# GROUND WATER CONTAMINATION



# **Safety & Environmental**

Solutions, Inc.

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NOV 1 4 1997

Environmental Bureau
Oil Conservation Division

# **ARCO PERMIAN South Justis Unit F-230**

# **Work Plan**

Investigation of Possible Groundwater Impact Lea County, New Mexico

> Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240

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# Purpose

The purpose of this Work Plan is to propose a scope of work to systematically confirm or deny possible groundwater contamination at the South Justis Unit F-230 in Unit C of Section 25 Township 25S Range 37E in Lea County, New Mexico. This plan will also make provisions for the accurate determination of the size and location of any plume of contamination found in the groundwater. The source of the possible contamination is an old pit site on location.

# **Background**

In October of 1997, Arco Permian secured the services of Safety and Environmental Solutions, Inc. to determine the vertical and horizontal extent of the abandoned pit site on the specified location. The surface area of the pit is 111' X 90' or 9990 square feet. The depth of the pit is currently approximately 8'. A bore hole was drilled in the center of the pit area to a depth of 55'and split-spoon soil samples taken every 5'. Total Petroleum Hydrocarbon (TPH) field tests were run on-site with the following results:

Sample Depth	Results
5°	Strong Smell
10'	Strong Smell
15'	Strong Smell
20'	10,027 ppm
27'	17,333 ppm
30'	13,333 ppm
35'	9,600 ppm
40'	10,933 ppm
45'	10,667 ppm
50'	Saturated Soil Sample
57'	Oil/Water Emulsion

Knowledge of process indicates that the material in the pit is exempt oil field waste.

### Method

Arco Permian proposes to install three (3) monitor wells around the pit area. These wells will be used to determined the gradient of the water table under the pit area. In addition these wells will provide initial indications of the extent of any groundwater contamination. One well will be installed up gradient of the pit and the other wells will be installed down gradient south and southeast of the pit. (See Diagram) After the installation of the initial wells, a drilling program will be initiated in the area indicated by the gradient of the water table to determine the extent of the contamination. After delineation of the contamination is complete, Arco Permian will submit another work plan which will address the appropriate methods and scope of work for the remediation of any groundwater contamination as well as vadose zone remediation.

The physical description of the monitor well installations is as follows:

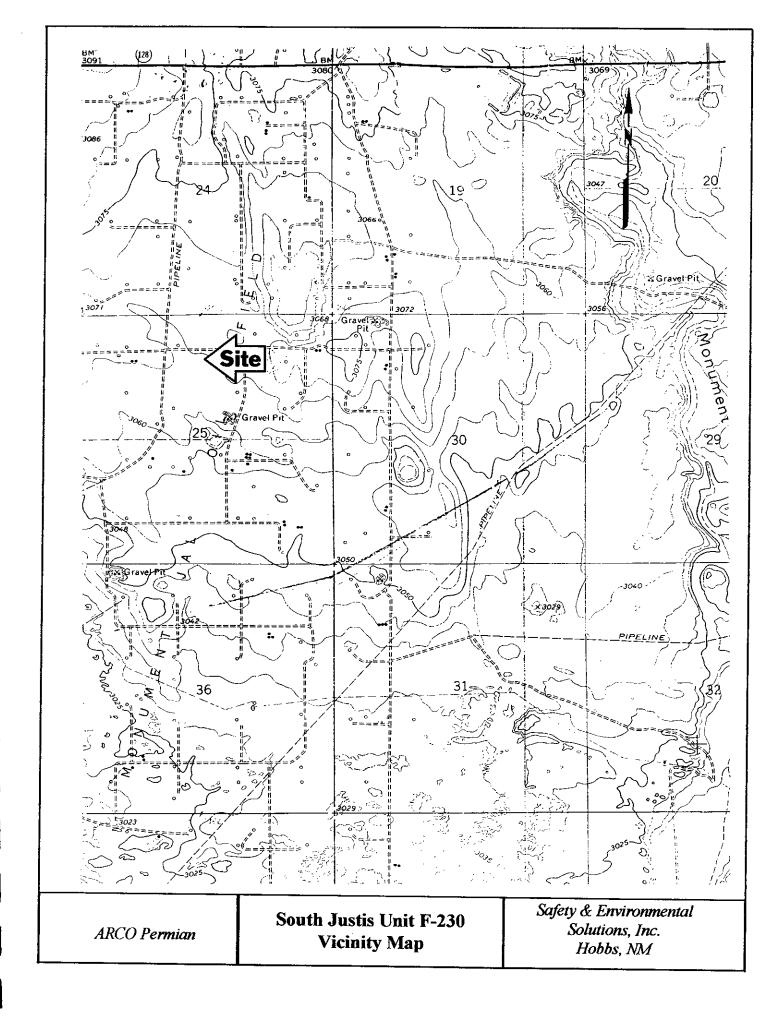
Each well will be drilled to a depth of ten (10) feet below the water table. Split spoon samples will collected at five (10') foot intervals and analyzed for TPH, and BTEX. A driller's log noting sample points and changes in lithology will be kept. The wells will cased with 2" PVC pipe with a minimum of fifteen (15) feet of well screen on the bottom. (Five (5) feet above the water table and ten (10) feet below the water table) Screen will gravel packed to a point 2-3 feet above the screen, with a bentonite plug set above the gravel pack. The remainder of the casing annulus to surface will grouted with cement containing 5% bentonite. Each well will be equipped with a locking well cap. (See monitor well diagram)

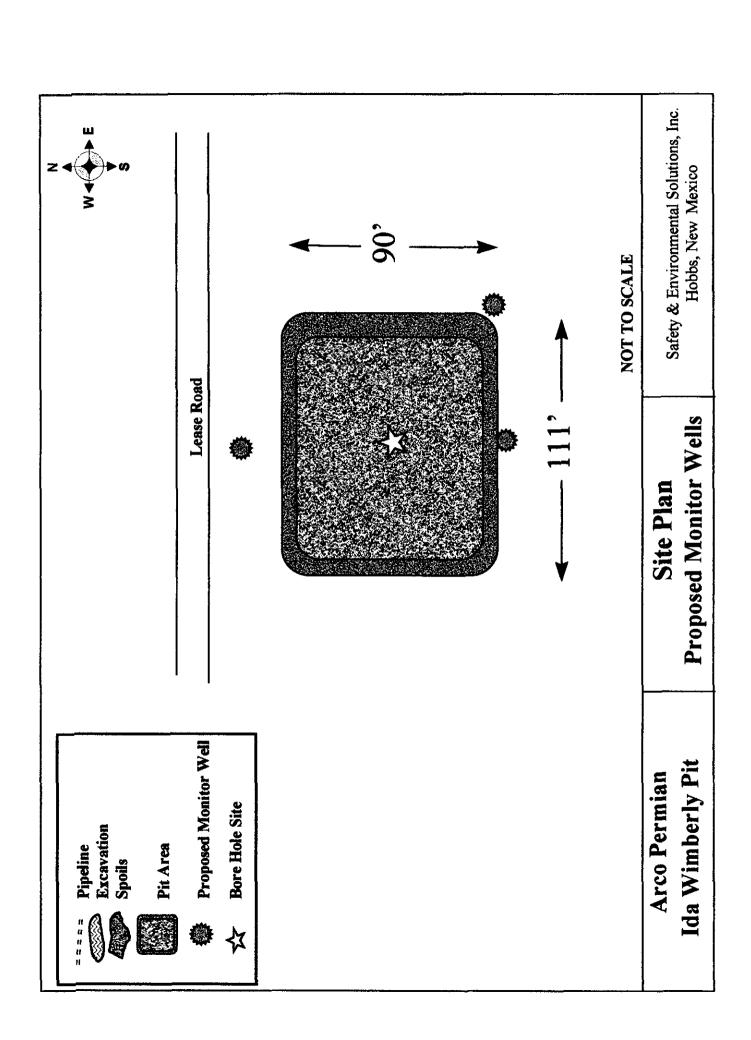
# **Monitoring Parameters**

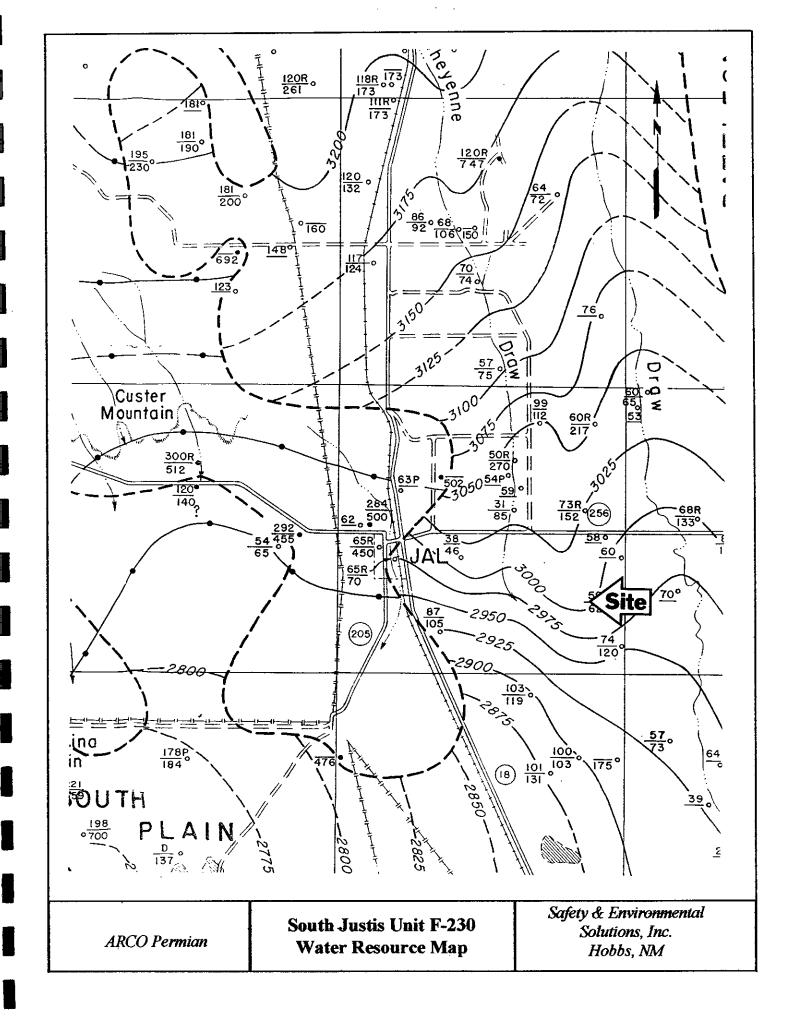
The monitor wells will initially be sampled and analyzed for TPH, BTEX, Chlorides, major Cations and Anions, and Total Dissolved Solids with results filed with the OCD Santa Fe and Hobbs District offices.

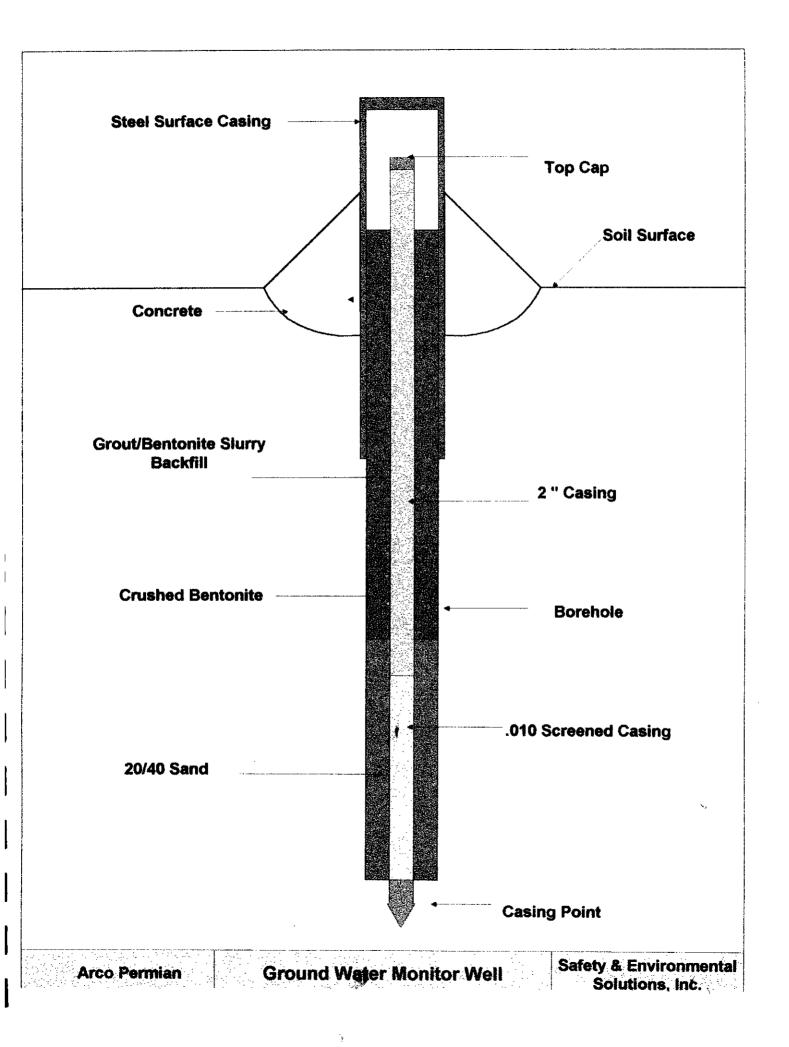
# Maps and Figures

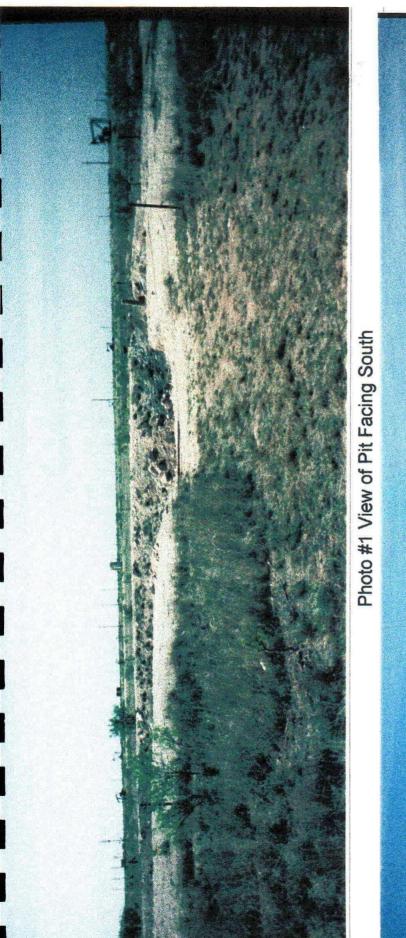
Vicinity Map
Site Plan
Water Resource Map
Ground Water Monitor Well Plat
Photo Exhibits
Chain of Custody for Samples
Analytical Results











