	1,3-dichlorobenzene	GN	88	79B	benzo(ghi)perylene NI
$q_{zz}$	अं र ज	4	1,4-dichlorobenzene	QN	<u> ಇ</u> ದಲ	ROB	fluorene NC
0,61	34 X 5	i h - S , i	i,2-diphenylhydrazine	ON	4413	ខាន	phenanthrene B 146
27. 	संक		fluorsnthens	Î	198	858	dibenzo(a, h)anthracene (II)
- 13. • - 12.4	408 4-	4-cnlorophanyl	egl phengl ethor	- GN	378	ଷ୍ଟର	indenocial 3.3-cd/pyreneHU
79. • 19. • 19. • 19.	7 S	ina semantang i	syl phenyl other	<b>G</b>	4.53	8+8	ON ouauhd
	4,215 6 1	ado Fuerencia es	estrentoros soprepativentes		₫ 	<u> </u>	2,4,6—trichlorophenol例
::3 -4	क्ष वा च च	ns(d-chier	bis (when programmy nethor	 	2 3 6 4	* <u>C</u> **! #%!	p-chlore-m-croselDD
# 14.	187 17		an apparently san		er En		2- klorophenol ND
				-			

Abalytical Serv	Results
	E (2/12/6)
学	

PAGE 4 RECEIVED: 02/15/95	37	Analytical Serv 84 Results by Sample	REPORT Ny Sample		LAB # 84-02-102 Continued From Above
M OF THE STATES	ZT.	FRACTION OIF TEST CODE Date & Time Collected not	TEST CODE ANFS	E ANFS NA	NAME Method 625 Acid/Neutrals 1ed Category
<b>84</b> <b>6</b> 7	32.5	hexachlorocyclopentadiene ND	2,4	314	2,4-dichlorophenol ND
<u>्</u> र ११	248	i sophorone ND	<b>&amp;</b> 	34A	2, 4-dimethylphenol NE
9 7 7	558	naphthalene ND	6A	57A	2-nitrophenol ND
40.6	897	bis(2-ethylhexyl)phthalate ND	7,4	58A	4-nitrophenol MD
# 1	a29	butyl benzyl phthalate ND	9.4 4.0	59A	2, 4-dinitrophenol ND
0.00	สลจ	di-n-butyl phthalateND	4 A	AOA	4, 6-dinitro-o-cresol NE
<b>23</b> 34 36	889	di-n-octyl phthalate ND	9.8	644	pentachlorophenol NB
31t/3	708	diethyl phthalate ND	104	65A	phenol NE
කු හ (ජ	7113	dimethyl phthalate ND			

MOTOS AND DEFINITIONS FOR THIS REPORT

SCAP a scan number of retention time on chromatogram

Type ar percept sales of the

Mis a not decepted at Frid detection librits

In 4-benzuribaranthens and bensu(kitiuaranthane carelula

expression and a particular series of the se

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ALENER OF DEST	THE REPORT OF THE PRINT HER PRINT OF THE NAME OF THE PRINT OF THE NAME OF THE PARTY	REPURI Sample	REPURI Sample TEST CODE ANES	NAMF O	LAB # 84-02-102 Continued From Above NAME Method 625 Acia/Neutral
		1	5	1	

n - unthracene and phonanthrena corelute.

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	الاست. و الاست. الاست. المناسبة	المالة المالة المالة المالة

Serv Results by Sample Analutical Serv

LAB # 84-02-102

FRACILUN UIG TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE EXTRACTED OS/22/284 MOTOR NOT FOR FACTOR

DATE INJECTED 02/28/84 ANALYST DL

VERIFIED BY CKT

RUSHIT COMPOUND

DET LIMIT

OTHER HERBICIDES

RESULT

DET. LIMIT

2-4-0

5 PDb NI

CANCEL (SILVEX)

Spph

All results reported in alcrograms/liter unless otherwise specified ROTES AND DEFINITIONS FOR THIS REPORT We a not detected at the specified detection limit.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102

SAMPLE ID IA

FRACTION OIG TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

COMPOUNDS DETECTED BY CKT	COMPOUND	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
ANALYST _	SCAN EPA	102P	103P	104P	105P	106P	107P	108P	1098	110P	1118	112P	113P	
	NPDES	95	a M	4	R P	18P	198	20P	216	228	23P	246	25P	
<u>02/25/84</u> <u>02/28/84</u>	RESULT N	Q	Q	9	Q	2	Ŷ	2	9	Q	9	Q	Q	QN
DATE EXTRACTED DATE INJECTED	COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-DBD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
501	Ö									Q)				Æ
DATA FILE 840210201 CONC. FACTOR 200	EPA	89P	90P	91P	92P	93P	94P	95P	496	97P	486	466	100P	101P

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102 Continued From Above

SAMPLE ID 1A

FRACTION 016 TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

NOTES

SCAN = scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

AND DEFINITIONS FOR THIS REPORT.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102

FRACTION 02F TEST CODE ANFS NAME Method 625 Acid/Neutrals SAMPLE ID 18

DATA FILE CONC. FACTOR NPDES SCAN E	FACTOR FACTOR SCAN I	B10202AN EPA 1B	СОМР	Date EXTRACTED E INJECTED enaphthene	02/29/84 03/12/84 03/12/84 RESULT	ີ່ ທີ່ປ	NOT SPECIFIED ANALYST TRUMENT AN 72B	1 1 1	Category  VERIFIED BY COMPOUNDS DETECTED  benzo(a)anthracene A	EP A EP A
46B 33B			, 2, 4-tri	1,2,4-trichlorobenzene hexachlorobenzene		6B 7B	73B 74B	3, 4-benzo	benzo(a)pyrene	QN Q
368 118 168		12B 18B bi	he) s(2-ch]c 2-ch]c	hexachloroethane bis(2-chloroethyl)ether 2-chloronaphthalene	Q Q Q	98 188 28	75B 76B 77B	benzo(k)	benzo(k)fluoranthene * _ chrysene A _ acenaphthylene _	Q Q Q
20B 21B		25B 26B	1, 2-di	1, 2-dichlorobenzene 1, 3-dichlorobenzene	Q Q	3B 8B	78B 79B	benz	anthracene B _ benzo(ghi)perylene _	Q Q
22B 29B		27B 37B	1,4-di 1,2-diph	1,4-dichlorobenzene 1,2-diphenylhydrazine		32B 44B	80B 81B	a.	fluorene , phenanthrene B .	QN QN
318	•	39B 40B 4-chlo	4-chlorophenyl	fluoranthene   phenyl ether	Q Q	19B 37B	82B 83B	dibenzo( indeno(1	dibenzo(a,h)anthracene indeno(1,2,3-cd)pyrene	Q Q
14B 12B		41B 4-brod 42B bis(2-	4-bromophenyl is(2-chlorois	4-bromophenyl phenyl ether bis(2-chloroisopropyl)ether	Q Q	45B 11A	84B 21A	2, 4, 6-t	pyrene _ 2, 4, 6-trichlorophenol _	Q Q
103			-chloroe	bis(2-chloroethoxy)methane	Q	BA :	22A	р- ф	p-chloro-m-cresol	Q :
ლ H−83 გ ლ	)	52B	hexach	hexachlorobutadiene	2	<b>4</b>	24A		2-chlorophenol .	Ż

ECEIVED: 02/15/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-102 Continued From Above

SAMPLE 1D 1B	18	FRACTI	S S	TEST CODE	ANFS NAME	TEST CODE ANFS NAME Method 625 Acid/Neutrals
		Date &	Time Col	lected not	Date & Time Collected not specified	Category
358	53B	hexachlorocyclopentadiene	QN	2A	31A	2, 4-dichlorophenol ND
388	24B	isophorone	Q	<b>4</b> 6	34A	2, 4-dimethylphenol ND
398	55B	naphthalene	QN	<b>6</b> A	57A	2-nitrophenol ND
138	899	bis(2-ethylhexyl)phthalate	Q	7A	58A	4-nitrophenol ND
158	829	butyl benzyl phthalate	QN	S A	59A	2,4-dinitrophenol ND
26B	689	di-n-butyl phthalate	QN	4	60A 4	4, 6-dinitro-o-cresol ND
29B	869	di-n-octyl phthalate	Q	94	64A	pentachlorophenol ND
24B	708	diethyl phthalate	QN	10A	65A	pheno! ND
25B	718	dimethyl phthalate	Q			
			-			

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

 $\star$  = 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute. H-84

A = benzo(a)anthracene and chrysene co-elute

# MANACORE

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SAMPLE ID 18

Analytical Serv REPORT Results by Sample

LAB # 84-02-102 Continued From Above

FRACTION O2F TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

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RECEIVED: 02/15/84

Analytical Serv

REPORT Results by Sample

LAB # 84-02-102

SAMPLE ID 18

FRACTION 026 TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE EXTRACTED 02/25/84 CONCENTRATION FACTOR

DATE INJECTED 02/28/84 ANALYST DL

VERIFIED BY CKT

COMPOUND

RESULT

DET. LIMIT

OTHER HERBICIDES

RESULT

DET. LIMIT

2, 4-D

5 ppb

5 ppb

2, 4, 5-TP (Silvex)

NOTES AND DEFINITIONS FOR THIS REPORT ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102

SAMPLE ID 18

FRACTION 02G TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

ANALYST DATE EXTRACTED 02/25/84 DATE INJECTED 02/28/84 840210202 200 DATA FILE CONC. FACTOR

VERIFIED BY CKI

` ,			•	,			
							н-87
				Q	heptachlor epoxide	101P	17P
toxaphene ND	tox	113P	25P	S	heptachlor	100P	16P
PCB-1016 ND	PC	112P	24P	S	endrin aldehyde	466	15P
PCB-1260 ND	PC	111P	23P	S	endrin	98P	14P
PCB-1248 ND	PC	110P	22P	Q	endosulfan sulfate	976	14P
PCB-1232 ND	PC	109P	216	QN	beta endosulfan	96P	12P
PCB-1221 ND	PC	108P	20P	Q	alpha endosulfan	95P	11P
PCB-1254 ND	PC	107P	19P	QN	4, 4'-DDD	94P	dЬ
PCB-1242 ND	PC	106P	18P	Q	4, 4'-DDE	93P	88
ta BHC ND	delta	105P	g.	N	4, 4'-DDT	92P	7.6
ma BHC ND	gamma	104P	46	N	chlordane	916	<b>6</b> P
beta BHC ND	đ	103P	<u>е</u>	Q	dieldrin	90P	10P
ha BHC ND	alpha	102P	2p	Q	aldrin	898	4
RESULT	COMPOUND	N EPA	NPDES SCAN	RESULT	COMPOUND	EPA	NPDES SCAN

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102 Continued From Above

SAMPLE ID 18

FRACTION 026 TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN = scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

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RECEIVED: 02/15/84

REPORT Results by Sample Analytical Serv

LAB # 84-02-102

띩 EPA 밁 밀 밀 밀 2 9 밀 9 9 2 밀 일 NAME Method 625 Acid/Neutrals COMPOUNDS DETECTED VERIFIED BY Þ benzo(a)pyrene acenaphthylene benzo(ghi)perylene fluorene m dibenzo(a,h)anthracene indeno(1,2,3-cd)pyrene pyrene 2, 4, 6-trichlorophenol benzo(a)anthracene 3, 4-benzofluoranthene benzo(k)fluoranthene chrysene anthracene phenanthrene Cateqoru ک ک Date & Time Collected not specified TEST CODE ANFS ANALYST INSTRUMENT 72B 73B 74B 75B 76B 77B **78B** 79B 80B 81B 82B 838 843 21A NPDES SCAN 11A **SB 6B** 78 188 93 28 38 88 32B 44B 19B 37B 45B ATE EXTRACTED <u>02/29/84</u> DATE INJECTED <u>03/12/84</u> RESULT 밁 밁 밁 FRACTION 03F 일 9 일 밁 밀 2 일 呈 呈 밁 9 DATE EXTRACTED acenaph thene 1, 2, 4-trichlorobenzene hexachlorobenzene hexachloroethane bis(2-chloroethyl)ether 2-chloronaphthalene 1, 2-dichlorobenzene 1, 3-dichlorobenzene 1, 4-dichlorobenzene 1,2-diphenylhydrazine fluoranthene 4-bromophenyl phenyl ether 42B bis(2-chloroisopropyl)ether 40B 4-chlorophenyl phenyl ether COMPOUND B10203AN EPA 1 B 88 9B 12B 18B 20B 25B 26B 27B 37B 39B 41B DATA FILE SAMPLE ID 1C CONC. FACTOR NPDES SCAN 46B 338 36B 16B 20B 21B 22B 29B 31B 17B 14B 128

H-89

S

2-chlorophenol

밁

p-chloro-m-cresol

22A

8

ᄝ

bis(2-chloroethoxy)methane

43B

10B

52B

34B

24A

14

윋

hexachlorobutadiene

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102 Continued From Above

outrals	N	QN	QN	QN	QN	QN	ON	CN	
Acid/Ne	ropheno]	ylphenol	2-nitrophenol	4-nitrophenol	ropheno	o-creso]	ropheno}	phenol	
NAME Method 625 Acid/Neutrals	2,4-dichlorophenol	2,4-dimethylphenol	2-nit	4-nit	2,4-dinitrophenol	4,6-dinitro-o-cresol	pentachlorophenol		
NAME Me	á	6			LV.	4,6-			
FRACTION O3F TEST CODE ANFS No Date & Time Collected not specified	31A	34A	57A	58A	59A	60A	64A	65A	
r cone									
TES.	2A	9 A	<b>6A</b>	7A	5A	4	94	104	
IN O3F Time Co	9	9	2	윙	9	외	g	R	Q
ACTIC ste &	iene	, e	<u>u</u>	a ·	, au	au u	a)	a a	u u
	entadi	sophorone	phthalene	phthalate	phthalate	phthalate	phthalate	phthalate	phthalate
i ä	hexachlorocyclopentadi	isophoror	naphthalen	ois(2-ethylhexyl)phthalat	butyl benzyl phthalat	di-n-butyl phthalat	di-n-octyl phthalat	diethyl phthalat	dimethyl phthalat
SAMPLE ID 1C FF	53B hexachlorocyclopentadi	54B isophoror	55B naphthaler	66B bis(2-ethylhexyl)phthalat	67B butyl benzyl phthalat	68B di-n-butyl phthalat	phtha	phtha	phtha

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

1/bn All results reported in\_\_

ND = not detected at EPA detection limits

= 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute

# RADIAN

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Analytical Serv Results by Sample

LAB # 84-02-102 Continued From Above

1.1 Pizza est est de la Parente

SAMPLE ID 10

FRACTION OJF TEST CODE ANFS NA Date & Time Collected not specified

NAME Method 625 Acid/Neutrals ed Category

 ${\bf B}$  = anthracene and phenanthrene co-elute.

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RECEIVED: 02/15/84

Analytical Serv

Serv REPORT Results by Sample

LAB # 84-02-102

SAMPLE ID 1C

FRACTION 03G TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE EXTRACTED 02/25/84 CONCENTRATION FACTOR

DATE INJECTED 02/28/84 ANALYST DL

VERIFIED BY CKT

RESULT

COMPOUND

DET. LIMIT

OTHER HERBICIDES

RESULT

DET. LIMIT

2, 4, 5-TP (Silvex)

밁

5 ppb

일

2, 4-D

5 ppb

All results reported in micrograms/liter unless otherwise specified. NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-102

FRACTION 03G TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category SAMPLE ID 10

COMPOUNDS DETECTED BY CKT	COMPOUND	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND		
ANALYST	NPDES SCAN EPA	2P 102P	3P 103P	4P 104P	5P 105P	18P 106P	19P 107P	20P 108P	21P 109P	22P 110P	23P 111P	24P 112P	25P 113P		
DATE EXTRACTED <u>02/25/84</u> DATE INJECTED <u>02/28/84</u>	COMPOUND RESULT NP	aldrin ND	dieldrin ND	chlordane ND	4, 4 '-DDT ND	4, 4'-DDE ND	4, 4 '-DDD ND	alpha endosulfan ND	beta endosulfan ND i	endosulfan sulfate ND ;	endrin ND	endrin aldehyde ND	heptachlor ND	heptachlor epoxide ND	
DATA FILE 840210203 CONC. FACTOR 200	NPDES SCAN EPA CON	1Р 89Р	10P 90P	6P 91P	7P 92P	48P 93P	9P 94P	11P 95P	12P 96P	14P 97P end	14P 98P	15P 99P	16P 100P	17P 101P hep	н-93

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Analytical Serv

REPORT Results by Sample

LAB # 84-02-102 Continued From Above

SAMPLE ID 1C

FRACTION 03G TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN = scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

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Serv REPORT NonReported Work Analytical Serv

LAB # 84-02-102

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE LOG\_IN 01K LOG\_IN 02K 01J 02J LOG\_IN LDG\_IN 011 LDG\_IN 021 01H 02H

LOG\_IN

# 

	02/15/84
AGE 1	RECEIVED:
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Analytical Serv REPORT 03/14/84 08:41:54

LAB # 84-02-103

REPORT Radian Austin

SAMPLES ATTEN William Little Tinker AFB TINKER

CL. I ENT COMPANY

FACILITY

Services Austin, Texas 78766 PREPARED <u>Radian Analutical</u> BY <u>8501 MoPac Blvd.</u> (512) 454-4797 P. O. Box 9948 PHONE ATTEN

CERTIFIED BY

CONTACT CONDVER

SAMPLE IDENTIFICATION

01 4A

INVOICE under separate cover

212-027-04-05

P. O. #

Fed Ex

TRANS

TYPE

zone 4 groundwater

WORK ID TAKEN Analytical Serv TEST CODES and NAMES used on this report ANFS

Method 625 Acid/Neutrals Cadmium, ICPES otal Cuanide SNTOTA

Mercury, Cold Vapor ICPES ICPES Nickel, ICPES Chromium, Copper,

Infrared and Grease, low level \_ead, DNG IR PB GA

Organic Carbon TOX Single Analysis Phenolics otal PHEN TOX

Zinc, ICPES

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PAGE 2
RECEIVED: 02/15/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-103

i Sample <u>VI</u> (entered units)	<. 002	₹.01	0.014	0.021	0.0004	0.009	7	0.006	<. 005	<u></u>	90.00	Cul i
ES  CUDE   default units	CD_E	CNTOTA	CR E		HOCA	NIE I	ONGIR	PB GA	PHENTA	10C		IN E

# EX MAISHAN

PAGE 3 RECEIVED: 02/15/84

Analytical Serv Results by Sample

LAB # 84-02-103

FRACTION OIF TEST CODE ANFS NAME Method 625 Acid/Neutrals SAMPLE ID 4A

			Date &	& Time Co	Time Collected r	not specified	fied Category
DATA FILE CONC. FACTOR	HE H	B10301	DATE EXTRACTED DATE INJECTED	02/29/84 03/12/84	INS	ANALYSTINSTRUMENT	COMPOUNDS DETECTED O
NPDES SCAN	EPA		COMPOUND	RESULT	NPDES SCAN	Z,	EPA
18	118		acenaphthene	Q	5B	72B	benzo(a)anthracene A ND
46B	88	1, 2, 4-t	1, 2, 4-trichlorobenzene	Q	<b>89</b>	738	benzo(a)pyrene ND
338	98	4	hexachlorobenzene	QN	78	74B	3, 4-benzofluoranthene * ND
36B	12B	£	hexachloroethane	QN	98	758	benzo(k)fluoranthene * ND
118	188	bis(2-ch	bis(2-chloroethyl)ether	QN	188	768	chrysene A ND
168	20B	2-ch	2-chloronaphthalene	QN	2B	77B	acenaphthylene ND
20B	25B	1,2-	1, 2-dichlorobenzene	Q	38	788	anthracene B ND
21B	26B	1, 3-	1, 3-dichlorobenzene	QN	88	798	benzo(ghi)perylene ND
22B	27B	1,4~	1,4-dichlorobenzene	Q	328	BOB	fluorene ND
29B	37B	1,2-di	1,2-diphenylhydrazine	Q	44B	818	phenanthrene B ND
318	39B		fluoranthene	QN	198	828	dibenzo(a,h)anthracene ND
178	40B	4-chlorophenyl	nyl phenyl ether	QN	378	838	indeno(1,2,3-cd)pyrene ND
148	41B	4-bromophenyl	nyl phenyl ether	CN	45B	848	pyrene ND
128	42B	bis(2-chloro	bis(2-chloroisopropyl)ether	Q	114	21A	2, 4, 6-trichlorophenol ND
108	43B	bis(2-chlor	bis(2-chloroethoxy)methane	QN	84	22A	p-chloro-m-cresol ND
о н В	52B	hexa	hexachlorobutadiene	QN	1.4	24A	2-chlorophenol ND
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PAGE 4 RECEIVED: 02/15/84

Analytical Serv Results by Sample

LAB # 84-02-103 Continued From Above

id/Neutrals		heno1 ND	heno1 ND	henol ND	heno1 ND	heno1 ND	resol ND	heno1 ND	pheno1 ND	
NAME Method 625 Acid/Neutrals	Category	2,4-dichlorophenol	2,4-dimethylphenol	2-nitrophenol	4-nitrophenol	2, 4-dinitropheno	4, 6-dinitro-o-cresol	pentachloropheno	ā	
ANFS	specified	31A	34A	57A	58A	59A	4 A09	64A	65A	
TEST CODE ANFS	Date & lime Collected not				_		_			
123	ollect	. 2A	₩.	¥9	, <u>, , , , , , , , , , , , , , , , , , </u>	ψ ·	 A	¥6 	10A	
FRACTION OIF	ime (	S	Q	S	N	N	S	Q	Q	R
FRACTI	Date &	hexachlorocyclopentadiene	isophorone	naphthalene	xyl)phthalate	yl phthalate	yl phthalate	ul phthalate	hyl phthalate	hyl phthalate
		hexachloroc			bis(2-ethylhexyl)phtha	butyl benzyl	di-n-buty1	di-n-octyl	diethyl	dimethy1
SAMPLE ID 4A		53B hexachloroc	54B	558	66B bis(2-ethylhe	67B butyl benz	68B di-n-but	69B di-n-oct	70B diet	71B dimet

# NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN - scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

\* = 3,4-benzofluoranthane and benzo(k)fluoranthene co-elute.

A=benzo(a) anthracene and chrysene co-elute.

PAGE 5 RECEIVED: 02/15/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-103 Continued From Above

SAMPLE ID 4A

FRACTION OIF TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

PAGE 6 RECEIVED: 02/15/84

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

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Analytical Serv REPORT NonReported Work

LAB # 84-02-103

## CADIMA

RECEIVED: 02/16/84

Analytical Serv

03/14/84 08:44:38

LAB # 84-02-107

CARA CARACTER STATE OF STATE O

REPORT Radian TO B1 4 Austin ATTEN William Little

Tinker AFB TINKER CL IENT COMPANY FACILITY

(512) 454-4797 ATTEN

SAMPLES

PREPARED Radian Analutical Services

Austin, Texas 78766

Box 9948

8501 MoPac Blvd

PERTIFIED BY

CONTACT CONDVER

P.O. # 212-027-04-05 INVOICE under separate cover zone 2 groundwater 212-027-04-05 TRANS Fed Ex WORK ID TYPE TAKEN

SAMPLE IDENTIFICATION

밁

Analytical Serv TEST CODES and NAMES used on this report Method 625 Acid/Neutrals ANFS BA E

Sadmium, ICPES Barium, ICPES

Chromium, ICPES otal Cuanide Jopper, ICPES CNTOTA 品品 CDE

Herbicides EC Iron, ICPES HERBES

Cold Vapor ICPES fercuru, Vickel, HG CA NI FI

PA 608 Pesticides by EC Infrared and Grease, ead, low level PB GA PESTES ONG IR

Organic Carbon otal Phenolics otal HEN A

TOX Single Analysis Zinc, ICPES TOX 1

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PAGE 2 RECEIVED: 02/16/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-107

									-			• • •		
Sample 01	0.21	0.006	(.01	<.001	< 001	0.23	0.0004	< 003	<b>5</b>	<.002	<. 005	<u></u>	10 ×	0.34
TEST CODE	BA E		CNTOTA		[ L	E LU (	HCG	NI NI	ONG IR	7,5 d	PHEN_A	100		H-103

PAGE 3 RECEIVED: 02/16/84

LAB # 84-02-107

SAMPLE ID 2A

FRACTION OIF TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category Analytical Serv REPORT Results by Sample

• . •				s aled	& lime collected	lected not	Specirie	led category	
0	DATA FILE CONC. FACTOR	Щœ	B10701F	DATE EXTRACTED DATE INJECTED	02/29/84 03/12/84	ANALYST INSTRUMENT	LYST MENT	VERIFIED BY	D BY CKT
<u>z</u>	NPDES SCAN	EPA	COM	COMPOUND	RESULT N	NPDES SCAN			EPA
	18	18		acenaphthene	QN	5 83	72B	benzo(a)anthracene /	A do
,	46B	88	1, 2, 4-t	1, 2, 4-trichlorobenzene	QN	89	73B	benzo(a)pyrene	QN
	338	98	e C	hexachlorobenzene	QN	78	74B	3,4-benzofluoranthene	ÜN *
	368	12B	£	hexachloroethane	QN	86	75B	benzo(k)fluoranthene ³	QN *
. بدیم	118	188	bis(2-ch	bis(2-chloroethyl)ether	QN	188	76B	chrysene	QN V
	168	20B	2-ch	2-chloronaphthalene	Q	2B	7.7B	acenaphthylene	ON O
,	208	25B	1,2-	1, 2-dichlorobenzene	QN	<b>8</b>	788	anthracene [	B
	218	26B	1, 3-	1, 3-dichlorobenzene	Q	88	79B	benzo(ghi)perylene	QN
	22B	27B	1,4-	1, 4-dichlorobenzene	Q	32B	808	fluorene	ON ON
	29B	378	1, 2-di	1,2-diphenylhydrazine	Q	44B	818	phenanthrene	QN 8
- • • - •	318	39B		fluoranthene	Q	198	828	dibenzo(a, h)anthracene	QN
	178	40B	4-chlorophenyl	yl phenyl ether	Q	37B	838	indeno(1, 2, 3-cd)pyrene	N N
• . •	14B	418	4-bromophenyl	yl phenyl ether	Q	458	848	pyrene	QN N
	12B	42B	bis(2-chloroisopropyl)e	isopropyl)ether	QN	114	21A	2, 4, 6-trichloropheno)	I ND
H-10	108	43B	bis(2-chlor	bis(2-chloroethoxy)methane	QN	ВА	22A	p-chloro-m-creso)	I ND
)4	348	52B	hexa	hexachlorobutadiene	QN	14	24A	2-chlorophenol	ON

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RECEIVED: 02/16/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-107 Continued From Above NAME Method 625 Acid/Neutrals FRACTION OIF TEST CODE ANFS SAMPLE ID 2A

	Ione Ione	QN lone	Ione Ione	anol ND	Ione Ione	Iose ND	ano 1 one	phenol ND	
Category	2,4-dichlorophenol	2,4-dimethylpheno	2-nitropheno	4-nitrophenol	2, 4-dinitrophenol	4,6-dinitro-o-creso	pentachloropheno	9 Ų d	
ate & Time Collected not specified	31A	34A	57A	58A	59A	60A	64A	65A	
d not									
lecte	2A	9 <del>V</del>	<b>6A</b>	7A	SA A	44	94	10A	
e (0)	2	2	Q	 Q		 일	<u> </u>	의 일	의 일
						2	2	Z	Z
Date & Tim	hexachlorocyclopentadiene	isapharone	naphthalene	late	butyl benzyl phthalate	di-n-butyl phthalate N	di-n-octyl phthalate N	diethyl phthalate N	dimethyl phthalateN
Date & Tim	iene	rone	lene		late	phthalate	phthalate	phthalate	phthalate

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

= 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute.

PAGE 5 RECEIVED: 02/16/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-107 Continued From Above

SAMPLE ID 2A

B = anthracene and phenanthrene co-elute.

FRACTION OIF TEST CODE ANFS NA Date & Time Collected not specified

NAME Method 625 Acid/Neutrals

RECEIVED: 02/16/84

Analytical Serv

Serv REPORT Results by Sample

LAB # 84-02-107

SAMPLE ID 2A

FRACTION OIG TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

CONCENTRATION FACTOR 200

DATE INJECTED 03/01/84 ANALYST DRL

VERIFIED BY CKT

COMPOUND

DET. LIMIT RESULT

RESULT

OTHER HERBICIDES

DET. LIMIT

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2, 4-D

2, 4, 5-TP (Silvex)

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NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit. All results reported in micrograms/liter unless otherwise specified.

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PAGE 7 RECEIVED: 02/16/84

Serv REPORT Results by Sample Analytical Serv

LAB # 84-02-107

SAMPLE ID 2A

FRACTION 01G TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

VERIFIED BY CKT COMPOUNDS DETECTED O	COMPOUND RESULT	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
ANALYST	SCAN EPA	102P	103P	104P	105P	106P	107P	108P	109P	110P	111P	112P	113P	
	NPDES 8	2P	g G	46	g G	186	19P	20P	21P	22P	23P	24P	25P	
02/17/84 03/01/84	RESULT	QN	QN	QN	R	Q	QV	Q	QN	QN	QN	QN	Q	QN
DATE EXTRACTED DATE INJECTED	сомРочив	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
8402107 200														
3 <b>K</b>	EPA	89P	90P	91P	92P	93P	94P	95P	96P	97P	98P	999	100P	1016
DATA FILE CONC. FACTOR	NPBES SCAN	119	10P	4P	7.5	98	96	11P	12P	146	14P	15P	16P	g_ H-108

PAGE 8 RECEIVED: 02/16/84

REPORT Analytical Serv Results by Sample

LAB # 84-02-107 Continued From Above

SAMPLE ID 2A

FRACTION OIG TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN = scan number on chromatogram.

All results reported in micrograms/liter unless otherwise specified.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

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PAGE 1	RECEIVED:

Analytical Serv REPORT 03/14/84 08:48:23

LAB # 84-02-108

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stin	William Litt]
AUS	ATTEN Wil
	Austin

SAMPLES

Tinker AFB

CLIENT TINKER
COMPANY TINKER
FACILITY

Radian Analytical Services	8501 MoPac Blvd.	P. O. Box 9948	Austin, Texas 78766		(512) 454-4797
PREPARED	BY			ATTEN	PHONE
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	M. Jahr	CERTIFIED BY
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zone 3 groundwater	FBB	Fed Ex		212-027-04-05	under separate cover
WORK ID		TRANS	TYPE	P. O. #	INVOICE

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Analytical Serv TEST CODES and NAMES	
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Method 625 Acid/Neutra	Cadmium, ICPES	Total Cuanide	Chromium, ICPES	Copper, ICPES	Mercury, Cold Vapor	-	Oil and Grease, Infrar	Lead, low level	Total Phenolics	Total Organic Carbon	TOX Single Analysis
ANFS	CD E	CNTOTA	CR E	CO E	HG CA	NI E	ONG IR	PB GA	PHEN A	TOC	TOX 1
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Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-108

ICSI VUDE default units	(entered units)	Sample UZ (entered units)	
ш <u>.</u>	₹. 002	<. 002	
CNTOTA	(.01	₹.01	
	< 001	<.001	
<u> </u>	<.001	<.001	
CA	0.0004	90000	
N. F.	<. 003	€. 003	
ONG IR	<b>5</b>	₽	
PB GA	<. 002	<. 002	
PHEN A	<.005	<.005	
10C 10C	▽	က	
	< 01	₹. 01	
IN E	0.016	0.024	

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Analytical Serv Results by Sample

LAB # 84-02-108

NAME Method 625 Acid/Neutrals d Category	LAK VERIFIED BY CKT COMPOUNDS DETECTED O	EPA	benzo(a)anthracene A ND	benzo(a)pyrene ND	3,4-benzofluoranthene * ND	benzo(k)fluoranthene * ND	chrysene A ND	acenaphthylene ND	anthracene B ND	benzo(ghi)perylene ND	fluorene	phenanthrene B ND	dibenzo(a, h)anthracene ND	indeno(1,2,3-cd)pyrene ND	Dyrene ND	2, 4, 6-trichlorophenol ND	p-chloro-m-cresol ND	2-chlorophenol ND
CODE ANFS not specifie	ANALYST	NPDES SCAN	<b>5B</b> 72B	6B 73B	7B 74B 3	9B 75B	18B 74B	2B 77B	38 788	88 798	32B 80B	44B 81B	19B 82B	37B 83B	45B 84B	11A 21A	8A 22A	1A 24A
FRACTION OIF TEST Date & Time Collected	B10801F DATE EXTRACTED 03/01/84 DATE INJECTED 03/12/84	COMPOUND RESULT NP	acenaphthene ND :	1, 2, 4-trichlorobenzene ND	hexachlorobenzene ND	hexachloroethane ND	bis(2-chloroethyl)ether ND	2-chloronaphthalene ND	1,2-dichlorobenzene ND	1, 3-dichlorobenzene ND	1, 4-dichlorobenzene ND	1,2-diphenylhydrazine ND	fluoranthene ND i	4-chlorophenyl phenyl ether ND ;	4-bromophenyl phenyl ether ND	bis(2-chloroisopropyl)ether ND	bis(2-chloroethoxy)methane ND ;	hexachlorobutadiene <u>ND</u> ;
35	FILE ACTOR	SCAN EPA	18	88	86	128	18B	20B	25B	26B	27B	37B	398	40B 4	418	42B b	43B	52B
SAMPLE ID 3E	DATA FILE CONC. FACTOR	NPDES S	118	46B	338	36B	113	16B	20B	218	228	29B	318	17B	148	123	80 -112	34B

PAGE 4 RECEIVED: 02/16/84

Analytical Serv

Serv REPORT Results by Sample

LAB # 84-02-108 Continued From Above

rals		N	S	N	N	Q	N	9	S	
NAME Method 625 Acid/Neutrals	Category	2, 4-dichlorophenol	2,4-dimethylphenol	2-nitrophenol	4-nitrophenol	2, 4-dinitrophenol	4,6-dinitro-o-cresol _	pentachlorophenol _	pheno1 _	
FS NAME	ecified	∢	∢	∢	∢	∢		∢	∢	
ODE AN	not sp	31A	34A	57A	SBA	59A	60A	64A	65A	
TEST CODE ANFS	lected	2A	9 Y	<b>6</b> A	7.A	SA	44	9A	10A	
RACTION OIF	Date & Time Collected not specified	QN	QN	QN	QN	QN	QN	Q	QN	2
FRACTIO	Date &	hexachlorocyclopentadiene _	isophorone	naphthalene	bis(2-ethylhexyl)phthalate _	butyl benzyl phthalate	di-n-butyl phthalate	di-n-octyl phthalate	diethyl phthalate	dimethyl phthalate
35		53B	24B	55B	899	67B	889 9	849	70B	71B
SAMPLE ID 3E		358	388	398	138	158	268	298	248	25B

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

= 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute.

SECONDARION OF

PAGE 5 RECEIVED: 02/16/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-108 Continued From Above

SAMPLE ID 3E

FRACTION OIF TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

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PAGE 6 RECEIVED: 02/16/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-108

FRACTION 02F TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category SAMPLE ID 3F

COMPOUNDS DETECTED BY CKT	EPA	benzo(a)anthracene A ND	benzo(a)pyrene ND	3,4-benzofluoranthene * ND	benzo(k)fluoranthene * ND	chrysene A ND	acenaphthylene ND	anthracene B ND	benzo(ghi)perylene ND	fluorene ND	phenanthrene B ND	dibenzo(a,h)anthracene ND	indeno(1, 2, 3-cd)pyrene ND	pyrene ND	2, 4, 6-trichlorophenol ND	p-chloro-m-cresol ND	2-chlorophenol ND
 ANALYSTINSTRUMENT	SCAN	72B	73B	74B	758	76B	778	788	798	808	818	828	838	848	21A	22A	24A
Ħ	NPDES (	58	<b>89</b>	78	98	188	28	38	88	32B	44B	198	378	45B	11A	8 4	14
03/01/84	RESULT	Q	Q	QN	Q	Q	QN	QN	Q	QN	Q	QN	QN	QN	Q	Q	QN
CTED		ene	ene	ene	a ::	her	ene	ene	ene	ene	ine	ene	her	e L	e L	ane	iene
DATE EXTRAC DATE INJEC	OMPOUND	acenaphth	-trichlorobenz	hexachlorobenz	hexachloroeth	chloroethyl)et						fluoranthe	phenyl et	enyl phenyl ether	ıroisopropyl}eth	oroethoxy}meth.	xachlorobutad
DATE DATE	COMPOUND	acenaphth	1, 2, 4-trichlorobenz	hexachlorobenz	hexachloroeth	bis(2-chloroethyl)et	2-chloronaphthal	1,2-dichlorobenze	1,3-dichlorobenze	1,4-dichlorobenze	1,2-diphenylhydrazi		phenyl et		bis(2-chloroisopropyl)eth	bis(2-chloroethoxy)meth	hexachlorobutadi
	EPA COMPOUND	1B acenaphth	8B 1,2,4-trichlorobenz	98 hexachlorobenz	12B hexachloroeth	18B bis(2-chloroethyl)et							et	phenyl	42B bis(2-chloroisopropyl)ether	43B bis(2-chloroethoxy)meth	52B hexachlorobutad

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Analytical Serv REPORT Results by Sample

LAB # 84-02-108 Continued From Above

hexachlorocyclopentad isophonable		53B hexact 54B 55B
exyl)phthalate nzyl phthalate utyl phthalate ctyl phthalate	bis(2-ethylhexyl)phthabutyl berzyl phthadi-n-butyl phthadi-n-butyl phthadi-n-octyl phtha	bis(2-ethylhexyl)phthabutyl berzyl phthadi-n-butyl phthadi-n-butyl phthadi-n-octyl phtha
thyl phthalate _ thyl phthalate _	diethyl phtha dimethyl phtha	phtha

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

= 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute. H-116

A = benzo(a)anthracene and chrysene co-elute.