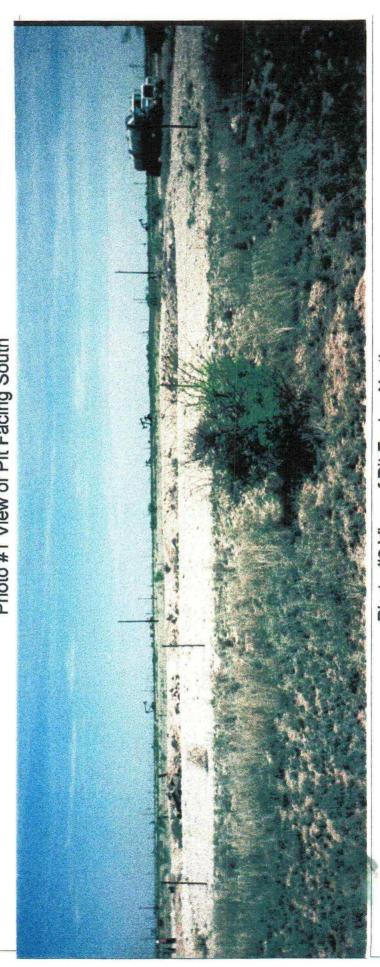


Photo #2 View of Pit Facing North

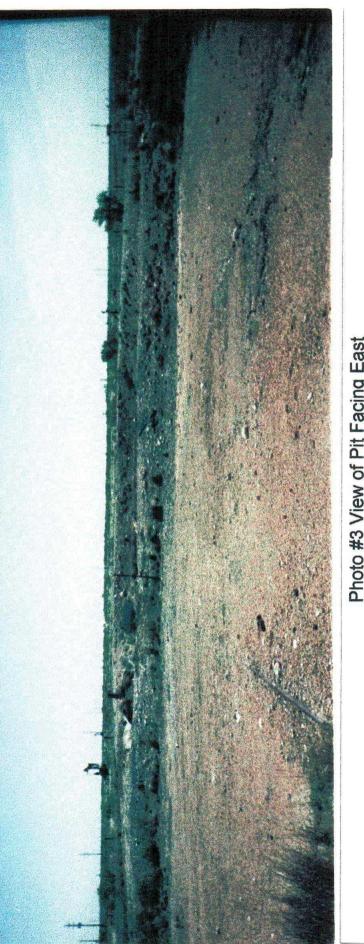


Photo #3 View of Pit Facing East

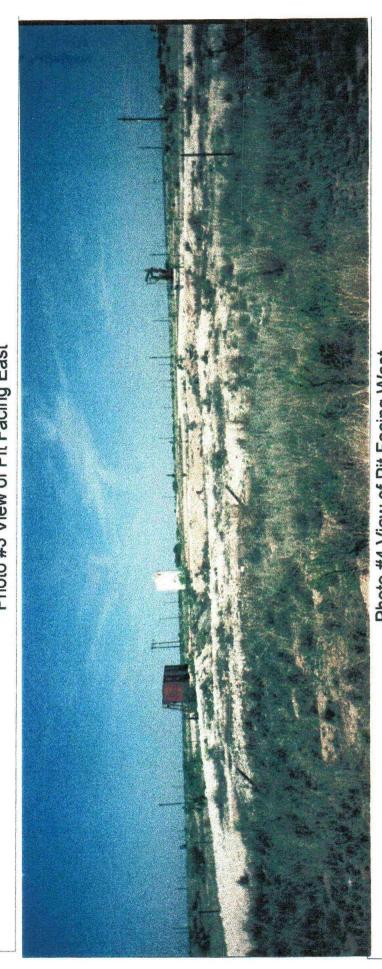


Photo #4 View of Pit Facing West

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ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E, CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: 505-393-4388

Receiving Date: 10/08/97
Reporting Date: 10/13/97
Project Number: NOT GIVEN

Project Number: NOT GIVEN Project Name: NOT GIVEN

Project Name: NOT GIVEN

Project Location: IDA WIMBERLY ARCO PERMIAN

Sampling Date: 10/03/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: AH

		TDS	CI
LAB NUMBER	SAMPLE ID	( mg/L )	(mg/L)

ANALYSIS [	DATE:	10/08/97	10/08/97		
H3256-1	HOLE #1, 55' DEPTH	6760	3499		
Quality Cont	rol	NR	484		
True Value (	2C	NR	500		
% Accuracy		NR	96.8		
Relative Per	cent Difference	NR	0		

METHODS: EPA 600/4-79-02 160.1 325.3

Chemist JA Cooke

Data



# Safety & Environmental

Solutions, Inc.

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MAR 02 1998

Environmental Bureau
Oil Conservation Division

# Arco Permian South Justis Unit F-230

# Installation of Monitor Wells and Investigation Results Lea County, New Mexico

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

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# I. Background

In October 1997 Arco Permian secured the services of Safety and Environmental Solutions, Inc. to determine the vertical and horizontal extent of the abandoned pit site on the specified location. A work plan was formulated to drill three monitor wells around the pit area for definition of the extent of the pit area and to provide initial indications of the extent of any groundwater contamination.

### II. Work Performed

Three monitor wells were drilled at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, NM according to the Approved Work Plan (GW-202 Pit Closure). SES contracted Eades Drilling and Pump Service of Hobbs, NM to drill these wells on December 8 and 9, 1997. Cardinal Laboratories of Hobbs, NM was also contracted to perform the laboratory analytical testing required for this project.

SES sampled the monitor well hole soils at intervals of ten (10') feet using SOPs found in Environmental Protection Agency, 1984, Characterization of Hazardous Waste Site - A Methods Manual: Vol II. The composite soil samples along with Chain of Custody were delivered to the laboratory for testing. The composite samples were analyzed for Total Petroleum Hydrocarbons (EPA Method 418.1) and BTEX (EPA Method 8020). The last sample taken from each well was also analyzed for Chlorides (EPA Method 600/4-79-020). The results of the BTEX, TPH and Chlorides were compared to the regulatory limits found in "Guidelines for Remediation of Leaks, Spills and Releases" New Mexico Oil Conservation Division - August 13, 1993. A summary of the laboratory analysis and correlated test hole data is represented in the following tables:

### Well #1

Monitor Well #1 was drilled on the north side of the lease road north of the pit area with 14' surface casing was set to prevent cave-ins, total depth of 66' (could not drill deeper - bit refusal).

1D/Depth Lithology	TPH:	Cl Benza	proportion of the second secon	Ethyl Total Benzene Xylenes
1-1 Caliche 10° 12° 12° 12° 12° 12° 12° 12° 12° 12° 12	146	<0.020	<0.020	<0.020 <0.060
1-2 No sample taken		4 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1		

1-3 Red Sand 109	<0.020 <0.02	0 <0.020 <0.060
	300/20 30.02	0.000
30° colling and a second state of the second	**************************************	
1-4 Red sand/ 173	<b>≤0.020</b> <0.02	0 <b>≤0.020 &lt;</b> 0.060
40° Coarse		
gravei		The second of the second
1-5 Fine sand/ <10	<b>&lt;0.020</b> <0.02	0 <0.020 <0.060
	347/20	V 5000
50: gravel		
1-6 Pea gravel/ 200	<b>128</b> ≤ <b>0.020</b> <0.02	0 <0.020 <0.060
60° sand		
	The Control of the Co	A SECULE AND SECULE AND SECULE

# Well #2

Monitor Well #2 was drilled south of Well #1 south of the pit area with top of casing at 63.3' and total depth of 71'.

Benzene Xylene	<b>.s</b>
2-1 Caliche <10 <0.020 <0.020 <0.020 <0.020 <0.060	
107	
2-2 Caliche w/ <10 <0.020 <0.020 <0.020 <0.060	
20' sandstone	·· -:[
2-3 Red Sand <10 <0.020 <0.020 <0.020 <0.020	
302	enek Zulik
2-4 Fine Sand <10 <0.020 <0.020 <0.020 <0.020	
407	.600.00 (7).
2-5 Sand with <10 <0.020 <0.020 <0.020 <0.020	fig.
50). gravel	
2-6 Sand/gravel <10 192 <0.020 <0.020 <0.020 <0.020	''''. '':: ''.'
602 -wet	

# Well #3

Monitor Well #3 was drilled east and slightly north of Well #2, nearer the pit area with top of casing at 63.6' and total depth of 71'.

TD/Denth Lithology	TPH C	Benzene Tolnene	Ethyl Total
	erent (a) in the same of the s		Benzene Xylenes
<del> </del>			
3-1 Caliche	146	<0.020 <0.020	< <b>0.020</b> <0.060
102			

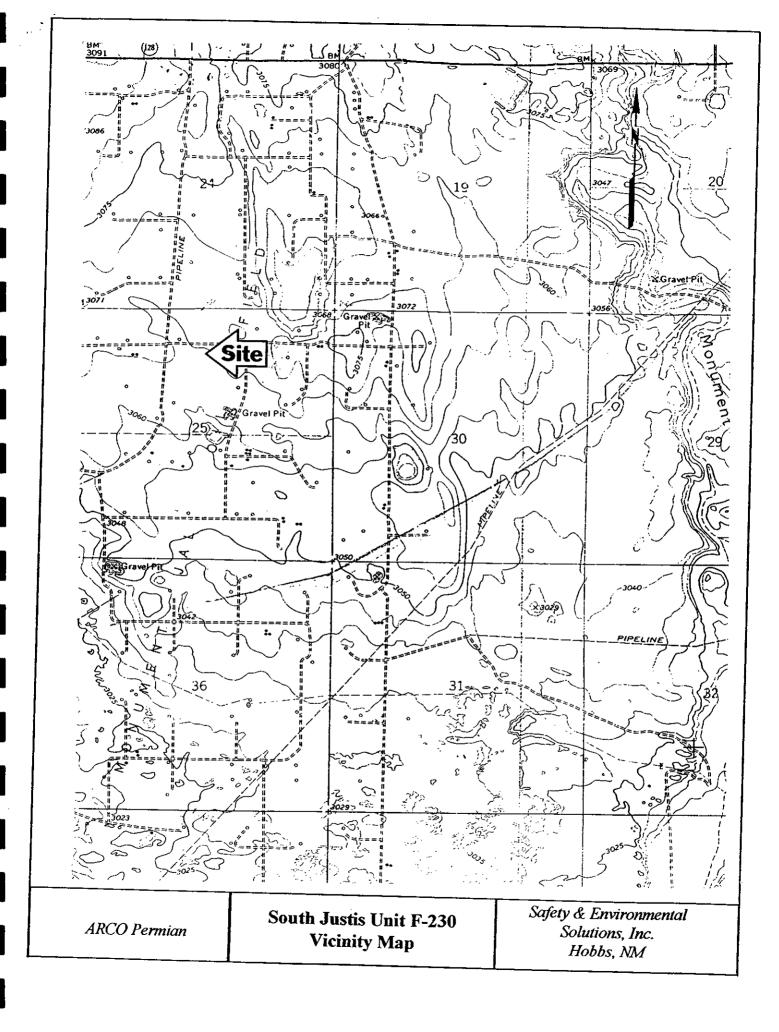
3-2 Caliche <1		<0.020 <0.020	<0.020	<0.060
20				
A STATE OF THE REAL PROPERTY OF THE STATE OF		<0.020 <0.020	<0.020	<0.060
		SUJUZU SUJUZU	30.040	~0.000
30': 7				
3_4		<0.020 <0.020	<0.020	<0.060
40'				
3-5 Sand with <1		<0.020 <0.020	<0.020	<0.060
50, gravel				The state of the s
	96	<0.0 <b>20</b> <0.020	<0.020	<0.060
	90	<b>~0.020 ~0.020</b>	70.020	<b>~U;UUU</b>
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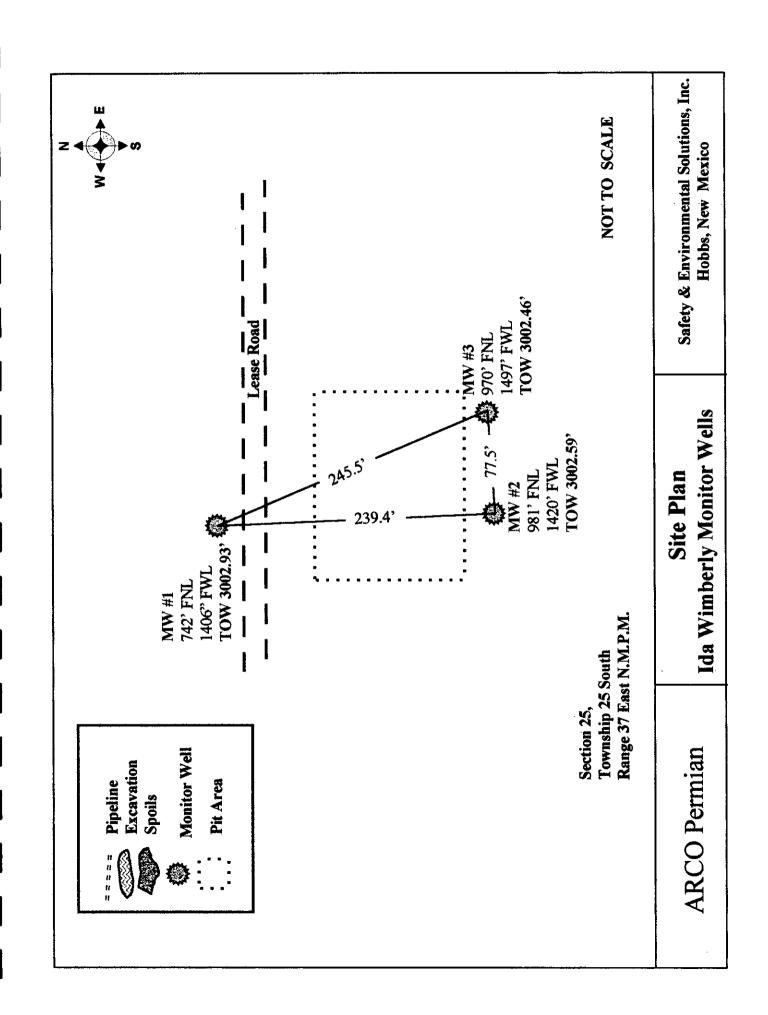
# III. Monitor Well Testing

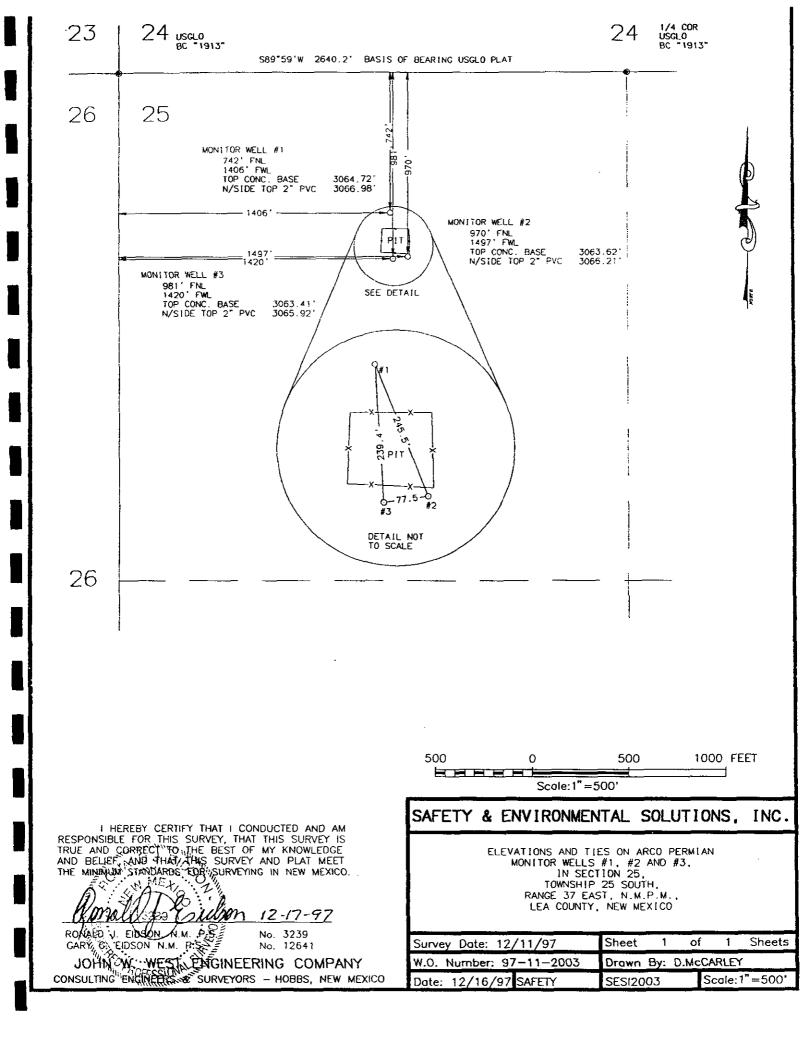
Initial water sampling from each of the three wells was performed on December 17, 1997 and the samples along with Chain of Custody were delivered to the laboratory for testing. The water samples were analyzed for BTEX (EPA Method 8020, 5030) as well as NMWQAC testing (Methods 625, 600/4-79-020, -206.2, -272.1,-213.1,-208.1, -218.1,-239.1,-245.1,-270.2, 600/4-78-020,-202.1,-220.1,-236.1,-243.1,-249.1,-289.1, 600/4-91-010,-212.1,-219.1,-246.1, SM4500-Cl-B, 375.4, 310.1, 150.1, 160.1, 120.1, 8049, 3500-Mg E, SM3500-Ca-D). (See Analytical Reports attached)

# IV. Maps and Figures

Vicinity Map Site Plan Survey Plat Chain of Custody for Samples Analytical Results









ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 12/09/97

Sampling Date: 12/09/97

Reporting Date: 12/12/97

Sample Type: SOIL

Project Number: NOT GIVEN

Sample Condition: COOL, INTACT

Sample Received By: GP

Project Name: ARCO PERMIAN MONITOR WELLS

Project Location: SOUTH JUSTIS FIELD

Analyzed By: BC

LAB NUMBI	ER SAMPLE ID	TPH (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS	DATE:	12/11/97	12/12/97	12/12/97	12/12/97	12/12/97
H3364-1	MW 1-1	146	<0.020	<0.020	<0.020	<0.060
H3364-2	MW 1-3	109	<0.020	<0.020	<0.020	<0.060
H3364-3	MW 1-4	173	<0.020	<0.020	<0.020	<0.060
H3364-4	MW 1-5	<10	<0.020	<0.020	<0.020	<0.060
H3364-5	MW 1-6	200	<0.020	<0.020	<0.020	<0.060
Quality Con	trol	184	0.091	0.088	0,087	0.266
True Value		200	0.100	0.100	0.100	0.300
% Recovery		92.1	91.0	88.2	87.4	88.6
Relative Pe	rcent Difference	2.7	4.8	3.9	0.3	0.7

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW-846-8260



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 12/09/97 Reporting Date: 12/12/97

Project Number: NOT GIVEN

Project Name: ARCO PERMIAN MONITOR WELLS

Project Location: SOUTH JUSTIS FIELD

Analysis Date: 12/10/97 Sampling Date: 12/09/97

Sample Type: SOIL

Sample Condition: COOL, INTACT

Sample Received By: GP

Analyzed By: AH

LAB NUMBER	SAMPLE ID	C[ (mg/Kg)
H3364-5	MW 1-6	128
· · · · · · · · · · · · · · · · · · ·		
Quality Control		500
True Value QC		500
% Recovery	····	100
Relative Percent Dif	ference	4.0
METHOD: EPA 600/4	79-020,	325.3

Chemist A Look

Date

CHAIN OF CUSTODY AND ANALYSIS REQUEST

■ 181(ENE. 'X '9601 # 2111 BEECHWOCD PHONE 9151 673-7001

PHONE, 5051 393-2325 4 101 E :XARLAND + HCBBS, NW 56240

A A BORATORIES

nu samples from splitspoon (holes covis) fust cultings 8 ANALYSIS REOUEST Phone Results: 1 Yes 1 No Additional Fax #: Fax Results: 1 Yes 1 No REMARKS: 9-1mm/5-1mm = Chlondes 1230 2 130 SAMPLING DATE 12.9 5. 1 6-2 67 BILTO ... PO #. Zp: PRESERVATION : ABHTO remony the any claim latests, wastown based in continuous as tand, as well as arrowing said the Count for assaystat.
Controved wastown arrows on a remong and separated by Countrius alman form; (35) sates after consequent on the approximate
A. Accounts, welltand investions, Zalentes returnations, total of lates, are set as in protes returned by clearly, as a factor of the controversion of protessions are almany to the control of the contr CE I COOF YCID: : ABHTO Company: Address: Phone #: 300078 State: Fax #: Attn: <del>ن</del>خ ت MATRIX SIC Received By: Received By: 301 **MYSTEWATER** Jaw Permion Marita Wells State: NV Zp: \$32 4 C **GROUNDWATER ECONTAINERS** 1857.6x0 COMP(C) OR GRAB(G) U Time; Time: 703 6 Chilon #10 M W 1-69 Sample I.D. PLESS NOTE: Likelity and Danages. Castinute has any and shorts exchemy to carmin, returning their perspects and any other castinute has been taken a carmin to carmin the castinute of the castinute and any other castinutes and castinute and A THE -1 Ly W 3 MA South <u>ک</u> Sampler Relinguished: CITY: 1-1 Splas Company Name: Project Manager: Project Location: LAB LD.# Project Name: 3364-Address: Project #: Phone #: Fax #:

CHECKED BY: (Initials)

UPS - Fed Ex - Bus - Other: Delivered By: (Circle One)



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 12/09/97

Sampling Date: 12/08/97

Reporting Date: 12/12/97

Sample Type: SOIL

Project Number: MONITOR WELL INSTALLATION #2

Sample Condition: COOL, INTACT

Project Name: ARCO PERMIAN IDA WIMBERLY

Sample Received By: GP

Project Location: SOUTH JUSTIS FIELD

Analyzed By: BC

LAB NUMBER SAMPLE ID		TPH (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS	DATE:	12/11/97	12/12/97	12/12/97	12/12/97	12/12/97
H3365-1	MW 2-1	<10	<0.020	<0.020	<0.020	<0.060
H3365-2	MW 2-2	<10	<0.020	<0.020	<0.020	<0.060
H3365-3	MW 2-3	<10	<0.020	<0.020	<0.020	<0.060
H3365-4	MW 2-4	<10	<0.020	<0.020	<0.020	<0.060
H3365-5	MW 2-5	<10	<0.020	<0.020	<0.020	<0.060
H3365-6	MW 2-6	<10	<0.020	<0.020	<0.020	<0.060
Quality Con	trol	184	0.091	0.088	0.087	0.266
True Value	QC	200	0.100	0.100	0.100	0.300
% Recovery	<i></i>	92.1	91.0	88.2	87.4	88.6
Relative Pe	rcent Difference	2.7	4.8	3.9	0.3	0.7

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW-846-8260



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. 703 E. CLINTON, SUITE 103 **HOBBS, NM 88240** FAX TO:

Receiving Date: 12/09/97 Reporting Date: 12/12/97

Project Number: MONITOR WELL INSTALLATION #2 Project Name: ARCO PERMIAN IDA WIMBERLY

Project Location: SOUTH JUSTIS FIELD

Analysis Date: 12/10/97 Sampling Date: 12/08/97 Sample Type: SOIL

Sample Condition: COOL, INTACT

Sample Received By: GP

Analyzed By: AH

LAB NUMBER	SAMPLE ID	C( (mg/Kg)
H3365-6	MW 2-6	192
·	· ,	
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent	Difference	4.0
ETHOD: EPA 600	1/4-79-020.	325.3

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ciain-of-custody record and analysis request $12-8-9.7$		TIME SO SO SO SO SO SO SO SO SO SO SO SO SO	S 66.35 K X	11.08 X	X × 27:11 8			REMARKS		·
al Solutions, Inc.  New Mexico 88240  Phone #:	1284 W) Whealy  1284 W) Whealy  120 M Od Od  Sampler Signature:	MATER SOIL SEERWATIVE SOIL SOIL SOIL SEERWATIVE SOIL SEERWATIVE SOIL SOIL SOIL SOIL SOIL SOIL SOIL SOIL	8-21	2	222	8-21		Times: Received by:	Three Received by:	Thurs: Received Whorehorz
Safety & Environmental Solutions, 703 E. Clinton, Suite 103, Hobbs, New Mexico 88240 (505)397-0510	Project #: Mowitop Well Institute 1 M.	FIELD CODE	3365-1 MW-2-1	MW-7-	7-7-MM 5-	2-2 mm 2-6		Kelling with hed by: Date: (2-8-97)	Rallogalsbed by: Dates	Relinquished by: Dates



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. 703 E. CLINTON, SUITE 103 HOBBS, NM 88240

FAX TO:

Receiving Date: 12/09/97

Reporting Date: 12/12/97

Project Number: MONITOR WELL INSTALLATION #3

Project Name: ARCO PERMIAN IDA WIMBERLY Project Location: SOUTH JUSTIS FIELD

Sampling Date: 12/08/97

Sample Type: SOIL

Sample Condition: COOL, INTACT

Sample Received By: GP

Analyzed By: BC

LAB NUMBE	R SAMPLE ID	TPH (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS E	DATE:	12/11/97	12/12/97	12/12/97	12/12/97	12/12/97
H3366-1	MW 3-1	146	<0.020	<0.020	<0.020	<0.060
H3366-2	MW 3-2	<10	<0.020	<0.020	<0.020	<0.060
H3366-3	MW 3-3	<10	<0.020	<0.020	<0.020	<0.060
H3366-4	MW 3-4	<10	<0.020	<0.020	<0.020	<0.060
H3366-5	MW 3-5	<10	<0.020	<0.020	<0.020	<0.060
H3366-6	MW 3-6	<10	<0.020	<0.020	<0.020	<0.060
Quality Cont	rol	184	0.091	0.088	0.087	0.266
True Value C	SC	200	0.100	0.100	0.100	0.300
% Recovery		92.1	92.1 91.0 88.3		87.4	88.6
Relative Pen	cent Difference	2.7	4.8	3.9	0.3	0.7

**METHODS:** TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW-846-8260



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 12/09/97 Reporting Date: 12/12/97

Project Number: MONITOR WELL INSTALLATION #3
Project Name: ARCO PERMIAN IDA WIMBERLY

Project Location: SOUTH JUSTIS FIELD

Analysis Date: 12/10/97 Sampling Date: 12/08/97

Sample Type: SOIL

Sample Condition: COOL, INTACT

Sample Received By: GP

Analyzed By: AH

LAB NUMBER	SAMPLE ID		C( (mg/Kg)
H3366-6	MW 3-6	·	96
	· · · · · · · · · · · · · · · · · · ·		
Quality Control	~ <del>~</del>	<del></del>	500
True Value QC			500
% Recovery			100
Relative Percent		4.0	
ETHOD: EPA 600	)/4-79 <b>-</b> 020	. 1	325.3

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Date /

ED AND ANALYSIS REQUEST	equest				18	nogh,	0												
CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST $ar{(Z-8-9.7)}$	. Analysis request			2 65 s8	2A QA 3 2A Q/ 2		or or or			\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\\	K K	ン ン ン ン	× ×				ŋ		
		7700			PRESERVATIVE SAMPLING WETHOD	эис яэн эт.	TO DA	12-8 2,20		12-6 3-55	3.20	12-8 3:48 1	12-9/4:10				Received by: REMARKS	Received by:	ilve by Inperior;
l Solutions, Inc. New Mexico 88240	Phone H: FAX #:	Ida Wimboo	Mand	Sampler Slenatúres	MATRIX	83TA JIC 9 35QU 35QU 33H	LO TS IV	2		7	7	7	2	-			Times: Rece	Timess	Thoes: Receive
Safety & Environmental Soluti 703 E. Clinton, Suite 103, Hobbs, New Mexico (505)397-0510			HE CHINESALIMIA	_( -3)	. s∌≣	FIELD CODE		1	4	1	- H/W	1	5-6		٠		Date: 72.8.97	Dates	Dates
afet	Stylet Mangett	Company Name & Address:	Projects: Wowiton Well	Inject London:	>		12 (-1 no 1 - 2	1 / WW	3	MW M	3 :	M C	ر <b>الا</b>				Kittle Str.	Relinquished by:	Relinquished by:



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103 HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/19/97 Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: GP

LAB NUMBE	R SAMPLE ID	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS [	DATE	12/18/97	12/18/97	12/18/97	12/18/97
H3384-1	MW-#1	<0.002	<0.002	<0.002	<0.006
H3384-2	MW-#2	<0.002	<0.002	<0.002	<0.006
H3384-3	MW-#3	<0.002	<0.002	<0.002	<0.006
Quality Cont	rol	0.095	0.093	0.094	0.282
True Value (	QC .	0.100	0.100	0.100	0.300
% Accuracy		94.8	92.8	93.7	93.9
Relative Per	cent Difference	5.4	4.3	4,3	4.0

METHOD: EPA SW 846-8020, 5030, Gas Chromatography

Chemist

Date



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/23/97

Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP

	CN	F	NO <sub>3</sub>
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)

ANALYSIS DATE	12/22/97	12/18/97	12/18/97	
H3384-1 MW-#1	<0.02	1.62	3.75	
H3384-2 MW-#2	<0.02	2.13	0.20	
H3384-3 MW-#3	<0.02	2.30	0.70	
Quality Control	0.105	1.00	5.15	
True Value QC	0.100	1.00	5.00	
% Accuracy	105	100	103	
Relative Percent Difference	4.8	3.0	1.4	

METHODS: EPA 600/4-79-020 353.2 335.2 340.1



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103 HOBBS, NM 86240

Receiving Date: 12/17/97

FAX TO:

Analysis Date: 12/19/97

Reporting Date: 12/19/97

Sampling Date: 12/17/97

Project Number: NOT GIVEN

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Project Name: ARCO MONITOR WELLS

Sample Condition, COOL &

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sample Received By: GP

Lab Number: H3384-1 Sample ID: MW-#1 Analyzed By: BC

# POLYNUCLEAR AROMATIC

HYE	DROCARBONS - 625 (mg/L)	Sample Result	Method			True Value
		H3384-1	Blank	QC_	% Recov.	QC
1	Naphthalene	<0.001	<0.001	0.039	78	0.050
2	2-Methylnaphthalene	<0.002	<0.002	0.043	86	0.050
3	1-Methylnaphthalene	<0.002	<0.002	NR	NR	NR
4	Acenaphthylene	<0.001	<0.001	0.040	80	0.050
5	Acenaphthene	<0.001	<0.001	0.042	84	0.050
6	Fluorene	<0.001	<0.001	0.048	96	0.050
7	Phenanthrene	<0.001	<0.001	0.053	106	0.050
8	Anthracene	<0.001	<0.001	0.049	98	0.050
9	Fluoranthene	<0.001	<0.001	0.049	98	0.050
10	Pyrene	<0.001	<0.001	0.048	96	0.050
11	Benzo(a)anthracene	<0.001	<0.001	0.046	92	0.050
12	Chrysene	<0.001	<0.001	0.048	96	0.050
13	Benzo(b)fluoranthene	<0.001	<0.001	0.038	76	0.050
14	Benzo(k)fluoranthene	<0.001	<0.001	0.044	88	0.050
15	Benzo(a)pyrene	<0.0007	<0.0007	0.045	90	0.050
16	Indeno(1,2,3-cd)pyrene	<0.002	<0.002	0.042	84	0.050
17	Dibenzo(a,h,)anthracene	<0.002	<0.002	0.049	98	0.050
18	Benzo(g,h,i)perylene	<0.002	<0.002	0.050	100	0.050

### % Recovery

19 Nitrobenzene-d5	58
20 2-Fluorobiphenyl	79
21 Terphenyl-d14	102

METHODS: EPA 625

Burgess J. A. Cooke, Ph. D.