PAGE 8 RECEIVED: 02/16/84

SAMPLE ID 3F

Analytical Serv REPORT Results by Sample

LAB # 84-02-108 Continued From Above

FRACTION O2F TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

03A : LOG\_IN

Analytical Serv REPORT NonReported Work

LAB # 84-02-108

H-118

RECEIVED: 02/16/84

Analytical Serv REPORT 02/28/84 09:10:47

LAB # 84-02-109

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REPORT Radian TO B1. 4 Austin

ATTEN William Little

Tinker AFB

TINKER

CLIENT COMPANY FACILITY

SAMPLES

PREPARED <u>Radian Analutical Services</u> BY 8501 MoPac Blvd. Austin, Texas 78766 (512) 454-4797 P. O. Box 9948 PHONE ATTEN

CERTIFIED BY

CONTACT CONDVER

INVOICE under separate cover WORK ID zone 4 groundwater 212-027-04-05 Fed Ex TAKEN TRANS TYPE

Analytical Serv TEST CODES and NAMES used on this report

Total Cyanide CNTOTA

SAMPLE IDENTIFICATION

Chromium, ICPES Copper, ICPES CR E

Infrared Mercury, Cold Vapor Oil and Grease, ICPES Nickel, ONG IR 4G CA

Phenolics low level **Fotal** PHEN A PB GA

otal Organic Carbon COX Single Analusis Zinc, ICPES Zinc, TOX 1 100

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LAB # 84-02-109

Analytical Serv REPORT RESULTS BY TEST

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Sample 01 (entered units)	<. 002	₹. 01	<. 001<	<. 001	<.0002	0.008	7	0.022	<. 005	43	<. 01	1.4
TEST CODE	CD_E	CONTOTA	CP C		H.	N N	ONGIR	A	PHEN_A	700	1 XOT	ZNE cg/m1

H-120

	02/20/84
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LAB # 84-02-140

Analytical Se	03	
	02/20/84	

REPORT TO	REPORT Radian TO B1 4 Austin	PREPARED BY BY
ATTEN	ATTEN William Little	ATTEN
CLIENT OMPANY	CLIENT TINKER SAMPLES 6 OMPANY TINKER AFB	

Mars &	CERTIFIED BY	CONTACT CONDVER
REPARED Radian Analytical Services BY 8501 MoPac Blvd	Austin, Texas 78766	PHONE (512) 454-4797

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		CODES and NAMES used on
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		Serv
		Analytical Serv
WORK ID zone 1 TAKEN FBB	P.O. # 212-027-04-05 INVOICE under separate cover	SAMPLE IDENTIFICATION

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under sec	E INENTIFICATION
INVOICE	CAMPIE

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Analytical Serv TEST CODES and NAMES u								-	-			1	ļ	1
and								Infrared		ou E				
CODES	Ç	r.			Vapor	ES			F. C.	FPA 608 Pesticides by EC	S	otal Organic Carbon	alusis	
ICPES	otal Cyanide	Copper, ICPES	PES	derbicides EC	Mercuru, Cold Vapor	Manganese, ICPES	Nickel, ICPES	Dil and Grease,	ead, low level	Pesti	otal Phenolics	ganic	OX Single Analysis	PES
Cal Serv	al Cu	Copper, I	Iron, ICPES	bicid	curu,	ganes	kel,	pue	d, 10	809	al Ph	al Or	Sing	Zinc, ICPES
ical	1	0 0	Iro		Mer	Man	Nic					104	TOX	<u> 7</u> 1 1 1
Analyt co E	CNTOTA	E E	FE E	HERBES	HG CA	M M	NI NI	ONG IR	PB GA	PESTES	PHEN A	TOC	TOX 1	ZN E

# TANGUAGO CO

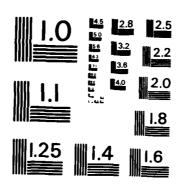
PAGE 2 RECEIVED: 02/20/84

Analytical Serv RESULTS BY TEST

LAB # 84-02-140

Sample 05 (entered units)	<. 002	₹ 01	<. 001	₹. 001	₹, 008	<.0005	0.053	€. 003	₽	<. 002	<. 005	ιn	< 01	€003
Sample 04 (entered units)	₹. 002	₹ 01	<. 001	₹. 001	₹. 008	<. 0005		€. 003	<b>5</b>	₹. 002	₹. 005	33	0.20	0.044
Sample 03 (entered units)	<.002	₹. 01	< 001	<.001	₹ 008	<. 0005	cu —i	€ 003	<b>5</b>	<. 002	<.005	17	(.01	< 003
Sample 02 (entered units)	₹ 005	€.01	₹.001	<. 001	€. 008	<.0005	0.71	€: 003	₽	<. 002	<.005	37	0.04	€.003
Sample 01 (entered units)	<.002	, O	₹.001	₹.001	S 008	<.0005	0.76	€.003	<b>7</b>	₹. 002	<.005	o-	0.05	C. 003
TEST CODE	CDE	NTOTA	1 L	Ψ,	<b>€</b>	HG CA		E LLI	THE IN		EN A	10C	TOX 1	IN E

INSTALLATION RESTORATION PROGRAM PHASE II
CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN
TD A SANDERS ET AL. SEP 85
RAD-DCN-84-212-927-94-92-VOL-2
F/G 13/2 AD-R168 894 UNCLASSIFIED NL



MICROCOPY RESOLUTION TEST CHART
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PAGE 3 RECEIVED: 02/20/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-140

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Results by Sample Analytical Serv

LAB # 84-02-140

SAMPLE ID groundwater

FRACTION OIF TEST CODE HERBES NAME Herbicides EC

DATE EXTRACTED 02/29/84 CONCENTRATION FACTOR

DATE INJECTED 03/11/84 ANALYST BWS

RESULT

VERIFIED BY CKT

OTHER HERBICIDES

DET. LIMIT

2, 4-D

1 ppp 밀

DET. LIMIT

RESULT

COMPOUND

1 ppp

2, 4, 5-TP (Silvex)

2

NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified

H-124

PAGE 5 RECEIVED: 02/20/84

Serv Results by Sample Analytical Serv

LAB # 84-02-140

THE RESERVE ASSOCIATION OF THE PROPERTY OF THE

SAMPLE ID groundwater

FRACTION OIF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

VERIFIED BY CKT COMPOUNDS DETECTED O	COMPOUND	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
ANALYST	SCAN EPA	102P	103P	104P	105P	106P	107P	108P	1098	110P	1116	112P	113P	
	NPDES 8	29	g G	4	g d	186	199	20P	21P	22P	23P	24P	25P	
<u>02/28/84</u> 03/13/84	RESULT N	Q	QN	QN	QN	QN	QN	Q	QN	QN	QN	QN	QN	QN
DATE EXTRACTED DATE INJECTED	COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
840214001 200	EPA C	896	90P	91P	92P	93P	94P	95P	496	97P e	486	d66	100P	101P h
DATA FILE CONC. FACTOR	NPDES SCAN	16	10P	<b>6P</b>	7P	<b>d</b> 8	d6	11P	12P	14P	14P	15P	16P	H-1

PAGE 6 RECEIVED: 02/20/84

Analytical Serv

REPORT Results by Sample

LAB # 84-02-140 Continued From Above

SAMPLE ID groundwater

FRACTION OIF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES SCAN = scan number on chromatogram.

All results reported in micrograms/liter unless otherwise specified.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

RECEIVED: 02/20/84

Serv REPORT Results by Sample Analytical Serv

LAB # 84-02-140

SAMPLE ID groundwater 2

CONCENTRATION FACTOR 200

FRACTION OZF TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

Category

DATE INJECTED 03/01/84
ANALYST BWS

VERIFIED BY CKT

2, 4-D

윋

RESULT

COMPOUND

1 ppp

OTHER HERBICIDES DET. LIMIT

RESULT

DET. LIMIT

2, 4, 5-TP (Silvex)

1 ppb 욷

NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

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PAGE 8 RECEIVED: 02/20/84

Results by Sample Analytical Serv

REPORT

LAB # 84-02-140

SAMPLE ID groundwater 2

FRACTION O2F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

COMPOUNDS DETECTED OF DRL ANALYST DATE EXTRACTED 02/28/84
DATE INJECTED 03/11/84 840214002 200 DATA FILE CONC. FACTOR

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RESUL											2		
COMPOUND	alpha BHC	beta BHC	gamma BHC	delta BHC	PCB-1242	PCB-1254	PCB-1221	PCB-1232	PCB-1248	PCB-1260	PCB-1016	toxaphene	
	n	ń	ū	0	0	ń	ń	n	n	0	0	ń	
SCAN EPA	102P	103P	104P	105P	106P	107P	108P	109P	110P	1111	112P	113P	
NPDES SC	25	е 	4		18P	19P	20P	21P	22P	23P	24P	. 25P	
RESULT	N	QN	QN	QN	QN	QN	N	ON	QN	N	Q	ND	QN
COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DDT	4,4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
ЕРА	d68	406	91P	92P	93P	94P	95P	96P	97P	98P	466	100P	101P
· NPDES SCAN	<b>d</b> .	10P	<b>6</b> P	7P	88 0-8	<b>d6</b>	11.6	12P	14P	14P	15P	16P	Н 17Р

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Analytical Serv

REPORT Results by Sample

LAB # 84-02-140 Continued From Above

SAMPLE ID groundwater 2

FRACTION O2F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN = scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

02/20/84
RECEIVED:

Analytical Serv

Serv REPORT Results by Sample

LAB # 84-02-140

SAMPLE ID groundwater 3

FRACTION O3F TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE EXTRACTED 02/29/84 CONCENTRATION FACTOR

200

DATE INJECTED 03/11/84 ANALYST BWS

DET. LIMIT

RESULT

COMPOUND

OTHER HERBICIDES

RESULT

DET. LIMIT

VERIFIED BY CKT

2, 4-D

2, 4, 5-TP (Silvex)

1 ppb 윋

1 ppp 밀 NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

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RECEIVED: 02/20/84

Serv Report Analytical Serv

LAB # 84-02-140

SAMPLE ID groundwater 3

FRACTION O3F TEST CODE PESTES N Date & Time Collected not specified

Category

NAME EPA 608 Pesticides by EC

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RESULT

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2

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VERIFIED BY COMPOUNDS DETECTED alpha BHC PCB-1242 PCB-1232 PCB-1260 PCB-1016 beta BHC gamma BHC delta BHC PCB-1254 PCB-1248 toxaphene PCB-1221 COMPOUND DRL ANALY EPA 102P 103P 104P 105P 106P 107P 1115 113P 108P 109P 110P 112P RESULT NPDES SCAN 25P 25 18P 19P 20p 21P 22P 23P 24P 35 44 å 02/28/84 2 S 2 일 밀 일 9 g 일 밁 밁 2 밁 DATE INJECTED DATE EXTRACTED aldrin 4, 4'-DDE 4, 4'-DDD alpha endosulfan dieldrin chlordane 4, 4'-DDT beta endosulfan endosulfan sulfate endrin endrin aldehyde heptachlor epoxide heptachlor COMPOUND 840214003 200 EPA d68 91P **97**P 90P 92P 93P 94P 95P 96P **486** 99P 100P 101P DATA FILE CONC. FACTOR NPDES SCAN 15 16P 10P 11P 12P 14P 14P 15P 17P <del>6</del>6 **7P** 8 96 H-131

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Analytical Serv

REPORT Results by Sample

LAB # 84-02-140 Continued From Above

SAMPLE ID groundwater 3

FRACTION O3F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES SCAN = scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

RECEIVED: 02/20/84

Analytical Serv

Serv Results by Sample

LAB # 84-02-140

SAMPLE ID groundwater 4

FRACTION 04F TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE EXTRACTED 02/29/84 CONCENTRATION FACTOR

DATE INJECTED 03/11/84 ANALYST BWS

VERIFIED BY CKT

RESULT COMPOUND

DET. LIMIT

OTHER HERBICIDES

DET. LIMIT

RESULT

밁 2, 4-D 2, 4, 5-TP (Silvex)

1 ppp S

1 ppb

NOTES AND DEFINITIONS FOR THIS REPORT.

All results reported in micrograms/liter unless otherwise specified. ND = not detected at the specified detection limit.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-140

SAMPLE ID groundwater 4

FRACTION 04F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

VERIFIED BY CKT COMPOUNDS DETECTED 0	COMPOUND	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
ANALYST	SCAN EPA	102P	103P	1046	105P	106P	107P	108P	1099	110P	1116	112P	113P	
	NPDES	25	g B	4	g.	18P	19P	20P	21P	22P	23P	24P	25P	
02/28/84 03/13/84	RESULT	QN	Q	QN	Q	Q	QN	QN	CON	Q	QN	QN	QN	Q
DATE EXTRACTED DATE INJECTED	COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DBT	4, 4'-DDE	4, 4'-DBD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
1LE <u>840214004</u> TOR <u>200</u>	ЕРА	898	90P	91P	92P	93P	94P	95P	96P	97P	98P	99P	100P	101P
DATA FILE CONC. FACTOR	NPDES SCAN	<b>41</b>	10P	<b>49</b>	7P	88 6	96	11P	12P	14P	14P	15P	16P	п. Н-134

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Analytical Serv REPORT Results by Sample

LAB # 84-02-140 Continued From Above

SAMPLE ID groundwater 4

FRACTION 04F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

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Analytical Serv

Serv REPORT Results by Sample

LAB # 84-02-140

SAMPLE ID groundwater 5

FRACTION OSF TEST CODE HERBES NAME Herbicides EC

CONCENTRATION FACTOR 200

DATE INJECTED 03/11/84 ANALYST BWS

VERIFIED BY CKT

OTHER HERBICIDES

DET. LIMIT

DET. LIMIT

RESULT

밁 RESULT COMPOUND 2, 4-D

1 ppp

밁

2, 4, 5-TP (Silvex)

1 ppp

NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-140

SAMPLE ID groundwater 5

FRACTION OSF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

COMPOUNDS DETECTED BY CKI	COMPOUND	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
ANALYST	SCAN EPA	102P	103P	104P	105P	106P	107P	108P	109P	110P	1116	112P	113P	
	NPDES	25	g G	46	a d	18P	19P	20P	21P	22P	23P	24P	25P	
<u>02/28/84</u> <u>03/13/84</u>	RESULT	Q	Q	QN	QN	2	Q	Q	Q	Q	Q	QN	Q	Q
DATE EXTRACTED DATE INJECTED	самрасив	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
840214005 200	J			<b>a</b> .	<u>α</u> .	<u>a</u>	94P	95P	96P	97P	98P	999	100P	101P
DATA FILE 840	EPA	89P	90P	916	92P	936	õ	<u>0</u>	0	0	0	0	10	10

RECEIVED: 02/20/84

Analytical Serv

REPORT Results by Sample

LAB # 84-02-140 Continued From Above

SAMPLE ID groundwater 5

FRACTION 05F TEST CODE PESTES NAME EPA 608 Perticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN = scan number on chromatogram.

All results reported in micrograms/liter unless otherwise specified.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

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Analytical Serv

Serv Results by Sample

LAB # 84-02-140

SAMPLE ID groundwater 6

FRACTION OGF TEST CODE HERBES NAME Herbicides EC

CONCENTRATION FACTOR 200

DATE INJECTED 03/11/84 ANALYST DRL

DET. LIMIT

VERIFIED BY CKT

2, 4-B

밁

1 ppb

DET. LIMIT

RESULT

COMPOUND

OTHER HERBICIDES

RESULT

2, 4, 5-TP (Silvex)

1 ppp 2

All results reported in micrograms/liter unless otherwise specified. NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

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Serv REPORT Results by Sample Analytical Serv

LAB # 84-02-140

SAMPLE ID groundwater 6

FRACTION OGF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

VERIFIED BY CKT COMPOUNDS DETECTED 0	COMPOUND RESULT	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
ANALYST _	SCAN EPA	102P	103P	104P	105P	106P	107P	108P	109P	110P	1111	112P	113P	
	NPDES (	2P	e e	4	r a	18P	19P	20P	21P	22P	23P	24P	25P	
<u>02/28/84</u> 03/13/84	RESULT	QN	Q	QV	QN	Q	QN	Q	Q	Q	QN	QN	QN	QN
DATE EXTRACTED DATE INJECTED	COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
E 840214006	EPA (	89P	90P	916	92P	93P	946	95P	96P	97P	98P	46b	100P	101P
DATA FILE CONC. FACTOR	NPDES SCAN	1.	10P	99	7P	88	d.6	11P	12P	146	14P	15P	16P	H-1

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Analytical Serv

REPORT Results by Sample

LAB # 84-02-140 Continued From Above

SAMPLE ID groundwater 6

FRACTION OF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number on chromatogram.

All results reported in micrograms/liter unless otherwise specified.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

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Analytical Serv

Serv REPORT Non-

LAB # 84-02-140

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE 016 026 036 046 056

CONTACT CONDVER Analytical Serv TEST CODES and NAMES used on this report PREPARED <u>Radian Analutical Bervices</u>
BY 8501 MoPac Blvd. Avstin, Texas 78766 and Grease, Infrared PA 608 Pesticides by EC (512) 454-4797 Box 9948 otal Organic Carbon **TOX Single Analysis** Analytical Serv REPC 04/11/84 13:11:52 Mercuru, Cold Vapor Hanganese, ICPEB Chromium, ICPES Phenolics ead, low level 1CPEB Total Cuanide Copper, ICPES Mickel, ICPEB Herbicides EC ron, ICPES Zinc, ICPEB PHONE ATTEN CD E PE GA PESTES PHEN A FE E HERBES NI E HS CA TOX 1 SR E 20 BAMPLEB <u>under separate cover</u> SAMPLE IDENTIFICATION ATTEN WILLIAM LISELS 212-027-04-05 landfill 4 leachate Tinker AFB RECEIVED: 02/20/84 groundwater 7 REPORT Radian TO B1. 4 Austin TINKER Fed Ex zone TYPE Pond-1 INVOICE MORK ID CL IENT COMPANY TAKEN P. O. \* FACILITY **agg** 

LAB # 84-02-141

REPORT

PAGE 2 RECEIVED: 02/20/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-02-141

COE	(entered units)	(entered units)	(entered units)	
	₹. 002	ć. 002	₹. 002	
CNTOTA	<b>C. 01</b>	C. 01	C. 01	
. — — — — — — — — — — — — — — — — — — —	<. 001	0.023	₹. 001	
1 L	<. 001	<. 001	<. 001	
= ·	<. 008	5.0	0.25	
12 CA	<. 0005	<b>C. 0005</b>	<. 0005	•
	es esi	0.33	0.010	
	<. 003	0.73	₹. 003	
ONG IR	5	7	₽	
7,58d	₹. 002	<. 002	₹. 002	•
PENA	<. 005	0.21	<. 005	•
100	7	340	ĸ	
10X 1	<. 01	1.5	<. 01	
H-14	₹ 003	<. 003	₹. 003	

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Analytical Serv RepORT Results by Sample

LAB # 84-02-141

SAMPLE ID groundwater 7

FRACTION OIF TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE INJECTED 03/01/84
ANALYST BB

VERIFIED BY LLN

CONCENTRATION FACTOR

DET. LIMIT

REBULT

OTHER HERBICIDES

DET. LIMIT

2, 4-D COMPOUND

1 4974 윋 REBULT

1/60 ] 月

2, 4, 5-TP (Silvex)

All results reported in micrograms/liter unless otherwise specified. NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-141

SAMPLE ID groundwater 7

FRACTION OIF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

COMPOUNDS DETECTED BY LLN	COMPOUND	alpha BHC ND	beta BHC ND	DE BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene	
ANALYST	BCAN EPA	102P	103P	104P	105P	106P	107P	108P	1099	1106	1116	112P	1139	
	NPDE8	ă	8	4	85	186	199	20P	216	22P	236	24P	236	
<u>02/29/84</u> 03/01/84	RESULT	QN	Q	Q	g	g	g	g	Q.	R	Q	DN	Q	Q
DATE EXTRACTED DATE INJECTED	COMPOUND	Aldrin	dieldrin	ch lordane	4, 4'-DDT	4, 4'-DDE	4, 4 '-DDD	alpha endosultan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
4 K	E₽A	896	906	916	926	93P	94P	466	476	979	986	466	100P	101P
DATA FILE CONC. FACTOR	NPDES BCAN	4	106	89	97	8	8	11.0	126	146	146	<b>9</b> ,	<b>99</b> F	<b>1</b> -146

PAGE 5 RECEIVED: 02/20/84

REPORT Analytical Serv REPO Results by Sample

LAB # 84-02-141 Continued From Above

SAMPLE ID groundwater 7

FRACTION OIF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number on chromatogram

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

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PAGE 6 RECEIVED: 02/20/84

Analytical Serv REPU Results by Sample

REPORT

LAB # 84-02-141

SAMPLE ID landfill 4 leachate

FRACTION OZF TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

DATE EXTRACTED 02/29/84 CONCENTRATION FACTOR

DATE INJECTED 03/01/84 ANALYST BS

VERIFIED BY LLN

COMPOUND

DET. LIMIT RESULT

DET. LIMIT

2, 4-D

윋

OTHER HERBICIDES

REBULT

2, 4, 5-TP (Silvex)

1 4976

1/07 윋

NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

PAGE 7 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-141

SAMPLE ID landfill 4 leachate

FRACTION OZF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

COMPOUNDS DETECTED BY LLN	COMPOUND REBULT	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene	
ANALYST DRL	EPA	102P	103P	104P	103P	106P	107P	108P	109P	110P	1116	112P	113P	
Ā	NPDES SCAN	8	d G	4	g.	186	196	20P	216	22P	236	24P	23P	
치치	Z													
02/29/84 03/01/84	RESULT	S	Q	QN	MD	MD	Q	9	Q	Q	Q.	Q	QN	g
DATE EXTRACTED <u>02/29/6</u> DATE INJECTED <u>03/01/6</u>		aldrin ND	dieldrin ND	chlordane ND	4, 4'-DDT ND	4, 4'-DDE ND	4, 4'-DDD ND	alpha endosultan ND	beta endosulfan ND	sulfate	endrin ND	endrin aldehyde ND	heptachlor ND	•boxid•
	COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin eldehyde	heptachlor	heptachlor epoxide
DATE EXTRACTED DATE INJECTED									1fan	sulfate				•boxid•

PAGE 8 RECEIVED: 02/20/84

REPORT Analytical Serv Results by Sample

LAB # 84-02-141 Continued From Above

CONTRACTOR STATE

SAMPLE ID landfill 4 leachate

FRACTION OZF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTEB SCAN = scan number on chromatogram

All results reported in micrograms/liter unless otherwise specified. ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

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RECEIVED: 02/20/84

Analytical Serv

Serv REPORT Results by Sample

LAB # 84-02-141

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SAMPLE ID pond-1

FRACTION OJF TEST CODE HERBES NAME Herbicides EC

Category

DATE EXTRACTED 02/29/84 CONCENTRATION FACTOR

DATE INJECTED 03/01/84 ANALYST BS

VERIFIED BY LLN

COMPOUND 2, 4-0

2

OTHER HERBICIDES

DET. LIMIT

REBULT

REBULT

DET. LIMIT

1 49/L 9

2, 4, 5-TP (Bilvex)

1 ug (L

NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

PAGE 10 RECEIVED: 02/20/84

Serv REPORT Analytical Serv

LAB # 84-02-141

SAMPLE ID pond-1

FRACTION 03F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

COMPOUNDS DETECTED \_\_\_O ANALYST DATE EXTRACTED 02/29/84 DATE INJECTED 03/01/84 DATA FILE CONC. FACTOR

RESULT	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
COMPOUND	•		•	J									
BCAN EPA	102P	103P	104P	105P	106P	107P	1086	1099	110P	1116	112P	1136	
NPDES 8	8 8	e e	4	g.	186	196	20P	216	22P	23P	1 24P	23P	
REBULT	QN	QN	Q.	Q	QN	QN	CN	QN	QN	N	QN	QN	Q
COMPOUND	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'-bbb	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
E E D	89P	90P	916	92P	936	946	936	496	97P	986	d66	100P	1016
NPDES SCAN	<b>G</b>	10e	<b>3</b>	<b>R</b>	8	<b>&amp;</b>	119	12P	146	148	10 T	168	H-152

RECEIVED: 02/20/84

Analytical Serv REPUR Results by Sample

REPORT

LAB # 84-02-141 Continued From Above

SAPLE ID pond-1

FRACTION O3F TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN - scan number on chromatogram.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79). All results reported in micrograms/liter unless otherwise specified.

PAGE 12 RECEIVED: 02/20/84

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

L00\_IN L00\_IN CDMPDS

H-154

NI COMPOS 03J I COMPOS 03G I LOG\_IN

LAB # 84-02-141

Analytical Serv REPORT NonReported Work

### CAMPIAN

LAB # 84-02-142

9706 AUR U G	Aictin
BY 8501 MoPac Bly	TO B1. 4
PREPARED Radian Analut	REPORT Radian
03/16/84 07:01:22	RECEIVED: 02/20/84
Analytical Serv REPORT	

REPORT Radian TO B1 4 Austin	PREPARED Radian Analytical Services BY 8501 MoPac Blvd. P. O. Box 9948 Austin, Texas 78766	CERTIFIED BY
CLIENT TINKER COMPANY TINKER AFB FACILITY	ES 1 PHONE (512) 454-4797	CONTACT CONDVER

Analytical Serv TEST CODES and NAMES used on this report SAMPLE IDENTIFICATION Of groundwater B

WORK ID zone 2
TAKEN FBB
TRANS Fed Ex
TYPE
P.O. # 212-027-04-05
INVOICE under separate cover

HES HES I	Barium, ICPES Cadmium, ICPES Cadmium, ICPES Copper, ICPES Copper, ICPES Herbicides EC Mercury, Cold Vapor Nickel, ICPES Coll and Grease, Infrared Lead, low level Total Phenolics Total Organic Carbon
TOX 1 T	FOX Single Analysis
ZNE	7:30 17000

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	02/20/84
PAGE 2	RECEIVED:

Analytical Serv REPORT

LAB # 84-02-142

<ul> <li>C.01</li> <li>C.001</li> <li>C.0005</li> <li>C.0005</li> <li>C.0005</li> <li>C.0005</li> </ul>
6 10 >
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### MARIAN

PAGE 3 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-142

E/ EU/ 04

FRACTION O1G TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category SAMPLE ID groundwater B

מוני מוני מוני מוני מוני שמוני שמי שמי שמי שמי שמי שמי שמי שמי שמי שמ	EXTRACTED 02/28/84 ANALYST MSF COMPOUNDS DETECTED 1	RESULT NPDES SCAN EPA	enaphthene ND i 5B 72B benzo(a)anthracene A ND	orobenzene ND i 6B 73B benzo(a)pyrene ND	orobenzene ND i 7B 74B 3,4-benzofluoranthene * ND	loroethane ND 98 758 benzo(k)fluoranthene * ND	thyllether ND 188 768 chrysene A ND	aphthalene ND ; 2B 77B acenaphthylene ND	orobenzene ND 38 788 anthracene B ND	orobenzene ND   8B 79B benzo(ghi)perylene ND	orobenzene ND 32B 80B fluorene ND	1hydrazine ND 44B 81B phenanthrene B ND	uoranthene ND 198 828 dibenzo(a,h)anthracene ND	enyl ether ND ; 37B 83B indeno(1,2,3-cd)pyrene ND	enyl ether ND / 45B 84B pyrene ND	opyl)ether ND i 11A 21A 2,4,6-trichlorophenol ND	xy)methane ND ; 8A 22A p-chloro-m-cresol ND	·
7 7 7 7	IAL YST UMENT	_	72B	738	74B	75B	768	778	788	79B	BOB	818	828	838	843	21A	22A	•
	AN INSTR		និន	<b>6</b> B	78	98	188	2B	en C	88	32B	44B	19B	37B	45B	114	84	
J = 4 -	02/28/84		QN	QN	QN	QN	Q	Q	Q	Q	Q	QN	Q	QN	QN	QN	QN	<b>-</b> !
ر د	DATE EXTRACTED DATE INJECTED	COMPOUND	acenaphthene	1, 2, 4-trichlorobenzene	hexachlorobenzene	hexachloroethane	bis(2-chloroethyl)ether	2-chloronaphthalene	1, 2-dichlorobenzene	1, 3-dichlorobenzene	1, 4-dichlorobenzene	1,2-diphenylhydrazine	fluoranthene	phenyl et	phenyl et	bis(2-chloroisopropyl)ether	bis(2-chloroethoxy)methane	•
	Z.	S		1, 2, 4-	Æ		bis(2-c	2-0	1,2	1,3	1,4	1, 2-d		4-chlorophenyl	4-bromophenyl	is(2-chlor	bis(2-chlo	•
	1000															Φ		
	DATA FILE <u>B14201AN</u> IC. FACTOR <u>1000</u>	SCAN EPA	118	88	98	12B	188	208	258	26B	278	37B	39B	40B	41B	42B	43B	i i

### LE COLONIA MAN

PAGE 4 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-142 Continued From Above

trals		QN	2	QN	QN	QN	QN	S	QN
TEST CODE ANFS NAME Method 625 Acid/Neutrals	Category	2, 4-dichlorophenol	2,4-dimethylphenol	2-nitrophenol	4-nitrophenol	2,4-dinitrophenol	4,6-dinitro-o-cresol	pentachlorophenol	phenol
NAME	fied						4		
ANFS	Speci	314	34A	57A	58A	59A	<b>604</b>	64A	65A
CODE	d not								
TEST	lecte	2A	9 A	<b>6</b>	7A	S. A	4 A	9 A	10A
FRACTION 016	Date & Time Collected not specified	Q	Q	QN	QN	, S	QN	QN	Q
		hexachlorocyclopentadiene	isophorone	naphthalene	bis(2-ethylhexyl)phthalate	butyl benzyl phthalate	di-n-butyl phthalate	di-n-octyl phthalate	diethyl phthalate
groundwa		538	54B	E 03	9 899	829	889	869	708
SAMPLE ID groundwater B	-	358	386	398	138	15B 1215	26B	29B	24B

2

dimethyl phthalate

71B

25B

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

 $\star$  = 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute. H-158

A = benzo(a)anthracene and chrysene co-elute

PAGE 5 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-142 Continued From Above

SAMPLE ID groundwater B

FRACTION OIG TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

## KWIDIWN

PAGE 6 RECEIVED: 02/20/84

Serv REPORT Results by Sample Analytical Serv

LAB # 84-02-142

SAMPLE ID groundwater B

FRACTION OIF TEST CODE HERBES NAME Herbicides EC Date & Time Collected not specified Category

Category

CONCENTRATION FACTOR 200

DATE INJECTED 03/14/84 ANALYST DRL

VERIFIED BY CKI

2, 4-D

2

1 ppp

OTHER HERBICIDES

DET. LIMIT

RESULT

COMPOUND

DET. LIMIT

2, 4, 5-TP (Silvex)

1 ppp S

NOTES AND DEFINITIONS FOR THIS REPORT.

All results reported in micrograms/liter unless otherwise specified ND = not detected at the specified detection limit.

PAGE 7 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-142

SAMPLE ID groundwater B

FRACTION OIF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

VERIFIED BY CKI ANALYST DATE EXTRACTED 02/28/84
DATE INJECTED 03/14/84 840214201 DATA FILE CONC. FACTOR

RESULT	N	Q.	N	N	Ü.	ND	ON	N	ON	N	Ö	Q	
	alpha BHC	beta BHC	gamma BHC	delta BHC	PCB-1242	PCB-1254	PCB-1221	PCB-1232	PCB-1248	PCB-1260	PCB-1016	toxaphene	
COMPOUND	.0		31	Ū									
N EPA	102P	103P	104P	105P	106P	107P	108P	109P	110P	1111	112P	113P	
NPDES SCAN	: 2P	ě	44	- S-	18P	196	20P	21P	1 22P	23P	24P	25P	
RESULT	QN	Q	QN	QN	Q	QN	Q	Q	QN	QN	QN	QN	QN
	aldrin	dieldrin	chlordane	4, 4'-DDT	4, 4'-DDE	4, 4'DBB	endosulfan	endosulfan	ın sulfate	endrin	aldehyde	heptachlor	r epoxide
COMPOUND							alpha e	beta e	endosulfan		endrin	E	heptachlor
EPA	896	90P	91P	92P	93P	94P	95P	96P	97P	98P	d66	100P	101P
NPDES SCAN	16	10P	49	7P	86	d6	116	12P	14P	14P	15P	16P	о. К н-161

PAGE 8 RECEIVED: 02/20/84

Analytical Serv Results by Sample

LAB # 84-02-142 Continued From Above

SAMPLE ID groundwater B

FRACTION OIF TEST CODE PESTES NAME EPA 608 Pesticides by EC Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES SCAN = scan number on chromatogram.

All results reported in micrograms/liter unless otherwise specified.

ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

CONTACT CONDVER CERTIFIED BY Analytical Serv TEST CODES and NAMES used on this report PREPARED Radian Analutical Services
BY 8501 MoPac Blvd. Duplicate of report of 04/06/84 Austin, Texas 78766 Oil and Grease, Infrared (512) 454-4797 P. O. Box 9948 Analytical Serv REPORT 04/16/84 14:40:23 Organic Carbon Mercuru, Cold Vapor TOX Single Analysis Chromium, ICPES Copper, ICPES Phenolics low level Cadmium, ICPES Total Cuanide Nickel, ICPES ICPES ATTEN PHONE 0 tal CD E PHEN A TOC TOX 1 DNG IR NI EA PB GA 를 강 CR E SAMPLES SAMPLE IDENTIFICATION ATTEN William Little 212-027-04-05 2991 Tinker AFB ECEIVED: 02/20/84 Ol groundwater G REPORT Redien Austin TINKER 200g Fed Ex B1. 4 FBB CLIENT WORK ID TRANS FACILITY TYPE TAKEN ₽. N. S. O. S.

LAB # 84-02-143

02/20/84	1 B 1 1 2 F 1 D 2 E 1	RESULTS BY TEST	
	Sample Ol		
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	80		
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	53		

PAGE 3 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-143

NAME Method 625 Acid/Neutrals

/EU: UE/EU/04

SAMPLE ID groundwater G

FRACTION OIF TEST CODE ANFS N Date & Time Collected not specified

¥ N EPA 9 皇 9 윋 물 月 月 月 月 COMPOUNDS DETECTED VERIFIED BY benzo(a)anthracene A benzo(a)pyrene acenaphthylene benzo(ghi)perylene 2-chlorophenol fluorene dibenzo(a, h)anthracene pyrene p-chloro-m-cresol indeno(1,2,3-cd)pyrene 2, 4, 6—trichlorophenol 3, 4-benzofluoranthene benzo(k)fluoranthene chrysene anthracene phenanthrene Category 멸 **73B** 21A 22A 244 INSTRUMENT 72B **74B** 75B **76B 77B 78B 79B BOB** 818 82B 838 848 ANALYST NPDES SCAN BA 18B **58** 88 32B 44B 19B 37B 45B 11A 14 38 **89** 78 38 DATE EXTRACTED 03/01/84 DATE INJECTED 04/04/84 月 9 月 윋 ᄝ 月 윋 뮏 윋 RESULT 물 9 S 2 얾 月 윋 acenaphthene 1, 2, 4-trichlorobenzene hexachlorobenzene bis(2-chloroethyl)ether 2-chloronaphthalene 1,2-dichlorobenzene 1, 3-dich lorobenzene fluoranthene 4-chlorophenyl phenyl ether 4-bromophenyl phenyl ether 42B bis(2-chloroisopropyl)ether hexachloroethane 1, 4-dichlorobenzene 1,2-diphenylhydrazine bis (2-chloroethoxy)methane hexachlorobutadiene COMPOUND DATA FILE 2CU02143A01 40B 43B EPA 37B 41B 18 18B 20B 25B **26B 27B** 39B 88 **9B** 12B **52B** NPDES SCAN 475 **B H H 1**65 20B 18 46B 33B 36B 118 16B 218 22B 29B 31B 17B 14B 12B

RECEIVED: 02/20/84

Results by Sample Analytical Serv

LAB # 84-02-143 Continued From Above

SAMPLE 1	SAMPLE ID groundwater G	water G	FRACTION OIF	OIF	TEST CODE ANFS	CODE		NAME Method 625 Acid/Neutrals
			Date & Ti	me Col	lected	not	Date & Time Collected not specified	Category
338	<b>23B</b>	hexachlorocyclopenta	adiene	Q Q	8	•	31A	2, 4-dichlorophenol ND
388	34B	isoph	horone	9	<b>∀</b>		34A	2, 4-dimethylphenol ND
398	328	naphth	halene	9	₹9		57A	2-nitrophenol ND
138	<b>66B</b>	bis(2-ethylhexyl)phth	halate	g	4		58A	4-nitrophenol ND
138	<b>678</b>	butyl benzyl phtha	thalate	9	ď,		59A	2, 4-dinitrophenol ND
268	<b>889</b>	di-n-butyl phtha	thalate	9	4		409	4,6-dinitro-o-cresol ND
29B	869	di-n-octyl phtha	thalate	9	46		64A	pentachlorophenol ND
248	708	diethyl phtha	thalate	9	10A	420	65A	phenol 220
258	718	dimethyl phtha	thalate	Q				
				-				

# NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in mg/L

ND = not detected at EPA detection limits

\* = 3, 4-benzofluoranthene and benzo(k)fluoranthene co-elute.

m benzo(a)anthracene and chrysene co-elute.

B = anthracene and phenanthrene co-elute

### NAME OF THE PARTY

DACE

LAB # 84-02-144

02/20/84
 RECEIVED: (

IGE 1 (CEIVED: 02/20/84	Analytical
REPORT <u>Radian</u> TO <u>Bl. 4</u> Austin	PRE

03/14/84 08: 52: 24	PREPARED Radian Analytical Serving BY 8501 MoPac Blvd.	
<b>*</b>		

Strack	ZERTIFIED BY	į	CONTACT CONDVER
BY 8501 MoPac Blvd. P. O. Box 9948	Austin, Texas 78766	ATTEN	PHONE (512) 454-4797

received	
n on 84-02-109,	
logged	
his sample	
5 Of t	
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Other	

SAMPLES 1

CLIENT TINKER COMPANY Tinker AFB FACILITY

zone 4	FBB	Fed Ex		212-027-04-05	under separate cover	
WORK ID	TAKEN	TRANS	TYPE	# 0 d	INVOICE	

Analytical Serv TEST CODES and NAMES used on this report

PAGE 2 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-144

## EMICIAN

PAGE 3 RECEIVED: 02/20/84

Analytical Serv Results by Sample

LAB # 84-02-144 Continued From Above

8	ground	SAMPLE ID groundwater G	FRACTION OLA	RACTION OIA TEST CODE ANFS Nate & Time Collected not specified	TEST CODE ANFS	CODE A	NFS NAME	NAME Method 625 Acid/Neutrals
	538	hexachlorocyclopenta	adiene	Q	2A	m	31A	2,4-dichlorophenol ND
	54B	isophe	horone	Q	e V	n	34A	2, 4-dimethylphenol ND
	55B	napht	naphthalene	QN	<b>6</b> A	מו	57A	2-nitrophenol ND
	668	bis(2-ethylhexyl)phthalate	thalate	Q	74	מו	58A	4-nitrophenol ND
	67B	butyl benzyl phthalate	thalate	QN	υĄ	U)	59A	2,4-dinitrophenol ND
	889	di-n-butyl phtha	thalate	QN	<b>4</b>	40	40A 4	4,6-dinitro-o-cresol ND
	869	di-n-octyl phthalate	thalate	Q	9A	Ð	64A	pentachlorophenol ND

밁

1.0

**65A** 

10A 241

diethyl phthalate

70B

24B

71B

25B

밀

dimethyl phthalate

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

1/BA All results reported in\_\_\_ ND = not detected at EPA detection limits

\*=3,4-benzofluoranthene and benzo(k)fluoranthene co-elute. H-169

= benzo(a)anthracene and chrysene co-elute

### NAME OF THE PARTY

PAGE 4 RECEIVED: 02/20/84

Analytical Serv Results by Sample

LAB # 84-02-144 Continued From Above

SAMPLE ID groundwater G

FRACTION O1A TEST CODE ANFS NA Date & Time Collected not specified

NAME Method 625 Acid/Neutrals

= anthracene and phenanthrene co-elute.

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PAGE 5 RECEIVED: 02/20/84

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

01B : LOG\_IN

Analytical Serv REPORT NonReported Work

LAB # 84-02-144

### 

REPORT Radian

Analutical Serv

REPORT

LAB # 84-02-145

02/23/84	
/20/84	

13:40:26

Radian Analutical Services 8501 MoPac Blvd Box 9948 PREPARED ₽¥

Austin, Texas 78766 ATTEN

(512) 454-4797

PHONE

SAMPLES

ATTEN William Little

Austin

Tinker AFB

TINKER

CLIENT COMPANY FACILITY

CONTACT CONDVER

Note: 1,1,2,2-tetrachloroethane and tetrachloroethulene

coelute.

SAMPLE IDENTIFICATION T5-018 T5-019 ସଖଣ

trip blnk

P.O. # 212-027-04-05 INVOICE under separate cover

212-027-04-05

zone 5

WORK ID

Fed Ex

TRANS TYPE

TAKEN

Analytical Serv TEST CODES and NAMES used on this report Total Organic Carbon GC 601 EPA Method 601/GC TOC Total Organic Car

		,	
LAB # 84-02-145			
**			
EA .			
E E			
Serv RESULTS BY TEST			
() <del>\</del>	7		
rv ESUL T	on 1		
	Sample <u>02</u> (entered units)		
Analytical			
Ana	Sample <u>Ol</u> (entered units)		
7	Sample 01		
	(ent		
C <b>ERMINIAN</b> : 02/20/84	2		
<b>1</b> (20)	10E		
PAGE 2 RECEIVED: 02/20/84	TEST CODE default units TOC mg/L		
PAGI RECT	FAFE		

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PAGE 3 RECEIVED: 02/20/84

REPORT Results by Sample Analytical Serv

LAB # 84-02-145

TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified FRACTION 01B SAMPLE 1D 15-018

Category

98 RESULT COMPOUNDS DETECTED VERIFIED BY COMPOUND ANALYST INSTRUMENT SCAN DATE INJECTED 02/22/84 RESULT COMPOUND DATA FILE CONC. FACTOR SCAN

1530 **Frichloroethene** Dibromoch loromethane 1, 1, 2-Trichloroethane 윋 2 2 Chloromethane Vingl Chloride Bromomethane

9 Chloroethane

윋 Methylene Chloride

**Trichlorofluoromethane** 1, 1-Dichloroethene

윋

윋

뮏

1, 1-Dichloroethane

32.8 trans-1, 2-Dichloroethene

뮏 Chloroform

윋 1, 2-Dichloroethane

1, 1, 1-Trichloroethane Carbon Tetrachloride

9

뮏

의 **Bromodichloromethane** 

뮏 1,2-Dichloropropane 밁

trans-1, 3-Dichloropropene

cis-1, 3-Dichloropropene

9

뮏 2 2-Chloroethylvinyl Ether Bromoform

9 윋 Tetrachloroethylene 1, 1, 2, 2-Tetrachloroethane

9 Chlorobenzene

밀 1, 3-Dichlorobenzene

윋 1, 2-Dichlorobenzene 皇 1, 4-Dichlorobenzene

PAGE 4 RECEIVED: 02/20/84

SAMPLE ID T5-018

r Serv Results by Sample Analytical Serv

LAB # 84-02-145 Continued From Above

FRACTION OIB TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

RECEIVED: 02/20/84

**SAMPLE ID 15-019** 

Results by Sample Analytical Serv

LAB # 84-02-145

TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified FRACTION 02B

COMPOUNDS DETECTED VERIFIED BY Category ANALYST INSTRUMENT DATE INJECTED 02/22/84 DATA FILE CONC. FACTOR

150 2 9 RESULT Trichloroethene COMPOUND SCAN 밀 RESULT Ch loromethane COMPOUND SCAN

9 **Bromomethane** 

9 2 Vinyl Chloride

Chloroethane

Methylene Chloride Trichlorofluoromethane

윋

밁

뮏

1, 1-Dichloroethene

1, 1-Dichloroethane

trans-1, 2-Dichloroethene

밀 月 Chloroform

1, 2-Dichloroethane

뮏

뮏 1, 1, 1-Trichloroethane

뮏 月 Carbon Tetrachloride **Bromodichloromethane** 

윋 1, 2-Dichloropropane

뮉

trans-1, 3-Dichloropropene

Dibromoch loromethane 1, 1, 2-Trichloroethane

皇

2 cis-1, 3-Dichloropropene 밁 일 Bromoform 2-Chloroethylvinyl Ether

뮏 1, 1, 2, 2-Tetrachloroethane S Chlorobenzene

2 B

Tetrach loroethylene

2 1, 3-Dichlorobenzene 밁 1, 2-Dichlorobenzene 2 1, 4-Dichlorober ene

PAGE 6 RECEIVED: 02/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-145 Continued From Above

SAMPLE 1D 15-019

FRACTION <u>028</u> TEST CODE <u>GC 601</u> NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

RECEIVED: 02/20/84

Results by Sample Analytical Serv

LAB # 84-02-145

VERIFIED BY TEST CODE GC 601 NAME EPA Method 601/GC Category 짇 Date & Time Collected not specified DATE INJECTED 02/22/84 FRACTION 03A 00 SAMPLE ID trip bink

750 COMPOUNDS DETECTED ANALYST INSTRUMENT DATA FILE CONC. FACTOR

RESULT Trichloroethene Dibromoch loromethane 1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene COMPOUND SCAN 윋 2 2 2 RESULT Chloromethane Vinyl Chloride Chloroethane Bromome thane COMPOUND SCAN

윋 Methylene Chloride

Trichlorofluoromethane

밀

Bromoform

2-Chloroethylvinyl Ether

1, 1, 2, 2-Tetrachloroethane

Tetrachloroethylene

Chlorobenzene

1, 3-Dichlorobenzene

1, 2-Dichlorobenzene

月 1, 1-Dichloroethene

月 1, 1-Dichloroethane trans-1, 2-Dichloroethene 2 Chloroform

뮏

2 1, 2-Dichloroethane

9 1, 1, 1-Trichloroethane

Carbon Tetrachloride

2

1, 4-Dichlorobenzene

뮏 Bromodichloromethane

묏 1,2-Dichloropropane 月

trans-1, 3-Dichloropropene

PAGE 8 RECEIVED: 02/20/84

Analytical Serv

REPORT Results by Sample

LAB # 84-02-145 Continued From Above

SAMPLE ID trip blnk

FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified.

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

Analytical Serv REPORT NonReported Work

Accessed a production

LAB # 84-02-145

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE L00-11N LD6\_IN 01D LD6\_IN 02D DUP601 01C 02C 03B

RECEIVED: 02/23/84

REPORT Radian

2

REPORT

LAB # 84-02-162

Analytical Serv Keru 07/23/84 09:17:22

PREPARED Radian Analutical Services

Austin, Texas 78766 8501 MoPac Blvd. P.O. Box 9948 ¥ ATTEN

CERTIFIED BY

CONTACT CONOVER

(512) 454-4797 PHONE

SAMPLES 1

ATTEN William Little

Austin

Tinker AFB

CLIENT COMPANY FACILITY

TINKER

Detection limit is 500 ppb or 0.5 ppm

625 (A/N) MORK ID zone 3, TAKEN

212-027-04-05 2992 TRANS P. O. N. O. Š. O. Š.

SAMPLE IDENTIFICATION

Analytical Serv TEST CODES and NAMES used on this report

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1	<b>=</b>
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RECEIVED: 02/23/84 PAGE 2

REPORT Results by Sample Analytical Serv

LAB # 84-02-162

¥¥\*

EPA

月

NAME Method 625 Acid/Neutrals VERIFIED BY COMPOUNDS DETECTED benzo(a)anthracene A benzo(a)pyrene acenaphthylene benzo(ghi)perylene fluorene dibenzo(a, h)anthracene indeno(1,2,3-cd)pyrene 2, 4, 6-trichlorophenol benzo(k)fluoranthene 3, 4-benzofluoranthene chrysene anthracene phenanthrene Category Ŧ Date & Time Collected not specified TEST CODE ANFS ANALYST INSTRUMENT 72B **73B** 74B 75B **76B 77B 78B** 79B 80B **81B** 82B 83B 843 21A NPDES SCAN 11A 188 32B 44B 198 37B 45B **89** 3B DATE EXTRACTED 03/08/84 DATE INJECTED 04/06/84 윋 FRACTION O1A RESULT 일 9 9.9 皇 9 뮏 2 月 밀 acenaph thene hexachlorobenzene hexachloroethane bis(2-chloroethyl)ether 2-chloronaphthalene 1, 2-dichlorobenzene 1, 3-dichlorobenzene 1, 4-dichlorobenzene fluoranthene 40B 4-chlorophenyl phenyl ether 4-bromophenyl phenyl ether 1, 2, 4-trichlorobenzene 1,2-diphenylhydrazine 42B bis(2-chloroisopropyl)ether COMPOUND DATA FILE 2002162A01 41B EPA 18 88 12B 188 20B 25B 26B **27B** 37B **86 39B** SAMPLE 10 3Ca NPDES SCAN 482 457 447 218 22B 20B 46B 33B 36B 11B **298** 31B 17B 12B 16B 14B

2

9

윋

2

H-182

34B

9

밁

月

2-chlorophenol

p-chloro-m-cresol

22A

8

윋

bis(2-chloroethoxy)methane

43B

10B

52B

24A

1 4

밀

hexachlorobutadiene

	02/23/84
PAGE 3	RECEIVED:

Analytical Serv REPORT Results by Sample

LAB # 84-02-162 Continued From Above

SAMPLE ID 3Ca	ID 3Ca	FRACTI	ION OIA	TEST CODE ANFS		NAME Method 625 Acid/Neutrals
		Date 8	k Time Co	llected not	specified	Category
358	538	) hexachlorocyclopentadiene	Q	2A	31A	2, 4-dichlorophenol ND
388	54B	isophorone	9	₩ W	34A	2, 4-dimethylphenol ND
39B	558	naphthalene	Q	<b>6</b> A	57A	2-nitrophenol ND
138	899	bis(2-ethylhexyl)phthalate	9	7A	58A	4-nitrophenol ND
15B	<b>67</b> B	butyl benzyl phthalate	Q	SA	59A	2, 4-dinitrophenol ND
26B 1	1557 68B	di-n-butyl phthalate	3.0	44	60A	4, 6-dinitro-o-cresol ND
29B	869	di-n-octyl phthalate	9	9A	64A	pentachlorophenol ND
24B	708	diethyl phthalate	Q	104	65A	pheno! ND
25B	718	dimethyl phthalate	Q			

# NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/g

ND = not detected at EPA detection limits

\*=3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute.

B = anthracene and phenanthrene co-elute.

### MANICH WAS

Analytical Serv REPORT 03/16/84 07:05:04

LAB # 84-02-163

/84	
02/23/	
S	
RECEIVED:	

Radian Bl. 4	Austin
REPORT TO	

-		SAMPLES 5	
TO B1. 4 Austin	ATTEN William Little	CLIENT TINKER COMPANY TINKET AFB	FACILITY

			4	\	
Radian Analutical Services	8501 MoPac Blvd.	P. O. Box 9948	Austin, Texas 78766	2	(512) 454-4797
PREPARED	BY			ATTEN	PHONE

March	MERTIFIED BY	CONTACT CONDVER
BY <u>B501 MoPac Blvd.</u> P. O. Box 9948	Austin, Texas 78766	PHONE (512) 454-4797

inder separate cover	
INVOICE L	1
INVOICE under	

212-027-04-05

TRANS TYPE P. O. #

TAKEN

WORK ID zone 5, 624 and 625 (A/N)

Analytical Serv TEST CODES and NAMES used on this report and 625 Acid/Neutrals MS 624 EPA Method 624/6C-MS

SAMPLE IDENTIFICATION 15-005 T5-018 T5-019 5-014 5-016 

PAGE 2 RECEIVED: 02/23/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-163

FRACTION OIB TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category SAMPLE ID 15-005

	BY CKT ED O	EPA	QN	QN	QN	ON	Ö	QN	QN	QN	QN	N	QN	QN	N	Q	QN	QN
2000	VERIFIED COMPOUNDS DETECT		benzo(a)anthracene A	benzo(a)pyrene	3,4-benzofluoranthene *	benzo(k)fluoranthene *	chrysene A	acenaphthylene	anthracene B	benzo(ghi)perylene	fluorene	phenanthrene B	dibenzo(a,h)anthracene	indeno(1, 2, 3-cd)pyrene	pyrene	2, 4, 6-trichlorophenol	p-chloro-m-cresol	2-chlorophenol
	LK		д		3, 4-	ben							dib	ind		ณ		
	ANALYST INSTRUMENT	z	72B	738	74B	758	76B	778	788	79B	808	818	82B	838	848	21A	22A	24A
	AINST	NPDES SCAN	58	89	78	913	188	28	38	88	328	44B	19B	37B	458	114	ВА	14
	84	Ž																
,	36	<b>-</b> -	呈	9	9	Ź	呈	9	2	밁	S	9	일	9	밀	잂	9	9
	03/02/84 03/13/84	RESULT	Q N	Q	Q	N	ON CO	ND	QN	Q	Q	ON CO	N	QN N	N	QN	QN	QN
	DATE EXTRACTED <u>03/02/</u> DATE INJECTED <u>03/13/</u>		acenaphthene ND	ene	ene	ane	her	ene	ene	ene	ene	ine	fluoranthene ND	phenyl ether	phenyl ether	her	ane	ene
	DATE EXTRACTED DATE INJECTED	COMPOUND	ene	ne									ene	phenyl ether	ether	her		
	B16301AN DATE EXTRACTED DATE INJECTED		ene	ene	ene	ane	her	ene	ene	ene	ene	ine	ene	ether	phenyl ether		ane	ene
	DATE EXTRACTED DATE INJECTED	COMPOUND	acenaphthene	1, 2, 4-trichlorobenzene	hexachlorobenzene	hexachloroethane	bis(2-chloroethyl)ether	2-chloronaphthalene	1, 2-dichlorobenzene	1, 3-dichlorobenzene	1, 4-dichlorobenzene	1,2-diphenylhydrazine	fluoranthene	4-chlorophenyl phenyl ether	4-bromophenyl phenyl ether	bis(2-chloroisopropyl)ether	bis(2-chloroethoxy)methane	52B hexachlorobutadiene

### NAMO

PAGE 3 RECEIVED: 02/23/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-163 Continued From Above

SAMPLE	SAMPLE ID 15-005		N OIB	TEST CODE lected not	FRACTION OIB TEST CODE ANFS NAME Date & Time Collected not specified	TEST CODE ANFS NAME Method 625 Acid/Neutrals	<u>م</u>
358	53B	hexachlorocyclopentadiene	QN	2A	31A	henol	ᄝ
388	548	isophorone	Q	34	34A	2,4-dimethylphenol N	S
398	55B	naphthalene	Q	<b>6A</b>	57A	2-nitrophenol N	2
138	66B	bis(2-ethylhexyl)phthalate	Q	7.4	58A	4-nitrophenol	2
158	67B	butyl benzyl phthalate	QN	5.4	59A	2, 4-dinitrophenol	밀
26B	889	di-n-butyl phthalate	Q	44	40 A03	4,6-dinitro-o-cresol N	2
298	69B	di-n-octyl phthalate _	Q	94	64A	pentachlorophenol N	S
24B	708	diethyl phthalate	Q	10A	65A	pheno! N	S
258	718	dimethyl phthalate	Q				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute

н-186

PAGE 4 RECEIVED: 02/23/84

SAMPLE ID 15-005

Analytical Serv REPORT Results by Sample

LAB # 84-02-163 Continued From Above

FRACTION O1B TEST CODE ANFS NA Date & Time Collected not specified

NAME Method 625 Acid/Neutrals ed Category

= anthracene and phenanthrene co-elute. <u>m</u>

PAGE 5 RECEIVE

Analytical Serv Results by Sample

LAB # 84-02-163

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VERIFIED BY CKT FRACTION OIA TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified Category Category BWS F4 ANALYST INSTRUMENT DATE INJECTED 02/27/84 B16301V SAMPLE ID 15-005 DATA FILE CONC. FACTOR

7	RESULT	N	S	Ö	QN	CN	ON	Ö	ND	Q	ON	ON	Q	QN	N	ON	ON
CONTRONDS DESCRIED	COMPOUND	1,2-dichloropropane	cis-1, 3-dichloropropylene	trans-1, 3-dichloropropylene	ethylbenzene	methylene chloride	methyl chloride	methyl bromide	bromoform	dichlorobromomethane	trichlorofluoromethane	dichlorodifluoromethane	chlorodibromomethane	tetrachloroethylene	toluene	trichloroethylene	vinyl chloride
	SCAN EPA	320	330	>ee	380	44	450	460	477	480	490	300	510	850	867	870	880
-	NPDES	170	180	180	190	227	210	200	> 20	120	300	130	8	240	250	290	310
	RESULT	Q	Q	QN	QN	QN	QN	QN	QN	Q	QN	QN	QN	QN	QN	Q	QN
	COMPOUND	acrolein	acrylonitrile	penzene	carbon tetrachloride	chlorobenzene	1,2-dichloroethane	1, 1, 1-trichloroethane	1, 1-dichloroethane	1, 1, 2-trichloroethane	1, 1, 2, 2-tetrachloroethane	chloroethane	(chloromethyl) ether	2-chloroethylvinyl ether	chloroform	1,1-dichloroethylene	1,2-trans-dichloroethylene
					C		***	1, 1,	<b>₩</b>	1, 1,	1, 1, 2, 2-		bis (ch	2-ch101		11	1,2-tran
NO DEL	SCAN EPA	24	36	<b>&gt;</b> 4	6V ca1	76	100	11. 1, 1, 1,	13/	140 1,1,	15V 1,1,2,2-	16V	17V bis (ch	19V 2-chlo	230	29V 1,	30V 1,2-tran

PAGE 6 RECEIVED: 02/23/84

Analytical Serv REPU Results by Sample

REPURT

LAB # 84-02-163 Continued From Above

SAMPLE ID 15-005

FRACTION OIA TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in  $\frac{19/L}{1}$  unless otherwise specified. ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

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PAGE 7 RECEIVED: 02/23/84

REPORT Results by Sample Analytical Serv

LAB # 84-02-163

NAME Method 625 Acid/Neutrals Category Date & Time Collected not specified TEST CODE ANFS FRACTION 02B SAMPLE 1D 15-014

EPA 밀 문 뮏 문 밀 밁 S CKT Q 밁 뮏 밀 밀 밁 밁 밀 VERIFIED BY COMPOUNDS DETECTED ∢ Þ acenaphthylene benzo(ghi)perylene മ pyrene benzo(a)pyrene \* Ω fluorene dibenzo(a, h)anthracene indeno(1,2,3-cd)pyrene 2, 4, 5-trichlorophenol p-chloro-m-cresol benzo(a)anthracene 3, 4-benzofluoranthene benzo(k)fluoranthene chrysene phenanthrene anthracene Ψ ANALYST INSTRUMENT 74B 818 21A 22A 72B 73B 75B 76B 77B 788 79B BOB 82B 83B 848 NPDES SCAN 11A **5B** 103 44B 37B 45B BA **89** 73 200 38 88 32B 19B 9B 03/02/84 RESULT 밁 S 呈 2 밁 밀 9 뮏 9 ᄝ 2 밁 일 밁 밀 DATE EXTRACTED DATE INJECTED acenaphthene 1, 2, 4-trichlorobenzene hexachlorobenzene hexachloroethane bis(2-chloroethyl)ether 2-chloronaphthaleme 1,2-dichlorobenzene 1, 3-dichlorobenzene 1, 4-dichlorobenzene 1,2-diphenylhydrazine fluoranthene bis(2-chloroethoxy)methane 4-chlorophenyl phenyl ether 4-bromophenyl phenyl ether bis(2-chloroisopropyl)ether COMPOUND B16302AN 40B 42B 41B EPA 13 83 98 18B 20B 25B 26B 27B 37B 43B 12B 39B DATA FILE NPDES SCAN CONC 46B 338 36B 11B 16B **20B** 218 22B 29B 318 17B 14B 12B 108 H-190

밁

2-chlorophenol

24A

1 A

呈

hexachlorobutadiene

**52B** 

34B

PAGE 8 RECEIVED: 02/23/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-163 Continued From Above

hexachlorocyclopentadi isophor naphthal bis(2-ethylhexyl)phthal di-n-butyl phthal di-n-octyl phthal di-n-octyl phthal
diethyl phthalatedimethul ohthalate
<u></u>

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in\_

ND = not detected at EPA detection limits

\*=3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute

02/23/84	15-014
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CEIVED	E E

LAB # 84-02-163 Continued From Above

= anthracene and phenanthrene co-elute.

9

FRACTION 02B TEST CODE ANFS NA Date & Time Collected not specified Analytical Serv REPORT Results by Sample

NAME Method 625 Acid/Neutrals

PAGE 10 RECEIVED: 02/23/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-163

FRACTION 02A TEST CODE MS 624 NAME EPA Method 624/6C-MS SAMPLE ID 15-014

	TED CKT	RESULT	QN	QN	QN	ND	QN	Q	QN	QN .	QN	QN	QN	QN	QN	QN	QN	QN
Category	VERIFIED BY COMPOUNDS DETECTED	COMPOUND	1, 2-dichloropropane	3-dichloropropylene	trans-1,3-dichloropropylene	ethylbenzene	methylene chloride	methyl chloride	methyl bromide	bromoform	dichlorobromomethane	trichlorofluoromethane	dichlorodifluoromethane	chlorodibromomethane	tetrachloroethylene	toluene	trichloroethylene	vinyl chloride
specified	BWS F4	Ü	***	cis-1, 3-	trans-1, 3-						die	tric	dichl	, e	ũ			
	ANALYST TRUMENT	EPA	320	330	330	380	44	450	460	470	480	490	200	510	850	867	870	980
ted not	ANALYST INSTRUMENT	S SCAN	>	>	>	>	>	>	>	50	>	>	<u>&gt;</u>	86	>	>	>	>
)]]ec	<b>≠</b> •l	NPDES	177	180	187	190	220	210	200		120	300	130		240	250	762	310
& Time Collected	02/27/84	RESULT	Q	ND	N	QN	QN	QN	QN	QN	Q	ND	Q	QN	ON	QN	N	Q.
										•								
Date	E INJECTED		acrolein	Jonitrile	benzene	rachloride	orobenzene	loroethane	loroethane	loroethane	loroethane	loroethane	loroethane	hyl) ether	inyl ether	chloroform	roethylene	roethylene
ري د د	DATE	COMPOUND	acrolein	acrylonitrile	benzene	tetrachlor	chlorobenzene	1,2-dichloroethane	1,1-trichloroethane	1,1-dichloroethane	1,2-trichloroethane	2-tetrachloroethane	chloroethane	ip T		chloroform		
ري د د		COMPOUND	acrolein		penzene	carbon tetrachloride	chlorobenzene	1,2-dichloroethane	1, 1, 1-trichloroethane	1,1-dichloroethane	1, 1, 2-trichloroethane	1, 1, 2, 2-tetrachloroethane	chloroethane	bis (chloromethyl) ether	2-chloroethylvinyl ether	chloroform	1,1-dichloroethylene	1,2-trans-dichloroethyl
ري د د	B16302V DATE	EPA COMPOUND	2V acrolein		4V benzene	tetrachlor	7V chlorobenzene	10V 1,2-dichloroethane	11V 1, 1, 1-trichloroethane	13V 1, 1-dichloroethane	14V 1, 2-trichloroethane	15V 1,1,2,2-tetrachloroethane	16V chloroethane	(chloromethyl) et		23V chloroform		
ري د د	DATE			acrylonitril		carbon tetrachlor	chlorobenz		1,1,1-trichloroeth	1,1-dichloroeth	1,1,2-trichloroeth	1,1,2,2-tetrachloroeth	chloroeth	bis (chloromethyl) et	2-chloroethylvinyl	chlorof	29V 1,1-dichloroethyl	1,2-trans-dichloroethyl

PAGE 11 RECEIVED: 02/23/84

REPORT Analytical Serv Results by Sample

LAB # 84-02-163 Continued From Above

SAMPLE 10 15-014

FRACTION 02A TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified Category

AND DEFINITIONS FOR THIS REPORT. NOTES

SCAN = scan number or retention time on chromatogram

All results reported in  $\frac{100/L}{L}$  unless otherwise specified. ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

Analytical Serv REPORT Results by Sample

LAB # 84-02-163

rals	BY CKT ED O	EPA	S	QN	8	S	Ñ	QN	N	QN	QN .	Ñ	S	N D	N	S	S	N
NAME Method 625 Acid/Neutrals d Category	VERIFIED BY COMPOUNDS DETECTED		benzo(a)anthracene A	benzo(a)pyrene	3,4-benzofluoranthene * _	benzo(k)fluoranthene * _	chrysene A_	acenaphthylene _	anthracene B .	benzo(ghi)perylene _	fluorene _	phenanthrene B	dibenzo(a, h)anthracene	indeno(1,2,3-cd)pyrene	pyrene	2, 4, 6-trichlorophenol	p-chloro-m-cresol _	2-chlorophenol _
F18					'n	٠							•	•				
	ANAL YST TRUMENT		72B	73B	74B	75B	76B	77B	788	79B	808	818	828	838	848	21A	22A	24A
TEST CODE ected not	ANALYST INSTRUMENT	NPDES SCAN	5B	<b>8</b> 9	78	98	188	2B	80	88	32B	448	198	37B	458	114	84	14
G011	03/02/84			<u> </u>		 2	 2	9	QN -	임		Q	 2	 2	 임	 Q	 Q	뎋
8	湖질		<b>—</b>	4					_				- 1		4		4-1	-
SI	03/(	RESULT																
FRACTION 03B TEST Date & Time Collected	DATE EXTRACTED 03/0 DATE INJECTED 03/0		acenaphthene	zene	zene	hane	ther	lene	zene	zene	zene	zine	fluoranthene	phenyl ether	phenyl ether	ther	hane	iene
FRACTION Date & Ti	DATE EXTRACTED DATE INJECTED	COMPOUND	hene										hene	phenyl ether	ether	ther		
	B16303AN DATE EXTRACTED DATE INJECTED		hene	zene	zene	hane	ther	lene	zene	zene	zene	zine	hene	ether	phenyl ether		hane	iene
SAMPLE ID 15-016 Date & Ti	DATE EXTRACTED DATE INJECTED	COMPOUND	acenaphthene	1, 2, 4-trichlorobenzene	hexachlorobenzene	hexachloroethane	bis(2-chloroethyl)ether	2-chloronaphthalene	1, 2-dichlorobenzene	1, 3-dichlorobenzene	1, 4-dichlorobenzene	1,2-diphenylhydrazine	fluoranthene	4-chlorophenyl phenyl ether	4-bromophenyl phenyl ether	42B bis(2-chloroisopropyl)ether	bis(2-chloroethoxy)methane	52B hexachlorobutadiene

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PAGE 13 RECEIVED: 02/23/84

Analytical Serv Results by Sample

LAB # 84-02-163 Continued From Above NAME Method 625 Acid/Neutrals FRACTION 03B TEST CODE ANFS SAMPLE 1D 15-016

	QN	QN	QN I	QN I	ND I	ON I	I	QN	
Category	2,4-dichlorophenol	2,4-dimethylphenol	2-nitrophenol	4-nitrophenol	2,4-dinitrophenol	4,6-dinitro-a-cresol	pentachlorophenol	phenol	
ite & Time Collected not specified	31A	34A	57A	SBA	59A	80A	64A	65A	
llected no	2A	<b>A</b> e	<b>6</b> A	7.4	54	44	94	104	
ဌ									
Time	Š	Q	2	Q	Q	QN	QN	Q	Q
Date & Time	hexachlorocyclopentadiene ND	i sophorone ND	naphthalene ND	bis(2-ethylhexyl)phthalate ND	butyl benzyl phthalate ND	di-n-butyl phthalate ND	di-n-octyl phthalate ND	diethyl phthalate ND	dimethyl phthalate ND
Date & Time	ene	one	ene	late	late	phthalate	phthalate	phthalate	ate

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a) anthracene and chrysene co-elute

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SAMPLE 1D 15-016

Analytical Serv Results by Sample

LAB # 84-02-163 Continued From Above

FRACTION 03B TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

RECEIVED: 02/23/84

Analytical Serv

LAB # 84-02-163

NAME EPA Method 624/GC-MS

TEST CODE MS 624

FRACTION 03A

REPORT Results by Sample

밁 S 2 2 문 ان ن 밀 皇 2 밁 2 2 2 2 2 밁 윉 RESULT COMPOUNDS DETECTED VERIFIED BY trichloroethylene ethylbenzene methylene chloride methyl bromide bromoform trich lorofluorome thane dichlorodifluoromethane chlorodibromomethane tetrach loroethy lene vinyl chloride 33V trans-1, 3-dichloropropylene methyl chloride dichlorobromomethane toluene 1, 2-dichloropropane cis-1, 3-dichloropropylene Category COMPOUND BMS F4 Date & Time Collected not specified 33< 380 440 460 470 480 490 500 510 850 798 870 880 EPA 320 450 INSTRUMENT **ANAL YST** 342 NPDES SCAN 297 250 13 **≥** 240 310 761 224 210 200 200 124 <u>გ</u> 17 186 18 DATE INJECTED 02/27/84 ᄝ RESULT 2 문 2 밀 Ż 皇 S ᄝ 2 2 2 S 9 2 9 chloroform acrylonitrile chlorobenzene chloroethane bis (chloromethyl) ether 2-chloroethylvinyl ether 1, 1-dichloroethylene 1, 2-trans-dichloroethylene acrolein benzene carbon tetrachloride 1, 2-dichloroethane 1, 1, 1-trichloroethane 1, 1-dichloroethane 1, 1, 2-trichloroethane 1, 1, 2, 2-tetrachloroethane COMPOUND B16303V SAMPLE 10 15-016 234 29 30< 3 ? 110 150 160 17 190 გ **4** 10 13 140 EPA 2 DATA FILE CONC. FACTOR NPDES SCAN 117 160 14 280 234 **% 4** 100 267 2 **>**9 ? 150 27 2 8

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PAGE 16 RECEIVED: 02/23/84

Analytical Serv REPORT Results by Sample

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LAB # 84-02-163 Continued From Above

SAMPLE 1D 15-016

FRACTION 03A TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79). ug/L unless otherwise specified. SCAN = scan number or retention time on chromatogram. All results reported in <u>uq/L</u> unless otherwise spec

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Analytical Serv REPORT Results by Sample

LAB # 84-02-163

SAMPLE ID 15-018

FRACTION 04B TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

Sindana nati	COMPOUNDS DETECTED O	EPA	benzo(a)anthracene A ND	benzo(a)pyrene ND	3, 4-benzofluoranthene * ND	benzo(k)fluoranthene * ND	chrysene A ND	acenaphthylene ND	anthracene B <u>ND</u>	benzo(ghi)perylene ND	fluorene ND	phenanthrene B ND	dibenzo(a,h)anthracene ND	indeno(1,2,3-cd)pyrene ND	pyrene ND	2, 4, 6-trichlorophenol ND	p-chloro-m-cresol ND	2-chlorophenol ND
ים ווחף שהברדידבה	ANALYST .	SCAN	72B	738	748	75B	768	778	788	79B	808	818	828	838	843	21A	22A	24A
) } } } }		NPDES	<b>2B</b>	<b>89</b>	7B	98	188	28	38	88	32B	44B	19B	378	45B	114	BA	1 A
וזווב בחוזכרינת	03/02/84 03/14/84	RESULT	Q	<b>S</b>	g	8	Q	Q	Q	S)	Q	Q	Q	Q	Q)	S S	Q	2
_		RES																I
- 5 La Ba	DATE EXTRACTED <u>03/</u> DATE INJECTED <u>03/</u>		acenaphthene	-trichlorobenzene	hexachlorobenzene	hexachloroethane	chloroethyl)ether	chloronaphthalene	2-dichlorobenzene	3-dichlorobenzene	4-dichlorobenzene	diphenylhydrazine	fluoranthene	enyl phenyl ether	enyl phenyl ether	roisopropyl)ether	oroethoxy}methane	xachlorobutadiene
خ د د	EXTRACTED E INJECTED	COMPOUND	acenaphthene	1, 2, 4-trichlorobenzene	hexachlorobenzene	hexachloroethane	bis(2-chloroethyl)ether	2-chloronaphthalene	1, 2-dichlorobenzene	1, 3-dichlorobenzene	1, 4-dichlorobenzene	1,2-diphenylhydrazine	fluoranthene	phenyl et	a t	bis(2-chloroisopropyl)ether	bis(2-chloroethoxy)methane	hexachlorobutadiene
خ د د	DATE EXTRACTED DATE INJECTED		1B acenaphthene	8B 1, 2, 4-trichlorobenzene	9B hexachlorobenzene	12B hexachloroethane	£	20B 2-chloronaphthalene	25B 1,2-dichlorobenzene	26B 1, 3-dichlorobenzene			39B fluoranthene	l phenyl et	phenyl et	42B bis(2-chloroisopropyl)ether	43B bis(2-chloroethoxy)methane	

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r Serv Results by Sample Analytical Serv

LAB # 84-02-163 Continued From Above

SAMPLE ID 15-018	15-018	FRACTION 04B	048	TEST CODE ANFS	ANFS	NAME Method 625 Acid/Neutrals
		Date & T	ime Col	Date & Time Collected not	t specified	Category
358	538	hexachlorocyclopentadiene	S	2A	31A	2, 4-dichlorophenol ND
388	54B	isophorone	8	٩	34A	2, 4-dimethylphenol ND
398	55B	naphthalene	2	<b>6</b> A	57A	2-nitrophenol ND
138	<b>66B</b>	bis(2-ethylhexyl)phthalate	2	7.8	58A	4-nitrophenol ND
158	67B	butyl benzyl phthalate	Q	5A	594	2,4-dinitrophenol ND
26B	889	di-n-butyl phthalate	Q	44	60A 4	4,6-dinitro-o-cresol ND
29B	869	di-n-octyl phthalate	9	98	64A	pentachlorophenol ND
24B	708	diethyl phthalate	8	10A	65A	pheno! ND
25B	71B	dimethyl phthalate	8			
			•			

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in\_

ND = not detected at EPA detection limits

= 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute

A = benzo(a)anthracene and chrysene co-elute

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SAMPLE ID T5-018

Analytical Serv REPORT Results by Sample

LAB # 84-02-163 Continued From Above

NAME Method 625 Acid/Neutrals

FRACTION 04B TEST CODE ANFS NA Date & Time Collected not specified

= anthracene and phenanthrene co-elute.