Date



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E, CLINTON, SUITE 103

HOBBS, NM 88240

Receiving Date: 12/17/97

FAX TO:

Analysis Date: 12/19/97

Reporting Date: 12/19/97

Sampling Date: 12/17/97

Project Number: NOT GIVEN

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Project Name: ARCO MONITOR WELLS Project Location: SOUTH JUSTIS IDA WIMBERLY

Sample Received By: GP

Lab Number: H3384-2

Analyzed By: BC

Sample ID: MW-#2

POLYNUCLEAR AROMATIC

HYDROCARBONS - 625 (mg/L)		Sample Result	Method			True Value
		H3384-2	Blank	QC	% Recov.	QC
1	Naphthalene	<0.001	<0.001	0.039	78	0.050
2	2-Methylnaphthalene	<0.002	<0.002	0.043	86	0.050
3	1-Methylnaphthalene	<0.002	<0.002	NR	NR	NR
4	Acenaphthylene	<0.001	<0.001	0.040	80	0.050
5	Acenaphthene	<0.001	<0.001	0.042	84	0.050
6	Fluorene	< 0.001	<0.001	0.048	96	0.050
7	Phenanthrene	<0.001	<0.001	0.053	106	0.050
8	Anthracene	<0.001	<0.001	0.049	98	0.050
9	Fluoranthene	<0.001	<0.001	0.049	98	0.050
10	Pyrene	<0.001	<0.001	0.048	96	0.050
11	Benzo(a)anthracene	<0.001	<0.001	0.046	92	0.050
12	Chrysene	<0.001	<0.001	0.048	96	0.050
13	Benzo(b)fluoranthene	<0.001	<0.001	0.038	76	0.050
14	Benzo(k)fluoranthene	<0.001	<0.001	0.044	88	0.050
15	Benzo(a)pyrene	<0.0007	<0.0007	0.045	90	0.050
16	Indeno(1,2,3-cd)pyrene	<0.002	<0.002	0.042	84	0.050
17	Dibenzo(a,h,)anthracene	<0.002	<0.002	0.049	98	0.050
18	Benzo(g,h,i)perylene	<0.002	<0.002	0.050	100	0.050

% Recovery

19 Nitrobenzene-d5	53	
20 2-Fluorobiphenyl	69	
21 Terphenyl-d14	88	

METHODS: EPA 625

PLEASE NOTE: Liability and Damages. Cardinel's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates described and out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** 

Receiving Date: 12/17/97

FAX TO:

Analysis Date: 12/19/97

Reporting Date: 12/19/97

Sampling Date: 12/17/97

Project Number: NOT GIVEN

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Project Name: ARCO MONITOR WELLS
Project Location: SOUTH JUSTIS IDA WIMBERLY

Sample Received By: GP

Lab Number: H3384-3 Sample ID: MW-#3 Analyzed By: BC

POLYNUCLEAR AROMATIC

HYDROCARBONS - 625 (mg/L)		Sample Result	Method			True Value	
		H3384-3	Blank	QC	% Recov.	QC	
1	Naphthalene	<0.001	<0.001	0.039	78	0.050	
2	2-Methylnaphthalene	<0.002	<0.002	0.043	86	0.050	
3	1-Methylnaphthalene	<0.002	<0.002	NR	NR	NR_	
4	Acenaphthylene	<0.001	<0.001	0.040	80	0.050	
5	Acenaphthene	<0.001	<0.001	0.042	84	0.050	
6	Fluorene	<0.001	<0.001	0.048	96	0.050	
7	Phenanthrene .	<0.001	<0.001	0.053	106	0.050	
8	Anthracene	<0.001	<0.001	0.049	98	0.050	
9	Fluoranthene	<0.001	<0.001	0.049	98	0.050	
10	Pyrene	<0.001	<0.001	0.048	96	0.050	
11	Benzo(a)anthracene	<0.001	<0.001	0.046	92	0.050	
12	Chrysene	<0.001	<0.001	0.048	96	0.050	
13	Benzo(b)fluoranthene	<0.001	<0.001	0.038	76	0.050	
14	Benzo(k)fluoranthene	<0.001	<0.001	0.044	88	0.050	
15	Benzo(a)pyrene	<0.0007	<0.0007	0.045	90	0.050	
16	Indeno(1,2,3-cd)pyrene	<0.002	<0.002	0.042	84	0.050	
17	Dibenzo(a,h,)anthracene	<0.002	<0.002	0.049	98	0.050	
18	Benzo(g,h,i)perylene	<0.002	<0.002	0.050	100	0.050	

% Recovery

	· · · · · · · · · · · · · · · · · · ·	
19 Nitrobenzene-d5	43	
20 2-Fluorobiphenyl	76	
21 Terphenyl-d14	89	

METHODS: EPA 625

Burgess J. A) Cooke Ph. D.

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103 HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97 Reporting Date: 12/24/97

Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOLITH, ILISTIS IDA WI

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP Analyzed By: AH/GP

### **RCRA METALS**

LAB NUMBER SAMPLE ID	As	Ag	Ba	Cd	Cr	Pb	Hg	Se
	ppm							
ANALYSIS DATE:	12/22/97	12/22/97	12/23/97	12/22/97	12/22/97	12/19/97	12/23/97	12/22/97
H3384-1 MW-#1	<0.1	<0.1	<1	<0.01	<0.05	<0.05	<0.02	<0.1
H3384-2 MW-#2	<0.1	<0.1	<1	<0.01	<0.05	<0.05	<0.02	<0.1
H3384-3 MW-#3	<0.1	<0.1	<1	<0.01	<0.05	<0.05	<0.02	<0.1
Quality Control	0.049	5.01	20.2	0.992	0.99	4.97	0.0093	0.091
True Value QC	0.050	5.00	20.0	1.000	1.00	5.00	0.0100	0.100
% Recovery	98	100	101	99	99	99	93	91
Relative Percent Difference	3.7	0.1	1.7	0.5	0.4	0.4	3.2	5.4
METHODS: EPA 600/4-79-020	206.2	272.1	208.1	213.1	218.1	239.1	245.1	270.2

Chernist Cools

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 12/17/97 Reporting Date: 12/19/97 Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: AH

		Na	Ca	Mg	K	Conductivity	T-Alkalinity
LAB NUMBE	R SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS D	ATE:	12/18/97	12/18/97	12/18/97	12/18/97	12/18/97	12/18/97
H3384-1	MW-#1	1007	296	112	22.5	6116	100
H3384-2	MW-#2	3700	426	193	90.0	17028	404
H3384-3	MW-#3	4875	629	302	118	23846	316
Quality Cont	rol	NR.	60	53	NR	1445	NR
True Value C		NR	50	50	NR	1413	NR
% Accuracy		NR	120	106	NR	102	NR
Relative Perd	cent Difference	NR	0	0	NR	0.3	NR
METHODS:		SM:	3500-Ca-D	3500-Mg E	8049	120.1	310.1
IVIETTIODO.						L	
INE THOOS.		ci_	SO <sub>4</sub>	CO₃	HCO₃	pH	TDS
					•••	1	
ANALYSIS D	DATE:	CI <sup>-</sup>	SO <sub>4</sub>	CO <sub>3</sub>	HCO₃	pН	TDS
	DATE: MW-#1	CI (mg/L)	SO <sub>4</sub> (mg/L)	CO <sub>3</sub> (mg/L)	HCO <sub>3</sub> (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS D	<del></del>	CI (mg/L) 12/18/97	SO <sub>4</sub> (mg/L) 12/18/97	CO <sub>3</sub> (mg/L) 12/18/97	HCO <sub>3</sub> (mg/L) 12/18/97	pH (s.u.) 12/18/97	TDS (mg/L) 12/19/97
ANALYSIS D	MW-#1	CI (mg/L) 12/18/97 1580	SO <sub>4</sub> (mg/L) 12/18/97 1050	CO <sub>3</sub> (mg/L) 12/18/97	HCO <sub>3</sub> (mg/L) 12/18/97 122	pH (s.u.) 12/18/97 5.58	TDS (mg/L) 12/19/97 3480
ANALYSIS D H3384-1 H3384-2 H3384-3	MW-#1 MW-#2 MW-#3	CI (mg/L) 12/18/97 1580 6200	SO <sub>4</sub> (mg/L) 12/18/97 1050 1160	CO <sub>3</sub> (mg/L) 12/18/97 0	HCO <sub>3</sub> (mg/L) 12/18/97 122 404	pH (s.u.) 12/18/97 5.58 7.84	TDS (mg/L) 12/19/97 3480 10490
ANALYSIS D H3384-1 H3384-2	MW-#1 MW-#2 MW-#3	CI (mg/L) 12/18/97 1580 6200 8500	SO <sub>4</sub> (mg/L) 12/18/97 1050 1160 1280	CO <sub>3</sub> (mg/L) 12/18/97 0 0	HCO <sub>3</sub> (mg/L) 12/18/97 122 404 316	pH (s.u.) 12/18/97 5.58 7.84 7.77	TDS (mg/L) 12/19/97 3480 10490 15300
ANALYSIS D H3384-1 H3384-2 H3384-3 Quality Cont	MW-#1 MW-#2 MW-#3	CI (mg/L) 12/18/97 1580 6200 8500	SO <sub>4</sub> (mg/L) 12/18/97 1050 1160 1280	CO <sub>3</sub> (mg/L) 12/18/97 0 0 0	HCO <sub>3</sub> (mg/L) 12/18/97 122 404 316	pH (s.u.) 12/18/97 5.58 7.84 7.77	TDS (mg/L) 12/19/97 3480 10490 15300
ANALYSIS D H3384-1 H3384-2 H3384-3 Quality Contrue Value C % Accuracy	MW-#1 MW-#2 MW-#3	CI (mg/L) 12/18/97 1580 6200 8500 496 500	SO <sub>4</sub> (mg/L) 12/18/97 1050 1160 1280 101	CO <sub>3</sub> (mg/L) 12/18/97 0 0 0 NR	HCO <sub>3</sub> (mg/L) 12/18/97 122 404 316 NR	pH (s.u.) 12/18/97 5.58 7.84 7.77 6.99 7.00	TDS (mg/L) 12/19/97 3480 10490 15300 NR NR

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ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97
Reporting Date: 12/24/97

Reporting Date: 12/24/97
Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP Analyzed By: AH/GP

#### **TOTAL METALS**

LAB NUMBER SAMPLE ID	Al	Cu	Fe	Mn	. Ni	Zn
	(mg/L)	(rng/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
ANALYSIS DATE:	12/23/97	12/19/97	12/19/97	12/19/97	12/19/97	12/19/97
H3384-1 MW-#1	<0.2	<0.1	0.388	0.345	<0.2	<0.2
H3384-2 MW-#2	<0.2	<0.1	<0.2	0.343	<0.2	<0.2
H3384-3 MW-#3	0.300	<0.1	<0.2	0.440	<0.2	<0.2
Quality Control	19.8	3.992	1.006	1.998	1.995	0.499
True Value QC	20.0	4.000	1.000	2.000	2.000	0.500
% Ассигасу	99	100	101	100	100	100
Relative Percent Difference	0.5	0.5	0.6	0.4	0.5	0.6
METHODS: EPA 600/4-78-020	202.1	220.1	236.1	243.1	249.1	289.1

Chemist HACools

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103 HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/24/97 Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS
Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP Analyzed By: AH/GP

	В	Co	Mo
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)

ANALYSIS DATE	12/23/97	12/23/97	12/23/97
H3384-1 MW-#1	<0.75	<0.05	<0.2
H3384-2 MW-#2	<0.75	<0.05	<0.2
H3384-3 MW-#3	<0.75	<0.05	<0.2
Quality Control	1.0	5.00	4.90
True Value QC	1.0	5.00	5.00
% Accuracy	100	100	98
Relative Percent Difference	1.7	0.1	0

METHODS: EPA 600/4-91-010, 212.1 219.1 246.1

Chemist JA Cook

Date

CHAIN-OF-CUSTODY RECORD AND ANALYSIS REQUEST  ANALYSIS REQUEST	BTEX 8020/5030  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Wetals Ag As Ba Cd Cl PD Hg Se  TOLP Wetals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se  TOLP Metals Ag As Ba Cd Cl PD Hg Se	Y BRS
Safety & Environmental Solutions, Inc. 703 E. Clinton, Suite 103, Hobbs, New Mexico 88240 (505)397-0510 Fried Manager: Fried M	Project #:  Project #:  Project Warm & Address:  Project Name:  ACO NON: FO Ke / Sampler Stensible:  Sampler Manne:  MATRIX  METHOD  ONLY  ACOUNTY  ACOU	Thina:  Thina:



# **Safety & Environmental**

Solutions, Inc.

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Environmental Bureau
Oil Conservation Division

# ARCO PERMIAN South Justis Unit F-230

Amended Work Plan
Investigation of Possible Groundwater Impact
Lea County, New Mexico

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

# **TABLE OF CONTENTS**

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Background	<u>1</u>
Method	<u>1</u>
Monitoring Parameters	<u>2</u>
Maps and Figures	<u>2</u>

### Purpose

The purpose of this Amended Work Plan is to propose a scope of work to further delineate the extent of horizontal contamination from the old pit site and systematically confirm or deny possible groundwater contamination at the South Justis Unit F-230 in Unit C of Section 25 Township 25S Range 37E in Lea County, New Mexico. This plan will also make provisions for the accurate determination of the size and location of any plume of contamination found in the groundwater.