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Analytical Serv REPORT Results by Sample

LAB # 84-02-163

	Y CKT	RESULT	Q	2	QN	QN	Q	QN	ON	QN	QN	Q	S	Š	15	Ü	1300	Q
A NAME EPA Method 624/GC-MS Fied Category	BWS VERIFIED BY	COMPOUND	1,2-dichloropropane	cis-1,3-dichloropropylene	trans-1,3-dichloropropylene	ethylbenzene	methylene chloride	methyl chloride	methyl bromide	bromoform	dichlorobromomethane	trichlorofluoromethane	dichlorodifluoromethane	chlorodibromomethane	tetrachloroethylene	taluene _	trichloroethylene	vinyl chloride
MS 624 N specified	YST	EPA	320	330	33V t	380	440	450	460	470	480	490	200	510	850	860	870	880
10E	ANALYST INSTRUMENT	SCAN													460		341	
TEST lected	Ä	NPDES 8	170	180	187	190	227	210	200	<u>ئ</u>	120	306	130	8	247	250	294	314
FRACTION 04A TEST C Date & Time Collected	02/27/84	RESULT N	QN	QN	QN	QN	6.0	526	QN	QN	4 ئ	Q	Q	QN	QN	QN	QN	71
FRACTI Date &	DATE INJECTED	COMPOUND	acrolein	acrylonitrile	benzene	carbon tetrachloride	chlorobenzene	1,2-dichloroethane	1, 1, 1-trichloroethane	1,1-dichloroethane	1,1,2-trichloroethane	1, 1, 2, 2-tetrachloroethane	chloroethane	bis (chloromethyl) ether	2-chloroethylvinyl ether	chloroform	1,1-dichloroethylene	1,2-trans-dichloroethylene
	B16304V					10 U			1,1		1,1	1, 1, 2, 2		bis (c	2-ch10		14	1,2-tran
5-018	ia ez	EPA	20	è	<b>7</b>	9	2	100	110	130	140	150	160	170	190	237	290	306
SAMPLE ID 15-018	DATA FILE CONC. FACTOR	NPDES SCAN	1.0	5	<b>&gt;</b> E	^9	77 512	15V <u>250</u>	277	140	287 355	237	<b>^</b> 6	4.	100	110	-н 16∨	<u> </u>

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Analytical Serv REPORT Results by Sample

LAB # 84-02-163 Continued From Above

SAMPLE 10 15-018

FRACTION 04A TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79). ug/L unless otherwise specified. All results reported in\_

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Serv Results by Sample Analytical Serv

LAB # 84-02-163

FRACTION OSB TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category SAMPLE ID 15-019

	CKT D	EPA	Q	N	S	Q	Q	QN	Q	Q	Q	Q	Q Q	N N	S	S	S	QN
n in the second	VERIFIED BY COMPOUNDS DETECTED		benzo(a)anthracene A _	benzo(a)pyrene	3,4-benzofluoranthene * _	benzo(k)fluoranthene * _	chrysene A	acenaphthylene	anthracene B _	benzo(ghi)perylene	fluorene	phenanthrene B _	dibenzo(a,h)anthracene	indeno(1,2,3-cd)pyrene	pyrene	2, 4, 6-trichlorophenol _	p-chloro-m-cresol _	2-chlorophenol
	ANAL YST INSTRUMENT	SCAN	728	738	748	758	768	778	788	798	BOB	818	828	838	843	21A	22A	24A
	INS	NPDES SC	58	<b>89</b>	78	98	188	28	38	88	328	443	198	37B	45B	114	ВА	14
	2/84		일	<u> </u>	2 2	 임		Q	 일	 위	- - - 잇	일	의 일	2 2	 2	 일	<i>-</i> 읽	 S
•	03/0	RESULT				Z	Z	2	Z	4			2	2	2			
	DATE EXTRACTED <u>03/02/84</u> DATE INJECTED <u>03/14/84</u>	_	acenaphthene	ne	ne	hexachloroethane N	er	ne	a c	a c	ar I	ne	fluoranthene	phenyl ether	phenyl ether	e r	ne	ne
	DATE EXTRACTED DATE INJECTED	COMPOUND	Je C	a d	au au	ne ne						4	ne	phenyl ether	ether	e r		
	EXTRACTED : INJECTED	_	Je C	ne	ne	ne ne	er	ne	a c	a c	ar I	ne	ne	ether	phenyl ether		ne	ne

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PAGE 23 RECEIVED: 02/23/84

Analytical Serv REPORT Results by Sample

LAB # 84-02-163 Continued From Above

REACTOR OF CONTRACTOR

trals	Q	N	Q	Q	S	S	QN	S	
NAME Method 625 Acid/Neutrals	2,4-dichlorophenol	2,4-dimethylphenol	2-nitrophenol	4-nitrophenol	2, 4-dinitrophenol	4,6-dinitro-o-cresol	pentachlorophenol	phenol	
NAME Fied						4			
TEST CODE ANFS Nected not specified	31A	34A	57A	58A	59A	60A	64A	<b>65A</b>	
S 5									
TEST 11ecte	2A	ЭА	<b>6</b> A	7.4	SA	4	9A	10A	
ت									
N OSB	Q	Q	ND	N	QN	QN	Ñ	Q	Z
FRACTION OSB TEST CODE Date & Time Collected not	hexachlorocyclopentadiene <u>ND</u>	isophorone ND	naphthalene <u>ND</u>	bis(2-ethylhexyl)phthalate ND	butyl benzyl phthalate ND	di-n-butyl phthalate ND	di-n-octyl phthalate ND	diethyl phthalate ND	dimethyl phthalate ND
SAMPLE ID 15-019  Date & Time	ene	one	ene	ate	phthalate	phthalate	phthalate	phthalate	phthalate

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

\* = 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute. H-206

A = benzo(a)anthracene and chrysene co~elute.

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SAMPLE ID 15-019

LAB # 84-02-163 Continued From Above

Analytical Serv REPORT Results by Sample

FRACTION OSB TEST CODE ANFS NA Date & Time Collected not specified

NAME Method 625 Acid/Neutrals

B = anthracene and phenanthrene co-elute.

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RECEIVED: 02/23/84

Results by Sample Analytical Serv

REPORT

LAB # 84-02-163

TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified FRACTION 05A **SAMPLE ID 15-019** 

2 2 2 뮏 2 2 9 g 9 9 밁 g g 2 2 밀 CK RESULT COMPOUNDS DETECTED VERIFIED BY vinyl chloride methylene chloride chlorodibromomethane tetrachloroethylene toluene trich loroethy lene 33V trans-1, 3-dichloropropylene methyl chloride methyl bromide bromoform dichlorobromomethane trichlorofluoromethane dichlorodifluoromethane 1, 2-dichloropropane cis-1, 3-dichloropropylene ethylbenzene Category COMPOUND BMB F4 33< 380 440 460 470 480 497 200 510 850 860 870 288 EPA 320 450 INSTRUMENT NPDES SCAN 297 316 254 200 12 300€ 13 247 170 18 18 197 222 214 **>** 8 DATE INJECTED 02/27/84 RESULT 밀 2 g 2 2 2 2 9 2 S S S 2 2 2 2 chloroform acrolein acrylonitrile 1, 1-dichloroethylene 1, 2-trans-dichloroethylene benzene carbon tetrachloride chlorobenzene 1, 2-dichloroethane 1, 1, 1-trichloroethane 1, 1-dichloroethane 1, 1, 2-trichloroethane 1, 1, 2, 2-tetrachloroethane chloroethane bis (chloromethyl) ether 2-chloroethylvinyl ether COMPOUND B16305V 300 150 167 17 190 234 294 EPA ລູ <u>გ</u> 2 110 13 140 **4** 3 305 DATA FILE CONC. FACTOR NPDES SCAN 2 234 100 117 267 274 140 284 \$ 2 9 3 150 <u>ۍ</u> >

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Analytical Serv Results by Sample

REPORT

LAB # 84-02-163 Continued From Above

SAMPLE ID 15-019

FRACTION 05A TEST CODE MS 624 NAME EPA Method 624/GC-MS Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN == scan number or retention time on chromatogram.

ug/L unless otherwise specified. All results reported in\_\_\_

ND = not detected at EPA detection limit method 624, (Federal Register, 12/3/79).

	02/28/84
PAGE 1	EIVED:
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Analytical Serv REPORT 04/04/84 15:46:17

LAB # 84-02-209

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REPORT Radian Austin

ATTEN William Little

SAMPLES

Tinker AFB

CLIENT COMPANY FACILITY

Services Austin, Texas 78766 PREPARED <u>Radian Analytical</u> BY <u>8501 MoPac Blvd.</u> (512) 454-4797 P. O. Box 9948 ATTEN

KERTIFIED BY

CONTACT CONDVER

INVOICE under separate cover 212-027-04-05 WORK ID soil zone 4, TAKEN TRANS TYPE P. O. #

Analytical Serv TEST CODES and NAMES used on this report

SAMPLE IDENTIFICATION

01 4E. 3

# KADIAR

REPORT Analytical Serv

LAB # 84-02-209

TEST CODE ANFS Results by Sample FRACTION 01A RECEIVED: 02/28/84 SAMPLE ID 4E. 3

EPA 皇 Š 웆 2 g 웆 밁 9 욷 S 일 g 윋 9 밁 NAME Method 625 Acid/Neutrals COMPOUNDS DETECTED VERIFIED ∢ benzo(a)anthracene A benzo(a)pyrene acenaphthylene benzo(ghi)perylene fluorene  $\Box$ dibenzo(a,h)anthracene indeno(1,2,3-cd)pyrene pyrene 2-chlorophenol p-chloro-m-cresol 2, 4, 6-trichlorophenol benzo(k)fluoranthene 3, 4-benzofluoranthene chrysene phenanthrene anthracene Category BS specified 72B 74B 75B 21A 73B 76B 77B **78B** 79B **80**B 818 82B 838 84B 22A 24A INSTRUMENT Date & Time Collected not NPDES SCAN 188 11A BA 14 5 5 8 **6B** 78 2B 38 88 32B 44B 19B 37B 45B DATE EXTRACTED 03/07/84
DATE INJECTED 04/02/84 RESULT ᄝ 밀 9 일 2 밁 밀 2 皇 밁 S 욷 일 9 밁 일 acenaphthene 1, 2, 4-trichlorobenzene hexachlorobenzene hexachloroethane 1, 4-dichlorobenzene fluoranthene bis(2-chloroethyl)ether 2-chloronaphthalene 1, 2-dichlorobenzene 1, 3-dichlorobenzene 1,2-diphenylhydrazine 40B 4-chlorophenyl phenyl ether 4-bromophenyl phenyl ether 42B bis(2-chloroisopropy1)ether bis(2-chloroethoxy)methane hexachlorobutadiene COMPOUND DATA FILE 2002209A01 EPA 41B 43B 13 188 20B 26B 37B 88 **8**6 12B 25B 27B 39B 52B CONC. FACTOR NPDES SCAN H-211 H-211 46B 338 36B 11B 163 17B 12B 10B 20E 21B 22B 29B 313 14B

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PAGE 3 RECEIVED: 02/28/84

Analytical Serv Results by Sample

LAB # 84-02-209 Continued From Above

SAMPLE ID 4E. 3

NAME Method 625 Acid/Neutrals FRACTION O1A TEST CODE ANFS

		Date &	Ime Col	lected	Date & Inme Collected not specified	Category	
358	53B	hexachlorocyclopentadiene _	QN	2A	31A	2, 4-dichlorophenol	S
388	24B	isapharane	QN	<b>∀</b>	34A	2,4-dimethylphenol	S
39B	55B	naphthalene	QN	<b>6</b> A	57A	2-nitrophenol	QN
138	66B	bis(2-ethylhexyl)phthalate	QN	7.A	58 <b>A</b>	4-nitrophenol	QN
158	67B	butyl benzyl phthalate	QN	S. A.	59A	2,4-dinitrophenol	QN
26B	889	di-n-butyl phthalate	QN	4	60A	4,6-dinitro-o-cresol _	S
29B	8'9	di-n-octyl phthalate	QN	9A	64A	pentachlorophenol	QN
24B	708	diethyl phthalate	QN	10A	65A	phenol	QN
25B	71B	dimethyl phthalate	Q				
			-				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in ug/L

ND = not detected at EPA detection limits

\* = 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

7 A = benzo(a)anthracene and chrysene co-elute

PAGE 4 RECEIVED: 02/28/84

SAMPLE ID 4E. 3

Analytical Serv REPORT Results by Sample

LAB # 84-02-209 Continued From Above

FRACTION OIA TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

B = anthracene and phenanthrene co-elute.

Analytical Serv REPORT 03/16/84 10:57:34

LAB # 84-03-042

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Radian	B1. 4	Austin
REPORT	맏	

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Austin	ATTEN William Little		COMPANY Tinker AFB	FACILITY
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INTO THE	CERTIFIED BY	CONTACT CONDVER
PREPARED Radian Analytical Services BY 8501 MoPac Blvd.	P. O. Box 9948 Austin, Texas 78766	ATTEN 6512) 454-4797

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# SAMPLE INFINITEICATION

INVOICE under separate cover

WORK ID zone 6 groundwater
TAKEN WML
TRANS Fed Ex
TYPE
P. O. # 212-027-04-05

Analytical Serv TEST CODES and NAMES used on this report

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01 T6-001	02 T6-002	• •	04 T6-004		07 T6-007			 	-	15 T6-015	16 T6-016	-	18 T6-018	19 T6-019	·	-	

PAGE 2 RECEIVED: 03/08/84

SAMPLE IDENTIFICATION

Analytical Serv REPORT 03/16/84 10:57:34

LAB # 84-03-042

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PAGE 3 RECEIVED: 03/08/84

REPORT Results by Sample Analytical Serv

LAB # 84-03-042

FRACTION 01A TEST CODE GC 601 NAME EPA Method 601/GC Category Date & Time Collected not specified SAMPLE ID 16-001

SS 64 2 일 일 <10 2 밀 2 물 2 RESULT 3500 COMPOUNDS DETECTED VERIFIED BY Trichloroethene Dibromoch loromethane 1, 1, 2-Trichloroethane cis-1,3-Dichloropropene Bromoform 1, 1, 2, 2-Tetrachloroethane Tetrachloroethylene Chlarobenzene 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene 2-Chloroethylvinyl Ether 1, 4-Dichlorobenzene COMPOUND RGS INSTRUMENT SCAN DATE INJECTED 03/14/84 S ND 2 S 밁 S 2 밀 9 2 밁 모 밀 S RESULT Chloromethane Vinyl Chloride Methylene Chloride Chloroform Bromomethane Chloroethane Trichlorofluoromethane 1, 1-Dichloroethene trans-1, 2-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane Carbon Tetrachloride Bromodichloromethane 1, 1-Dichloroetha COMPOUND DATA FILE CONC. FACTOR SCAN

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1, 2-Dichloropropane

H-216

밁

trans-1, 3-Dichloropropene

PAGE 4 RECEIVED: 03/08/84

Analytical Serv REPORT Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE ID 16-001

FRACTION OIA TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

## NAME OF THE PARTY

FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category INSTRUMENT SCAN REPORT Results by Sample DATE INJECTED 03/14/84 밁 2 2 밁 9 2 2 윋 일 2 2 밁 RESULT Analytical Serv Chloromethane Bromomethane Vinyl Chloride Chloroethane Methylene Chloride Chloroform Trichlorofluoromethane 1, 1-Dichloroethene 1, 1-Dichloroethane trans-1, 2-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane COMPOUND PAGE 5 RECEIVED: 03/08/84 SAMPLE 1D 16-002 DATA FILE CONC. FACTOR SCAN

LAB # 84-03-042

780

VERIFIED BY COMPOUNDS DETECTED

RGS

Category

RESULT

COMPOUND

3300

Trichloroethene

2

Dibromoch loromethane

1, 1, 2-Trichloroethane

밀

9

cis-1, 3-Dichloropropene

2-Chloroethylvinyl Ether

9

S

Bromoform

S

1, 1, 2, 2-Tetrachloroethane

**110** 

**Tetrachloroethylene** 

밁

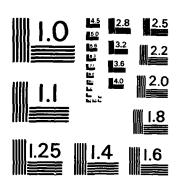
Chlorobenzene

g

1, 3-Dichlorobenzene

밁 밁 1, 2-Dichlorobenzene 1, 4-Dichlorobenzene ᄝ 믜 밁 밁 trans-1, 3-Dichloropropene Carbon Tetrachloride 1,2-Dichloropropane Bromodichloromethane

INSTALLATION RESTORATION PROGRAM PHASE II CONFIRMATION/QUANTIFICATION STA..(U) RADIAN CORP AUSTIN TX D A SANDERS ET AL. SEP 85 RAD-DCN-84-212-027-04-02-VOL-2 F/G 13/2 5/4 AD-A160 094 UNCLASSIFIED NL



MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A

PAGE 6 RECEIVED: 03/08/84

Analytical Serv

Serv Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE ID T6-002

FRACTION 02A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

## MANAMAN

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Results by Sample Analytical Serv

REPORT

LAB # 84-03-042

SAMPLE 10 16-003

756 RESULT VERIFIED BY COMPOUNDS DETECTED NAME EPA Method 601/GC Category RGS b Date & Time Collected not specified FRACTION 03A TEST CODE GC 601 INSTRUMENT **ANALYST** SCAN DATE INJECTED 03/14/84 RESUL.T COMPOUND DATA FILE CONC. FACTOR SCAN

Trichloroethene 3400 COMPOUND

Dibromoch loromethane 1, 1, 2-Trichloroethane

S

Vinyl Chloride

2

Bromomethane

S

Chloromethane

g

Chloroethane

S

Methylene Chloride

2

Trichlorofluoromethane

S

1, 1-Dichloroethene

2

1, 1-Bichloroethane

밁

trans-1, 2-Dichloroethene

ᄝ

Chloroform

2

1, 2-Dichloroethane

S

1, 1, 1-Trichloroethane

2

S cis-1, 3-Dichloropropene

2-Chloroethylvinyl Ether

Bromoform

1, 1, 2, 2-Tetrachloroethane

<10 Tetrachloroethylene

2 Chlorobenzene

2 1, 3-Dichlorobenzene 밁 1, 2-Dichlorobenzene

S

1, 4-Dichlorobenzene

밁 Carbon Tetrachloride

S Bromodich loromethane

2 1, 2-Dichloropropane S

trans-1, 3-Dichloropropene

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SAMPLE ID T6-003

Analytical Serv REPORT Results by Sample

LAB # 84-03-042 Continued From Above FRACTION 03A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

7
1
푌
S
3
2

RECEIVED: 03/08/84

Results by Sample Analytical Serv

LAB # 84-03-042

REPURI

FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC Category Date & Time Collected not specified **SAMPLE 1D 16-004** 

2 750 밁 윋 2 밁 뮏 밁 밁 밁 3500 RESULT COMPOUNDS DETECTED VERIFIED BY Trichloroethene 1, 4-Dichlorobenzene 1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene Bromoform 1, 1, 2, 2-Tetrachloroethane Tetrachloroethylene Chlorobenzene 1, 3-Dichlorobenzene Dibromoch loromethane 2-Chloroethylvinyl Ether 1, 2-Dichlorobenzene COMPOUND RGS b ANALYST INSTRUMENT SCAN DATE INJECTED 03/14/84 밀 물 皇 ĝ 밁 9 뮏 S 2 2 ᄝ 윋 유 문 밀 윋 RESULT Methylene Chloride Chloroform Bromodichloromethane trans-1, 3-Dichloropropene Chloromethane Vinyl Chloride Trichlorofluoromethane 1, 1-Dichloroethene 1, 1-Dichloroethane trans-1, 2-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane Carbon Tetrachloride 1, 2-Dichloropropane Bromomethane Chloroethane COMPOUND DATA FILE CONC. FACTOR SCAN H-222

### MANAGEMENT OF THE IN

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Analytical Serv Results by Sample

LAB # 84-03-042 Continued From Above

AT PROCESSION IN ACCORDANCE AND

SAMPLE ID T6-004

FRACTION 04A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN == scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

RECEIVED: 03/08/84

Results by Sample Analytical Serv

REPORT

LAB # 84-03-042

SAMPLE ID T6-005

TEST CODE GC 601 NAME EPA Method 601/GC FRACTION O5A TEST CODE GC 601 N/ Date & Time Collected not specified

Category

DATE INJECTED 03/14/84 DATA FILE CONC. FACTOR

RGS ANALYST INSTRUMENT

SCAN

RESULT

COMPOUND

SCAN

일

Chloromethane

S

Bromomethane

일

Vinyl Chloride

일

Chloroethane

밁

Methylene Chloride

일

Trichlorofluoromethane

S

1, 1-Dichloroethene

밁

1,1-Dichloroethane

윋

trans-1, 2-Dichloroethene

일

Chloroform

2

1,2-Dichloroethane

9

1, 1, 1-Trichloroethane

밁

Carbon Tetrachloride

밁

Bromodichloromethane

윋

1, 2-Dichloropropane

밁

trans-1, 3-Dichloropropene

VERIFIED BY COMPOUNDS DETECTED

580 28

COMPOUND

Trichloroethene

Dibromoch loromethane 1, 1, 2-Trichloroethane

2

3000

RESULT

cis-1, 3-Dichloropropene

2

呈 2-Chloroethylvinyl Ether

2 Ŝ Bromoform 1, 1, 2, 2-Tetrachloroethane \$10 **Tetrachloroethylene** 

밁 Chlorobenzene

S 1, 3-Dichlorobenzene

ĝ 1, 2-Dichlorobenzene

9 1, 4-Dichlorobenzene

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Analytical Serv

Serv Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE ID 16-005

FRACTION 05A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified

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REPORT Results by Sample Analytical Serv

LAB # 84-03-042

SAMPLE 10 16-006

380 RESULT COMPOUNDS DETECTED VERIFIED BY FRACTION 06A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category COMPOUND RGS b ANALYST INSTRUMENT SCAN DATE INJECTED 03/14/84 RESULT COMPOUND DATA FILE CONC. FACTOR SCAN

4000 Trichloroethene Dibromoch loromethane 2 S Ch loromethane Bromomethane

cis-1, 3-Dichloropropene 2 S Vinyl Chloride Chloroethane

일 Methylene Chloride

呈

Trichlorofluoromethane

2 皇 1, 1-Dichloroethene 1, 1-Dichloroethane

<10

Tetrachloroethylene

2

Chlorobenzene

2

1, 3-Dichlorobenzene

밁

1, 2-Dichlorobenzene

S

2-Chloroethylvinyl Ether

2

1, 1, 2-Trichloroethane

2

Bromoform

g

1, 1, 2, 2-Tetrachloroethane

2 trans-1, 2-Dichloroethene

S Chloroform

皇 1, 2-Dichloroethane

문 1, 1, 1-Trichloroethane

S Carbon Tetrachloride S 1, 2-Dichloropropane S

trans-1, 3-Dichloropropene

g

Bromodichloromethane

1, 4-Dichlorobenzene

밁

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Analytical Serv

serv Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE 10 16-006

FRACTION 06A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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RECEIVED: 03/08/84

Results by Sample Analytical Serv

LAB # 84-03-042

SAMPLE 10 16-007

NAME EPA Method 601/60

Category FRACTION O7A TEST CODE GC 601 N Date & Time Collected not specified

986 S 밁 4600 2 2 밁 밁 RESULT COMPOUNDS DETECTED VERIFIED BY Trichloroethene Dibromochloromethane Bromoform 1, 1, 2, 2-Tetrachloroethane 1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene 2-Chloroethylvinyl Ether COMPOUND RGS b ANALYST INSTRUMENT SCAN DATE INJECTED 03/15/84 呈 밁 2 밁 일 9 2 RESULT Chloromethane Bromomethane Vinyl Chloride Methylene Chloride Chloroethane Trichlorofluoromethane 1, 1-Dichloroethene COMPOUND DATA FILE CONC. FACTOR SCAN

**○10** Tetrachloroethylene Chlorobenzene

S

1, 1-Dichloroethane

뮏

trans-1, 2-Dichloroethene

밁

Chloroform

윋

1,2-Dichloroethane

밀

1, 1, 1-Trichloroethane

밁

Carbon Tetrachloride

밁 일 1, 3-Dichlorobenzene 1,2-Dichlorobenzene

밁

물 1, 4-Dichlorobenzene

H-228

윋

Bromodichloromethane

밁

1,2-Dichloropropane

밀

trans-1,3-Dichloropropene

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Serv Results by Sample Analytical Serv

LAB # 84-03-042 Continued From Above

SAMPLE ID 16-007

FRACTION 07A TEST CODE GC 601 NAME EPA Method 601/GC Date & Ime Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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RECEIVED: 03/08/84

Results by Sample Analytical Serv

REPORT

LAB # 84-03-042

SAMPLE ID 16-008

FRACTION OBA TEST CODE GC 601 NAME EPA Method 601/GC

Date & Time Collected not specified

Category

RGS b ANALYST INSTRUMENT SCAN DATE INJECTED 03/15/84 RESULT COMPOUND 2 DATA FILE CONC. FACTOR SCAN

2

Chloromethane

밁

Bromomethane

S

Vinyl Chloride

COMPOUNDS DETECTED VERIFIED BY

786

RESULT

Trichloroethene COMPOUND

1, 1, 2-Trichloroethane

2

밁

Dibromochloromethane

4200

2 cis-1, 3-Dichloropropene

S

Chloroethane

밁

Methylene Chloride

S

Trichlorofluoromethane

밁

1, 1-Dichloroethene

Ŝ

trans-1, 2-Dichloroethene

2

1, 1-Dichloroethane

윋

Chloraform

밁 2-Chloroethylvinyl Ether

2 Bromoform

일 1, 1, 2, 2-Tetrachloroethane 010 **Tetrachloroethylene**  g Chlorobenzene

밀 1, 3-Dichlorobenzene

g 1, 2-Dichlorobenzene

1, 4-Dichlorobenzene

2

문 Carbon Tetrachloride

2

1, 1, 1-Trichloroethane

2

1, 2-Dichloroethane

9 Bromodichloromethane

1, 2-Dichloropropane

물

밁

trans-1, 3-Dichloropropene

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Analytical Serv REPORT Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE 1D 76-008

FRACTION OBA TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

### Name In Marie In

RECEIVED: 03/08/84

Results by Sample Analytical Serv

REPORT

LAB # 84-03-042

RESULT COMPOUNDS DETECTED FRACTION 09A TEST CODE GC 601 NAME EPA Method 601/GC Category COMPOUND RGS b Date & Time Collected not specified ANALYST INSTRUMENT SCAN DATE INJECTED 03/15/84 SAMPLE 1D 16-009 CONC. FACTOR DATA FILE

**JSG** 2 VERIFIED BY

> RESULT COMPOUND SCAN

밁

Chloromethane

밀

Bromomethane

9

Vinyl Chloride

일

Chloroethane

2

Methylene Chloride

2

Trichlorofluoromethane

2

1, 1-Dichloroethene

밀

1, 1-Dichloroethane

딩

trans-1, 2-Dichloroethene

윋

Chloroform

2

1, 2-Dichloroethane

g

1, 1, 1-Trichloroethane

S

Trichlor ethene Dibromoch loromethane

S

2700

1, 1, 2-Trichloroethane

Ÿ

cis-1, 3-Dichloropropene

2 2-Chloroethylvinyl Ether S

Bromoform

밁 1, 1, 2, 2-Tetrachloroethane <10 Tetrachloroethylene 밁 1, 3-Dichlorobenzene

Chlorobenzene

2

S 1, 2-Dichlorobenzene S

1, 4-Dichlorobenzene

Carbon Tetrachloride

S g Bromodichloromethane

1,2-Dichloropropane

Q

trans-1, 3-Dichloropropene

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Analytical Serv Results by Sample

REPORT

LAB # 84-03-042 Continued From Above

SAMPLE 1D 16-009

FRACTION 09A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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Results by Sample Analytical Serv

LAB # 84-03-042

NAME EPA Method 601/60 FRACTION 10A TEST CODE GC 601 N Date & Time Collected not specified FRACTION 10A SAMPLE ID T6-010

Category

ANALYST INSTRUMENT DATE INJECTED 03/15/84 DATA FILE CONC. FACTOR

RGS b

VERIFIED BY COMPOUNDS DETECTED

986

Trichloroethene COMPOUND

SCAN

RESULT

COMPOUND

SCAN

밀

Chloromethane

S

Bromomethane

9

Vinyl Chloride

밀

Chloroethane

밀

Methylene Chloride

2

Trichlorofluoromethane

2

1, 1-Dichloroethene

RESULT

2600

Dibromochloromethane

Q

9 1, 1, 2-Trichloroethane

밁 cis-1, 3-Dichloropropene

9 2-Chloroethylvinyl Ether

밁

Bromoform

밁 1, 1, 2, 2-Tetrachloroethane

**∵**10 **Tetrachloroethylene** 

呈 1, 3-Dichlorobenzene

문

Chlorobenzene

9

trans-1, 2-Dichloroethene

밀

Chloroform

S

1, 1-Dichloroethane

밁 1, 2-Dichlorobenzene

1, 4-Dichlorobenzene

뮏

1, 1, 1-Trichloroethane

밀

1, 2-Dichloroethane

2

Carbon Tetrachloride

Bromodichloromethane

일

물

1,2-Dichloropropane

밁

trans-1, 3-Dichloropropene

g

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SAMPLE ID 16-010

Analytical Serv REPORT Results by Sample

LAB # 84-03-042 Continued From Above

FRACTION 10A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN - scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

## 

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Serv REPORT Results by Sample Analytical Serv

LAB # 84-03-042

SAMPLE ID 16-011

FRACTION 11A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified

58 2

RESULT

2200

밁

밁

일

呈

010

밀

밀

밁

Ÿ

9

밁

1,2-Dichloropropane

H-236

g

trans-1, 3-Dichloropropene

	RESU	thene 22(	thane	thane	opene	Ether	Bromoform !	thane <	ylene	nzene	nzene	nzene	nzene		
COMPOUNDS DETECT	COMPOUND	Trichloroethene	Dibromochloromethane	1,1,2-Trichloroethane	cis-1, 3-Dichloropropene	2-Chloroethylvinyl	Broa	1, 1, 2, 2-Tetrachloroethane	Tetrachloroethylene	Chlorobenzene	1,3-Dichlorobenzene	1,2-Dichlorobenzene	1,4-Dichlorobenzene		
YENT P				1,	r i S	2-ch1		1,1,2,							
INSTRUMENT	SCAN	1	İ												
INJECTED 03/15/84	RESULT	Q	Q	Q	Q	Q	QN	QV	Q	Q	Q	Q	QN	QN	QZ
TACKE STA		romethane	Bromomethane	Chloride	Chloroethane	Chloride	romethane	oroethene	oroethane	oroethene	Chloroform	oroethane	oroethane	achloride	romethane
	COMPOUND	Chlorom	Bro	Vinyl Ch	Ch1	Methylene Ch	Trichlorofluoromethane	1,1-Dichloro	1,1-Dichloro	trans-1,2-Dichloro	o	1,2-Dichlora	1, 1, 1-Trichloro	Carbon Tetrach	Bromodichloromethane
CONC. FACTOR	SCAN			1											!

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Analytical Serv REPORT Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE ID 16-011

FRACTION 11A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

## TANDICAL.

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REPORT Results by Sample Analytical Serv

LAB # 84-03-042

SAMPLE ID 16-012

TEST CODE GC 601 NAME EPA Method 601/GC FRACTION 12A

Category

98 2 밁 2 S 밁 9 2 RESULT 2200 읭 뮏 밁 2 VERIFIED BY COMPOUNDS DETECTED Trichloroethene Dibromochloromethane 1, 1, 2-Trichloroethane Bromoform cis-1, 3-Dichloropropene 2-Chloroethylvinyl Ether 1, 1, 2, 2-Tetrachloroethane Tetrachloroethylene Chlorobenzene 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene 1, 4-Dichlorobenzene COMPOUND RGS b Date & Time Collected not specified INSTRUMENT SCAN DATE INJECTED 03/15/84 밀 2 2 밁 밁 S 2 밀 2 밁 일 뮏 밁 RESULT Chloromethane Bromomethane Vinyl Chloride Chloroethane Methylene Chloride Chloroform **Trichlorofluoromethane** 1, 1-Dichloroethene 1, 2-Dichloroethane 1, 1-Bichloroethane trans-1,2-Dichloroethene 1, 1, 1-Trichloroethane Carbon Tetrachloride COMPOUND DATA FILE CONC. FACTOR SCAN

윋

Bromodichloromethane

9

1, 2-Dichloropropane

밁

trans-1, 3-Dichloropropene

# NAME OF THE PARTY

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Analytical Serv Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE 10 16-012

FRACTION 12A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN == scan number or retention time on chromatogram.

All results reported in <u>uq/L</u> unless otherwise specified

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Serv REPORT Results by Sample Analytical Serv

LAB # 84-03-042

TEST CODE GC 601 NAME EPA Method 601/GC FRACTION 13A **SAMPLE 1D 16-013** 

8 RESULT VERIFIED BY COMPOUNDS DETECTED Category RGS b Date & Time Collected not specified ANALYST INSTRUMENT DATE INJECTED 03/15/84 DATA FILE CONC. FACTOR

呈 Trichloroethene 2000 Dibromochloromethane 1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene COMPOUND SCAN 9 S 뮏 밁 RESULT Chloromethane Bromomethane Vinyl Chloride Chloroethane COMPOUND SCAN

2

2

밀

2-Chloroethylvinyl Ether

2

Bromoform

9

1, 1, 2, 2-Tetrachloroethane

\ 10 10

Tetrachloroethylene

물

Chlorobenzene

9

1, 3-Dichlorobenzene

2

1, 2-Dichlorobenzene

9

1, 4-Dichlorobenzene

밀 2 Methylene Chloride Trichlorofluoromethane

일 밀 1, 1-Dichloroethene 1, 1-Dichloroethane

욷 Chloraform trans-1, 2-Dichloroethene

S

밁 1, 2-Dichloroethane

문 1, 1, 1-Trichloroethane

2 Carbon Tetrachloride **Bromodichloromethane** 

일

딝 1, 2-Dichloropropane

trans-1, 3-Dichloropropene

밁

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Serv REPORT Results by Sample Analytical Serv

LAB # 84-03-042 Continued From Above

SAMPLE 10 16-013

FRACTION 13A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram.

All results reported in <u>uq/L</u> unless otherwise specified.

Analytical Serv REPORT Results by Sample

LAB # 84-03-042

GC 601 NAME EPA Method 601/GC specified Category	ST MCL VERIFIED BY JSG NT COMPOUNDS DETECTED 2	COMPOUND	Trichloroethene 2080	Dibromochloromethane ND	1, 1, 2-Trichloroethane ND	cis-1,3-Dichloropropene ND	2-Chloroethylvinyl Ether ND	Bromoform ND	1, 1, 2, 2-Tetrachloroethane ND	Tetrachloroethylene <10	Chlorobenzene ND	1, 3-Dichlorobenzene ND	1,2-Dichlorobenzene ND	1, 4-Dichlorobenzene ND		
	ANALYST INSTRUMENT	SCAN	1					1								
FRACTION 14A TEST CODE Date & Time Collected not	BATE INJECTED 03/15/84	COMPOUND	Chloromethane ND	Bromomethane ND	Vinyl Chloride ND	Chloroethane ND	Methylene Chloride ND	Trichlorofluoromethane ND	1, 1-Dichloroethene ND	1, 1-Dichloroethane ND	trans-1, 2-Dichloroethene ND	Chloroform ND	1,2-Dichloroethane ND	1, 1, 1-Trichloroethane ND	Carbon Tetrachloride ND	Bromodich loromethane ND
SAMPLE ID 16-014	DATA FILE CONC. FACTOR	SCAN														

밀

1,2-Dichloropropane

H-242

trans-1, 3-Dichloropropene

뮏

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Analytical Serv

I Serv Results by Sample

LAB # 84-03-042 Continued From Above

**SAMPLE ID 16-014** 

FRACTION 14A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

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Results by Sample Analytical Serv

REPORT

LAB # 84-03-042

SAMPLE 1D 76-015

FRACTION 15A TEST CODE GC 601 NAME EPA Method 601/GC

Category

1880 98 밁 2 **∵** 밁 2 Ż 밁 2 2 일 S RESULT COMPOUNDS DETECTED VERIFIED BY Trichloroethene Dibromochloromethane 1, 1, 2-Trichloroethane cis-1,3-Dichloropropene 2-Chloroethylvinyl Ether Bromoform 1, 1, 2, 2-Tetrachloroethane **Tetrachloroethylene** Chlorobenzene 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene 1, 4-Dichlorobenzene COMPOUND ACL D Date & Time Collected not specified INSTRUMENT ANALYST SCAN DATE INJECTED 03/15/84 일 윋 S 밁 욷 밁 2 2 g 윋 밁 밀 밁 S 밀 RESULT Chloroform Chloromethane Bromomethane Vinyl Chloride Chloroethane Methylene Chloride Trichlorofluoromethane 1, 1-Dichloroethene 1, 1-Dichloroethane trans-1, 2-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane Carbon Tetrachloride Bromodichloromethane 1,2-Dichloropropane COMPOUND DATA FILE CONC. FACTOR SCAN

밁

trans-1, 3-Dichloropropene

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REPORT Results by Sample Analytical Serv

LAB # 84-03-042 Continued From Above

SAMPLE ID 16-015

FRACTION 15A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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PAGE 33 RECEIVED: 03/08/84

Results by Sample Analytical Serv

REPORT

LAB # 84-03-042

SAMPLE 10 16-016

FRACTION 16A TEST CODE GC 601 NAME EPA Method 601/GC

Category

COMPOUND MCL Date & Time Cullected not specified ANALYST INSTRUMENT SCAN DATE INJECTED 03/15/84 RESULT COMPOUND DATA FILE CONC. FACTOR SCAN

皇

Chloromethane

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Bromomethane

2

Chloroeth ine

밀

Vinyl Chloride

일

Methylene Chloride

2

Trichlorofluoromethane

2

1, 1-Dichloroethene

2

1, 1-Dichloroethane

윋

Chloroform

S

1, 2-Dichloroethane

밁

trans-1, 2-Dichloroethene

윋

Carbon Tetrachloride

밁

1, 1, 1-Trichloroethane

ᄝ

**Bromodichloromethane** 

일

1,2-Dichloropropane

물

trans-1, 3-Dichloropropene

COMPOUNDS DETECTED VERIFIED BY

786 286

Trichloroethene Dibromochloromethane

2090

RESULT

2

2 1, 1, 2-Trichloroethane

밁 cis-1, 3-Dichloropropene

2-Chloroethylvinyl Ether

밀

Bromoform

9

9 1, 1, 2, 2-Tetrachloroethane

**₹10** Tetrachloroethylene

밁 1, 3-Dichlorobenzene

Chlorobenzene

2

1, 2-Dichlorobenzene

g

밁 1, 4-Dichlorobenzene

PAGE 34 RECEIVED: 03/08/84

Analytical Serv REPORT Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE 10 T6-016

FRACTION 16A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN == scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

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PAGE 35 RECEIVED: 03/08/84

REPORT Results by Sample Analytical Serv

LAB # 84-03-042

SAMPLE ID 16-017

FRACTION 17A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

980 1280

COMPOUNDS DETECTED VERIFIED BY **Trichloroethene** Dibromochloromethane 1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene 2-Chloroethylvinyl Ether Bromoform 1, 1, 2, 2-Tetrachloroethane **Tetrachloroethylene** Chlorobenzene 1, 3-Dichlorobenzene 1, 2-Dichlorobenzene 1, 4-Dichlorobenzene COMPOUND MCL INSTRUMENT SCAN DATE INJECTED 03/15/84 9 S 밁 呈 g 밁 2 9 밁 밁 일 밁 RESULT Chloromethane Chloroform Bromomethane Vinyl Chloride Chloroethane Methylene Chloride Trichlorofluoromethane 1, 1-Dichloroethane trans-1, 2-Dichloroethene 1, 1-Dichloroethene 1, 2-Dichloroethane 1, 1, 1-Trichloroethane COMPOUND DATA FILE CONC. FACTOR SCAN

밁

밁

9

1690

RESULT

밁

010

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밁

윋

밁

呈

Carbon Tetrachloride

밁

Bromodichloromethane

밁

1,2-Dichloropropane

밁

trans-1,3-Dichloropropene

THE PARTY

PAGE 36 RECEIVED: 03/08/84

Analytical Serv

Serv Results by Sample

LAB # 84-03-042 Continued From Above

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SAMPLE 10 16-017

FRACTION 17A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified.

RECEIVED: 03/08/84 PAGE 37

LAB # 84-03-042

FRACTION 18A TEST CODE GC 601 NAME EPA Method 601/GC ACL P Date & Time Collected not specified ANALYST INSTRUMENT serv Report Results by Sample DATE INJECTED 03/15/84 Analytical Serv SAMPLE 10 T6-018 DATA FILE CONC. FACTOR

VERIFIED BY COMPOUNDS DETECTED Category

786 2

RESULT

COMPOUND SCAN RESULT COMPOUND SCAN

밀

Chloromethane

일

Bromomethane

2

Vinyl Chloride

Dibromoch loromethane

Trichloroethene 1830

呈

2 1, 1, 2-Trichloroethane 9 cis-1, 3-Dichloropropene S 2-Chloroethylvinyl Ether

Ñ

Methylene Chloride

2

Trichlorofluoromethane

S

1, 1-Dichloroethene

2

Chloroethane

S Bromoform 2 1, 1, 2, 2-Tetrachloroethane

<10 Tetrachloroethylene

g Chlorobenzene

2

trans-1, 2-Dichloroethene

밁

1, 1-Dichloroethane

2

Chloroform

2

1, 2-Dichloroethane

밁 1, 3-Dichlorobenzene

ĝ 1, 2-Dichlorobenzene

Ŷ

1, 4-Dichlorobenzene

S 1, 1, 1-Trichloroethane

일 Bromodichloromethane

Carbon Tetrachloride

2

밀 1, 2-Dichloropropane

S

trans-1, 3-Dichloropropene

# TANK MODERAL

PAGE 38 RECEIVED: 03/08/84

Analytical Serv

Serv REPORT

LAB # 84-03-042 Continued From Above

SAMPLE 1D 16-018

FRACTION 18A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram

All results reported in ug/L unless otherwise specified

PAGE 39 RECEIVED: 03/08/84

Analytical Serv

LAB # 84-03-042

SAMPLE 1D 16-019

Serv Results by Sample

FRACTION 19A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

99

1770

2

N

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ris-1.3-Dirbloropape				7	
1, 1, 2-Trichloroethane		QN	Chloride	Vinyl	
Dibromochloromethane		Q	Bromomethane	Bro	
1 Trichloroethene		Q	Chlorome thane	Ch 10	
N COMPOUND RE	SCAN	RESULT		COMPOUND	
INSTRUMENT BCC COMPOUNDS DETECTED		03/15/B	INJECTED 03/15/84	DATE	1

1. 1. 3. 3. Totrach lorgothans	
Bromoform	Trichlorofluoromethane ND
2-Chloroethylvinyl Ether	Methylene Chloride ND
cis-1,3-Dichloropropene	Chloroethane ND

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밀

**10** 

S

밁

S

2

1,1-Dichloroethane ND   Tetrachlo trans-1,2-Dichloroethene ND   Chl	-	roethene ND	roethane ND

	Carbon Tetrachloride ND	
1,4-Dichlorobenzene	1, 1, 1-Trichloroethane ND	
1,2-Dichlorobenzene	1,2-Dichloroethane ND	
1, 3-Dichlorobenzene	Chloroform ND :	

S

Bromodichloromethane

밁

1, 2-Dichloropropane

밁

trans-1, 3-Dichloropropene

PAGE 40 RECEIVED: 03/08/84

Analytical Serv

Serv REPORT

LAB # 84-03-042 Continued From Above

SAMPLE 1D 16-019

FRACTION 19A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified

### KADIMK

RECEIVED: 03/08/84

Results by Sample Analytical Serv

LAB # 84-03-042

REPORT

SAMPLE 1D 16-020

FRACTION 20A TEST CODE GC 601 NAME EPA Method 601/GC Category COMPOUND MCL Date & Time Collected not specified ANALYST INSTRUMENT DATE INJECTED 03/15/84 DATA FILE CONC. FACTOR

980 COMPOUNDS DETECTED VERIFIED BY

1790

Dibromoch loromethane

RESULT

Trichloroethene SCAN 2 RESULT Chloromethane COMPOUND SCAN

욷 2 Bromomethane Vinyl Chloride

皇

Chloroethane

2

Methylene Chloride

2

Trichlorofluoromethane

2

1, 1-Dichloroethene

S

1, 1-Dichloroethane

문

trans-1, 2-Dichloroethene

2

Chloroform

뮏

1, 2-Dichloroethane

9

1, 1, 1-Trichloroethane

1, 1, 2-Trichloroethane cis-1, 3-Dichloropropene

2-Chloroethylvinyl Ether

2

S

S Bromoform 1, 1, 2, 2-Tetrachloroethane <10 Tetrach loroethy lene 밀 Chlorobenzene

2 1, 3-Dichlorobenzene 2 1, 2-Dichlorobenzene S

1, 4-Dichlorobenzene

밀 ĝ Carbon Tetrachloride

2 Bromodichloromethane

1, 2-Dichloropropane

ᄝ

trans-1, 3-Dichloropropene

PAGE 42 RECEIVED: 03/08/84

Analytical Serv Results by Sample

LAB # 84-03-042 Continued From Above

SAMPLE 1D 16-020

FRACTION 20A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram

All results reported in <u>ug/L</u> unless otherwise specified

PAGE 43 RECEIVED: 03/08/84

Analytical Serv REPORT Results by Sample

LAB # 84-03-042

FRACTION 21A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category SAMPLE ID trip blank

MCL VERIFIED BY JSG  L  COMPOUNDS DETECTED O	COMPOUND	Trichloroethene ND	Dibromochloromethane ND	1, 1, 2-Trichloroethane ND	is-1,3-Dichloropropene ND	2-Chloroethylvinyl Ether ND	Bromoform ND	1, 1, 2, 2-Tetrachloroethane ND	Tetrachloroethylene ND	Chlorobenzene ND	1,3-Dichlorobenzene ND	1,2-Dichlorobenzene ND	1, 4-Dichlorobenzene ND				
ANALYST MG INSTRUMENT	SCAN			-	cis	2-Ch		1,1,2									
B DATE INJECTED 03/15/84	COMPOUND RESULT	Chloromethane ND !	Bromomethane ND	Vinyl Chloride ND	Chloroethane ND	Methylene Chloride ND	Trichlorofluoromethars ND	1,1-Dichloroethene ND :	1,1-Dichloroethane ND	trans-1, 2-Dichloroethene ND :	Chloroform ND :	1,2-Dichloroethane ND	1, 1, 1-Trichloroethane ND	Carbon Tetrachloride ND	Bromodichloromethane ND	1,2-Dichloropropane ND	trans-1,3-Dichloropropene ND
DATA FILE CONC. FACTOR	SCAN					SAASSIP STATES									i	H-2	    56

PAGE 44 RECEIVED: 03/08/84

SAMPLE ID trip blank

Analytical Serv Results by Sample

LAB # 84-03-042 Continued From Above

FRACTION 21A TEST CODE GC 601 NAME EPA Method 601/GC Date & Time Collected not specified Category

NOTES AND DEFINITIONS FOR THIS REPORT

SCAN = scan number or retention time on chromatogram.

All results reported in <u>ug/L</u> unless otherwise specified

ND = not detected at EPA detection limit method 601, (Federal Register, 12/3/79).

PAGE 45 RECEIVED: 03/08/84

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

DUP601 21C : DUP601 21D : DUP601 LOG\_IN

21B 22A

Analytical Serv REPORT NonReported Work

LAB # 84-03-042

H-258

# R AND HOLLEN

LAB # 84-03-130

REPORT

Analytical Serv

RECEIVED: 03/20/84

04/10/84 08: 47: 58

CONTACT CONDVER PREPARED Radian Analutical Services Austin, Texas 78766 8501 MoPac Blvd. P. D. Box 9948 (512) 454-4797 ATTEN Æ SAMPLES 2 WORK ID zone 1 groundwater ANFB William Little 212-027-04-05 Tinker AFB REPORT Redien. TO B1. 4 Austin TINKER CLIENT TRANS TYPE P. O. # ATTEN TAKEN FACILITY

Analytical Serv TEST CODES and NAMES used on this report

under separate cover

INVOICE

SAPPLE IDENTIFICATION

Ol sroundwater 2

PAGE 2 RECEIVED: 03/20/84

Analytical Serv REPORT Results by Sample

LAB # 84-03-130

SAMPLE ID groundwater 2

FRACTION OIA TEST CODE ANFS NAME Method 625 Acid/Neutrals Date & Time Collected not specified Category

				מ ושב נחווגוננה		ווחר אברדובם	הוחלבת הפונהתות
CONC.	FACTOR	DATA FILE 2CU03130A01	DATE EXTRACTED DATE INJECTED	03/23/84	ANINGTR	ANALYBT INSTRUMENT	COMPOUNDS DETECTED O
NPDES	BCAN	EPA (	COMPOUND	REBULT N	NPDES SCAN		EPA
<b>1</b>		18	acenaphthene	g	æ	728	benzo(a)anthracene A ND
468		8B 1, 2, 4	1, 2, 4-trichlorobenzene	Q.	89	738	benzo(a)pyrene ND
338		98	hexachlorobenzene	Ø	78	748	3, 4-benzofluoranthene * ND
<b>36B</b>		128	hexachloroethane	Q	86	758	benzo(k) fluorenthene * ND
118		18B bis(2-	bis(2-chloroethyl)ether	9	198	768	chrysene A ND
168	••	20B 2-	2-chloronaphthalene	9	28	778	acenaphthylene ND
20 <b>B</b>	- <del>-</del>	25B 1.	1, 2-dichlorobenzene	9	38	788	anthracene B ND
218	- <del>-</del>	268 1,	1, 3-dichlorobenzene	9	88	798	benzo(ghi)perglene ND
22B	•	278 1,	1, 4-dichlorobenzene	Q	328	808	fluorene ND
29B	•	378 1,2-	1,2-diphenylhydrazine	QN	448	818	phenanthrene B ND
318	••	39B	fluoranthene	g	198	828	dibenzo(a, h) anthracene ND
178	•	408 4-chlorophenyl	henyl phenyl ether	Ø	378	838	indeno(1, 2, 3-cd)pyrene ND
148	,	418 4-bromophenyl	henyl phenyl ether	Q	438	848	DN
128	•	42B bis(2-chlc	bis(2-chloroisopropyl)ether	g	114	214	2, 4, 6-trichlorophenol ND
<b>8</b> 0 H-2	,	43B bis(2-ch]	bis(2-chloroethoxy)methane	g	<b>8</b>	22A	p-chloro-m-cresol ND
<b>846</b>		528 he	hexachlorobutadiene	9	۲.	244	2-chlorophenol ND

# KANDIME

PAGE 3	PAGE 3	Analytical Serv REPO	REPORT	Continued From Above
RECEIVED:	RECEIVED: 03/20/84	Results by Sample	Sample	
	groundwater 2	Date & Time Col	Date & Time Collected <u>not specified</u>	ified Category Category

_	Above
<b>84-</b> 03-130	From
- <del>-</del>	tinued
LAB	Col

	9	Q	S	Q	g	9	9	ğ	
Category	2, 4-dichlorophenol	2, 4-dimethylphenol	2-nitrophenol	4-nitrophenol	2, 4-dinitrophenol	4,6-dinitro-o-cresol	pentachlorophenol	phenol _	
te & Time Collected not specified	31A	34A	97A	<b>38A</b>	99A	<b>409</b>	64A	<b>68</b>	
llected	8	<b>∢</b>	<b>₹</b>	4	€ S	4	<b>4</b>	104 401	
Time Co	QN	Q)	QV.	QZ	QZ	QQ	Q	QY	2
~×	•	_	_	•	_			_	_
Dati	hexachlorocyclopentadiene	isophorone	naphthalene	bis(2-ethylhexyl)phthalate	butyl benzyl phthalate	di-n-butyl phthalate	di-n-octyl phthalate	diethyl phthalate	dimethyl phthalate
Dati	538 hexachlorocyclopentadien	548 isophorone	558 naphthalen	66B bis(2-ethylhexyl)phthalate	67B butyl benzyl phthalate	68B di-n-butyl phthelate	698 di-n-octyl phthalate	70B diethyl phthalate	71B dimethyl phthalate

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in us/L

ND = not detected at EPA detection limits

+ = 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

A = benzo(a)anthracene and chrysene co-elute.

.earthracene and phenanthrene co-slute.
H-561

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Results by Sample Analytical Serv

REPORT

LAB # 84-03-130

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¥ EPA NAME Method 625 Acid/Neutrals COMPOUNDS DETECTED VERIFIED BY benzo(a)anthracene A benzo (ghí )perylene acenaphthylene fluorene dibenzo(a, h)anthracene p-chloro-m-cresol 2-chlorophenol benzo(a)pyrene indeno(1,2,3-cd)pyrene かいっしかる 2, 4, 6—trichlorophenol benzo(k) fluoranthene 3, 4-benzofluoranthene chrysene anthracene phenanthrene Category 버 Date & Time Collected not specified TEST CODE ANFS 21A 22 **42** 74B 75B **76B 77B** 79B **BOB** 818 82B 838 848 22A 24A **ANALYBT** 788 INBTRUMENT NPDEB BCAN ₹ 188 8 328 19B 378 45B 114 ₩ 3 44B DATE EXTRACTED 03/23/84 DATE INJECTED 04/06/84 FRACTION 02A REBULT 月 뮏 S 9 뒫 月 물 물 뒫 뒫 묏 뒥 덜 月 윋 뒥 acenaph thene 1, 2, 4-trichlorobenzene hexach lorobenzene bis(2-chloroethyl)ether 2-chloronaphthalene 1, 2-dichlorobenzene 1, 3-dichlorobenzene 1, 4-dichlorobenzene 1,2-diphenylhydrazine fluoranthene 4-chlorophenyl phenyl ether 42B bis(2-chloroisopropyl)ether hexachlorosthans 4-bromophenyl phenyl ether bis (2-chlorosthoxy)methens hexachlorobutadiene COFFOUND DATA FILE <u>2CU03130A01</u> CONC. FACTOR SAMPLE ID groundwater **43B 408** 418 FPA 188 **308** 23B **26B 27B** 378 128 398 32B NPDES SCAN **5** H-262 468 338 36B 118 16B **808** 218 22B 29B 318 17B 148 128 348 2

	03/20/84
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Analytical Serv

REPORT

LAB # 84-03-130

RECEIVED: 03/20/84	03/50/		Results by Sample	Sample		Continued From Above	
SAMPLE ID groundwater 4	ground	Water 4	FRACTION OZA TEST CODE ANFS N Date & Time Collected not specified	TEST CODE	ANFS NAME Specified	NAME Method 625 Acid/Neutrals	
338	<b>338</b>	hexachlorocyclopenta	entadiene ND	2A	31A	2, 4-dichlorophenol ND	
388	846	₩.	isophorone ND	€	34A	2. 4-dimethylphenol ND	8
368	928	•	naphthalene ND	\$	57A	2-nitrophenol ND	덬
138	<b>668</b>	bis(2-ethylhexyl)phth	phthalate ND	٧,	58A	4-nitrophenol ND	
138	<b>67B</b>	butyl benzyl phth	phthalate ND	₹ 50	39A	2, 4-dinitrophenol ND	의
<b>3</b> 98	889	di-n-butyl phth	phthelete ND	\$	4 409	4, 6-dinitro-o-cresol ND	
298	698	di-n-octyl	phthelate ND	<b>V</b> 6	64A	pentachlorophenol ND	9
248	708	diethyl phth	phthalate ND	104	65A	pheno! ND	열
228	718	dimethal phth	ohthelate ND :				

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number or retention time on chromatogram.

All results reported in us/L

ND = not detected at EPA detection limits

 $\star$  = 3,4-benzofluoranthene and benzo(k)fluoranthene co-elute.

- benzo(a) anthracens and chrysene co-elute.

anthracene and phenanthrane co-elute.

RECEIVED: 03/27/84

Analytical Serv REPORT 04/25/84 12:36:26

LAB # 84-03-179

REPORT Radian TO B1. 4 Austin ATTEN William Little

SAMPLES Tinker AFB TINKER CLIENT COMPANY FACILITY

PREPARED Radian Analutical Services Austin, Texas 78766 8501 MoPac Blvd (512) 454-4797 Box 9948 P. O. ATTEN B≺

CERTIFIED BY

CONTACT CONDVER

under separate cover WORK ID zone 1 groundwater 212-027-04-05 hand TRANS INVOICE P. O. # TAKEN

SAMPLE IDENTIFICATION

**M**-8

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Analytical Serv TEST CODES and NAMES used on this report EPA 608 Pesticides by EC Organic Carbon Single Analysis ercury, Cold Vapor anganese, ICPES otal Phenolics Chromium, ICPES and Grease, low level Cadmium, ICPES otal Cuanide Copper, ICPES ICPES Herbicides EC ICPES ron, ead CNTOTA SHEN A ERBES JNG IR PESTES PB GA CR 본 ŏ

PAGE 2 RECEIVED: 03/27/84

Analytical Serv REPORT RESULTS BY TEST

LAB # 84-03-179

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01	<. 002	₹. 02	0.005	001	121	302	110	€.003	₽	302	<. 005	Cu	0.03	0.015
Sample 01 (entered units)	Ü	<b>.</b> ,	ö	Ũ	Ö	٠ ٧	Ö	Ü		Ü	Ü		0	0.
							<i></i> -							
E units														
TEST CODE	CD E	ITOTA	<u>, m</u>	إساق	اِساً اِ	CA	[ w]		IG IR	. <del>(</del> 8)	EN A	<u>. ت</u>	TOX 1	ZN E
H 9	3	55	<b>15</b>	73 S		52	5 <b>£</b>	32	36 S		5 E		5P	H-265

CORPORATION	Anslutical Conv	I AR # 84-03-179
RECEIVED: 03/27/84	lts by Sam	
SAMPLE ID MW-8	FRACTION OIF TEST CODE HERBES Date & Time Collected 03/26/84	NAME Herbicides EC Category
DATE EXTRACTED 04/05/84	DATE INJECTED 04/11/84	VERIFIED BY

CONCENTRATION FACTOR

IED BY LLN

COMPOUND

RESULT

밁

2, 4-D

DET. LIMIT

OTHER HERBICIDES

RESULT

DET. LIMIT

2, 4, 5-TP (Silvex)

밁

NOTES AND DEFINITIONS FOR THIS REPORT. ND = not detected at the specified detection limit.

All results reported in micrograms/liter unless otherwise specified.

RECEIVED: 03/27/84

I Serv REPORT Results by Sample Analytical Serv

LAB # 84-03-179

SAMPLE ID MW-8

FRACTION OIF TEST CODE PESTES
Date & Time Collected 03/26/84

NAME EPA 608 Pesticides by EC Category

DRL ANALYST DATE EXTRACTED 04/04/84
DATE INJECTED 04/10/84 2140410 DATA FILE CONC. FACTOR

VERIFIED BY LLN COMPOUNDS DETECTED 0

RESULT	alpha BHC ND	beta BHC ND	gamma BHC ND	delta BHC ND	PCB-1242 ND	PCB-1254 ND	PCB-1221 ND	PCB-1232 ND	PCB-1248 ND	PCB-1260 ND	PCB-1016 ND	toxaphene ND	
COMPOUND	<b>rg</b>		Ö	70								ţ	
SCAN EPA	102P	103P	104P	105P	106P	107P	108P	1099	110P	111P	112P	113P	
NPDES 6	95 25	ස ස	4	g.	186	199	20P	21P	22P	23P	24P	25P	
RESULT	Q	Q	S	Q	N	QN	Q	S	S	S	QN	QN N	Q
COMPOUND	aldrin	dieldrin	chlordane	4, 1'-DDT	4, 4'-DDE	4, 4'-DDD	alpha endosulfan	beta endosulfan	endosulfan sulfate	endrin	endrin aldehyde	heptachlor	heptachlor epoxide
EPA	89P	90P	91P	92P	93P	946	95P	96P	97P	98P	999	100P	101P
NPDES SCAN	16	10P	<b>6</b> P	7.0	<b>8</b>	d6	119	12P	1 4P	1 4P	156	16P	H-1

RECEIVED: 03/27/84

Analytical Serv REPU Results by Sample

REPORT

LAB # 84-03-179 Continued From Above

SAMPLE ID MM-8

FRACTION OIF TEST CODE PESTES
Date & Time Collected 03/26/84

NAME EPA 608 Pesticides by EC Category

NOTES AND DEFINITIONS FOR THIS REPORT.

SCAN = scan number on chromatogram.

All results reported in micrograms/liter unless otherwise specified. ND = not detected at EPA detection limit method 608, (Federal Register, 12/3/79).

PAGE 6 RECEIVED: 03/27/84

FRACTION AND TEST CODES FOR WORK NOT REPORTED ELSEWHERE

016 : LDG\_IN

Analytical Serv REPORT NonReported Work

LAB # 84-03-179

H-269



Oklahoma State Department of
Health Analytical Data

State Board of Karth

EDWARD H FITE, JR., M.D., PRESIDENT W A "TATE" TAYLOR, VICE-PRESIDENT HAROLD A TOAZ, SECRETARY WALLACE BYRD, M.D. JOHN B CARMICHAEL, D.D.S. JAMES A. COX, JR., M.D. LINDA M. JOHNSON, M.D. ROBERT D. McCULLOUGH, II, D.O. WALTER SCOTT MASON, III



JOAN K. LEAVITT, M.D.

Oklahoma State Department of Health

1000 Northeast 10th Street Post Office Box 53551 Oklahoma City, Oklahoma 73152

March 21, 1984

Mr. William Little Radian Corp PO Box 9948 Austin, Texas 78766

Dear Mr. Little:

The State Environmental Laboratory Service of the Oklahoma State Department of Health recently split some samples collected from the monitoring wells which your organization has drilled at Tinker Air Force Base. Additionally, we recently sampled wells at the Midwest Maintenance disposal site near Tinker. Capt. Darrell Cornell asked that I provide copies of these analyses to you.

GC/MS scans of both purgables and extractables have been completed for all of the Midwest Maintenance samples. Of the Tinker samples, only sample numbers 108821, 108787, 108786, and 108822 have been analysed for both purgables and extractables. The remainder have only been analysed for purgables. When the extractables analyses are completed we will share this information with you.

Should you have any questions, please contact me. I may be reached at (405) 271-5240.

Very truly yours

Judith A. Duncan, Chief

State Environmental Laboratory Service

JAD/jb

cc: Capt. Darrell Cornell, USAF HOSP/SGB

AMPLE # : 108986 DATE COLLECTED : 2/16/84 REPORT DATE : 2/25/84

RUJECT : MIDWEST MAINTENENCE

CODE : PW-XMS

AMPLE DISCRIPTION : SUPPLY WELL

COMPOUND 

DI-N-BUTYL PHTHALATE

BIS(2-ETHYLHEXYL) PHTHALATE 0.9

BUTYL BENZYL PHTHALATE

TO INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH!

ANALYST'S COMMENTS :

H-274

	STATE	ENVIRONMENTA GC/MS REF		RY		
FRLE # : 108	985 DATE	COLLECTED :	2/16/84	REPORT	DATE :	2/25/84
ROJECT : MIDW	EST MAINTENENCE				CODE :	PW-XMS
AMPLE DISCRIP	TION : SHOP (DR	INKING WATER)				
	COM	POUND		PPB		
	BIS(2-ETHYLHE	XYL) PHTHALAT	E	7.2		•
	BUTYL BENZYL	PHTHALATE		0.3		
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INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !

NALYST'S COMMENTS : H-275

NALYST :

	GC/MS KEP(	ואנ				
ATTLE # : 10898	DATE COLLECTED :	2/16/84	REPORT	DATE	:	2/25/84
ROJECT : MIDWES	ST MAINTENENCE			CODE	:	PW-XMS
AMPLE DISCRIPT	ON : MW # 6		:=======	:=====		:#2:22###
	COMPOUND		PPB			
	DI-N-BUTYL PHTHALATE	1.2	2			
· .	BIS(2-ETHYLHEXYL) PHTHALATE	E 0.7	,			
	DIETHYL PHTHALATE	0.4	•			
	•					

\* INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !

ANALYST'S COMMENTS : H-276

ANALYST : \_\_\_\_\_

الإستراد # : 108983 DATE COLLECTED : 2/16/84 REPORT DATE : 2/25/84

ROJECT : MIDWEST MAINTENENCE

CODE : PW-XMS

SAMPLE DISCRIPTION : MW # 2

 COMPOUND	РРВ
DI-N-BUTYL PHTHALATE	1.1
BIS(2-ETHYLHEXYL) PHTHALATE	0.5
DIETHYL PHTHALATE	0.2
BUTYL BENZYL PHTHALATE	0.1

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !

ANALYST'S COMMENTS :

H-277

AMPLE # : 108982	DATE COLLECTED : 2/16/84	REPORT DATE : 2/25/84
ROJECT : MIDWEST MAINTE	NENCE	CODE : PW-XMS
AMPLE DISCRIPTION : MW :	<b>† 1</b>	
	COMPOUND	PPB
<b>***</b>		=======

NONE DETECTED

#### STATE ENVIRONMENTAL LABORATORY

	GC/MS REPO	IRT	
LE # : 108981	DATE COLLECTED :	2/16/84 REPORT	DATE : 2/25/84
ROJECT : MIDWEST MAI	NTENENCE		CODE : PW-XMS
AMPLE DISCRIPTION :	FISHER WELL		
	COMPOUND	PPB	
NONE	DETECTED		

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH ! H-279

AMPLE # : 108980 DATE COLLECTED : 2/16/80 REPORT DATE : 2/25/84 RUJECT : MIDWEST MAINTENENCE CODE : PW-XMS

AMPLE DISCRIPTION : SUPPLY WELL NE OF SITE

COMPOUND PPB DI-N-BUTYL PHTHALATE 0.9 BIS(2-ETHYLHEXYL) PHTHALATE 0.3 DIETHYL PHTHALATE 0.4

🗀 INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH ! ANALYST'S COMMENTS :

H-280

AMPLE # : 108787 DATE COLLECTED : 2/13/84 REPORT DATE : 3/13/84

ROJECT : TINKER CODE : TF-XMS

AMPLE DISCRIPTION : MONITOR WELL # 1A

COMPOUND PPB
1.4-DICHLOROBENZENE 4.8
BIS(2-ETHYLHEXYL) PHTHALATE 1.1
1.2-DICHLOROBENZENE 1.0
DIETHYL PHTHALATE 2.8

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !

NALYST'S COMMENTS : H-281

NALYST : \_\_\_\_\_

*=====	==	==		=====	=========	===		:=====:	=====	==	======:::
AMPLE	‡	:	108786	DATE	COLLECTED	:	2/13/84	REPORT	DATE	:	3/13/8
ROJECT	:		TINKER						CODE	:	TF-XMS

AMPLE DISCRIPTION : MONITOR WELL # 18

DIETHYL PHTHALATE 0.9

COMPOUND

ISOPHORONE 0.4

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !

NALYST'S COMMENTS :

H-282

AMPLE # : 108822

DATE COLLECTED: 2/14/84 REPORT DATE: 3/13/84

ROJECT : TINKER

CODE : TF-XMS

AMPLE DISCRIPTION : MONITOR WELL #10

COMPOUND	PPB
 TRICHLORGE CHENE	210
 1.1,2-TRICHLOROETHANE	5.6
BIS(2-ETHYLHEXYL) PHTHALATE	5.0
DIETHYL PHTHALATE	7.8
ISOPHORONE	4.0

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH!

ANALYST'S COMMENTS :

H-283

INALYST :

AMPLE # : 108854 DATE COLLECTED : 2/15/84 REPORT DATE :

ROJECT : TINKER CODE : TF-XMS

AMPLE DISCRIPTION : MONITORING WELL # 2A

COMPOUND PPB
TRICHLOROFLUOROMETHANE 3.8

1.1-DICHLOROETHANE 25

1.1,1-TRICHLOROETHANE 4.2

TRICHLOROETHENE 30.4

TETRACHLOROETHENE 12.2

\* INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !

ANALYST'S COMMENTS :

H-284

ANALYST :

			=======	
	DATE COLLECTED :		REPORT	
ROJECT : TINKER		•		CODE : TF-XMS

SAMPLE DISCRIPTION : MONITORING WELL # 28

COMPOUND PPB

NO PURGEABLES DETECTED

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH! ANALYST'S COMMENTS : H-285 ANALYST :

	GC/MS REPO		
ample	DATE COLLECTED :	2/15/84 REPORT	
ROJECT : TINKER		•	CODE : TF-XMS
•	MONITORING WELL # 3E		
ے میں میں میں بدن جب جب ایس میں بہت جات <u>جب طل میں ہے ہے ہیں جب میں میں میں ہو</u> ۔	COMPOUND	PPB	

NO PURGEABLES DETECTED

INDICAT	ES	COMPOUND	IS	TENTATIVELY	IDENTIFIED	BY	NBS	LIBRARY	SEARCH	!
HALYST'S	C	MMENTS :								
ANALYST :	_				_					

## STATE ENVIRONMENTAL LABORATORY

GC/MS REPORT								
	DATE COLLECTED :				<b></b>			
ROJECT : TINKER				CODE :	PW-XMS			
	: MONITORING WELL # 3F							
	COMPOUND		PPB					
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ОМ	PURGEABLES DETECTED							

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH ! ANALYST'S COMMENTS : ANALYST :

SAMPLE # : 108853 DATE COLLECTED : 2/15/84 REPORT DATE :

'ROJECT : TINKER

CODE : TF-XMS

BAMPLE DISCRIPTION : MONITORING WELL # 3G

	COMPOUND	PPB	
<u>.</u>	METHYLENE CHLORIDE	786	
<u>.</u>	TRANS-1.2-DICHLOROETHENE	259	
	1.2-DICHLOROETHANE	2680	
	TRICHLOROETHENE	2220	
	TRIBITEDROL TILIL	2220	
	1.1,2-TRICHLOROETHANE	86	
	TOLUENE	132	
•	TOLOLIKE	132	
	CHLOROBENZENE	378	

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH!

NALYST'S COMMENTS :

ANALYST :

AMPLE # : 108821 DATE COLLECTED : 2/14/84 REPORT DATE : 3/13/84

ROJECT : TINKER CODE : TF-XMS

AMPLE DISCRIPTION : MONITOR WELL # 4A

COMPOUND PPB

1,2-DICHLOROETHANE 2.7

TRICHLOROETHENE 101

DIETHYL PHTHALATE

8.1

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !
NALYST'S COMMENTS :
H-289

-	STATE ENVIRONMENTA GC/MS REP				
AMPLE # : 108850	DATE COLLECTED :	2/15/84	REPORT	DATE	:
ROJECT : TINKER				CODE	: TF-XMS
AMPLE DISCRIPTION	: MONITOR WELL # 4G				
	СОМРОИМД	jipa gidda garin dang jiman gamp pand dalan piggi dalah dilam dara gari	PPB		
NO.	PURGEABLES DETECTED				
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INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH ! MALYST'S COMMENTS : NALYST :

STATE ENVIRONMENTAL LABORATORY  GC/MS REPORT							
AMPLE # : 109001		COLLECTED :		REPORT			
ROJECT : TINKER					CODE :	TF-XMS	
AMPLE DISCRIPTION							
	COMI	מאטסי		PPB	:=====		
	PURGEABLES						
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INDICATES COMPOUN	ID IS TENTA	TIVELY IDENT	IFIED BY NBS	LIBRARY SEA	ARCH !		
NALYST'S COMMENTS	:						

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AMPLE :	<b>‡</b> :	108884	DATE	COLLECTED	:	2/16/84	REPORT	DATE	:		
		TT111/ED						0005		****	

AMPLE DISCRIPTION : MONITORING WELL # 1 (OLD WELLS)

COMPOUND

PPB

NO PURGEABLES DETECTED

INDICATES	COMPOUND	IS	TENTATIVELY	IDENTIFIED	BY	NBS	LIBRARY	SEARCH	!
NALYST'S C	OMMENTS :								
NALYST :									
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AMPLE				 	DATE	 <b></b> -			 	 	 REPORT		==:	
ROJEC"	Γ :	T	INKER									CODE	:	TF-XMS
AMPLE		_									 	:		=======================================
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NO PURGEABLES DETECTED

INDICATES	COMPOUND	IS	TENTATIVELY	IDENTIFIED	BY	NBS	LIBRARY	SEARCH	!
NALYST'S CO	OMMENTS :		•						
ANALYST :		<del></del>		**************************************					

GC/MS REPORT											
AMPLE # : 108998	DATE COLLECTED :		REPORT								
ROJECT : TINKER				CODE :	TF-XMS						
AMPLE DISCRIPTION : MON											
,	COMPOUND		PPB								
- CHLOROBE			118								
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INDICATES COMPOUND IS	TENTATIVELY IDENT	IFIED BY NBS	LIBRARY SEA	ARCH !							
NALYST'S COMMENTS :											

NALYST :

# STATE ENVIRONMENTAL LABORATORY GC/MS REPORT

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AMPLE # : 108999

DATE COLLECTED : 2/17/84

REPORT DATE :

ROJECT : TINKER

CODE : TF-XMS

AMPLE DISCRIPTION : MONITORING WELL # 5

COMPOUND PPB

NO PURGEABLES DETECTED

INDICATES	COMPOUND	IS	TENTATIVELY	IDENTIFIED	BY	NBS	LIBRARY	SEARCH	!
NALYST'S C	DMMENTS :								
NALYST :									

	STATE	ENVIRONMENTA GC/MS REP			
AMPLE # : 1089	97 DATE	COLLECTED :	2/17/84	REPORT	DATE :
ROJECT : TINKE	R				CODE : TF-XMS
AMPLE DISCRIPT	ION : MONITOR V	IELL #5			
. ====================================	COMP	OUND	E	PPB	
	NO PURGEABLES	DETECTED			
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INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH !
NALYST'S COMMENTS :
NALYST : \_\_\_\_\_\_

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AMPLE # : 109002	P DATE COLLECTED : 2/	17/84 REPORT	DATE :
ROJECT : TINKER			CODE : TF-XMS
AMPLE DISCRIPTION	N : MONITORING WELL # 6 (OLD	WELL)	
	CUMPOUND	PPB	
_ 7	RANS-1.2-DICHLOROETHENE	385	·
- 1	RICHLOROETHENE	62.1	
•			

INDICATES COMPOUND IS TENTATIVELY IDENTIFIED BY NBS LIBRARY SEARCH ! ANALYST'S COMMENTS : NALYST :

# STATE ENVIRONMENTAL LABORATORY GC/MS REPORT

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AMPLE # : 1090		DATE COLLEC			REPO		<b></b>
ROJECT : TINKER	2					CODE :	TF-XMS
AMPLE DISCRIPTI							
		COMPOUND			PPB		
-		2-DICHLOROE			22.8		
35.	TRICHLOR	OETHENE			12		
			. `			•	
				<b>.</b> .			
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INDICATES COMP	POUND IS	TENTATIVELY	IDENTIF	TED BY N	BS LIBRARY	SEARCH !	
NALYST'S COMMEN	NTS :		•				
NALYST :							



### APPENDIX I

Correspondence with Federal, State and/or Local Regulatory Authorities



212-027-04

6 October 1983

Mr. James R. Barnett
Executive Director
Oklahoma Water Resources Board
Post Office Box 53585
Oklahoma City, Oklahoma 73152

Dear Mr. Barnett:

Radian Corporation is under contract to the U.S. Air Force Occupational and Environmental Health Laboratory to conduct certain hydrogeologic investigations at Tinker Air Force Base, Oklahoma. The work will include installation of ground-water monitoring wells in the vicinity of known or suspected hazardous waste disposal sites, so the drillers will utilize EPA Level C personal protection equipment (full-face respirators, splash-proof outer clothing, gloves and impervious footgear).