### **Background**

In December of 1997, Safety and Environmental Solutions, Inc. contracted the services of Eades Drilling for the installation of three monitor wells. The three monitor wells were sampled and found to have elevated levels of Chlorides and Total Dissolved Solids as noted below: (See Analytical Results)

Monitor Well	TDS Results		
#1	3,480ppm		
#2	10,490ppm		
#3	15,300ppm		

Monitor Well	Chlorides Results
#1	1,580ppm
#2	6,200ppm
#3	8,500ppm

#### Method

Arco Permian proposes to drill another borehole to determine the extent of the pit area in a southeasterly direction from the current monitor wells. Northwest to southeast is the prevailing direction of the fluid flow of the water table.

Once the extent of the pit area is determined, an additional four (4) monitor wells will be drilled to determine the possible extent of groundwater contamination. One well will be installed up gradient of the existing monitor wells and the other wells will be installed down gradient south and southeast of the pit and the existing monitor wells. (See Diagram)

After delineation of the contamination is complete, Arco Permian will submit another work plan which will address the appropriate methods and scope of work for the remediation of any groundwater contamination as well as vadose zone remediation.

The physical description of the monitor well installations is as follows:

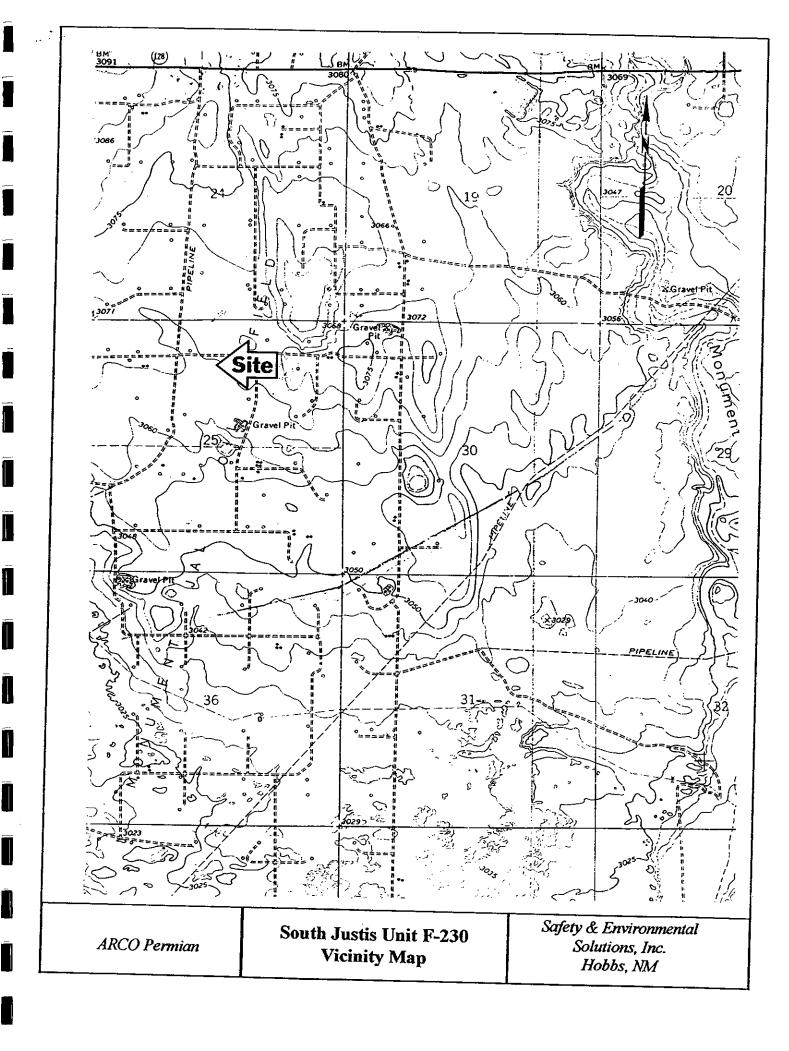
Each well will be drilled to a depth of ten (10) feet below the water table. Split spoon samples will collected at five (10') foot intervals and analyzed for TPH, and BTEX. A driller's log noting sample points and changes in lithology will be kept. The wells will cased with 2" PVC pipe with a minimum of fifteen (15) feet of well screen on the bottom. (Five (5) feet above the water table and ten (10) feet below the water table) Screen will gravel packed to a point 2-3 feet above the screen, with a bentonite plug set above the gravel pack. The remainder of the casing annulus to surface will grouted with cement containing 5% bentonite. Each well will be equipped with a locking well cap. (See monitor well diagram)

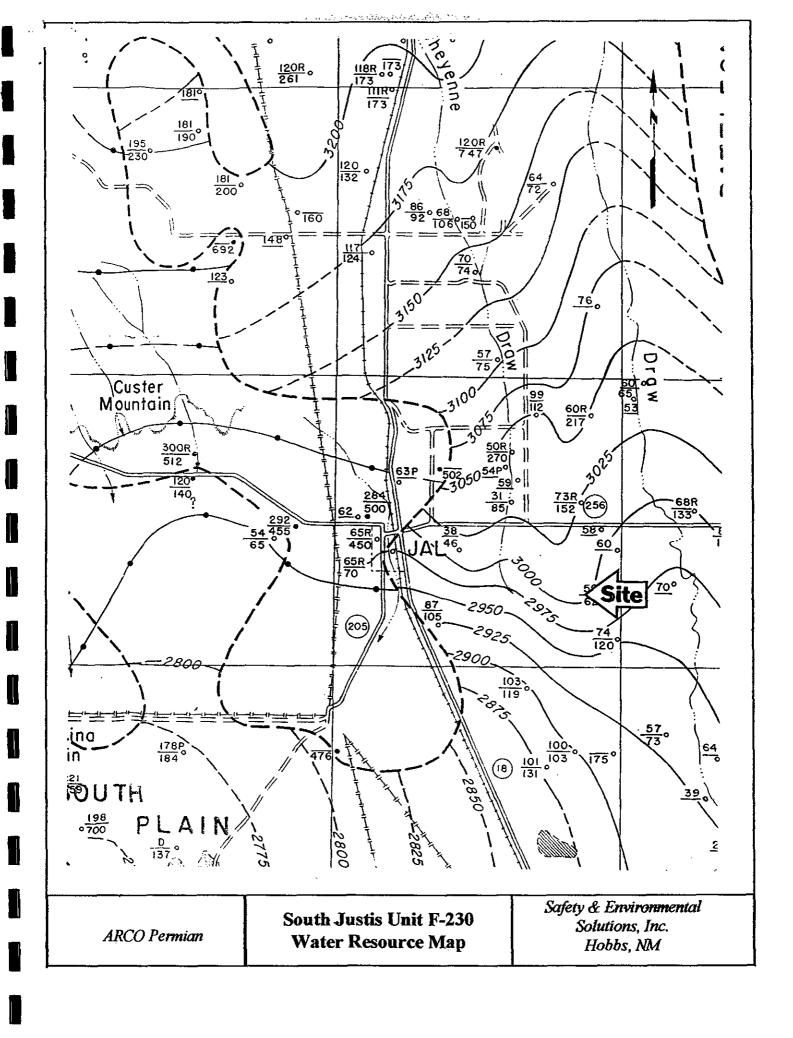
## **Monitoring Parameters**

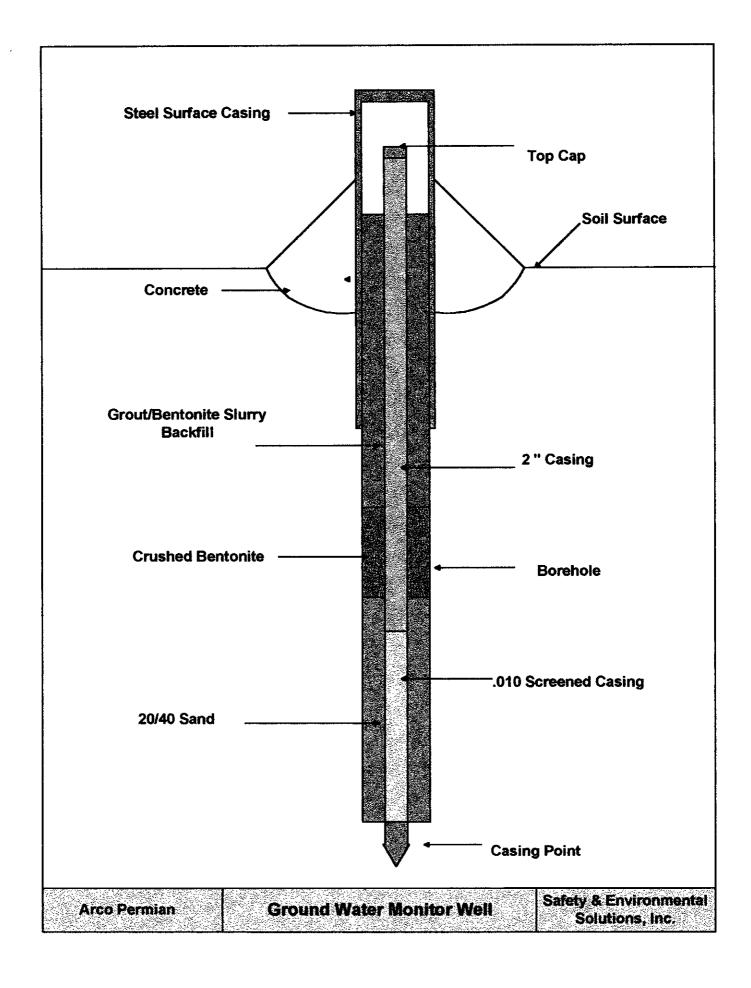
The additional monitor wells will initially be sampled and analyzed for TPH, BTEX, Chlorides, major Cations and Anions, and Total Dissolved Solids with results filed with the OCD Santa Fe and Hobbs District offices.

# Maps and Figures

Vicinity Map
Site Plan
Water Resource Map
Ground Water Monitor Well Plat
Chain of Custody for Samples
Analytical Results







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ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103 HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/19/97

Project Number: NOT GIVEN
Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: GP

ETHYL TOTAL
BENZENE TOLUENE BENZENE XYLENES
LAB NUMBER SAMPLE ID (mg/L) (mg/L) (mg/L) (mg/L)

ANALYSIS DATE		12/18/97	12/18/97	12/18/97	12/18/97
H3384-1	MW-#1	<0.002	<0.002	<0.002	<0.006
H3384-2	MW-#2	<0.002	<0.002	<0.002	<0.006
H3384-3	MW-#3	<0.002	<0.002	<0.002	<0.006
Quality Cont	trol	0.095	0.093	0.094	0.282
True Value	2C	0.100	0.100	0.100	0.300
% Accuracy		94.8	92.8	93.7	93.9
Relative Per	cent Difference	5.4	4.3	4.3	4.0

METHOD: EPA SW 846-8020, 5030, Gas Chromatography

Chemist

Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service, in no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliated Cardinal subsidiarie



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** 

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/23/97

Project Number: NOT GIVEN Project Name: ARCO MONITOR WELLS

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP

Sampling Date: 12/17/97

Project Location: SOUTH JUSTIS IDA WIMBERLY

	CN	F	NO <sub>3</sub>
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)
ANALYSIS DATE	12/22/97	12/18/97	12/18/97
H3384-1 MW-#1	<0.02	1.62	3.75
H3384-2 MW-#2	<0.02	2.13	0.20
H3384-3 MW-#3	<0.02	2.30	0.70
Quality Control	0.105	1.00	5.15
True Value QC	0.100	1.00	5.00
% Accuracy	105	100	103
Relative Percent Difference	4.8	3.0	1.4
METHODS: EPA 600/4-79-020	335.2	340.1	353.2



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/19/97

Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Lab Number: H3384-1 Sample ID: MW-#1 Analysis Date: 12/19/97

Sampling Date: 12/17/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: BC

#### POLYNUCLEAR AROMATIC

HYDROCARBONS - 625 (mg/L)		Sample Result	Method			True Value
		H3384-1	Blank	QC_	% Recov.	QC
1	Naphthalene	< 0.001	< 0.001	0.039	78	0.050
2	2-Methylnaphthalene	<0.002	<0.002	0.043	86	0.050
3	1-Methylnaphthalene	<0.002	<0.002	NR	NR	NR
4	Acenaphthylene	<0.001	<0.001	0.040	80	0.050
5	Acenaphthene	<0.001	<0.001	0.042	84	0.050
6	Fluorene	<0.001	<0.001	0.048	96	0.050
7	Phenanthrene	<0.001	<0.001	0.053	106	0.050
8	Anthracene	<0.001	<0.001	0.049	98	0.050
9	Fluoranthene	<0.001	<0.001	0.049	98	0.050
10	Pyrene	<0.001	<0.001	0.048	96	0.050
11	Benzo(a)anthracene	<0.001	<0.001	0.046	92	0.050
12	Chrysene	<0.001	<0.001	0.048	96	0.050
13	Benzo(b)fluoranthene	<0.001	<0.001	0.038	76	0.050
14	Benzo(k)fluoranthene	<0.001	<0.001	0.044	88	0.050
15	Benzo(a)pyrene	<0.0007	<0.0007	0.045	90	0.050
16	Indeno(1,2,3-cd)pyrene	<0.002	<0.002	0.042	84	0.050
17	Dibenzo(a,h,)anthracene	<0.002	<0.002	0.049	98	0.050
18	Benzo(g,h,i)perylene	<0.002	<0.002	0.050	100	0.050

#### % Recovery

19 Nitrobenzene-d5	58
20 2-Fluorobiphenyl	79
21 Terphenyl-d14	102

METHODS: EPA 625

Burgess J. A. Cooke, Ph. D.

Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliated 1336443 (2014) out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** 

Receiving Date: 12/17/97 Reporting Date: 12/19/97

FAX TO:

Analysis Date: 12/19/97

Sampling Date: 12/17/97

Project Number: NOT GIVEN

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Project Name: ARCO MONITOR WELLS

Sample Received By: GP

Project Location: SOUTH JUSTIS IDA WIMBERLY

Lab Number: H3384-2 Sample ID: MW-#2

Analyzed By: BC

**POLYNUCLEAR AROMATIC** 

HYDROCARBONS - 625 (mg/L)	Sample Result	Method			True Value
	H3384-2	Blank	QC	% Recov.	QC
1 Naphthalene	<0.001	<0.001	0.039	78	0.050
2 2-Methylnaphthalene	< 0.002	<0.002	0.043	86	0.050
3 1-Methylnaphthalene	<0.002	<0.002	NR	NR	NR
4 Acenaphthylene	<0.001	<0.001	0.040	80	0.050
5 Acenaphthene	<0.001	<0.001	0.042	84	0.050
6 Fluorene	<0.001	<0.001	0.048	96	0.050
7 Phenanthrene	<0.001	<0.001	0.053	106	0.050
8 Anthracene	<0.001	<0.001	0.049	98	0.050
9 Fluoranthene	<0.001	<0.001	0.049	98	0.050
10 Pyrene	<0.001	<0.001	0.048	96	0.050
11 Benzo(a)anthracene	<0.001	<0.001	0.046	92	0.050
12 Chrysene	<0.001	<0.001	0.048	96	0.050
13 Benzo(b)fluoranthene	<0.001	<0.001	0.038	76	0.050
14 Benzo(k)fluoranthene	<0.001	<0.001	0.044	88	0.050
15 Benzo(a)pyrene	<0.0007	<0.0007	0.045	90	0.050
16 Indeno(1,2,3-cd)pyrene	<0.002	<0.002	0.042	84	0.050
17 Dibenzo(a,h,)anthracene	<0.002	<0.002	0.049	98	0.050
18 Benzo(g,h,i)perylene	<0.002	<0.002	0.050	100	0.050

% Recovery

19 Nitrobenzene-d5	. 53
20 2-Fluorobiphenyl	69
21 Terphenyl-d14	88

**METHODS: EPA 625** 

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no great shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates of selections are shall be decreased alless of the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** 

FAX TO:

Receiving Date: 12/17/97 Reporting Date: 12/19/97

Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Lab Number: H3384-3 Sample ID: MW-#3 Analysis Date: 12/19/97 Sampling Date: 12/17/97

Sample Type: GROUNDWATER

Sample Condition: COOL & INTACT Sample Received By: GP

Analyzed By: BC

#### POLYNUCLEAR AROMATIC

HYC	ROCARBONS - 625 (mg/L)	Sample Result	Method			True Value
		H3384-3	Blank	QC	% Recov.	QC
1	Naphthalene	<0.001	<0.001	0.039	78	0.050
2	2-Methylnaphthalene	<0.002	<0.002	0.043	86	0.050
3	1-Methylnaphthalene	<0.002	<0.002	NR	NR	NR
4	Acenaphthylene	<0.001	<0.001	0.040	80	0.050
5	Acenaphthene	<0.001	<0.001	0.042	84	0.050
6	Fluorene	<0.001	<0.001	0.048	96	0.050
7	Phenanthrene	<0.001	<0.001	0,053	106	0.050
8	Anthracene	<0.001	<0.001	0.049	98	0.050
9	Fluoranthene	<0.001	<0.001	0.049	98	0.050
10	Pyrene	<0.001	<0.001	0.048	96	0.050
11	Benzo(a)anthracene	<0.001	<0.001	0.046	92	0.050
12	Chrysene .	<0.001	<0.001	0.048	96	0.050
13	Benzo(b)fluoranthene	<0.001	<0.001	0.038	76	0.050
14	Benzo(k)fluoranthene	<0.001	<0.001	0.044	88	0.050
15	Benzo(a)pyrene	<0.0007	<0.0007	0.045	90	0.050
16	Indeno(1,2,3-cd)pyrene	<0.002	<0.002	0.042	84	0.050
17	Dibenzo(a,h,)anthracene	<0.002	<0.002	0.049	98	0.050
18	Benzo(g,h,i)perylene	<0.002	<0.002	0.050	100	0.050

% Recovery

19 Nitrobenzene-d5	. 43
20 2-Fluorobiphenyl	76
21 Terphenyl-d14	89

METHODS: EPA 625

Burgess J. A) Cooke Ph. D.

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 12/17/97 Reporting Date: 12/24/97 Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP Analyzed By: AH/GP

#### **RCRA METALS**

LAB NUMBER SAMPLE ID	As	Ag	Ba	Cd	Cr	Pb	Hg	Se
•	ppm							
ANALYSIS DATE:	12/22/97	12/22/97	12/23/97	12/22/97	12/22/97	12/19/97	12/23/97	12/22/97
H3384-1 MW-#1	<0.1	<0.1	<1	<0.01	<0.05	<0.05	<0.02	<0.1
H3384-2 MW-#2	<0.1	<0.1	<1	<0.01	<0.05	<0.05	<0.02	<0.1
H3384-3 MW-#3	<0.1	<0.1	<1	<0.01	<0.05	<0.05	<0.02	<0.1
Quality Control	0.049	5.01	20.2	0.992	0.99	4.97	0.0093	0.091
True Value QC	0.050	5.00	20.0	1.000	1.00	5.00	0.0100	0.100
% Recovery	98	100	101	99	99	99	93	91
Relative Percent Difference	3.7	0.1	1.7	0.5	0.4	0.4	3.2	5.4
METHODS: EPA 600/4-79-020	205.2	272.1	208.1	213.1	218.1	239.1	245.1	270.2

Chemist Cools

Date

PLEASE NOTE: Liability and Damages. Cardinal's kiability and client's exclusive remedy for any claim arising, whether based in contract or ton, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waked unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, toss of use, or loss of profits incurred by client, its subsidiaries, affiliates 13384Nbb/KuBing out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/19/97

Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: AH

		Na	Ca	Mg	к	Conductivity	T-Alkalinity
LAB NUMBER	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)		(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DAT		12/18/97	12/18/97	12/18/97	12/18/97		12/18/97
H3384-1	MW-#1	1007	296	112	22.5		100
H3384-2	MW-#2	3700	426	193	90.0		404
H3384-3	MW-#3	4875	629	302	118		316
Quality Control		NR	60	53	NR	1445	NR
True Value QC		NR	50	50	NR		NR
% Accuracy	· · · · · · · · · · · · · · · · · · ·	· NR	120	106	NR	102	NR
Relative Percer	t Difference	NR	0	0	NR	0.3	NR
METHODS:		SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1
		o	-00	20		_11	TDO
		CI	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	•	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)		(mg/L)
ANALYSIS DAT		12/18/97	12/18/97	12/18/97	12/18/97	<del></del>	12/19/97
H3384-1	MW-#1	1580	1050	0	122	5.58	3480
H3384-2	MW-#2	6200	1160	0	404	7.84	10490
H3384-3	MW-#3	8500	1280	0	316	7.77	15300
Our life Control		400	404			6.00	
Quality Control	·	496	101	NR	NR		NR
True Value QC		500	100	NR	NR		NR
% Accuracy		99.2	101	NR	NR		NRNR
Relative Percen	t Difference	0.8	0	NR	NR	0	0.3
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1	160.1
		0141-1000-01-01	U, U. T	0.0.1	0,0.1	1 .00.1	

Chemist Hold Andre

12/19/47

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/24/97 Project Number: NOT GIVEN

Project Name: ARCO MONITOR WELLS

Project Location: SOUTH JUSTIS IDA WIMBERLY

Sampling Date: 12/17/97

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP Analyzed By: AH/GP

#### **TOTAL METALS**

LAB NUMBER SAMPLE ID	Al	Cu	Fe	Mn	. Ni	Zn
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
ANALYSIS DATE:	12/23/97	12/19/97	12/19/97	12/19/97	12/19/97	12/19/97
H3384-1 MW-#1	<0.2	<0.1	0.388	0.345	<0.2	<0.2
H3384-2 MW-#2	<0.2	<0.1	<0.2	0.343	<0.2	<0.2
H3384-3 MW-#3	0.300	<0.1	<0.2	0.440	<0.2	<0.2
Quality Control	19.8	3.992	1.006	1.998	1.995	0.499
True Value QC	20.0	4.000	1.000	2.000	2.000	0.500
% Accuracy	99	100	101	100	100	100
Relative Percent Difference	0.5	0.5	0.6	0.4	0.5	0.6
METHODS: EPA 600/4-78-020	202.1	220,1	236.1	243.1	249.1	289.1

Chemist Chemist

Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliated to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

**HOBBS. NM 88240** 

FAX TO:

Receiving Date: 12/17/97

Reporting Date: 12/24/97

**Project Number: NOT GIVEN** 

**Project Name: ARCO MONITOR WELLS** 

Project Location: SOUTH JUSTIS IDA WIMBERLY

METHODS: EPA 600/4-91-010,

Sampling Date: 12/17/97

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: AH/GP

	В	Co	Mo	
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	
ANALYSIS DATE	12/23/97	12/23/97	12/23/97	
H3384-1 MW-#1	<0.75	<0.05	<0.2	
H3384-2 MW-#2	<0.75	<0.05	<0.2	
H3384-3 MW-#3	<0.75	<0.05	<0.2	
Quality Control	1.0	5.00	4.90	
True Value QC	1.0	5.00	5.00	
% Accuracy	100	100	98	
Relative Percent Difference	1.7	0.1	0	

212.1

219.1

246.1



# Safety & Environmental

Solutions, Inc.

RECEIVED

FEB 0 8 1999

Arco Permian South Justis Unit F-230

**ENVIRONMENTAL BUREAU** OIL CONSERVATION DIVISION

# **Installation of Additional Monitor Wells** and Investigation Results

Lea County, New Mexico

Error Repor

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

# TABLE OF CONTENTS

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Work Performed	2
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Well # 7	5
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Conclusions	6
Maps and Figures	6

# I. Background

In October 1997 Arco Permian secured the services of Safety and Environmental Solutions, Inc. to determine the vertical and horizontal extent of the abandoned pit site on the specified location. A work plan was formulated to drill three monitor wells around the pit area for definition of the extent of the pit area and to provide initial indications of the extent of any groundwater contamination. Upon completion of these wells, it was determined that the water showed elevated Chlorides and Total Dissolved Solids (TDS). Further delineation was required to determine the extent of elevated Chlorides and TDS levels. To this end, a new Work Plan was formulated to drill up to four additional monitor wells.

## II. Work Performed

Four additional monitor wells were drilled at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, NM according to the Approved Work Plan (GW-202 Pit Closure). SES contracted Atkins Engineering of Roswell, NM to drill these wells on August 7 to August 12, 1998. Cardinal Laboratories of Hobbs, NM was also contracted to perform the laboratory analytical testing required for this project.

SES sampled the first two additional monitor well hole soils (MW #4 & MW #5) at intervals of ten (10') feet using SOPs found in Environmental Protection Agency, 1984, Characterization of Hazardous Waste Site - A Methods Manual: Vol II. Field testing was performed on these samples for TPH, BTEX and Chlorides. The composite soil samples along with Chain of Custody were then delivered to the laboratory for confirmatory testing. The composite samples were analyzed for Total Petroleum Hydrocarbons (EPA Method 418.1), BTEX (EPA Method 8020) and Chlorides (EPA Method 600/4-79-020). The results of the BTEX, TPH and Chlorides were compared to the regulatory limits found in "Guidelines for Remediation of Leaks, Spills and Releases" New Mexico Oil Conservation Division - August 13, 1993. A summary of the laboratory analysis and correlated test hole data is represented in the following tables:

Well #4

Monitor Well #4 was drilled between Monitor Wells #2 and #3, upgradient of MW #3 on the south berm of the pit area with to a total depth of 80'.

(D/Depth	Lithology	124	CL	Benzene	Toluene	Ethyl	Total
4-1	Caliche	*10	223	<0.002	<0.002	Benzene sti (102	Xylenes ≤0.006
107							
4-2 20'	Sandy Caliche	<b>-510</b>	490	<0.002	<0.002	<0.002	<0.006
4.9	Sand	×10	1462	<0.002	<0.002	≠0.0H2	<0.006
30" 4-4 30"	Red Sand	<10 ⋅	1337	<b>~0.002</b> "	<0.902	<0.002	<0.006
4-5 50*	Silty Sand W/gravel	- <b>≺10</b>	1257	₹0.002	<0.002	<0.00Z	<0.006
4-6 60*	Silty Clayey Sand	44.7	1195	<0.002	<0.002	-9,002	<0.006
47 70	Sandy Gravel	<b>&lt;10</b>	1498	<0.002	<0.002	<0.002	<0.006
4-8 80*	Red Clay	<b>\$10</b>	2283	≓0.002	⊴0,002	-<0,002	<0.006
TD	Ground water	\$1.0°	9641	≤0.033°	.<0.002	≤0.007	<0,006

The groundwater sampled at total depth (80') on Monitor Well #4, in addition to testing as shown above, was tested for Cations, Anions and Total Dissolved Solids (TDS). These results indicated no elevated levels except on Chlorides and TDS. (See Attached Analytical Results)

#### **Well #6**

Monitor Well #6 was drilled southeast of Monitor Wells #3 and #4, approximately 50 feet down-gradient of an existing produced water line, to a total depth of 80'. Testing was performed on the groundwater sampled at total depth (80') only.

ID/Depth Lithology TPH CL TDS Benzene Toktene Eth	yl Total
Benz	ene Xylenes
6-1 TD Ground <1.0 29600 58260 0.044 0.004 <0.0 80 water	

#### Well #7

Monitor Well #7 was drilled southwest of Monitor Wells #6 to a total depth of 75°. Testing was performed on the groundwater sampled at total depth (75°) only.

ID/Depth Lithol	y TPH CL TDS Benzene Toluene	Ethyl Total Benzene Xylenes
7-1 TD Grou 75: water	48.7 5015 13496 0.013 0.002	

#### III. Monitor Well Testing

Initial water sampling from each of the four wells was performed on August 25, 1998 according to SW- 846 methods and transported under Chain of Custody to the laboratory for analysis. The water samples were analyzed for BTEX (EPA Method 8020, 5030) as well as NMWQAC testing (Methods 625, 600/4-79-020, -206.2, -272.1,-213.1,-208.1, -218.1,-239.1,-245.1,-270.2, 600/4-78-020,-202.1,-220.1,-236.1,-243.1,-249.1,-289.1, 600/4-91-010,-212.1,-219.1,-246.1, SM4500-Cl-B, 375.4, 310.1, 150.1, 160.1, 120.1, 8049, 3500-Mg E, SM3500-Ca-D). (See Analytical Reports attached)

On August 25, 1998, the groundwater in all seven monitor wells were sampled again according to SW - 846 methods and transported under Chain of Custody to the laboratory for analysis. The water was analyzed for TPH, BTEX and major cations, anions, and TDS. The results indicated high levels of Chlorides and TDS in all wells. Monitor well # 4 exhibited small amounts of Benzene and Ethyl Benzene and monitor well # 7 exhibited a small amount of Benzene. The TPH in all wells was very low.