Radian has conducted a diligent search, both by letter and telephone, for an Oklahoma-based firm to subcontract the monitor well drilling effort. We are unable to locate a firm with the required equipment and hazardous waste experience. Consequently, the search has been widened, and suitable firms have been located here in Texas.

This is not, in any way, to be construed as a reflection on the general level of competence of Oklahoma water well drillers. The practice of monitor well installation, even though based on the same technology, is different from that of production well installation. We also need a subcontractor who is experienced in the safety aspects associated with hazardous waste sites. This project requires personnel who can maintain a satisfactory production rate while maintaining adequate protection for themselves, nearby personnel and the environment.

As we understand it, there is no reciprocity agreement between Texas and Oklahoma for licensing of water well drillers. We further understand that, even though these wells at Tinker AFB are not production wells, you wish them to be installed by a licensed driller. However, we have found no Oklahoma-based, licensed firm with the requisite hazardous waste site experience to undertake the project. Therefore, we request that, for this project at Tinker AFB only, Radian Corporation and its designated drilling subcontractor be exempted from the licensing requirements.



Mr. James R. Barnett 6 October 1983 Page Two.

The start of field work is being delayed, pending the outcome of this action. We appreciate your early consideration and response.

Sincerely,

William M. Little Project Director

WML:sg

cc: Mr. Baladi, OEHL/CVT Dr. Sanders, OEHL/ECQ

CPT Cornell, Tinker AFB Hospital SGB



212-027-04

31 October 1983

Mr. Jenkins Dunbar
Oklahoma State Department
of Health
Industrial and Solid
Waste Service
Post Office Box 53551
Oklahoma City, Oklahoma 73152

Dear Mr. Dunbar:

Radian Corporation is under contract to the U.S. Air Force Occupational and Environmental Health Laboratory to conduct certain hydrogeologic investigations at Tinker Air Force Base, near Oklahoma City. The Air Force has previously provided you with the Statement of Work for the study. In support of that study, we are preparing to drill two shallow ground-water monitoring wells, three soil borings and six deep ground-water monitoring wells. The purpose of this letter is inform you of the contemplated drilling and well construction procedures. Field work is expected to begin on or about 7 November 1983.

#### Shallow Monitor Wells

Drilling locations will be specified by Radian. The anticipated average depth of the wells is 30 feet. Actual depth of each well will be determined in the field by the supervising Radian geologist. The cores for installing the wells will be drilled by hollow-stem auger and core samples will be obtained at five-foot intervals with a split-spoon sampler (ASTM D-1536). Drilling and completion logs will be kept and samples retained by the supervising geologist.

#### Well construction materials will be as follows:

- Casing: two-inch diameter, flush joint, Schedule 80 PVC.
- Screen: two-inch diameter, flush joint, Schedule 80 PVC,
   0.010-inch continuous slot. Normal screen length will be
   10 feet, to be reduced to 5 feet at the discretion of the supervising geologist.
- Sand/gravel pack: grain size compatible with screen slot size, emplaced from bottom of hole to one foot above top of screen.
- 4. Bentonite seal: two feet above top of sand pack.



Mr. Jenkins Dunbar 31 October 1983 Page Two.

- 5. Grout: neat cement (Type I Portland cement) grout from the top of the bentonite seal to the land surface.
- 6. Surface completion: The PVC casing is cut off to provide a two to three foot stickup and a coupling with an end plug cemented to the casing. A three-inch diameter guard pipe, four feet in length, is placed over the exposed casing, and seated in the cement. A locking cap lid is installed on the guard pipe.
- 7. ALTERNATIVE FLUSH SURFACE COMPLETION: The PVC casing is cut off 2-3 inches below the land surface, and a locking cap lid cemented in place. The corehole is over-excavated, if necessary, and a valve box or other flush cover cemented in place with premixed concrete. Care is taken to maintain free drainage within the valve box. Radian will specify the surface completion procedure to be used. Approximately three of the wells will have flush completions.
- 8. Guard pipes or posts: Three-inch diameter steel posts, six feet in length, with a minimum of 2 feet below ground, 3 feet in length, with a minimum of 2 feet below ground, 3 each installed radially 4 feet from the wellhead (not required for flush surface completion).

#### Deep Monitor Wells

These wells will be drilled to an approximate total depth of 125 feet at locations to be specified by the supervising geologist. Well specifications are as follows:

- Drilling method air rotary.
- 2. Casing four-inch diameter, flush joint, Schedule 80 PVC.
- 3. Screen four-inch diameter, flush joint, Schedule 80 PVC, ten feet in length, with 0.010-inch continuous slot.
- 4. Sand/gravel pack: grain size compatible with screen slot size, emplaced from bottom of hole to one foot above top of screen.
- 5. Bentonite seal: two feet above top of sand pack.
- 6. Grout: neat cement (Type I Portland cement) grout from the top of the bentonite seal to the land surface.
- Surface completion and guard posts: same as for two-inch monitor wells.



Mr. Jenkins Dunbar 31 October 1983 Page Three.

#### Soil Borings

In addition to the above, there will be three cores to a nominal depth of 30 feet. Actual depth of each core will be determined in the field by the supervising Radian geologist. The cores will be drilled by hollow-stem auger and samples will be obtained at five-foot intervals with a split-spoon sampler (ASTM D-1536). Drilling logs will be kept and samples retained by the supervising geologist. After the cores are advanced to total depth, each will be grouted back to the surface as the augers are withdrawn.

#### Coordination

A licensed water well driller has been retained to conduct the drilling and well construction. The Water Resources Board will be notified of the drilling locations and appropriate records (Form 424-10 76) will be filed with the Board after the wells are completed.

Please call me if you have any questions.

Sincerely,

William M. Little Project Director

WML:sg

cc: Duane Smith, OK Water Resources Board CPT Cornell, Tinker AFB Hospital/SGB

Dr. Sanders, OHEL/ECQ Mr. Baladi, OEHL/CVT



7 November 1983

212-027-04

Mr. Jenkins Dunbar
Oklahoma State Department
of Health
Industrial and Solid
Waste Service
Post Office Box 53551
Oklahoma City, OK 73152

Dear Mr. Dunbar:

This is to confirm our telephone discussion today, concerning the hydrogeologic investigations at Tinker Air Force Base.

- 1. Well construction We note Oklahoma State Department of Health concurrence in the proposed well construction procedures.
- 2. Well diameter As we discussed, it is technically and financially inappropriate to increase the proposed well diameter at Industrial Waste Pit No. 2 from two to four inches.
- 3. Coordination Radian intends to keep your office fully informed of the progress of the investigation and to provide you with ample opportunity to visit work in progress. However, it will be necessary to schedule field visits at times that are mutually convenient. Please remember that, when you visit the drilling operation, you will need a minimum of EPA Level D personal protection equipment.

Please call me anytime you have questions about the Tinker AFB investigation.

Sincerely,

William M. Little Project Director

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WML:sg

cc: Dr. Sanders, OEHL/ECQ

Mr. Baladi, OEHL/CVT

CPT Cornell, Tinker AFB Hospital/SGB



APPENDIX J

References

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- 9. Wood, P.R., and L.C. Burton, 1968, Ground-Water Resources in Cleveland and Oklahoma Counties, Oklahoma: Oklahoma Geological Survey Circular 71, 75 p. (Geologic map revised by R.O. Fay, 1970).



#### APPENDIX K

### Biographies of Key Personnel

Marshall F. Conover - Program Manager

William M. Little - Project Director

Rick A. Belan - Supervising Geologist

Fred B. Blood - Monitor Well Sampling

Kathey A. Ferland - Monitor Well Sampling

Lawrence N. French - Supervising Geologist

Jill P. Rossi - Cartographer

Ann E. St. Clair - Technical Review



#### MARSHALL F. CONOVER, P.E.

#### EDUCATION:

Graduate Studies, University of California, San Diego, CA.

B.A., Physics, San Diego State University, San Diego, CA, 1963.

#### PROFESSIONAL EXPERIENCE:

Senior Program Manager, Radian Corporation, 1977-Present.

Assistant Project Manager, TRW Systems Group, 1968-1977.

Group Leader, Grumman Corporation, 1965-1968.

Sr. Flight Test Engineer, General Dynamics, 1958-1965.

#### FIELDS OF EXPERIENCE:

Mr. Conover is a Program Manager in the Research and Engineering Operations at Radian. He develops new business and manages contracted projects that provide technical multidisciplinary services in failure analysis, research, engineering, corrosion, alternate energy, and energy conservation.

In activities for the electric power industry, Mr. Conover has been responsible for many failure analyses of operational and R&D power plant components, viz: a pump shaft and expansion bellows for a 500 KW R&D plant; and isobutane turbine and heat exchanger tubes for Magma Power; and FGD expansion joint of the City of Springfield, MO; a steam diffuser at The Geysers; and currently, for EPRI, he is managing a project (RP 1195-8) to determine the cause of failures on downhole, high temperature, geothermal production pumps for binary geothermal power plants.

Mr. Conover has managed many corrosion-related studies of geothermal power plants for SDG&E, Heber, CA; DOE, Raft River, ID; a utility consortium in Nevada, and Hawaii Electric, Puna, HI. In addition, Mr. Conover has also directed several EPA projects aimed at determining the energy costs and plant effluents resulting from more stringent national standards for sulfur dioxide emissions from steam-electric power plants.

For five years Mr. Conover has been responsible for a DOE project to determine materials selection guidelines for geothermal power plants. Mr. Conover and Radian staff members established relationships and visited geothermal power plants in Japan, New Zealand, El Salvador, Mexico, Iceland, Italy as well as the United States to gain knowledge of a broad spectrum of corrosion problems, data and experience. From detailed analyses, the concept of site-specific corrosion phenomena was reduced to an emperical concept that all geothermal

#### Marshall F. Conover

resources fit into six corrosivity classes. Further, Mr. Conover's team determined that only six key chemical species in the fluid were responsible for the preponderance of corrosion.

Prior to joining Radian Corporation, Mr. Conover performed consulting engineering to the United States Energy Research and Development Administration's Office for Fossil Energy Development. In various senior project positions, Mr. Conover conferred with Fossil Energy Project Offices to establish their annual plans for coal liquefaction and gasification, magnetohydrodynamics (MHD), demonstration plants, advanced research, enhanced oil and gas recovery, and in situ oil shale and coal gasification technologies. While in close interaction with the MHD Office, Mr. Conover was instrumental in synthesizing and translating their R&D requirements into procurements for development of critical components for the U.S. coal-fired MHD power generation program. In addition, Mr. Conover played a central role in formulating ERDA's plans for developing natural gas resources from the Western tight gas sands and Eastern gas shales.

As Fleet Command Support Center (FCSC) Assistant Project Manager for Site Engineering, Mr. Conover was responsible for Field Offices at the London, Norfolk, Honolulu, and Pentagon Command Centers (CC) as well as a support office at the customer's offices in Arlington, VA. His Site Engineering group represented the FCSC Project at the user's control centers; translated user requirements into scenarios for system specification input; and provided special support as needed. Site Engineering teams conducted detailed site configuration surveys and developed site-unique specifications delineating the FCSC design requirements for each FCSC facility with supporting television, microfilm, projection, and communications equipment.

For the Space Shuttle, Mr. Conover was responsible for payload accommodation/interfaces, technical marketing pursuits and studies. He developed customer contacts, made presentations, assisted and/or monitored targeted procurements at NASA Johnson, Marshall and Kennedy Space Centers per Business Development Plan. Also responsible for Shuttle/payload carrier computer interface work, Mr. Conover's major concerns included requirements for implementation of process auditing, function allocation coordination, requirements compliance and system design assessments, and panel/working group participation. As Lead Experiments Engineer for a project that produced the Skylab Experiments Operational Data Book, Mr. Conover's Task Force developed data specifications, acquired data per specifications for all 56 Skylab experiments and validated data via cognizant Principal Investigators/Engineers, and published and updated data as designs progressed. Mr. Conover also organized and staffed a Data Engineering Group which was responsible for the data systems and reporting of the Apollo Lunar Module (LM) thermal-vacuum mission simulation testing at NASA/Johnson Space Center. This group performed instrumentation installation, data processing and analysis, vehicle checkout computer programming requirements, instrumentation calibration data processing, and test evaluation and reporting.

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#### Marshall F. Conover

For a wide range of Atlas Space Launch Vehicle payloads, Mr. Conover was responsible for the flight test evaluations and reports. Extensive failure analyses were conducted using instrumentation/telemetry data, photographic data and laboratory simulations. Mr. Conover also functioned in an associate contractor integrating role which required identification of other contractor's flight hardware problems, determination of corrective action, and communication of the flight problems resolution and status to the client.

#### PROFESSIONAL ACTIVITIES:

- o Associate Fellow, AIAA, 1970-1974
- o Geothermal Resources Council, 1978-1983
- o Texas Solar Energy Society, 1979
- o ASTM, E45.3, Subcommittee Chairman, 1980
- o ASHRAE, TC 6.8, Research Subcommittee Chairman, 1982

#### LICENSE:

Registered Professionsl Engineer: Texas - SN 33369.

#### PAPERS AND PUBLICATIONS:

Conover, Marshall F., et al., <u>Direct Utilization of Geothermal Energy for Space and Water Heating at Marlin, Texas</u>, NTIS DOE/ET/27059-1, Radian Corporation, Austin, TX, May 1983.

Conover, Marshall F., et al., <u>Corrosion Reference for Geothermal Downhole Materials Selection</u>, NTIS DOE/SF/11503-1, Radian Corporation, Austin, TX, March 1983.

Conover, M.F., "Designing Geothermal Power Plants to Avoid Reinventing the Corrosion Wheel," Geothermal Resources Council <u>Bulletin</u>, Vol. 12, No. 3, March 1983.

Conover, M.F., "A Corrosivity Classification System for Geothermal Resources," Geothermal Resources Council <u>Bulletin</u>, Vol. 12, No. 2, February 1983.

Conover, M.F. and P.F. Ellis, "Corrosivity Classes and Materials Selection Guidelines for Geothermal Energy Utilization Systems," AIChE Anaheim, CA Meeting, June 1982.

Ellis, P.F., II and M.F. Conover, <u>Materials Selection Guidelines for Geo-thermal Energy Utilization Systems</u>, NTIS DOE/RA/27026-1, Radian Corporation, Austin, TX, January 1981.

#### Marshall F. Conover

Conover, M.F., P.F. Ellis, and A.M. Cruzon, "Materials Selection Guidelines for Geothermal Power Systems," <u>Sourcebook on the Production of Electricity from Geothermal Energy</u>, Joseph Kestin, Editor-in-Chief, DOE/RA/28320-2, GPO: Washington, DC, August 1980.

Conover, M.F., P.F. Ellis, and A.M. Cruzon, "Materials Selectin Guidelines for Geothermal Power Systems--An Overview," Geothermal Scaling and Corrosion, Casper/Pinchback, Eds., ASTM STP 717, Philadelphia, PA, 1980.

Ellis, P.F. and M.F. Conover, "Corrosion Engineering for Geothermal Heating Systems," Special Report No. 9: Commercial Uses of Geothermal Heat, Geothermal Resources Council, Davis, CA, June 1980.

Ellis, P.F. and M.F. Conover, "Materials (Alloys) Selection for High Temperature Downhole Instrumentation," <u>High Temperature Electronics and Instrumentation Seminar Proceedings</u>, December 3-4, 1979, Publication Code SAND-80-0834C, Sandia Laboratories, Albuquerque, NM, May 1980.

Conover, M.F. and R.L. Miller, "Corrosion and Scaling in Direct Applications of Geothermal Fluids," Presented at The Electrochemical Society, Los Angeles, CA Meeting, October 1979.

Conover, M.F., P.F. Ellis, and D.A. Mitchell, "Premature Failure of Residential Geothermal Heating System Fan-Coil Units," Paper No. 274 presented at The Electrochemical Society Los Angeles, CA Meeting, October 1979.

Conover, M.F. and P.F. Ellis, "Materials Selection Guidelines for Geothermal Energy Systems," Geothermal Resource Council <u>Transactions</u>, Vol. 3, September 1979.

Conover, M.F. and L. Bennett, "Compression and R-Wave Detection of ECG/VCG Data," NASA Tech Brief, B72-10391, July 1972.

Hellmann, R.F., M.F. Conover, E. Morrison, and G. Neilson, "Lunar Module Thermal-Vacuum Simulation Utilizing Conformal Thermal Heater Control," <u>AIAA</u> <u>Spacecraft Journal</u>, Vol. 7, No. 2, February 1970.



#### WILLIAM M. LITTLE

#### **EDUCATION:**

M.S., Civil Engineering, University of California, Berkeley, 1974.

M.S., Hydrology, University of Arizona, Tucson, 1968.

B.S., Hydrology, University of Arizona, Tucson, 1967.

#### EXPERIENCE:

Senior Engineer and Group Leader, Radian Corporation, Austin, TX, 1982-Present.

Senior Engineer, Radian Corporation, Austin, TX, 1978-1982.

Hydrologist, U.S. Army Environmental Hygiene Agency, 1973-1978.

Research and Technical Operations Officer, U.S. Army Engineer Nuclear Cratering Group, 1969-1971.

Graduate Student in Research, University of Arizona, Tucson, 1968.

#### FIELDS OF EXPERIENCE:

Mr. Little is a Senior Engineer and Group Leader with a major technical specialty in ground-water pollution studies. He is currently the Project Director for hydrogeologic investigations of multiple waste disposal sites on Kelly Air Force Base, Texas, and Tinker Air Force Base, Oklahoma. These investigations include monitoring well construction, ground-water sampling, and contaminant transport assessment. He is responsible for program design and execution, subcontractor selection, and managing and editing the final report. He has recently completed a hydrogeologic investigation of a Superfund site in western New York state. The project included monitoring well construction, definition of ground-water flow system, assessment of contaminant transport potential, and presentations to regulatory authorities. Mr. Little served as Project Director and principal investigator.

He has served as Project Director and field manager for a large, multidisciplinary characterization of an abandoned hazardous waste disposal site in southern California. The waste materials consist of acid petroleum refinery sludges. Major areas of investigation were: chemical characterization of wastes and geologic materials; quantification of sulfur dioxide and hydrocarbon emissions; and ground-water monitoring. Mr. Little was responsible for managing the field operations and supervising report preparation.

Mr. Little has served as assistant Project Director and field manager for an investigation of the ground-water quality impact of a spill of a coal-distillate liquid at an SRC pilot plant near Tacoma, Washington. The study involved

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detailed unsaturated zone coring and designing and constructing a series of ground-water monitoring wells A Remedial Measures Plan was formulated and adopted to remove contaminated materials and to prevent the further spread of ground-water contamination. Following the evaluation of the spill event, Mr. Little directed an expanded program to evaluate the ground-water quality effects of overall plant operations. The possible sources of contamination were identified and characterized. Mr. Little then developed a ground-water monitoring program and supervised the installation of the monitoring network. He designed and conducted aquifer pump tests to define aquifer performance and interpreted the results.

Mr. Little has also conducted a program to evaluate the extent of ground-water contamination by refinery operations and wastes at an oil refinery near Duncan, Oklahoma. The initial assessment was based on site reconnaissance, interviews with refinery personnel and a study of existing hydrogeologic and process data.

Mr. Little has recently completed two environmental/regulatory fatal flaw studies for lignite mines and associated power plants in East Texas. He was both Project Director, responsible for overall management and preparation of the final report, and hydrology task leader, responsible for assembling data on hydrologic conditions and assessing probable impacts. He has also recently served as task leader for regulations review, impact analysis and permit application preparation for a commercial-scale coal gasification facility in Wyoming and ground-water hydrology task leader for environmental analysis of a major lignite mine and associated synfuels plant in east Texas.

In another program, Mr. Little directed an evaluation of surface-water and ground-water availability in the vicinity of the proposed Solvent Refined Coal-II (SRC-II) demonstration plant and commercial facilities near Morgantown, West Virginia.

For a private industrial client, Mr. Little reviewed and evaluated the environmental monitoring data from the vicinity of an in situ coal gasification test in the Powder River Basin of Wyoming. The water quality impacts of the test burn were assessed, and a program of aquifer restoration and hydrologic testing recommended. Based on available hydrologic and geochemical data, a conceptual model of the test site was developed. He also developed a ground-water monitoring and contingency aquifer restoration program for a proposed future test. The program includes selection of well locations and parameters for monitoring and specification of restoration strategies.

Mr. Little has also participated in an assessment of the environmental behavior of fluidized bed combustion (FBC) waste for EPA, IERL. Mr. Little was responsible for the design, construction and operation of field cells for testing FBC waste disposal alternatives and for the development of a preliminary waste transport model. He has also been project director and hydrology

#### William M. Little

task leader in the evaluation of the environmental suitability of an ash/ scrubber sludge disposal site. He was responsible for the overall management of the program, evaluated the laboratory and hydrogeologic data and predicted contaminant migration.

As a hydrologist with the Water Quality Engineering Division, U.S. Army Environmental Hygiene Agency, Mr. Little served as a consultant to the Office of the Surgeon General and to major commands and installations on hydrologic aspects of water supply and wastewater disposal. He prepared design criteria for programs of effluent and receiving water monitoring at Army manufacturing and research facilities, evaluated ground-water pollution potential of waste disposal practices, and reviewed draft NPDES discharge permits issued to Army installations. He performed preliminary technical feasibility studies of land treatment of wastewater including field investigations and trial systems design. He conducted environmental impact statement data requirements review and prepared and reviewed portions of environmental impact statements. Mr. Little also managed the Army Medical Department's nationwide Drinking Water Surveillance Program.

With the Corps of Engineers, Mr. Little was assigned as a Research and Technical Operations Officer, U.S. Army Engineer Nuclear Cratering Group. There he conducted a general investigation of hydrologic transport of radionuclides from Plowshare application sites. This work included literature searches, computer simulation, experimental design and conceptual modeling of transport phenomena. He also participated in final preparation of a 1971 Corps of Engineers report on Wastewater Management in the San Francisco Bay Region.

While at the University of Arizona, Mr. Little was a member of the Operations Research Study Group on the Tucson Basin, gathering background hydrologic material, and conducting a literature and data file search. He directed and participated in preliminary adaptation of a two-dimensional, finite difference model of a large, heterogeneous ground-water basin.

#### HONORARY AND PROFESSIONAL SOCIETIES:

American Geophysical Union, American Water Resources Association, National Water Well Association, Sigma Xi.

#### CERTIFICATION:

AIPG Certified Professional Geological Scientist No. 6468.

#### PUBLICATIONS/REPORTS:

Numerous technical reports in the fields of water resources development, ground-water contaminant migration, occurrence of radionuclides in ground water, land treatment feasibility and receiving water monitoring, including:

#### William M. Little

Little, W.M., "Hydrogeologic Investigations, Facet Enterprises, Inc., Elmira, New York," Radian Corporation Final Report to Facet Enterprises, Inc., September 1983.

Little, W.M., et al., "McColl Site Investigation - Phase 1," Radian Corporation Report to the Participants Committee, November 1982.

Little, W.M., et al., "Environmental Considerations and Air Quality Modeling for the Freestone County Project," Radian Corporation Report to Tenneco Coal Company, March 1982.

Grimshaw, T.W., et al., "Assessment of Fluidized-Bed Combustion Solid Wastes for Land Disposal," Draft Final Report, Radian Corporation Report to EPA Industrial Environmental Research Laboratory, December 1982.

Little, W.M., et al., "Environmental Considerations and Air Quality Modeling for the Edgewood and Mustang Creek Prospects and Associated Energy Park," Radian Corporation Report to Tenneco Coal Company, November 1981.

Little, W.M., et al., "Ground-Water Impact of SRC Pilot Plant Activities Fort Lewis, Washington," Radian Corporation report to Gulf Mineral Resources Company, January 1981.

Little, W.M., et al., "Ground Water Modeling at an In-Situ Coal Gasification Test," Radian Corporation Report to confidential industrial client, September 1980.

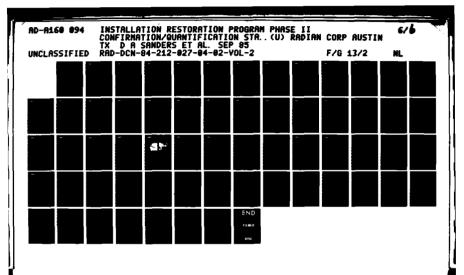
Little, W.M. and H.J. Williamson, "Recommended Ground-Water Monitoring and Aquifer Restoration Programs, Future In-Situ Coal Gasification Test," Radian Corporation Report to confidential industrial client, September 1980.

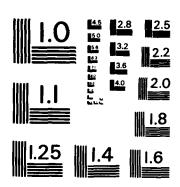
Little, W.M. and W.C. Micheletti, "Recommended Aquifer Restoration and Hydrologic Testing Program for an In-Situ Coal Gasification Test," Radian Corporation Report to confidential industrial client, August 1980.

Grimshaw, T.W. and W.M. Little, "Remedial Measures Plan for a Spill of Solvent Refined Coal Liquid at the SRC Pilot Plant, Fort Lewis, Washington," Radian Corporation Report to Gulf Mineral Resources Company, August 1980.

Little, W.M., et al., "Hydrologic Evaluation of a Combined Ash/FGD Sludge Storage Site, Craig Station," Radian Corporation Report to Colorado Ute Electric Association, July 1980.

Little, W.M., T.J. Wolterink, and M.H. McCloskey, "Water Availability Appraisal for the Proposed Solvent Refined Coal-II Demonstration Plant, Monongalia County, West Virginia," Radian Corporation Report to U.S. Department of Energy, February 1980.





MICROCOPY RESOLUTION TEST CHART
NATIONAL BUREAU OF STANDARDS - 1963 - A

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#### William M. Little

Little, W.M., "Water Quality Geohydrologic Consultation No. 24-0286-77," Twin Cities Army Ammunition Plant, New Brighton, MN, 21-23 July 1976, U.S. Army Environmental Hygiene Agency, 11 January 1977 (six additional geohydrologic consultations; sole author on two, senior on three, junior on one).

Little, W.M., Drinking Water Consultation Visit No. 24-1301-77, Joliet Army Ammunition Plant, Illinois, 2-4 August 1976, USAEHA, 9 February 1977 (four additional drinking water consultations).

Little, W.M., Water Quality Geohydrologic Consultation No. 24-058-75/76, Land Disposal Feasibility Study, Fort Polk, Louisiana, 2-29 April and 9-29 October 1975, USAEHA, 19 August 1976.

Little, W.M., Water Quality Geohydrologic Consultation No. 24-005-76, Land Disposal Feasibility Study, Fort Dix, New Jersey, 21-30 July and 15-23 September 1975, USAEHA, 18 June 1976 (two additional land treatment evaluations as part of water quality engineering special studies).

Little, W.M., Water Quality Monitoring Consultation No. 24-048-74/75, Aberdeen Proving Ground, Maryland, 25-27 Fabruary 1974, USAEHA, 17 December 1974 (three additional monitoring consultations).

Little, W.M., Water Quality Engineering Special Study No. 24-017-74, Mixing in Receiving Waters, 7 September-24 October 1973, USAEHA, 3 January 1974.

Little, W.M., Analysis of Hydrologic Transport of Tritium, U.S. Army Engineer Nuclear Cratering Group Technical Memorandum 70-7, Lawrence Radiation Laboratory, Livermore, CA, April 1971.

Little, W.M., An Engineering and Economic Feasibility Study for Diversion of Central Arizona Project Waters from Alternate Sites, M.S. Thesis, Department of Hydrology, University of Arizona, Tucson, AZ, 1968.



#### RICK A. BELAN

#### EDUCATION:

M.S., Hydrology, University of Arizona, Tucson, 1972.

B.S., Geology, Kent State University, OH, 1970.

#### EXPERIENCE:

Staff Hydrogeologist, Radian Corporation, 1980-Present.

Groundwater Hydrologist, William F. Guyton and Associates, 1977-1980.

Captain, United States Army, 1972-1977.

Environmental Impact Assessment Officer, United States Army, 1975.

Research Associate, University of Arizona, 1970-1972.

#### FIELDS OF EXPERIENCE:

Mr. Belan is currently conducting field investigations of various hazardous waste sites at Kelly and Tinker Air Force Bases in Texas and Oklahoma, respectively. These efforts, as part of the Air Force's Installation Restoration Program (IRP), entail the installation of monitoring wells and hazardous waste site soil sampling for chemical analysis. The results will be used to define the site hydrogeology and waste site impacts, if any, on the local groundwater system.

Mr. Belan is the hydrogeological project director for an Installation Restoration Program investigating four hazardous waste disposal sites at Hill Air Force Base, Utah. The field phase entailed the direction of the investigation efforts for monitor well installation and completion, soil and ground-water sampling, geophysical resistivity surveys and chemical analysis coordination. The results of this effort were to determine the nature and extent of ground water contamination and define the local hydrogeology.

As part of a remedial actions assessment of the McColl hazardous waste site in California, he conducted the conceptual design and evaluation of a slurry trench wall system. Containment wall materials were selected for laboratory testing. Additional wall materials and installation costing, survivability, and suitability were evaluated.

Mr. Belan conducted, as part of a remedial actions assessment of the Lipari Superfund site in New Jersey, the conceptual design and costing of a dewatering system. This included an impact assessment of the formations dewatering on a slurry trench cutoff wall. The results of this evaluation provided discharge information for a ground-water treatability study.

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He worked on three Environmental Protection Agency Superfund projects. Two projects entailed the hydrogeological evaluations of hazardous waste sites in Louisiana and New Jersey with the results developing and supporting site remedial measures activities. The third EPA Superfund activity was the evaluation of a new potential waste isolation technology which had been tested. The test attempted to isolate a large block of soil by slurry injection at depth areally and vertically using a patented process. Mr. Belan supervised the site investigation for determining the success of the technique to isolate the soil block. This entailed directing a geophysical survey, and confirmation soil borings to determine the soil isolation success of the test.

He coordinated and supervised the air rotary drilling and casing drive completion of a 270-foot monitoring well for an unused waste site containing mainly petroleum refinery waste sludges. This upgradient well located in California was drilled in difficult caving formations. The successful completion of this well permitted the location of a third final downgradient monitoring well for the clients.

In the area of solid waste management, Mr. Belan coordinated, supervised, and documented the disposal of fluidized bed combustion byproducts from a synfuels experiment sponsored by the Environmental Protection Agency. This project entailed the coordination with local agencies for the disposal at an appropriate landfill, and hydration of the wastes to neutralize its exothermic reaction prior to disposal.

Mr. Belan was instrumental in providing a hydrogeological assessment of an inactive hazardous waste site in south central New York. The site is listed by EPA as a priority site for action under Superfund. The result of the assessment was the design and costing of a monitoring well program for the client.

As the environmental baseline task leader and geological/hydrogeological team member, Mr. Belan coordinated, developed and identified environmental constraints or issues for a New Mexico Synfuels Project Feasibility Study. Analysis for this study for an industrial client permitted enumeration of ground-water and surface-water environmental issues associated with two inmine and two plant sites disposal of hazardous/nonhazardous solid waste from a synfuels plant. The results of the study summarized the regional and site-specific geology, ground-water and surface-water. The study identified mine and plant environmental constraint areas concerning solid and liquid waste disposal and also described the waste disposal options as to which mine or plant sites the solid waste should go.

Mr. Belan conducted as part of a geothermal feasibility study a hydrogeological assessment of two aquifers for potential utilization for each of four U.S. military bases which are located in the vicinity of San Antonio, Texas. This entailed the development of conceptual well depths, productivity estimates, static water levels, water temperatures and water quality. These data

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were used to support benefit/cost analyses of a total geothermal systems package that included costs of well completion and production, heat extraction systems and projected heat demands.

He completed a state-of-the-art review of geopressured/geothermal fluids disposal technologies and environmental problems associated with the disposal techniques for the Texas Energy and Natural Resources Advisory Council (TENRAC). The two primary disposal methods reviewed were injection wells and surface discharge. From this study, Mr. Belan developed areas of geopressured/geothermal fluids gaps to commercialization. This review and subsequent recommendations provided TENRAC with a means to evaluate Texas geothermal/geopressured development especially towards commercialization and of potential technology areas that merit further study with public funds.

Mr. Belan conducted a preliminary assessment of the feasibility of utilizing a deep injection well for disposal of hazardous waste fluids from a prospective lignite gasification plant in East Texas. This entailed identifying aquifer parameters and computing long-term injection affects in order to assess two candidate aquifers for potential injection horizons.

As a staff hydrogeologist at Radian, Mr. Belan has experience in a wide range of ground-water sampling and analysis efforts. He was the field task leader and hydrogeological analyst for an environmental constraint study of a Lurgi coal gasification plant in East Texas. The study was to be the basis of a solid waste management plan for the plant site and the selection of a solid waste disposal site. It provided the client with supporting information to be used in obtaining state permits. Mr. Belan was the task leader for coordinating the air quality, ecology, surface water, and cultural impact portions of the reports, and developing future site-specific environmental studies requirements.

Mr. Belan analyzed aquifer testing methods and parameter data for an in-situ coal gasification project in Wyoming providing regional and vertical characteristics of the coal and overburden aquifers. The results became part of a relicensing application prepared for the U.S. Department of Energy, Laramie, Wyoming.

At refinery waste disposal sites in the area of Kenai, Alaska, Mr. Belan conducted a hydrogeological evaluation. This entailed the field supervision and interpretation of the drilling, geologic sampling, construction, and groundwater sampling of monitor wells in and around the disposal sites. The data obtained was used to define the local ground-water systems, sub-surface geology, and establish if any ground-water contamination had occurred.

Mr. Belan directed and conducted the production and injection testing of two geothermal wells at Navarro College, Corsicana, Texas; one well was to supply geothermal fluid for heat extraction and the other will be used for disposal

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of the same fluid. He analyzed the test data for well performance, and aquifer parameters; providing a report and recommendations before final geothermal system design.

Mr. Belan, at Radian, conducted an impact assessment of ground-water availability and development quantitatively and qualitatively for a proposed petrochemical complex near the Texas Gulf Coast. His work involved developing a hypothetical well field for producing 6,900 gallons per minute and assessing the ground-water effects with time for varying aquifer conditions. Mr. Belan analyzed the local ground-water qualities to establish present baselines and if sufficient quality plant water could be available for use by the proposed plant.

He assisted in the preparation of the geology and ground-water hydrology sections of an Environmental Information Document for a proposed lignite mine in East Texas. He worked extensively on the supervision of the drilling, electrical logging, sampling, and construction of the test and monitor wells associated with this program with his former employer and, presently, with Radian prepared the study results for inclusion into the report.

As a ground-water hydrologist with W. F. Guyton and Associates, Mr. Belan provided hydrogeological field support for an overland liquid disposal facility for a client in Louisiana. In order to define the hydrogeology in and around the disposal facility, Mr. Belan provided the field supervision and interpretation of the mud rotary drilling, logging, completion, development, and ground-water sampling of a series of monitor wells. This information aided in defining what impacts, if any, the overland disposal would have on the local ground-water system.

Also while Mr. Belan was working for W. F. Guyton and Associates, his varied field tasks took him to Arizona, Nevada, and Texas. He assisted three large utility power companies in the field supervision of the drilling, geophysical logging, construction, pump and aquifer testing, and water quality sampling of over twenty large production water wells along with a number of observation wells. These wells were drilled on the different jobs by cable tool, mud rotary, and reverse drilling methods. These activities were summarized in well completion reports.

Mr. Belan completed with Mr. Guyton an in-depth analysis of the hydrogeology of the property of Texas Electric Service Company for Texas Utilities Services, Inc. for a prospective water supply, along with a well inventory of property outside the client's area of interest. During this study proposed water well field proposal consisting of 38 production water wells for a projected new electrical generating station. This study included estimated pumping rates, depths of wells, and estimated initial water quality for the well field.

#### Rick A. Belan

As an officer in the United Stated Army stationed in West Germany in 1975, Mr. Belan initiated, developed and provided Environmental Impact Assessments (EIA) for the U.S. Frankfurt Military Community, and initiated research for 44 U.S. military installations throughout West Germany, which were to be included in the Frankfurt Master Plan. These studies were to define the environmental problems, if any, of the military installations for remedial measures planning and budgeting. His earlier duties included terrain/soils trafficability studies and weather analysis, and the supervision, evaluation, and distribution of tactical information.

As a Graduate Research Assistant in the Department of Soils, Water and Engineering at the University of Arizona, Mr. Belan was responsible for the planning, research, development, and quantifying of Mountain Front Recharge of the Tucson Santa Catalina Mountains under the supervision of his thesis director. The results of the study were published in an Arizona Water Resources periodical.

#### HONORARY AND PROFESSIONAL SOCIETIES:

Certified Professional Geological Scientist (American Institute of Professional Geologists), Technical Division National Water Well Association, Society of Petroleum Engineers, Sigma Gamma Epsilon Geology Honorary.

#### PUBLICATIONS/REPORTS:

Belan, R.A., Summary of Extended Water Level and Oil Thickness Measurement Program Vicinity of Chemical Disposal Pits Nos. 1 and 2 Hill AFB, Utah, Radian Corporation, Austin, TX, 1984.

Belan, R.A., Hill Air Force Base, Utah Installation Restoration Program Phase II Hydrogeological Field Investigation, Volumes I, II, and III Draft Report, Radian Corporation, Austin, TX, 1983.

Belan, R.A., W.M. Little, and R. Glaccum, Geophysical and Soil Boring Field Test Evaluation of Block Displacement Method, Whitehouse, Florida, Radian Corporation, Austin, TX, and Technos, Inc., Miami, FL (Published and presented paper at National Water Well Association Technical Conference, St. Louis, MO, 1983).

Stein, N.P., et al., Treatability Study of Contaminated Ground Water from the Lipari Landfill, Pitman, New Jersey - Draft Report, Radian Corporation, 1983 (Developed the hydrology assessment section on the remedial action impacts and costs of a dewatering system).

Belan, R.A., W.M. Little, and R. Glaccum, Draft Report Foster-Miller Test Site Evaluation, Radian Corporation, Austin, TX, and Technos, Inc., Miami, FL, 1982.

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#### Rick A. Belan

Radian Staff, Remedial Action Alternatives for the McColl Site, Fullerton, California, Radian Corporation, Austin, TX, 1983 (Conducted the remedial action assessment and materials selection for a slurry trench wall system).

Radian Staff, Geothermal Resource Evaluation in the Area of Coso Hot Springs KGRA (exact title client confidential), Radian Corporation, Austin, TX, 1983 (Evaluated geothermal reservoir testing results).

Radian Staff, Technical Review of Reports on Two Hazardous Waste Sites Near Baton Rouge, Louisiana, Austin, TX, 1982 (Developed report evaluation criteria and reviewed reports on hydrogeological investigation results.)

Ajmera, K.T., W.F. Holland, N.P. Stein, R.A. Belan, and L.J. Holcombe, A Report on Waste Disposal/Hydrology Study New Mexico Synfuels Project, Radian Corporation, Austin, TX, 1982 (Environmental task leader, document editior, authored activity impacts and hydrogeological sections).

Belan, R.A., J.C. Lippe, and J.P. Rossi, An Overview of Regional Geology and Hydrology for Solid Waste Disposal Study, Radian Corporation, Austin, TX, 1982 (Environmental task leader and authored geological and ground-water sections and document editor).

Radian Staff, Volume I Final Report Life Cycle Cost-Effectiveness Studies for Direct Utilization of Geothermal Energy at Four Military Installations in South-Central Texas, Austin, TX, 1982 (Authored hydrogeological parameter development and environmental considerations).

Belan, R.A., K.T. Ajmera, An Overview of Earth Resistivity Surveys - Technical Memorandum, Radian Corporation, Austin, TX, 1982.

Belan, R.A., Technical Note, ETSP Soil Samples for Attenuation Capacity Analysis, Radian Corporation, Austin, TX, 1981.

Belan, R.A. and K.T. Ajmera, Technical Note, ETSP Preliminary Geotechnical and Surface Water SWMP Related Field Studies and Preliminary Layout of Solid Waste Disposal Site, Radian Corporation, Austin, TX, 1981.

Belan, R.A. and A.F. Ferguson, Geothermal Injection and Production Well Test Results: Project Title - Water and Space Heating for a College and Hospital by Utilizing Geothermal Energy, Radian Corporation, Austin, TX, 1981.

Belan, R.A., et al., Summary of the ETSP Solid Waste Disposal Area Selection and Trade-Offs, Radian Corporation, Austin, TX, 1981.

Belan, R.A., et al., Summary of Findings for the Fatal Flaw Assessment of the Northern Area, Radian Corporation, Austin, TX, 1981.

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#### Rick A. Belan

Belan, R.A. et al., Technical Note, Environmental Constraint Screening of Mine Property and Surrounding Areas for Solid Waste Disposal Siting near Troup, Texas, (Environmental section Task Leader and authored ground-water section), Radian Corporation, Austin, TX, 1981.

Radian Staff, Relicensing Application - Hanna Experimental In-situ Coal Gasification Project, Hanna, Wyoming, (Provided analysis of supplied aquifer parameter values pertaining to regional and vertical distributions and ranges of applicability), Radian Corporation, Austin, TX, 1981.

Radian Staff, Compilation of Environmental Information for a Proposed Olefins Complex, Brazoria County, Texas, (Author of ground-water baseline and development), Austin, TX, 1981.

Radian Staff, Evaluation of Hydrogeology and Waste Management Options at Tesoro Alaska Petroleum Company's Kenai, Alaska Refinery, (Author of hydrogeology section), Austin, TX, 1980.

Guyton, W.F., R.A. Belan, and W. Stevens, Report on the Ground-Water Availability for Prospective Coal-Fueled Electric Generating Station in Ward County, Texas, W. F. Guyton and Associates, Austin, TX.

R.A. Belan authored a number of Environmental Impact Assessments for U.S. Military Installations for the Department of the Army, Federal Republic of Germany.

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#### FRED B. BLOOD

#### EDUCATION:

M.S., Biology (Aquatic Ecology), Virginia Commonwealth University, 1973.

B.S., General Science (Biology and Chemistry), Virginia Polytechnic Institute. 1969.

#### EXPERIENCE:

Biologist, Radian Corporation, Austin, TX, 1981-Present.

Senior Consultant, Seagull Environmental Control, 1980-1981.

Technical Field Advisor, U.S. EPA Region V, Law Engineering Contract, 1979.

Aquatic Ecologist, Law Engineering Testing Co., 1976-1979.

Staff Biologist, Virginia Electric and Power Co., 1973-1976.

Visiting Scholar, Smithsonian Institute, 1973.

Teaching Assistant, Virginia Commonwealth University, 1971-1973.

Teacher, Henrico County (Virginia) Public Schools, 1969-1971.

#### FIELDS OF EXPERIENCE:

At Radian, Mr. Blood is responsible for managing the collection, identification, and interpretation of ecological data. His particular area of expertise involves aquatic ecology and environmental toxicology. The following project experience demonstrates his expertise.

Mr. Blood is currently task director on a U.S. EPA acid rain project. This project was established to collect and analyze water from 3500 lakes to determine the extent and susceptibility of U.S. lakes to acid deposition. This task involves varoius management functions including the preparation of audit samples to verify collection procedures and intralaboratory consistency and accuracy.

Mr. Blood has participated in U.S. Air Force IRP programs. The programs involve interviews, site visits, and environmental monitoring (generally ground water and soils). The purpose of the programs is to evaluate and document potential contamination from past practices of handling of hazardous waste on the bases. These studies have included five bases in Texas, Oklahoma, Utah, and Louisiana.

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Mr. Blood is a task leader to evaluate mining applications for OSM. In this capacity Apparent Completeness Reviews (ACR) and Technical Analyses (TA) are being accomplished. Important issues include highwalls, large raptors, and prey abundance in relation to reclamation plans.

Mr. Blood has also visited several non-ferrous industries to provide environmental assessments in relation to U.S. EPA's Effluent Guidelines development and/or to provide input to Environmental Impairment Liability insurance programs. Included in these studies were beryllium, aluminum, and nickel plants and a circuit board manufacturer.

Mr. Blood was Project Director on a subcontract for the Cummins Creek lignite project. Collection of aquatic ecological data, including analyses of fish, and plankton data was performed. The study was expanded to include 20 stations including rivers, streams, cattle tanks, and SCS reservoirs.

As a task director, Mr. Blood was involved in assessing potential environmental impacts from proposed mitigation procedures at a hazardous waste site in Southern California. This task involved evaluation of ground water, air quality, and transportation for the redisposal of 200,000 yd<sup>3</sup> of hazardous material.

As a task director, Mr. Blood was responsible for evaluating an urban lake below an uncontrolled hazardous waste site (U.S. EPA Superfund Site). This project involves the collection of biotic, water, and sediment samples. Extensive organic and metal analyses have been accomplished to document existing conditions and derive a monitoring program for the future. A cost-effective monitoring program based on empirical data and environmental fate modeling was proposed.

Mr. Blood was Project Director of a study concerning six uranium mine reclamation ponds in Southeast Texas. This study involved the quantification of physico-chemical data, periphyton, fish, macrophytes, phytoplankton, zooplankton, and aquatic macrophytes. Also included are limited chemical analyses of the water column and detailed trace metal and radionuclide determinations of water, sediments, and various aquatic biotic food chains. The evaluation included insights into the relative success and failure of reclamation processes.

As an Ecology Task Leader, Mr. Blood was responsible for input into an environmental assessment for a lignite gasification plant located in Northeast Texas. This study includes all the standard terrestrial and aquatic studies including wetlands, vegetative mapping, wildlife, and aquatic environments.

Mr. Blood has also been involved with environmental studies associated with a synfuels plant on the Ohio River Floodplain in Kentucky. Responsibilities included analyses of endangered and protected species, wetlands, fisheries,

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macroinvertebrates, and plankton. A NEPA-responsive study was accomplished. He also provided input into three other lignite projects, either at an ecological resources or aquatic resources level. These inputs were primarily concerned with "fatal flaw" or other siting programs.

While with Radian, Mr. Blood has provided asbestos inspection services to several VA hospitals and private hospitals, large State hospital in Ohio, air monitoring consultation to many industries throughout Texas, and helped with the training of laborers in several states. This last process provided the attendees of the Northern California Laborers Training Center with official certification by CAL-OSHA as asbestos workers and started a process where the State may require more stringent respiratory protection of asbestos workers. Mr. Blood has also participated in writing/ reviewing specifications, air monitoring, and quality control for asbestos removal contracts throughout the U.S.

As Senior Consultant for the Seagull Environmental Company, Mr. Blood had a variety of responsibilities. Many buildings and structures were inspected and evaluated by Mr. Blood, including work for various school districts, universities, and private industry. Mr. Blood made presentations on asbestos-related problems at seminars and meetings sponsored by state and local environmental health associations in Ohio and Illinois. He oversaw the training of asbestos workers at numerous projects in states ranging from Illinois and Florida to New Hampshire.

Mr. Blood served as Technical Field Advisor to the U.S. EPA asbestos-in-schools program for Region V (Chicago). In this capacity he made over 60 presentations to 2,500 people across the six-state region. He inspected and evaluated more than 100 schools and provided advice to numerous contractors and analytical laboratories in becoming involved in asbestos abatement activities.

As an Aquatic Biologist with Law Engineering Testing Company, Mr. Blood was Project Director for a baseline aquatic survey for a paper mill in the Oconee River, near Dublin, Georgia. The study included physico-chemical data, fisheries, periphyton, and macrobenthos collected at seven stations during four seasons.

Mr. Blood was co-director for a water quality management study for the Corps of Engineers. The study involved two one-year studies of two reservoirs (Carters Lake and Lake Allatoona) in Georgia. These studies involved twice seasonal collections at over 15 stations on both reservoirs. Data collected included: physico-chemical profiles, nutrients, trace metals, and organic pesticides in the water column; fisheries; macrobenthos; zooplankton; periphyton; Hester-Dendy substrates; algal growth potential; and trace metal and organic pollutants in various portions of the aquatic food chain. All data underwent rigorous QA/QC audits and were coded into the U.S. EPA STORET data base.

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As a biologist for Virginia Electric and Power Company, Mr. Blood was responsible for biological analyses of aquatic environments associated with nine operational sites and two site screening studies. The operation studies included six estuarine and three freshwater sites. Mr. Blood studied thermal and velocity discharge effects on macroinvertebrate and fish communities. He also evaluated impingement and entrainment. Two sites, one estuarine and one freshwater, included nuclear power stations and Mr. Blood supervised collections for radionuclide studies.

In the summer and fall following graduate school, Mr. Blood was co-holder of a visiting scholar fellowship to study the freshwater clams (Unionidae) of Virginia. He also attended a biological field camp sponsored by the University of Montana on Flathead Lake, Montana. While in Montana, he studied trophic states in two pot-hole lakes, snow algae, and physical geology.

As a graduate student, Mr. Blood was involved in various studies, including: intensive catfish culture, primary productivity (conventional and as C<sup>14</sup>); fishery surveys, acid mine drainage, post-impoundment surveys, and his thesis on freshwater clams.

While teaching general, earth, and biological sciences to eighth and ninth graders, Mr. Blood participated in summer research projects. These studies involved pre-impoundment surveys for a large recreational reservoir to be utilized by a nuclear power plant and acid-mine recovery studies.

#### HONORARY AND PROFESSIONAL SOCIETIES:

Society of Environmental Toxicology and Chemistry, American Fisheries Society (Certified Fisheries Scientist), Ecological Society of America, Sport Fishing Institute.

#### **PUBLICATIONS:**

"Environmental Assessment of the Remedial Action Alternatives for the McColl Site," Fullerton, CA, (Radian Report) 1983.

"Direct Utilization of Geothermal Energy for Space and Water Heating at Marlin, Texas" (Radian and DOE/ET 27059-1), 1983.

"Reclamation Impoundment Study: An Analysis of Aquatic Habitats Created in the Reclamation of Uranium Surface Mines in South Central Texas," (Radian Report) 1983.

"Development of a Monitoring Program to Evaluate the Effect of Remedial Actions at the Lipari Landfill on Alcyon Lake, Pitman, New Jersey," (Radian Report) 1983.

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Ecology - in "Environmental Consideration and Air Quality Modeling for the Edgewood and Mustang Creek Prospects and Associated Energy Park," (Radian Report) 1981.

Aquatic Resources Chapter - in "Preliminary Environmental Analysis Report for Coal Gasification Plant, Henderson, Kentucky," (Radian Report) 1981.

"Oconee River Biological Baseline Evaluation," (Law Engineering Report) 1980.

"Contract Report - A Water Quality Management Study of Carters Lake, GA," (Law Engineering Report) 1980.

"Contract Report - A Water Quality Management Study of Lake Allatoona, GA," (Law Engineering Report) 1980.

"A 316(b) Study of the Lansing Smith Steam Plant," prepared for Gulf Power Company (Law Engineering Report).

"A Preliminary Comparison of Two Oxidation Ponds with Different Trophic States in Central Virginia," co-authored with J. Reed and G. Samsel, <u>Va. J. Science</u>, 23 (2), 1973.

"A Laboratory Heated Raceway for Studying the Biology of Channel Catfish (<u>Ictalurus punctatus</u>)," co-authored with J. Reed and G. Samsel, <u>Progressive Fish Culturist</u>, 35 (1), 1973.

"A Check List of Unionid Fauna (Mollusca: Bivalvia) in the Pamunkey River System, Virginia, "co-authored with M. Riddick, Nautilus, 38 (2), 1973.

#### PROFESSIONAL PRESENTATIONS:

"Investigation of Nutrient Factors Limiting Phytoplankton Productivity in Two Central Virginia Ponds" (with J. Reed, G. Samsel, and H. Winfrey), Annual Meeting, Association of Southeastern Biologists, Mobile, AL, 1972.

"Preliminary Comparison of Two Oxidation Ponds with Different Trophic States in Central Virginia," (with J. Reed, G. Samsel, and H. Winfrey), Annual Meeting, Association of Southeastern Biologists, Mobile, AL, 1972.

"Unionidae (Mollusca) of the Pamunkey River, Virginia" (with M. Riddick and J. Reed), Annual Meeting, Association of Southeastern Biologists, Savannah, GA, 1974.

"An Effects Assessment of Impingement at the Lansing Smith Steam Plant" (with R.A. Garrett), Annual Meeting, Association of Southeastern Biologists, Tuscaloosa, AL, 1978.

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"Strategies of Collecting Macro-invertebrates," Annual Meeting, Georgia Fisheries Workers Association, R 29, GA, 1978.

"Asbestos in Schools, Its Evaluation, Its Solutions," 65 locations throughout six states (MI, IL, OH, IN, MN, WI), 1979.



### KATHEY A. FERLAND

#### EDUCATION:

M.A., Regional Planning, University of North Carolina, Chapel Hill, NC, 1983.

B.A., English, University of Texas, Austin, TX, 1976.

#### EXPERIENCE:

Staff Socioeconomist, Radian Corporation, Austin, TX, 1983-Present.

Survey Coordinator, Center for Health Services, Nashville, TN, 1982.

Research Assistant, Department of City and Regional Planning, Chapel Hill, NC, 1981-1982.

Grants Administrator, American Institute for Learning, Austin, TX, 1978-1981.

### FIELDS OF EXPERIENCE:

Ms. Ferland is in the Policy Analysis Division of Radian Corporation. Her fields of expertise are resource economics, energy policy analysis, socioeconomic impact evaluation, and water resources. While at Radian, Ms. Ferland has participated in projects concerning energy and commodity price forecasts, socioeconomic impact evaluation, and environmental regulations and permitting at hazardous waste sites.

Ms. Ferland was Leader of the commodity and energy price forecasting task for an economic and technical feasibility study of electricity generation technologies for the Air Force. On this project, she reviewed several national energy supply and demand models and regionalized price forecasts to the southern California market. These forecasts served as the basis for industrial gas price projections. At Radian, Ms. Ferland has also participated in several projects related to hazardous waste. One involved assessing the supply and demand for technologies which degrade dioxins. In another study, she assessed research needs in the national hazardous waste site cleanup program.

Ms. Ferland has also conducted policy and project studies for local and state governments and academic departments in the areas of water resources and hazardous waste disposal. These studies include: an evaluation of the impact of industrial location decisions on water supply and effluent treatment capacities; a projection of the impacts of watershed development on phosphorous concentration in High Point Lake, North Carolina; an analysis of the use of utility extension policy as a growth management tool; and evaluation of the technical and financial options for controlling inactive hazardous waste sites in North Carolina.

## Kathey A. Ferland

Her thesis, "Cost-Benefit Analysis and Environmental Standard Setting: A Case Study of the Implementation of Executive Order 12291," examines the use of economic analysis in the setting of water pollution control guidelines. This paper also analyses the legal and organizational background influencing the standard setting process for the steel industry BAT and BPT guidelines and evaluates the environmental modeling component of EPA's cost-benefit analysis.

Ms. Ferland coordinated a survey to over 1200 people in rural Kentucky to ascertain the health effects of contaminated drinking water. She has experience in the initiation, design, implementation, and analysis of surveys.

Ms. Ferland performed administrative and management functions at the American Institute for Learning, a not-for-profit educational institute. As a Grants Administrator, she was responsible for all aspects of grants management, proposal and budget preparation. and reporting.

#### PROFESSIONAL SOCIETIES:

American Planning Association.



#### LAWRENCE N. FRENCH

### EDUCATION:

M.A., Geological Sciences, University of Texas at Austin, 1979.

B.S., Geological Sciences, University of California at Riverside, 1975.

#### EXPERIENCE:

Group Leader, Radian Corporation, Austin, TX, 1982-Present.

Staff Geologist, Radian Corporation, Austin, TX, 1979-Present.

Geologist, Sargent and Lundy Engineers, Chicago, IL, 1978-1979.

Teaching Assistant, University of Texas at Austin, 1975-1976.

#### FIELDS OF EXPERIENCE:

At Radian, Mr. French is involved in a variety of hydrogeologic and geologic studies. His roles in these studies range from collecting and analyzing hydrogeologic data, interpreting and reporting results of investigations, to directing interdisciplinary programs.

Mr. French has been involved in various aspects of ground-water investigations at several hazardous waste disposal sites. He recently served as Project Director for a study of PCB-contaminated soils at an industrial site in North Texas. The study involved sampling and analysis of near-surface soils to define the extent of PCB contamination. Remedial measures options were also identified. Mr. French also developed a ground-water monitoring plan in accordance with the Compliance Agreement between the state and the property owner. As Ground-Water Task Leader, he supervised the installation of monitoring wells at an abandoned petroleum products waste dump in Southern California. This effort involved collection and logging of soil samples and collection of water samples for chemical analysis. He later co-authored a technical report on the occurrence and character of ground water at the site. As Radian's involvement in the investigation continued, Mr. French prepared technical designs and specifications for a permanent, post-remedial action ground-water monitoring network. Mr. French has also been responsible for field activities related to the USAF Installation Restoration Program at Tinker AFB, Oklahoma. At Tinker, electromagnetics surveys were performed at closed industrial waste impoundments and monitoring wells were installed near landfills. At England AFB, Louisiana, Mr. French developed a work plan for the evaluation of waste disposal practices at the base.

As part of a comprehensive hydrogeologic evaluation of a solvent refined coal pilot plant in Washington, Mr. French supervised the installation of water quality monitoring wells and conducted pumping tests for the evaluation of

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aquifer characteristics. He also supervised soil coring and sampling efforts at the site of process fluid spill. Mr. French also served as Project Director for a pre-closure evaluation of two hazardous waste impoundments at a wood treatment plant in Washington. The plant had discharged wastewater containing creosote and pentachlorophenol to the unlined impoundments, which are located on floodplain sands and gravels of the Columbia River. A second site was also examined in terms of disposal practices and the character and volume of wastes. Results of the pre-closure survey were used for a definition of areas of concern requiring closure and for the selection of ground-water monitoring parameters based on the character and volume of wastes.

Mr. French has participated in several ground-water studies for Western coal mining programs. For a large surface mine in New Mexico, he was a principal author of the cumulative hydrologic impat assessment conducted for the Office of Surface Mining. Principal hydrologic concerns for individual mines were identified and compared to predicted hydrologic impacts in order to determine if material damage would result from mining. For a proposed commercial underground coal gasification project, Mr. French was involved in the conceptual design of an aquifer restoration program. Ground water would be withdrawn from the burn cavity, treated at the surface, and reinjected into the coal seam. As Task Leader for both geology and ground-water hydrology tasks for a feasibility study of a proposed lignite gasification facility, Mr. French investigated waste disposal and ground-water supply issues. In addition, Mr. French examined the feasibility of a deep well injection system for the disposal of process wastewaters. This initial evaluation included the identification and characterization of possible injection zones, formation water chemistry, probable injection rates and pressures, and subsurface migration of waste fluids.

As a Project Director on a quick-response effort for the Department of Energy, Division of Fossil Fuel Processing, Mr. French evaluated the water availability for a proposed solvent refined coal demonstration plant in northwestern Kentucky. This project consisted of a comprehensive appraisal of existing and future water supplies, demands, and policies that affect water availability in the vicinity of the demonstration plant.

While employed by Sargent and Lundy Engineers, Mr. French was involved in detailed hydrologic and geologic studies for Preliminary and Final Safety Analysis Reports (PSAR and FSAR) for several nuclear power plants. The PSARs and FSARs involved detailed geologic mapping, inventory of water wells, analysis of subsurface flow, and reviews of regional geologic features. In a study conducted with the Illinois and Indiana Geological Surveys, Mr. French analyzed stratigraphic, structural, and hydrologic features at sites in the Illinois Basin for a compressed air energy storage project. Mr. French directed an extensive hydrogeologic and geologic study of potential sites for a lignite-fired electric generation station in Walker County, Texas. Mr. French also conducted the field program for an engineering soils exploration

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effort at a construction site for a lignite-fired power plant in Harrison County, Texas.

Mr. French supervised several field programs at Sargent and Lundy. These programs included: construction and testing of two industrial water wells near Cincinnati; installation and testing of pneumatic piezometers at a nuclear power plant excavation in northern Indiana; and aquifer testing and analysis of hydraulic characteristics of the alluvial-glacial outwash aquifer near Wausau, Wisconsin.

### HONORARY AND PROFESSIONAL SOCIETIES:

American Institute of Professional Geologists, CPGS No. 6307; California Registered Geologist No. 3804; Ground-Water Technology Division of the National Water Well Association; Geological Society of America.

### PUBLICATIONS/REPORTS:

French, L.N. and J.L. Machin, "Cumulative Hydrologic Impact Assessment for McKinley Mine," Radian Corporation, Austin, TX, January 1984.

Little, W.M. and L.N. French, "Hydrogeologic Aspects of the McColl Site, Fullerton, California," Radian Corporation, Austin, TX, November 1982.

French, L.N., "Pre-Closure Evaluation of the Treated Wood Products Facility and Site C, Longview, Washington," Radian Corporation, Austin, TX, May 1983.

Lacy, J.C., L.N. French, and T.W. Grimshaw, "Regulation of the Hydrologic Impacts of Underground Coal Gasification," in Proc. Sixth Underground Coal Conversion Symposium, Shangri-La, OK, pp. V-79 thru V-88, July 1980.

French, L.N., et al., "Environmental Constraint Analysis of the Proposed Coastal Bend Coal Gasification Project," Radian Corporation, Austin, TX, August 1981.

White, D.M. and L.W. French, "Evaluation, Screening, and Prioritization of Candidate Gulf Coast Lignite Resource Blocks," Radian Corporation, Austin, TX, April 1981.

French, L.N. and J.L. Machin, "Water Availability Appraisal for the Proposed Solvent Refined Coal-I Demonstration Plant, Daviess County, Kentucky," Radian Corporation, Austin, TX, December 1979.

U.S. Bureau of Land Management, "Proposed Camp Swift Lignite Leasing (Draft and Final EIS)," Radian Corporation, Austin, TX, September 1980.

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French, L.N., "Compilation of Environmental Information for a Proposed Olefins Complex, Brazoria County, Texas," Radian Corporation, Austin, TX, July 1981 (author of Ground-Water Hydrology and Topography and Geology chapters).

Skinner, F.D., L.N. French, and D.E. Pusch, "Regulatory Review and Estimated Costs for a Proposed In-Situ Gasification Facility," Radian Corporation, Austin, TX, April 1982.

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### JILL P. ROSSI

#### EDUCATION:

B.A. Geography, The University of Minnesota at Minneapolis, 1972.

#### EXPERIENCE:

Geographer, Cartographer, Policy and Environmental Analysis Division, Radian Corporation, Austin, TX, 1980-Present.

Drafting and Graphics Assistant, Dam Safety Unit, Texas Department of Water Resources, Austin, TX, 1979-1980.

Cartographer, Continental Map Inc., Austin, TX, 1978-1979.

Teaching Assistant, University College-Geology, University of Minnesota at Minneapolis, 1972.

#### FIELDS OF EXPERIENCE:

At Radian, Ms. Rossi is responsible for producing maps and coordinating graphics for the Policy and Environmental Analysis Division. She utilizes data from a variety of technical disciplines (geology, hydrology, noise and air monitoring, sociology, soils, and hydrogeology) to create maps which clearly and concisely illustrate the written text. Ms. Rossi has been responsible for work in the following projects:

- o Develop base maps and coordinate graphics throughout an Environmental Impact Statement prepared for the U.S. Bureau of Land Management for a central Texas lignite mine;
- Develop color overlay method of mapping for site selection process of commercial waste disposal sites in Texas and southeastern Oklahoma;
- o Develop a series of figures used as illustrations in a manual for the Environmental Protection Agency on Remedial Actions at Uncontrolled Hazardous Waste Sites:
- o Draft maps and coordinate the graphics for an Environmental Impact Statement for a synfuels plant in Tennessee;
- Create base and thematic maps for Air Force Installation Restoration Programs (Phase I and Phase II) for the following locations: Kelly AFB, Texas; Hill AFB, Utah; Bergstrom AFB, Texas; Cannon AFB, New Mexico; England AFB, Louisiana; Tinker AFB, Oklahoma; and Reese AFB, Texas;

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- o Map limestone deposits, lime plants, and limestone quarries in the United States by county in a series of regional maps for the Electric Power Research Institute;
- o Map compliance/non-compliance with air pollution standards for counties in the United States in a series of EPA regional maps;
- o Map concentrations of selected air pollutants in the El Paso, Texas, area for a Texas Air Control Board study in a series of quarterly and annual reports;
- o Prepare aerial photography history of a wood preserving plant for a commercial client which included extensive research of available aerial photography and interpretation of those photos to determine historical features of interest:
- o Prepare complex permitting schedules for proposed mines, energy facilities, and hazardous waste handling sites;
- o Preparation of base and thematic maps for various feasibility studies, fatal flaw analyses, Environmental Information Documents, and Environmental Impact Statements; and
- o Research of available map resources, aerial photography, remote sensing products, and mapping technologies as required by individual client needs.

While with the Texas Department of Water Resources, Ms. Rossi worked in the graphics section of the Dam Safety Unit, a federal grant program. She prepared maps and exhibits, and laid out phototypset text into camera-ready form according to standards, developed with her assistance, for the technical reports written by the engineering section.

During her employment with Continental Map Incorporated, Ms. Rossi was involved in all phases of four color map production. These included source information procurement and classification, imaging base maps, scribing plates, cutting specialties, sizing and adhering type, designing customer copy panels, indexing streets and points of interest, photo-lab contact reproduction of base plates, and the final compositing of the four negative plates to be sent to the printer. These maps included large metroplex areas, counties, enlarged downtown sections, and simplified principle city thoroughfares.

While employed by the University of Minnesota as a Geology Teaching Assistant, Ms. Rossi taught geology laboratory sessions, prepared geology lab work materials, tutored students, and assisted the professors by preparing classroom presentations and grading and proctoring exams.

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### ANN E. ST. CLAIR

### EDUCATION:

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M.A., Geological Sciences, The University of Texas at Austin, 1979.

B.A., Geology, Trinity University, 1973.

#### EXPERIENCE:

Department Head, Radian Corporation, Austin, TX, 1982-Present.

Group Leader, Radian Corporation, 1979-1982.

Senior Geologist, Radian Corporation, 1980-Present.

Staff Geologist, Radian Corporation, 1978-1980.

Research Scientist Associate, The University of Texas at Austin, Bureau of Economic Geology, 1975-1978.

Research Scientist Assistant, The University of Texas at Austin, Bureau of Economic Geology, 1973-1975.

#### FIELDS OF EXPERIENCE:

At Radian, Ms. St. Clair has had extensive experience in studies relating to ground-water geology, waste disposal, and environmental impacts. Her work has included acquisition of data on ground water, assessment of water quality impacts, and compilation and interpretation of geologic data including geophysical and core logs, and evaluation of impacts of waste disposal and other activities. In hazardous waste studies her work has also involved evaluation of remedial action alternatives and interface with engineers, chemists and other specialists regarding various aspects of hazardous waste investigations including engineering design and cost of remedial action, control of emissions and odors, and waste characteristics. As Department Head at Radian Ms. St. Clair supervises the work of geologists, hydrologists, and ecologists and has management and technical review responsibility for programs in these technical areas.

Ms. St. Clair was Project Director for the second phase of a continuing study at the McColl hazardous waste site in the Los Angeles area. In this phase, data collected in Radian's Phase I field investigation of the site were evaluated and used in the selection and design of the remedial action plan for the site. The site, which is located adjacent to a residential and recreational area, contains various hydrocarbon wastes, principally acidic refinery sludges and drilling muds. Control of volatile emissions, odors, and the potential for contamination of surface water and ground water were addressed in the



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remedial action design. The design must meet strict criteria regarding exposure to contaminants both during remedial action implementation and over the long term.

Ms. St. Clair has major responsibility for studies being performed at several uncontrolled hazardous waste sites, including sites identified as priority sites for remedial action under Superfund. She was Project Director for the first phase of a study to evaluate ground-water conditions at a Superfund site in up-state New York which was used for disposal of wastes from a metal plating operation. The study included installation of monitor wells and test borings and collection of soil and ground-water samples in order to define the presence or extent of subsurface contamination. Based on the results of the field investigation, recommendations for further study or remedial action were developed. During the course of this program, Ms. St. Clair has been involved in initial site evaluation and data collection, development of a site field program, and interface with state and federal regulatory agencies.

Ms. St. Clair has had overall technical responsibility for a variety of activities for the EPA Solid and Hazardous Waste Research Division. These studies, generally involving technical support of Superfund activities, have included a field geophysical survey, treatability studies, column absorption/desorption studies, hydrogeologic evaluations, review of feasibility studies, and evaluation of remedial action technologies for approximately ten Superfund sites.

Ms. St. Clair's role included project management, technical supervision and review, and agency coordination.

For the Lipari landfill Superfund site near Pitman, New Jersey, Ms. St. Clair was responsible for coordinating a variety of technical activities as support to EPA Region II. The site contains a variety of industrial wastes, of which several volatile organic chemicals known to be extremely hazardous are of primary concern. Leachate seeps enter surface streams adjacent to the site and have resulted in a ban on fishing and boating in a lake 1000 feet downstream. Ms. St. Clair had overall responsibility for coordinating the following activities at this site—cost-effectiveness evaluation of 32 remedial action alternatives, preparation of an Environmental Information Document assessing the environmental impacts of remedial action alternatives, definition of baseline conditions and design of a long-term monitoring program on the lake, and a treatability study of the landfill leachate. For all these activities Ms. St. Clair was the principal interface with EPA and had primary technical review and management responsibility.

In a study for the EPA Municipal Environmental Research Laboratory, Ms. St. Clair supervised development of a methodology for conducting evaluations of cost-effectiveness of remedial actions at uncontrolled hazardous waste sites. Under the Comprehensive Environmental Response, Compensation and Liability Act (Superfund), remedial actions conducted at Superfund sites must be demonstrated to be cost-effective. The study involved review of technical and cost

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data on remedial technologies, evaluation of methodologies for cost-effectiveness and related types of analyis, assessment of impacts of time and discount rates on the evaluation, and development of the analytical framework and guidance manual to be used by decision makers in selecting remedial measures.

Ms. St. Clair has participated in Radian's activities related to collection of insurance underwriting information for Environmental Impairment Liability (EIL) Insurance. She worked closely with Radian's parent company, Hartford Steam Boiler Inspection and Insurance Company (HSB) in developing procedures for collection of technical and engineering underwriting information and functions in a Quality Assurance role by reviewing results of all Radian investigations of this type. In 1981 Ms. St. Clair was Project Director for a risk assessment of three power plants in the Boston area. The study involved brief site visits and review of corporate and regulatory agency files in order to assess the potential for gradual environmental impairment as a result of plant activities. The study included assessment of ground-water conditions, waste management practices, hazardousness of materials used on-site, population-atrisk, and corporate approach to environmental matters. A report was prepared containing information for use in underwriting Environmental Impairment (EIL) Insurance.

During 1981, Ms. St. Clair was Project Director for a large program to develop a waste management strategy for the Wyoming Coal Gasification Project. The program involved chemical and physical analysis and regulatory classification of power plant and gasification wastes and organic by-products. Based on the results of the testing, recommendations were made for treatment and disposal of wastes to meet applicable regulatory requirements. In addition, the study included column leaching studies to assess impacts of mine disposal of plant wastes, evaluation of ground water impact of disposal facilities at the plant site, and preparation of applicable state and federal permit applications.

In 1980-1981, Ms. St. Clair was Project Director for a program to evaluate waste disposal practices and ground-water conditions at a large petroleum refinery in Kenai, Alaska. The study focused on development of a long-term waste management strategy for disposal of refinery wastes, principally API separator bottoms and crude tank bottoms, which have been designated as hazardous wastes under RCRA. Initially Ms. St. Clair supervised design, installation and sampling of ground-water monitoring wells in the vicinity of existing disposal sites in order to assess the water-quality impacts of past disposal practices. Samples of all refinery waste streams and wastes from existing pits were characterized for the purpose of developing a plan for closure of existing pits and an ultimate waste management plan. Options were evaluated with respect to technical feasibility (particularly in light of climatic factors), environmental acceptability, regulatory compliance, and economics.

In 1979, Ms. St. Clair was Project Director for an investigation of soil/ground-water contamination and remedial action at a pesticide formulation

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facility in north Texas. The study was aimed at evaluating possible contamination from underground waste storage tanks suspected of leaking. Ms. St. Clair initially conducted sampling of soils in the vicinity of the tanks to determine if leakage had occurred. She also designed and supervised installation of a network of ground-water monitoring wells in order to evaluate ground-water flow at the site and to assess water-quality impacts of the suspected leakage. During drilling, core samples were taken in both the unsaturated and saturated zone for chemical analysis. Ms. St. Clair performed slug tests on the wells to provide data on aquifer properties. She also supervised infiltration tests in order to evaluate the surface infiltration conditions and to qualitatively assess the potential for leachate generation. Based upon the results of this study, recommendations were made for further studies and possible remedial actions.

In a study to determine impacts of a product spill at a Solvent Refined Coal-II demonstration plant in Fort Lewis, Washington, Ms. St. Clair was responsible for portions of the ground-water evaluation, including installation of monitoring wells, measurements of water levels, and interpretation of hydrologic and chemical data. She was also involved in interfacing with state regulatory agencies.

Ms. St. Clair was Project Director of a study for EPA Region III, evaluating the suitability of land around the Cheswick Power Station near Pittsburgh, Pennsylvania, for disposal of coal ash and scrubber sludge. The study was conducted as technical support for enforcement actions brought by EPA Region III concerning alleged violations of air emissions regulations from the coalfired power plant. In the event that installation of SO<sub>2</sub> scrubbers was to be required by EPA, this study was underaken to document the availability of land for disposal of wastes from the scrubbers. During the study, Ms. St. Clair supervised a multidisciplinary team evaluating the hydrogeology, transportation, land use, ecology, and economic factors affecting the acceptability of sites in the vicinity of the plant for disposal of wastes.