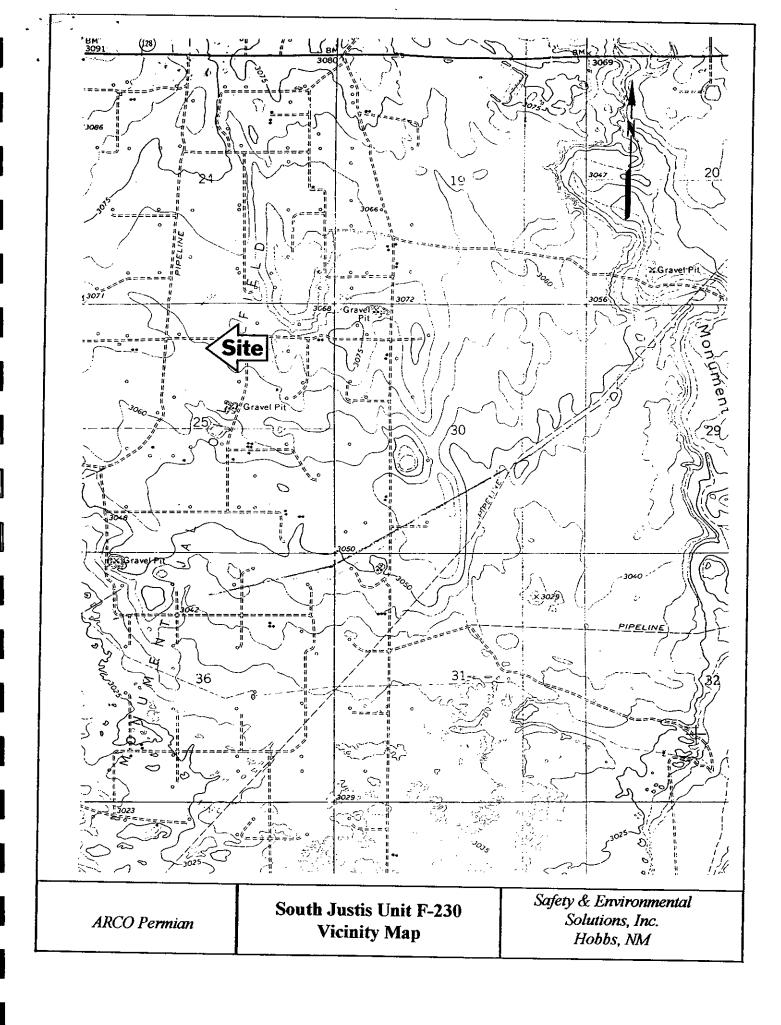
Monitor well # 6 exhibits extremely high levels of Chlorides and TDS. These levels are 5.8 and 6.5 times higher than monitor well # 3 which is only 55' upgradient. The uncharacteristically high levels of Chlorides and TDS may indicate another source of contamination other than the subject site. There is a saltwater disposal line that is located between monitor well #3 and monitor well #6. (See Analysis Results - August 25, 1998).

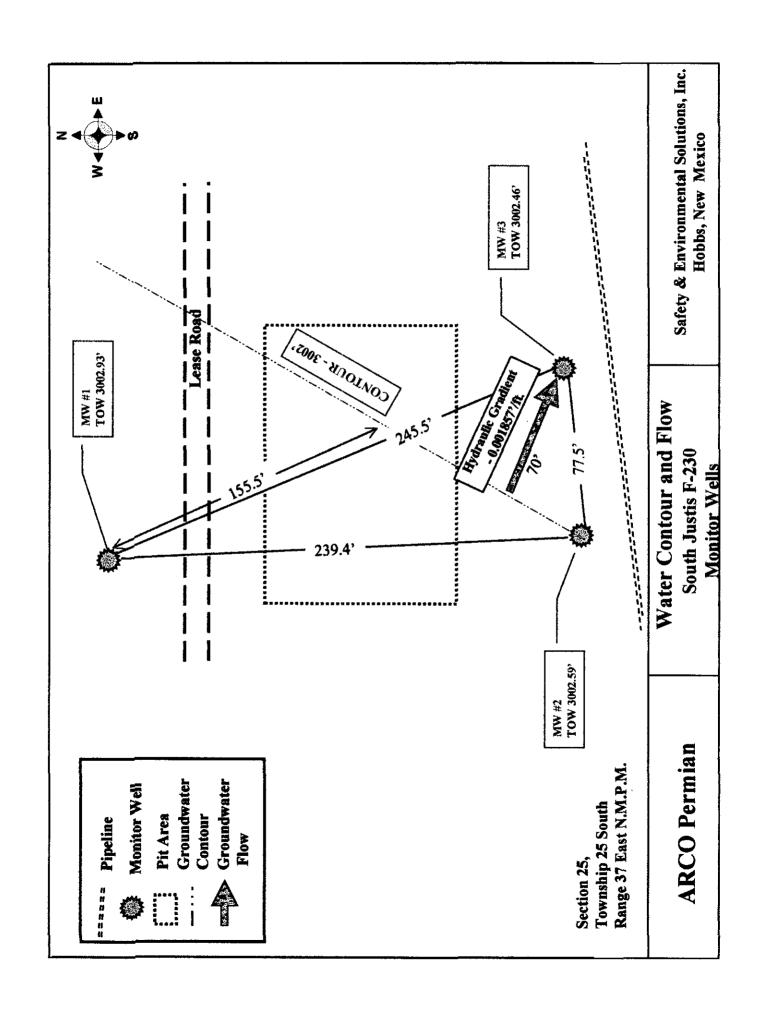
#### IV. Conclusions

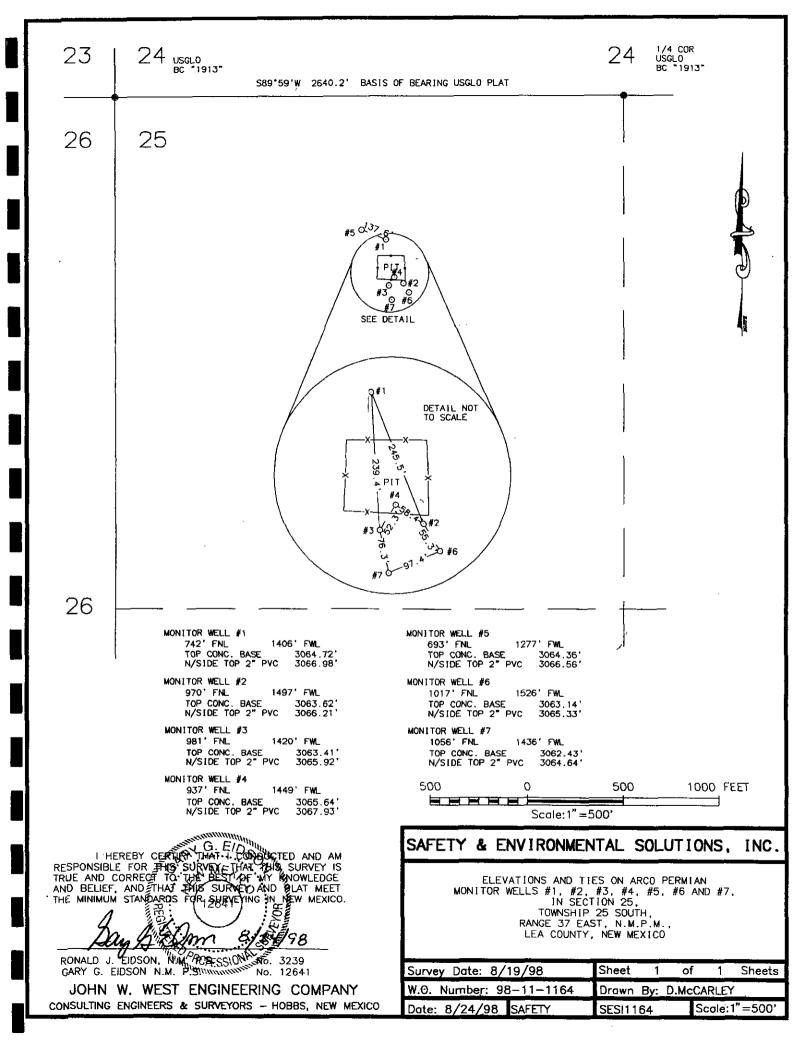
The gradient of the water table is established to be relatively flat but sloping slightly from the Northwest to the Southeast. The entire group of monitor well exhibits high levels of Chlorides and TDS indicates the water in the whole area is not of very high quality. The horizontal extent of the contamination plume that results from the subject pit area appears to extent downgradient to monitor wells # 6 and #7. However, the extremely high levels of contaminants in well # 6 appears to indicate an additional source of contamination between well # 3 and well #6. It is our opinion that the completion of this phase of the plume investigation has satisfactorily delineated the plume caused by the subject pit.

# V. Maps and Figures

Vicinity Map
Water Contour and Flow Plan
Survey Plat
Driller's Log
Analysis Results - August 25, 1998
Chain of Custody for Samples
Analytical Results







Atkins Engineering Associates, Inc. P.O. Box 3156 LOG OF BORING South Justice FT 30 MW #4 Roswell, New Mexico 88202 (Page 1 of 2) ARCO Oil Co. : 5 miles E. of Jal Date : 8-7-98/8-10-98 Site Location Jal. New Mexico **Drill Start** : Hollow Stem : 11:45 A.M. 8-7-98 Auger Type : 10:00 A.M. 8-10-98 : Mort Bates Drill End Logged By Contact: Mr. Bob Allen **Boring Location** : S. Bank of Pit Job #98280.20 Well: MW #4 Elev.: Depth USCS DESCRIPTION in 4" x 4" x 5' Metal Well Cover feet 0 Silty Clay w/Caliche, Tan, Loose, Dry CL Caliche, Tan, Firm, Dry 1 Sandy Caliche, Tan, Firm, Dry 2 Sand, Tan, Soft, Dry Grout 2" Sch. 40 PVC Casing 25 SP 30 3 Sand, Red, Firm, Dry 35 SP 40 4 Silty Sandy Clay, Red, Soft, Dry CL Silty Sand w/small Gravel, Reddish-Tan, Stiff, Damp

Atkins Engineering Associates, Inc. P.O. Box 3156 LOG OF BORING South Justice FT 30 MW #4 Roswell, New Mexico 88202 (Page 2 of 2) ARCO Oil Co. : 5 miles E. of Jal Date : 8-7-98/8-10-98 Site Location Jal, New Mexico Drill Start : 11:45 A.M. 8-7-98 Auger Type : Hollow Stem Drill End : 10:00 A.M. 8-10-98 Logged By : Mort Bates Contact: Mr. Bob Allen : S. Bank of Pit **Boring Location** Job #98280.20 Well: MW #4 Elev.: Depth USCS **DESCRIPTION** in feet 45 SM 50 5 Grout Silty Clayey Sand w/Gravel, Tan, Loose, damp 55 2' Bentonite Seal SM 6 65 Cemented Sandy Gravel, Tan, Firm, Wet to Saturated 8/16" Sand Pack 7 2" .020 Sch. 40 PVC Screen GP 75 80 8 TD = 80 ft. Below 80' - Clay, Red, Firm, Saturated 85 90

Atkins Engineering Associates, Inc. P.O. Box 3156 LOG OF BORING South Justice FT 30 MW #5 Roswell, New Mexico 88202 (Page 1 of 2) ARCO Oil Co. Date : 8-11-98 Site Location : 5 miles E. & 2 miles S. of Jal Jal, New Mexico **Drill Start** : 10:15 A.M. : Hollow Stem Auger Type Logged By **Drill End** : 6:00 P.M. : Mort Bates Contact: Mr. Bob Allen : N.W. of Pit, N. of Road **Boring Location** Job #98280.20 Well: MW #5 Elev.: Depth uscs DESCRIPTION in x 4" x 5' Metal Well Cover feet Silty Clay w/Caliche, Tan, Loose, Dry CL Silty Caliche, Tan, Loose, Dry Silty Caliche Clay w/Gravel, Tan, Loose, Dry 15 Caliche, White, Loose, Dry 2 Grout 2" Sch. 40 PVC Casing Silty Clayey Sand, Pink, Loose, Dry 30 3 SC 35 Silty Clayey Sand w/small Caliche, Pink, Loose, Dry sc 40 4 Silty Clayey Sand w/trace of Caliche, Tan, Loose, Dry sc

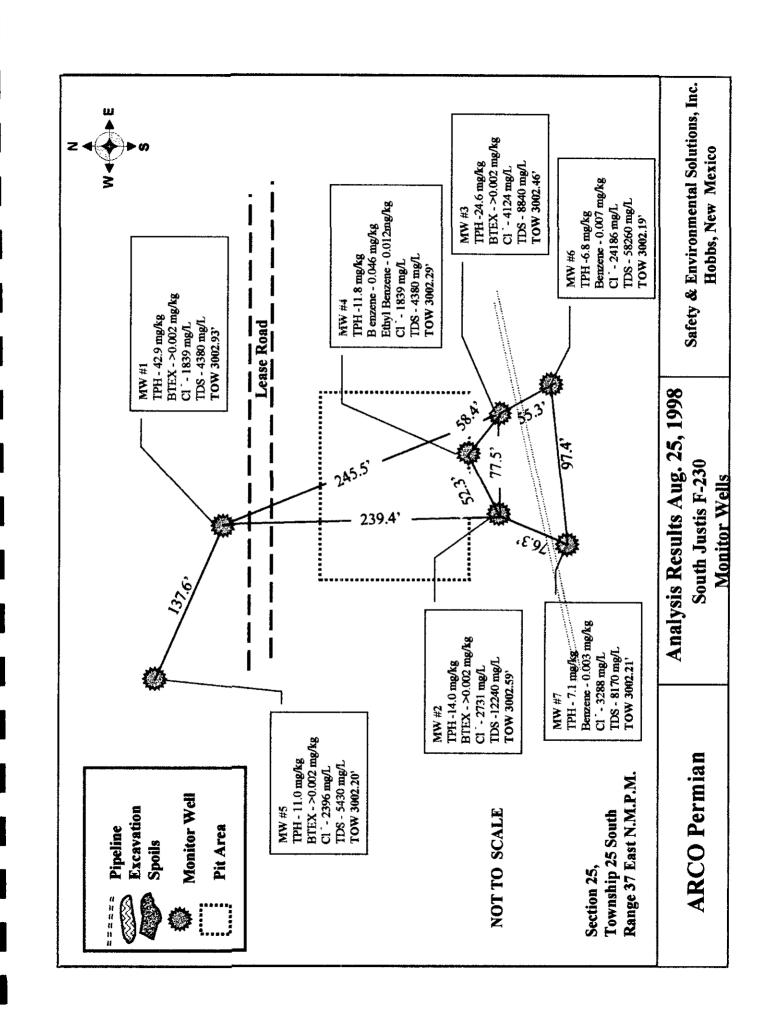
Atkins Engineering Associates, Inc. P.O. Box 3156 LOG OF BORING South Justice FT 30 MW #5 Roswell, New Mexico 88202 (Page 2 of 2) ARCO Oil Co. : 5 miles E. & 2 miles S. of lat : 8-11-98 Site Location Jal, New Mexico Drill Start : 10:15 A.M. Auger Type : Hollow Stem Drill End : 6:00 P.M. : Mort Bates Logged By Contact: Mr. Bob Allen **Boring Location** : N.W. of Pit, N. of Road Job #98280.20 Well: MW #5 Elev.: Depth **DESCRIPTION** feet 45 SC 50 5 Grout Silty Clayey Sand w/Gravel, Tan, Loose, Dry 55 2" Sch. 40 PVC Casing 2 Bentonite Seal SC 6∙ GM Cemented Silty Sandy Gravel, Tan, Firm, Dry Cemented Sandy Gravel, Tan, Hard, Dry GM WL @ 70 ft. 8/16" Sand Pack Sandy Gravel, Tan, Soft, Saturated 2" .020 Sch. 40 PVC Screen 80 8 TD = 80 ft. Below 80 ft. - Clayey Sand, Red, Firm, Saturated 85