In a study for EPA Region VII, Ms. St. Clair supervosed several protrams concerned with suitability of soils for septic tanks and nitrate contamination of ground water in Missouri. Ms. St. Clair supervised technical efforts on three programs. One program involved detailed soils mapping and field examination of septic tank failures in Greene County, Missouri, and in order to develop a septic-tank suitability map. Another study focused on determination of any relationships between water well construction practices and occurrence of ground water contamination in Howell County, Missouri. It involved a field survey for sampling of ground water and for obtaining information on well construction. A third program was conducted to develop a regional map of nitrate concentrations in ground water in the four-state area of EPA Region VII. In addition to development of technical reports for each of these studies, reports were prepared for lay readers.

Ann E. St. Clair

Ms. St. Clair was Project Director for a feasibility and site selection study for an in-situ gasification project utilizing Texas lignite. The study focused on evaluation of environmental factors that might affect project feasibility. Ms. St. Clair was involved in overall project coordination as well as studies related to environmental and hydrologic conditions at several candidate sites.

As a research associate at the Bureau of Economic Geology, Ms. St. Clair was involved in numerous studies requiring collection and interpretation of geologic data, sampling and chemical analysis of ground water, and evaluation of environmental and engineering impacts of man's activities. She was responsible for the preparation of maps, technical reports, and presentations, as a part of these programs.

## PROFESSIONAL/TECHNICAL SOCIETIES:

American Institute of Profession Geological Scientists, Certified Professional Geological Scientist 4741; National Water Well Association, Ground Water Technology Division; Geological Society of America; Austin Geological Society.

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APPENDIX L

Geophysical Tracings



Specifications of Ground Conductivity Meters Utilized for Geophysical Surveys (from manufacturer's literature, Geonics, Ltd.)

## ONE MAN CONTINUOUS READING



## EM31

nics EM31 provides a measurement of terrain conductivity without contacting the ground using a patented inductive electromagnetic technique. The in-strument is direct reading in millimhos per meter and surveys are carried out simply by traversing the ground,

The effective depth of exploration is approximately six meters making it ideal for Internet open on exponential is approximately six meters making it local for engineering geophysics. By eliminating ground contact, measurements are easily carried out in regions of high resistivity such as gravel, permatrost and bedrock. Over a uniform half space the EM31 reads identically with conventional resistivity. and the measurement is analogous to a conventional galvanic resistivity surve with a fixed array spacing, interpretation curves supplied with each instrument often permit an estimate of a layered earth

The advantages of the EM31 are the speed with which surveys can be carried out. the ability to precisely measure small changes in conductivity, and the continuous readout which provides a previously unobtainable lateral resolution.

# **Specifications**

MEASURED QUANTITY Apparent conductivity of the ground in millimhos per

PRIMARY FIELD SOURCE Self-contained dipole transmitter SEMSOR Self-contained dipole receiver

INTERCOIL SPACING 3 66 meters

OPERATING FREQUENCY 9.8 kHz

POWER SUPPLY

8 disposable alkaline 'C' cells (approx 20 hrs life con-

tinuous use)

CONDUCTIVITY RANGES 3, 10, 30, 100, 300, 1000 mmhos/meter

MEASUREMENT PRECISION ±2% of full scale

MEASUREMENT ACCURACY ±5% at 20 millimhos per meter

RSE LEVEL

< 0.1 milimhos per meter

OPERATOR CONTROLS . Mode Switch

 ● Phasing Potentiometer
 ● Coarse Inphase Compe @Fine Inphase Compensation

DIMENSIONS

4 0 meters extended 1 4 meters stored Console 24 x 20 x 18 cm Shipping Crate 155 x 42 x 28 cm

WEIGHT

Instrument Weight 9 kgm Shipping Weight 23 kgm

### TWO MAN VARIABLE DEPTH



## EM34-3

Operating on the same principles as the EM31, the EM34-3 is designed to achieve a substantially increased depth of exploration and a readily available vertical conductivity profile.

The underlying principle of operation of this patented non-contacting method of measuring ferrain conductivity is that the depth of penetration is independent of terrain conductivity and is determined solely by the instrument geometry i.e. the in-tercoil spacing and coil orientation. The EM34-3 can be used at three fixed spacings of 10, 20, or 40 meters and in the vertical coplanar (as shown) or horizontal co of 10, 20, or 40 meters and in the vertical copanara (as shown) or indicantal co-plinair mode, in the vertical coplanar mode, the instrument senses to approx 0.75 of the intercoil spacing, in the horizontal coplanar mode, the instrument can sense to 1.5 times the intercoil spacing. For the horizontal coplanar mode, however, coil mis-alignment errors are more serious than in the vertical mode so greater care must be rcised to achieve the maximum 60 meter depth

Simple operation, survey speed and straight forward data interpretation makes the EM34-3 a versatile and cost effective tool for the engineering geophysicist

# Specifications

MEASURED QUANTITY Apparent conductivity of the ground in millimhos per

PRIMARY FIELD SOURCE Self contained dipole transmitter SENSOR Self-contained dipole receiver

REFERENCE CABLE Lightweight, 2 wire shielded cable

INTERCOIL SPACING & 010 meters at 6 4 kHz

OPERATING FREQUENCY #20 meters at 1 6 kHz

POWER SUPPLY

Transmitter: 8 disposable 'D' cells

● 40 meters at 0.4 kHz

Receiver 8 disposable C' cells CONDUCTIVITY RANGES 3, 10, 30, 100, 300 mmhos/meter

MEASUREMENT PRECISION : 2% of full scale deflection

MEASUREMENT ACCURACY : 5% at 20 millimhos per meter

< 0.2 millimhas per meter

MOISE LEVEL DIMENSIONS

Receiver Console
Transmitter Console
Coils

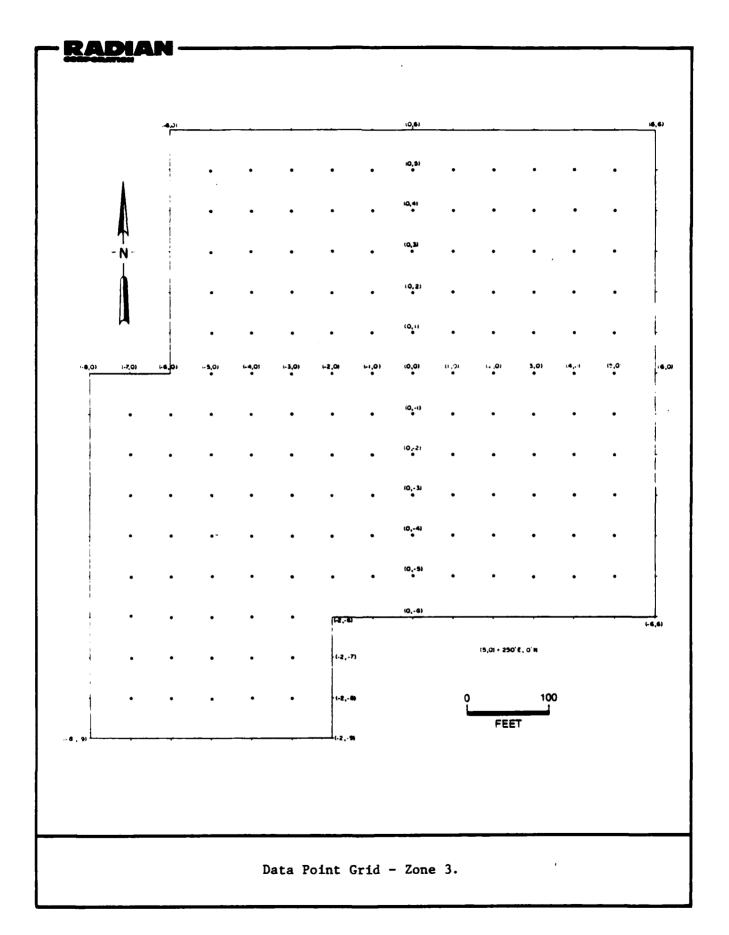
19 5 x 13 5 x 26cm
15 x 8 x 26cm
63cm diameter

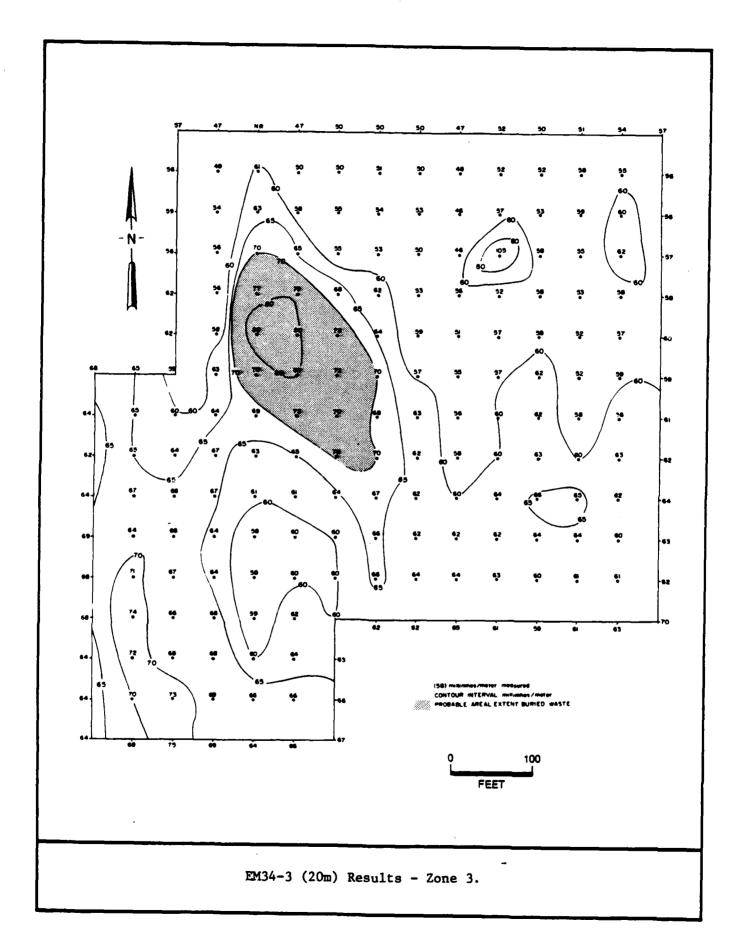
Receiver Coil

Transmitter Cod

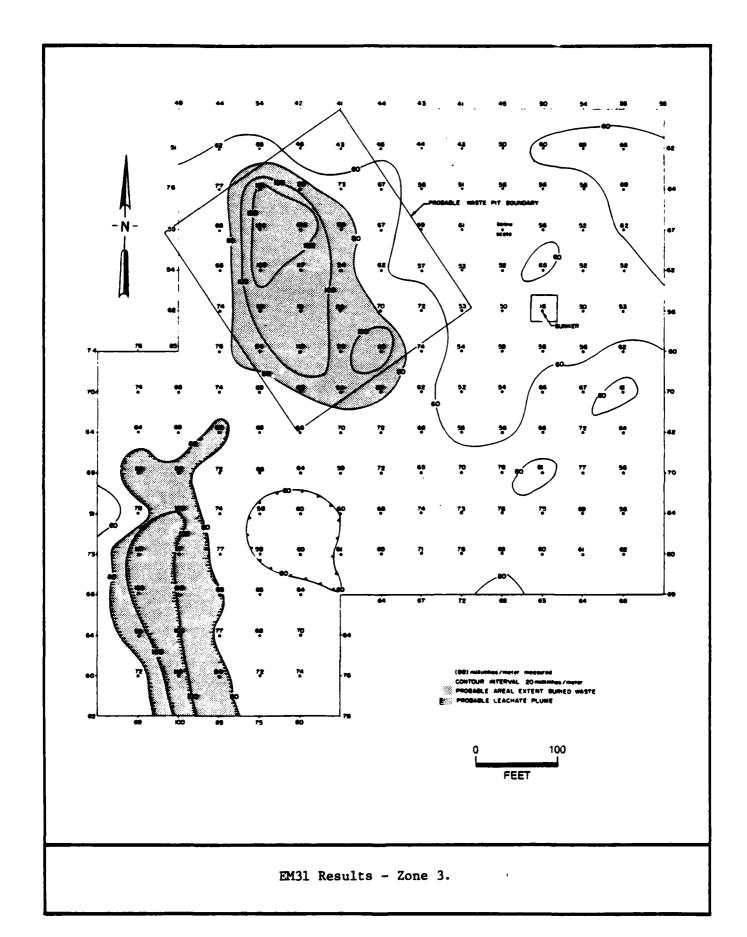


Zone 3 Plots





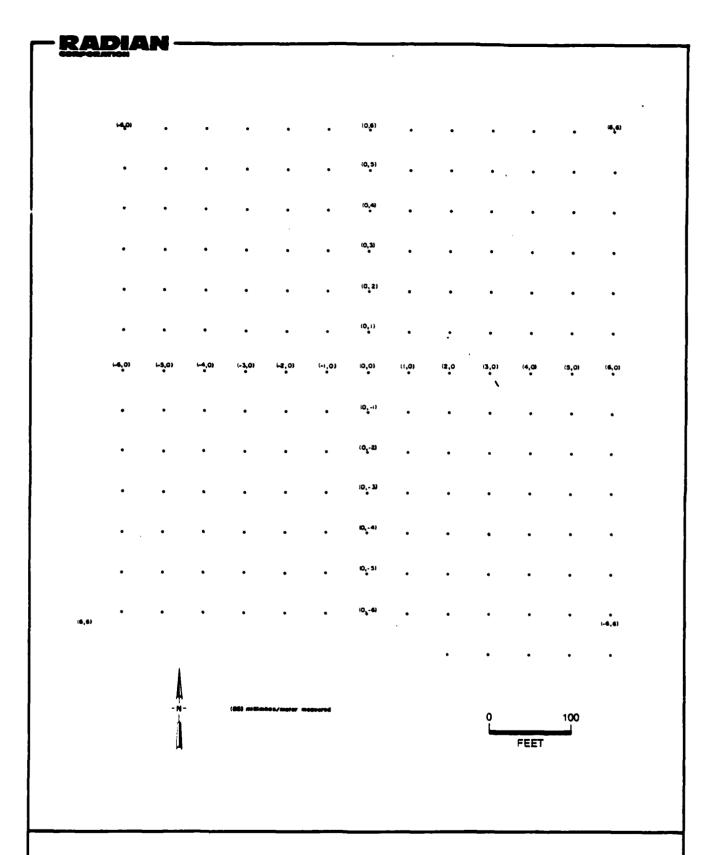
L-8



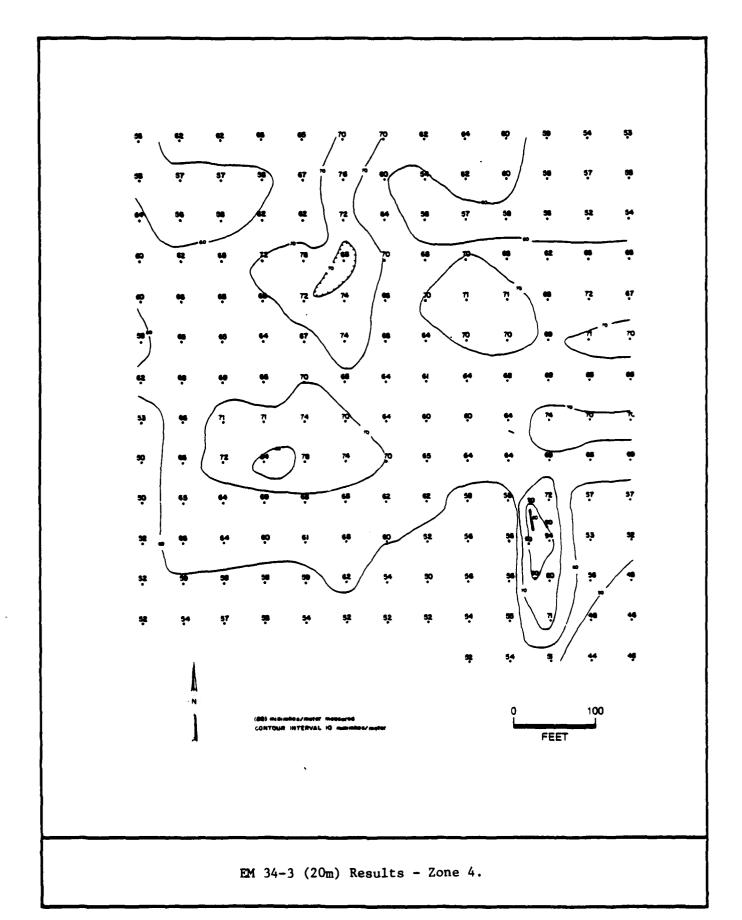
L-9

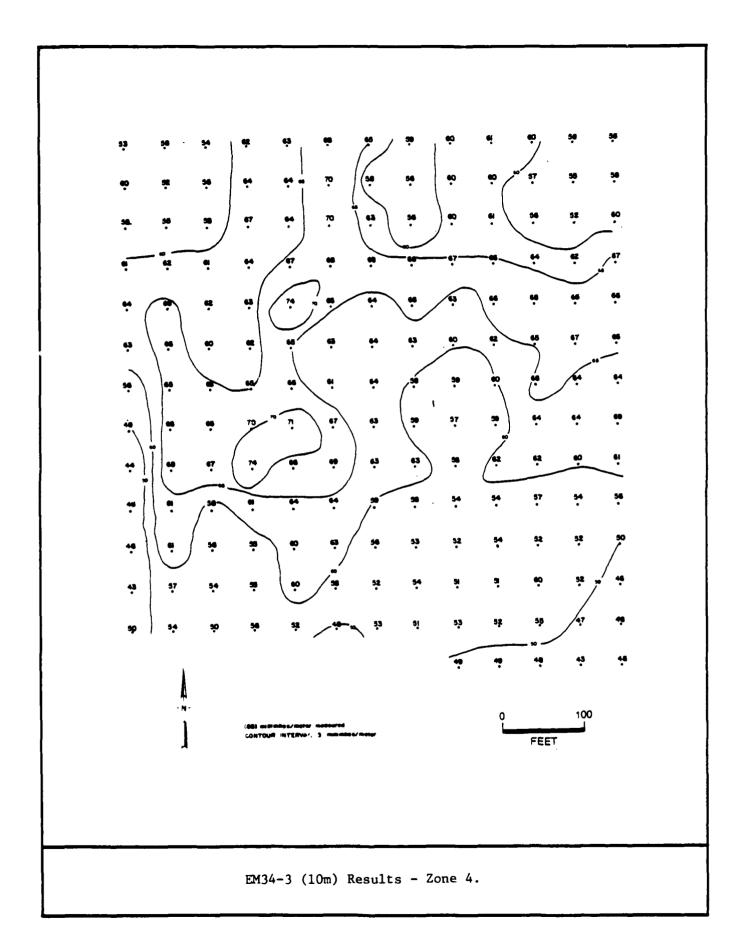


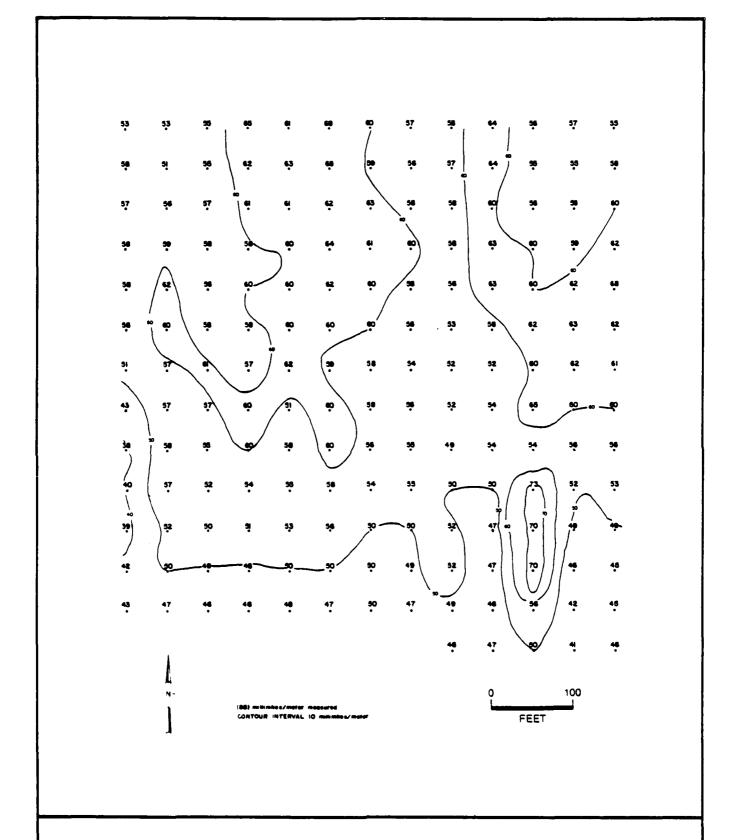
Zone 4 Plots



Data Point Grid - Zone 4.







EM31 Results - Zone 4.



APPENDIX M
Safety Plan Utilized on this Project

DCN 83-212-027-04-01

TINKER AFB IRP PHASE IIB SAFETY AND HEALTH PLAN

Prepared by: Fred B. Blood

25 October 1983

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## 1.0 PROJECT DESCRIPTION

The purpose of this project is to determine if environmental contamination has occurred from the waste disposal practices at Tinker AFB, OK. The project consists of a variety of field activities; the installation of wells and sample collection, analysis of samples, and reporting. This safety plan is to address the field activities.

The following activities are required in the field portion of the project:

- Installation of six deep sampling wells utilizing an air rotary drilling rig (open hole drilling prior to well casing installation). These wells are not situated directly over the waste site, but they may pass through contaminated ground water.
- O Drilling of five soil borings utilizing a hollow-stem auger. These soil borings are directly over a waste site.
- o Collection of 16 well water samples, six from the newly completed deep wells, eight from existing shallow ground water wells, and two from the soil boring holes.
- o Collection of 30 soil samples from the soil boring holes.
- O Collection of five leachate samples from existing seeps.

- o Collection of four water samples from an existing recreational impoundment.
- o Performance of surface geophysical testing.

There exists a reasonable probability that all of these activities, with the exception of the geophysical testing, will result in contact with waste contaminated materials. The waste materials include pesticide containers, a wide variety of solvents (including trichloroethylene), metal plating wastes, fuels and oils and radioactive wastes. It is considered highly improbable that radioactivity will be encountered in any samples except the impoundment water samples, and there in low to background levels.

## 2.0 RATIONALE OF SAFETY APPROACH

The Supervising Geologist is responsible for the proper execution of the safety plan described herein which is for the prevention of deleterious exposure to hazards associated with the handling of toxic wastes. Additionally, typical safety practices related to drilling activities must also be observed (use of safety hats, shoes, and life vests in boat use, etc.). These safety and health practices are to be observed by all Radian personnel and subcontractor personnel.

The potential for worker exposure to fumes and vapors requires gas-proof eye protection. This is accomplished by using full-face respirators. Respiratory protection must include organic vapor, acid gas, and fume protection. The expected concentrations should be within the capacity of air purifying respirator protection. Ambient air monitoring will be performed to provide an indication of excessive levels, which will then require increased protections. The collection of and working with aqueous samples requires splash protection, to be provided by coveralls and jackets. The handling of samples that may contain a wide range of solvents, including trichloroethylene, requires two-layer hand protection.

This safety program is established as a minimum requirement. Variations from the program for greater protection will not be discouraged. However, decreasing the protection must be authorized by the Supervising Geologist or the Project Director. Program changes will be documented in the after-action report.

## 3.0 SAFETY TRAINING

Prior to the initiation of site activities, a training session will be held to discuss the proposed work, associated safety and health plans, and emergency response plans. All personnel assigned to drilling activities and water sampling efforts will be instructed regarding the potential health and safety hazards associated with the work and protective measures available. Specifically, the following topics will be covered in the training session:

- o Potential routes of contact with toxic and/or corrosive substances
  - skin contact/adsorption
  - eye contact
  - inhalation
  - ingestion
- o Types, proper use, limitations and maintenance of applicable protective clothing and equipment
  - safety helmet
  - industrial safety glasses
  - chemical goggles
  - chemical resistant gloves
  - chemical resistant safety-toe boots
  - chemical resistant body coverings (apron, blouse, trousers, coveralls)
- Respiratory protection using half- and fullfacepiece air purifying respirator with replaceable filter cartridges
  - Hierarchy of protective controls: engineered, administrative, work practice, personal protective clothing and equipment.

- Forms of respiratory protection: air purifying (disposal/reusable), air supplied, self contained.
- Selection of respiratory protection based on hazard: dust, fume, mist, gas, irritant, warning properties.
- NIOSH certification/approval of respiratory protection equipment.
- Medical/physical/physiological fitness to wear respiratory protection (e.g., spirometry, clean shaven, etc.).
- Reevaluation of respirator selection.
- Use, limitations and maintenance of full-facepiece air-purifying respirator: qualitative fit test, routine inspection, replacement of parts, cleaning/disinfection, storage.
- Use, limitations and maintenance of half-facepiece air-purifying respirator: qualitative fit test, routine inspection, replacement of parts, cleaning/disinfection, storage.
- o Reporting of accidents and availability of medical assistance.

# 4.0 PROTECTIVE CLOTHING AND EQUIPMENT

All monitoring well installation work will be performed by persons wearing the following required personal protective equipment:

- o PVC bib overalls
- o PVC jacket
- o Gauntlet style, chemical resistant, Viton gloves over butyl rubber gloves
- o Chemical resistant safety toe, steel shank boots
- o Respirator (full-facepiece air purifying)
- o Safety helmet

Depending on site conditions and drilling conditions, other items may be used for supplemental protection. Such items may include:

- o Tyvek® coveralls
- o Chemical resistant apron
- o Respirator (half-facepiece, air purifying)
- o Chemical eye goggles or safety spectacles with side shields

Because of the potential for migration of contaminants into and through the shallow aquifer zone, well-defined disposal site boundaries are uncertain. Several disposal sites have a high potential for migration of contaminants. Most of the monitoring wells will be installed in areas hydraulically down-gradient of known disposal sites or in areas of unknown ground water flow direction. Since the degree of contamination and potential migration patterns of contaminants are not known, respirator use will be required as a precaution during all drilling activities and well installation work. Full-facepiece air purifying

respirators will be used with Ultra-Twin GMC Cartridges for acid gases, dust and fume protection, and organic vapors. The Supervising Geologist may decide to implement the use of half-face-piece, air purifying respirators depending on specific site and drilling conditions. Only when well installation work is being performed in areas hydraulically up-gradient of respective sites and when there is considerable confidence that well locations are outside zones of possible cross-contamination, may respirator use be discontinued.

Control of the Contro

#### 5.0 WORK ZONES AND DECONTAMINATION PROCEDURES

To minimize the transfer of hazardous substance(s) from the site, contamination control procedures are needed. Contaminants must be removed from people and equipment prior to relocation from a work zone.

# 5.1 Work Zones

Prevention of exposures and spread of contamination will be controlled through the establishment of work zones. Two primary work zones will be utilized and will be referred to as the (1) Exclusion Zone and (2) Decontamination Zone.

The Exclusion Zone is the area where disturbance activities are conducted and where contaminants are or may be present. Only those properly trained individuals attired in the specific protective clothing and equipment will be allowed to enter and work in this zone.

The Decontamination Zone is the area where personnel and equipment will be decontaminated before moving to the next site.

The Exclusion Zone will comprise a 25-foot radius circle around the monitoring well and the Decontamination Zone will comprise a 25-foot wide ring around the Exclusion Zone as shown in Figure 5-1.

# 5.2 Decontamination Procedures

Personal protective equipment and drilling/sampling equipment can become contaminated in a number of ways including:

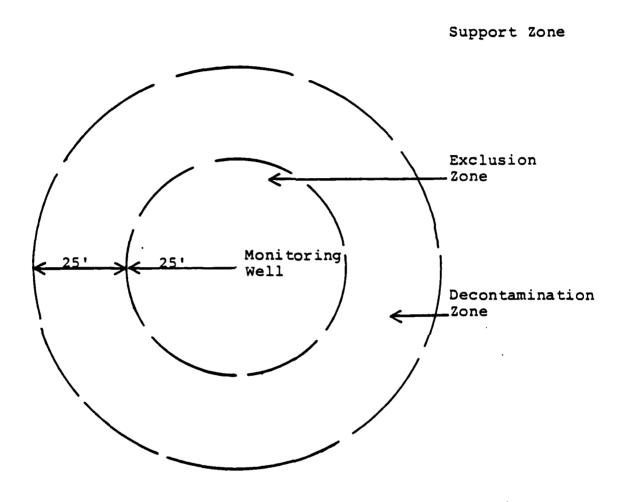


Figure 5-1. Monitoring Well Work Zone.

- Contacting vapors, gases, mists, or particulates in the air.
- Walking through puddles of liquids or on contaminated soil.
- Using contaminated instruments or equipment.

Protective clothing and respirators help prevent the wearer from becoming contaminated or inhaling contaminants, while good work practices help reduce contamination of protective clothing, instruments, and equipment. Even with these safeguards, contamination may occur. Harmful materials can be transferred into clean areas, exposing unprotected personnel. Or in removing contaminated clothing, personnel may contact contaminants on the clothing and/or inhale them.

Decontamination consists of physically removing contaminants. How extensive decontamination must be depends on a number of factors, the most important being the type of contaminants involved. The more harmful the contaminant, the more extensive and thorough the decontamination must be. Combining decontamination, the correct method of doffing personnel protective equipment, and the use of site work zones minimizes cross-contamination from protective clothing to wearer, equipment to personnel, and one area to another.

Decontamination at the monitoring wells will be accomplished by physically removing contaminants from the surfaces of personal protective equipment and drilling/sampling equipment with detergent water followed by rinse with clean water. The process will be repeated (see Figure 5-2).

	rinse			
sampl	ing equ	ıipı	ment	with
clean	water			

Rewash drilling/ sampling equipment with detergent water

Rinse drilling/ sampling equipment with clean water

Wash drilling/ sampling equipment with detergent water Wash exposed skin surfaces

Remove respirators and gloves

Final rinse of PPE with clean water

Rewash PPE with detergent water

Rinse PPE with clean water

Wash PPE with detergent water

Monitoring Well

Decontamination Zone



Exclusion Zone

Figure 5-2. Monitoring Well Decontamination Procedures.

### 6.0 SAFETY MONITORING

In addition to the use of personal protective equipment and respirator protection, safety support plans are also necessary. At Tinker AFB, safety support will constitute ambient air monitoring of hazardous and/or toxic materials for the protection of Radian and Air Force personnel and emergency response in the event of an employee injury or other medical emergency.

# 6.1 Ambient Air Monitoring

Ambient air monitoring will be performed using two techniques. One technique will use the combustible gas meter (TLV Sniffer) and the other will use colorimetric indicator tubes and the grabsampling method. All readings must be documented (minimum 2/hole) in field notes.

Air monitoring will be performed during drilling activities to determine if the respiratory protection chosen affords adequate protection from contaminant concentrations found on-site.

# 6.1.1 TLV Sniffer

A Bacharach Instruments TLV Sniffer will be used to locate on-site organic vapor concentrations that are higher than ambient outdoor air concentrations. The instrument will be used to determine general areas of elevated organic vapor concentrations, and not as a precision analytical instrument. It is an instantaneous measuring instrument and displays concentrations on a meter in parts per million (ppm), referenced to hexane.

The TLV Sniffer displays a meter reading directly in parts per million (ppm) volatile flammable vapor allowing an estimate of combustible gas concentrations. The instrument can be calibrated to read directly in parts per million for any one of many kinds of combustible gases. Factory calibration is for hexane unless otherwise specified, though readings from other gases and vapors may be interpreted easily by means of reading conversion curves (Figure 6-1).

### 6.1.2 Grab-Sampling Using Colorimetric Indicator Tubes

A Draeger® kit with an assortment of indicator tubes will be used to obtain quick analysis of unknown hazardous substances in air. The Draeger® tubes are colorimetric direct reading detector tubes and function as "real time" hazardous condition indicators. Samples will be collected during drilling activities. An initial screening tube (Polytest®) will be used for a general qualitative test. This tube will give a positive reaction indicating the presence of ethyl acetate, benzene, acetone, alcohol, and/or hydrocarbons. If a positive reaction does occur, more specific tests may be made using more specifically reacting Draeger® tubes. Table 6-1 lists the sampling strategy to be used when obtaining grab-samples via Draeger® tubes at Tinker AFB. In addition to the Polytest®, any of the detector tubes listed in Table 6-1 may be used individually if the presence of that compound is suspected.

The respirators selected for use at Tinker AFB have been assigned protection factors by the National Institute for Occupational Safety and Health (NIOSH). These respirator protection factors are listed in Table 6-2. In event that sampling results indicate that the respective Threshold Limit Values (TLVs) may be exceeded, concentrations should be compared to the Protection

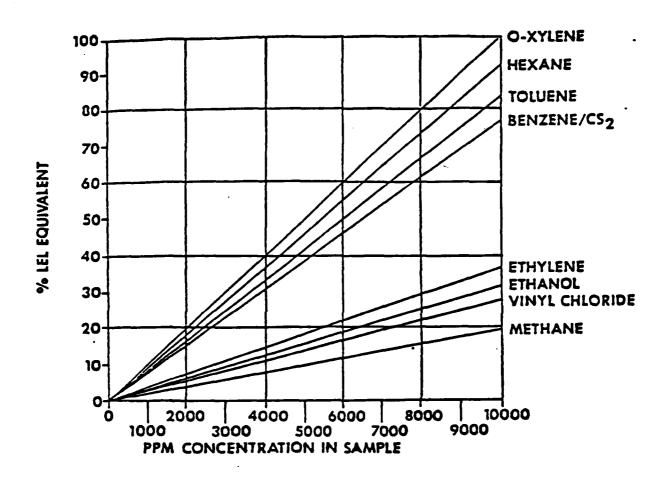


Figure 6-1. Conversion Curves Showing Relationship of PPM Concentrations of Various Gases to Percent L.E.L. Equivalents.

TABLE 6-1. DETECTOR TUBES FOR AMBIENT AIR MONITORING

	Detector Tube <sup>1</sup>	Positive Reaction Indicates Presence of	Detection Limit	TLV (ACGIH 1982)	MUC <sup>2</sup>
÷	Polytest	2, 3, 4, 5, 6*	50 ppm (benzene) 2000 ppm (acetone)		
2.	Ethyl acetate 200/a	Esters, 3, 4, 5	200 ppm	mdd 007	1000 ppm
	Benzene 0.05	Aromatic H/C	15 ppm	10 ppm	500 ppm
4.	Acetone 100/b	Ketones	100 ppm	750 ppm	1000 ppm
5.	Alcohol 100/a	Alcohols	100 ppm		
6.	Hydrocarbon 0.1%/b	Aliphatic H/C	0.1% (butane)		
7.	Sulfur dioxide 1/a	Sulfur dioxide	l ppm	2 ppm	100 ppm
ထံ	Hydrogen sulfide 1/c	Hydrogen sulfide	1 ppm	10 ppm	500 ppm

<sup>&</sup>lt;sup>1</sup> List is a modification of the sampling strategy for unknown substances developed by National Draeger, Inc.
Tubes are manufactured by National Draeger, Inc.

 $<sup>^2</sup>$  MUC = Maximum Use Concentration based on full-faced respirators. If levels exceed this value, respiratory protection must be increased.

A positive test also occurs for arsin, carbon disulfide, nitric oxide, carbon monozide, and methyl bromide.

TABLE 6-2. RESPIRATOR PROTECTION FACTORS

Type Respirator	Facepiece Pressure	Protection Factor
Half- or Quarter-mask, High-Efficiency Air Purifying	negative	10*
Full Facepiece, High Efficiency Air Purifying	negative	50*

<sup>\*</sup> These Protection Factors pertain to properly fitted facepieces with new cartridges and filters.

Factor associated with the particular respirator in use. If the concentrations of contaminants are not conservatively within the listed Protection Factor, work activities will be terminated until satisfactory respiratory protection can be obtained.

#### 6.2 Personal/Site Hygiene

Punctured, internally contaminated, cracked, stubbornly soiled, protective items will be disposed in sealed plastic bags.

Paper, rags, and other disposables used on-site or in equipment/sample container clean up will be disposed of in sealed plastic bags.

No food will be consumed on the exploration site. Employees will thoroughly wash their hands, forearms and face before consuming food or beverages other than water held in disposal cups. Drinking water will be available at the perimeter of the site being investigated. Disposable cups will be used to consume water after protective gauntlet gloves are removed.

Soil cuttings from augering which display contamination will be removed from the site in suitable sealed containers for eventual disposal.

# 6.3 Emergency Medical Services

In the event of an employee injury or other medical emergency on-site, the Supervising Geologist and other personnel trained in first aid and CPR will immediately provide assistance. An MSA model self-contained breathing apparatus (SCBA) will be nearby for use by the Supervising Geologist and back-up geologist during emergency rescue situations requiring respiratory protection.

A portable eye/face wash unit will be in the immediate proximity of any field work in progress. Flushing of the eyes should be started immediately (within 15 seconds) and should continue for 15 minutes whenever hazardous gas, liquid, dust or particles that may be chemically contaminated, enter the eye.

Because contact lenses tend to hold contaminants in close proximity to the eye ball and inhibit flushing, contact lenses will not be allowed on-site.

Additional first aid supplies will be kept in close proximity to field work activities for quick, easy access.

Medical emergencies that require outside medical assistance will be treated by the medical clinic at Tinker AFB. The clinic is in close proximity to the work site and is staffed with trained medical professionals. Pertinent communications information regarding medical services will be made available to all personnel during the safety training session.

# END

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