Atkins Engineering Associates, Inc. P.O. Box 3156 LOG OF BORING South Justice FT 30 MW #6 Roswell, New Mexico 88202 (Page 1 of 2) ARCO Oil Co. : 5 miles E. & 2 miles S. of al Date : 8-11-98 Site Location Jal, New Mexico **Drill Start** : 7:20 A.M. : Hollow Stem Auger Type Drill End : 1:45 P.M. Logged By : Mort Bates Contact: Mr. Bob Allen **Boring Location** : S.E. of Pit Job #98280.20 Well: MW #6 Elev.: Depth **DESCRIPTION** in x 4" x 5' Metal Well Cover 0 CL Silty Clay w/Caliche, Tan, Loose, Dry Silty Clay, Tan, Loose, Dry CL Caliche w/Silty Clay, Tan, Loose, Dry Caliche Rock, White, Firm, Dry 20 Grout 2" Sch. 40 PVC Casing 25 Silty Clayey Sand w/Caliche, Tan, Firm, Dry 35 SC 40

Atkins Engineering Associates, Inc. LOG OF BORING South Justice FT 30 MW #6 P.O. Box 3156 Roswell, New Mexico 88202 (Page 2 of 2) ARCO Oil Co. Date : 8-11-98 Site Location : 5 miles E. & 2 miles S. of Jal Jal, New Mexico **Drill Start** : 7:20 A.M. : Hollow Stem Auger Type Drill End : 1:45 P.M. Logged By : Mort Bates Contact: Mr. Bob Allen **Boring Location** : S.E. of Pit Job #98280.20 Well: MW #6 Elev.: Depth DESCRIPTION feet SC Sand, Tan, Loose, Moist SP GM Cemented Gravel w/Sand, Tan, Stiff, Dry Sand w/Gravel, Tan, Soft, Wet Grout SW Gravel w/sand, Tan, Loose, Dry 55 GW 2" Sch. 40 PVC Casing Sand, Reddish-Tan, Loose, Damp 2' Bentonite Seal 60 SP 65 WL @ 70 ft. 70 8/16" Sand Pack Sand, Reddish-Tan, Loose, Saturated SP 2" ,020 Sch. 40 PVC Screen Clay, Red, Stiff, Saturated 75 CL 80 TD = 80 ft. 85 90

Atkins Engineering Associates, Inc. LOG OF BORING South Justice FT 30 MW #7 P.O. Box 3156 Roswell, New Mexico 88202 (Page 1 of 2) ARCO Oil Co. : 5 miles E. & 2 miles S. of Jal : 8-11-98 Date Site Location Jal, New Mexico Drill Start : 1:55 P.M. Auger Type : Hollow Stem Drill End : Mort Bates : 6:45 P.M. Logged By Contact: Mr. Bob Allen : 75 ft. S. of Pit **Boring Location** Job #98280.20 Well: MW #7 Elev.: GRAPHIC Depth nscs DESCRIPTION in 4" x 4" x 5' Metai Well Cover feet 0 Silty Clay w/Caliche, Tan, Loose, Dry CL Caliche, Tan, Loose, Dry 15 -Caliche Rock, White, Hard, Dry 20 Grout Caliche w/Silty Clay, Tan, Loose, Dry 2" Sch. 40 PVC Casing Clayey Sand, Reddish-Tan, Loose, Dry Gravel w/Sand, Tan, Firm, Dry GW Sandy Clay, Tan, Loose, Damp CL Silty Sand, Tan, Loose, Damp Sand w/Gravel, Tan, Loose, Dry SW

Atkins Engineering Associates, Inc. LOG OF BORING South Justice FT 30 MW #7 P.O. Box 3156 Roswell, New Mexico 88202 (Page 2 of 2) ARCO Oil Co. Date : 8-11-98 : 5 miles E. & 2 miles S. of al Site Location Jal, New Mexico Drill Start : 1:55 P.M. : Hollow Stem Auger Type Drill End : 6:45 P.M. : Mort Bates Logged By Contact: Mr. Bob Allen : 75 ft. S. of Pit **Boring Location** Job #98280.20 Well: MW #7 GRAPHIC Elev.: Depth Samples nscs DESCRIPTION feet 45 SW 50 Grout Cemented Sitty Sand, White, Hard, Dry SM Clayey Sand, Tan, Loose, Dry SC 2" Sch. 40 PVC Casing Clayey Sand w/Gravel, Tan, Firm, Dry 2' Bentonite Seal SC Cemented Sand w/Gravel, Hard, Gray, Dry SM 8/16" Sand Pack Sand, Tan, Loose, Saturated 70 2" .020 Sch. 40 PVC Screen SP 75 TD = 75 ft. Below 75 ft. - Clay w/Gravel, Red, Firm, Wet 80 85 90



Atkins Engineering Associates, Inc. P.O. Box 3156 LOG OF BORING South Justice FT 30 MW #4 Roswell, New Mexico 88202 (Page 1 of 2) ARCO Oil Co. : 8-7-98/8-10-98 : 5 miles E. of Jal Site Location Jal. New Mexico Drill Start : 11:45 A.M. 8-7-98 Auger Type : Hollow Stem Drill End : 10:00 A.M. 8-10-98 Logged By : Mort Bates Contact: Mr. Bob Allen **Boring Location** : S. Bank of Pit Job #98280.20 Well: MW #4 Elev.: Samples Depth USCS DESCRIPTION x 4" x 5' Metal Well Cover feet Sifty Clay w/Caliche, Tan, Loose, Dry CL Caliche, Tan, Firm, Dry 1 15 Sandy Caliche, Tan, Firm, Dry 2 Sand, Tan, Soft, Dry Grout 2" Sch. 40 PVC Casing 25 SP 30 3 Sand, Red, Firm, Dry 35 SP 40 4 Silty Sandy Clay, Red, Soft, Dry CL. Silty Sand w/small Gravel, Reddish-Tan, Stiff, Damp

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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101 E	(202)	
X 79603	373-7020	
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wood, A	7001 Fa	
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Sample LD.  Sample	Sample I.D. Rever 343-4380 Advises: 10 BX 1611  Sample I.D. Rever 343-4380 Advises: 10 BX 1611  Sample I.D. Rever 343-4380 Advises: 10 BX 1611  Sample I.D. Rever 343-4380 PRESERV SAUPLING  ROUTHER: Fear #: 505-347-0320  PRESERV SAUPLING  ROUTHER: Rever 505-347-0320  PRESERV SAUPLING  ROUTHER: Rever 505-347-0320  ROUTHER: Rever 505-347-0320  ROUTHER: Rever 655-347-0320  ROUTHER: ROUTHER: REVER 655-347-0320  ROUTHER: ROUTHER: REVER 655-347-0320  ROUTHER: REVER 655-347-0320  ROUTHER: REVER 655-347-0320  ROUTHER: REVER 655-347-0320  ROUTHER: REVER 655-347-0320  ROUTHER: REVER 655-347-0320  ROUTHER: REVER 655-347-0320  ROUTHER: ROUTHER: REVER 655-347-0320  ROUTHER: ROUTHER: REVER 655-347-0320  ROUTHER: ROUTHER: REVER 655-347-0320  ROUTH	Company Name: Project Manager:	Company Name: CEST Protect Manager:						M è	4		3			$\vdash$	-	-	<b>\$</b>  _	ANALYSIS	RECOESI	<u>-</u>	-	-	F
Sample I.D.  Sampl	Company: SESI Address: POBX (61)  Address: POBX (61)  State: Mr Zip: 88240  State: Mr Zip: 88240  Prome #: SUS-397-0380  FER #: 505-397-0380  FOR #: 505-397-0380  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  SLUDGE  ACRUPE OIL  ACR	formus sodo!			1					É	:													
Sample LD. Review 10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Address: POEX 16/11  Address: POEX 16/11  State: An Aloho S. State: An Zip: 48240  Flower S. So - 393-4320  Flower S. So S - 393-	Address: 10	ろ	$\overline{\lambda}$	$\bar{c}$	<b>⟨</b>			ડ	mpa.	ij.	3	27											
Sample LD.  Sample	Address: POBX 1611 State: Albbs State: Alm Zip: 88240 State: Alm Zip: 88240 State: Albors = 505-393-4380 Fear #: 5	工		Zip	4	3	07		¥₩	ž	161	2	12/TIL											
Sample LD. Revised Owner.  Sample LD. Revised Oil   100   10	Chy: Hobbs State: VIn Zip: 88240 Phone #: 505-393-4390 OTHER: PRESERV SAMPLING OTHER: School School School OTHER: School Sampling ACID SCOIL School School School School Sampling School	$\mathcal{C}$	7-0510	3-	43	Š			¥	Jres		5	۱۹۱×											
Sample LD.  Sample	State: A.M. Zip: \$8240  Prome #: \$05-397-0570  Fex#: \$65-397-0320  Fex#: \$65-397-0320  Forupe oil   Prome #: \$05-397-0320  Forupe oil   Pr	Project #:	Project Owner	ن	:				ਠੱ	1	100	15			_					_				-
# CONTAINERS  #	PHONE #: \$05-393-4380  FREX. \$05-393-4380  OTHER: CRUDE OIL SUIDER	Project Name:	55W						Sta	te: /	J.	Zip:	887	40	- 2									
(G)RASE OR (C)OMP.  # CONTAINERS  # CONTAINERS  # CONTAINERS  # CRUDE OIL  CR	Ferth Sale CRUDE OIL CRUDE	Project Location	on: JAL		. *				€	. <b>6</b>	Ň	5-,	397-0	2/0	כל								_	
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Sampler Relinquished: 0 11	AND MAN TO SECULIAR S		Relinquished By:	8	- Company Company	Delivered By: (Circle One)		Sampler - UPS • Eus • Other:

<sup>†</sup> Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.





ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH P.O. BOX 1613 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/12/98 Project Number: NOT GIVEN

Project Name: SJU F230 Project Location: JAL Sampling Date: 08/07/98

Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	CI (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DAT	E:	08/10/98	08/11/98	08/10/98	08/10/98	08/10/98	08/10/98
H3775-1	MW # 4 TD	<10	2283	<0.002	<0.002	<0.002	<0.006
H3775-2	MW # 4 10'	<10	223	<0.002	<0.002	<0.002	<0.006
H3775-3	MW # 4 20'	<10	490	<0.002	<0.002	<0.002	<0.006
H3775-4	MW # 4 30'	<10	1462	<0.002	<0.002	<0.002	<0.006
H3775-5	MW # 4 40'	<10	1337	<0.002	<0.002	<0.002	< 0.006
H3775-6	MW # 4 50'	<10	1257	<0.002	<0.002	<0.002	< 0.006
H3775-7	MW # 4 60'	44.7	1195	<0.002	<0.002	<0.002	<0.006
H3775-8	MW # 4 70'	<10	1498	<0.002	<0.002	<0.002	<0.006
			1 2 3				
Quality Control		269	1209	0.103	0.093	0.098	0.301
True Value QC		273	1319	0.100	0.100	0.100	0.300
% Accuracy		97.4	91.7	103	92.7	98.4	100
Relative Percer	t Difference	6.1	4.4	12.6	5.9	2.5	1.9

METHODS:

TRPHC-EPA 600/4-79-020, 418.1;CI-EPA 600/4-79-020 325.3 BTEX-EPA SW-846-8020

Burgess J. A. Cooke.

Date

H3775-1.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240 (915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

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yees. Al dains including the fos. In no event shall Cardin stast or successors adding on	types. All debraic house for negleptos and any other cause whatecever shall be deemed watered usess made in writing and received by Cardmal within 30 days after completion of the applicable. However that Cardmal be table the highest at consequent and stranges, institution, beliness instructions, as of use, to be of profit in burst for the stranges and an active stranges and active stranges are strained as a stranges and active stranges are strained as a strained active strained and active strained active strained active strained and active strained act	ever shall be gree, include	ng withou	of firstfall	duriese Ion, busin	made in wase into	a griffing a vruptions	nd receiv 1, loss of In its has	use, or t	ardinal with tope of prof	in 30 days its incurre	f by clark	writing and received by Cardinal within 30 days after completion of the applicable implied by a loss of use, or loss of profile incurred to great, it is the action on or the above a large construction and other above a large cases or otherwise.	he applica uries.	ž		06 20 20 20 20 20 20 20 20 20 20 20 20 20	ays past o il costs of	te at the f colectio	30 days past due at the rate of 24% per annun from the original date of involce, and all costs of poderdions, inchading attorney's fees.	4% per and Ang attorn	num from i ays fees.	ngho ett :	inal date o	of Involce,		
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† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH P.O. BOX 1613 **HOBBS, NM 88240** 

FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/13/98 Project Number: NOT GIVEN Project Name: MONITOR WELL #4

Project Location: SOUTH JUSTIS F-230

Sampling Date: 08/10/98 Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: JS

Analyzed By: AH

	Na	Ca	Mg	к	Conductivity	T-Alkalinity
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(m <b>g/</b> L)	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DATE:	08/13/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3776-1 MW #4	5252	480	340	68	18190	360
Quality Control	NR	48.0	52.0	3.05	1402	NR
True Value QC	NR	50.0	50.0	3.00	1413	NR
% Accuracy	NR	96	104	102	99.2	NR
Relative Percent Difference	NR	4.2	3.8	1.6	0.1	NR
METHODS:	SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1
			1.5			
	C[_	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	pH	TDS
	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS DATE:	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3776-1 MW #4	9641	159	0	• 439	6.69	13580
		····		<del></del> -		
Quality Control	1209	48.92	112	221	7.00	NR
True Value QC	1319	50.00	124	259	7.00	NR
% Accuracy	91.7	98	90	85	100	NR
Relative Percent Difference	4.4	- 3.1			0.6	2.3
METHODS:	SM4500-CI-B	375.4	310.1	310.1	150.1	160.1



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

P.O. BOX 1613 HOBBS, NM 88240

FAX TO: (505) 393-4380

Receiving Date: 08/10/98

Reporting Date: 08/13/98

Project Number: NOT GIVEN

Project Name: MONITOR WELL # 4

Project Location: SOUTH JUSTIS F-230

Sampling Date: 08/10/98

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: JS

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS	DATE:	08/10/98	08/10/98	08/10/98	08/10/98	08/10/98
H3776-1	MW #4	<1.0	0.033	<0.002	<0.007	<0.006
	·					
					* .	
				*		
Quality Con	itrol	209	0.103	0.093	0.098	0.301
True Value	QC	200	0.100	0.100	0.100	0.300
% Recovery	y	105	103	92.7	98.4	100
Relative Pe	rcent Difference	1.2	12.6	5.4	2.5	1.4

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

emist

Date

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page of

ARDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603

101 East Marland, Hobbs, NM, 88240 (505) 393-2326 Fax (505) 393-2476 (915) 673-7001 Fax (915) 673-7020

REQUEST ANALYSIS 2 17.00 TIME 050 67.61 - C. なみか 00 SAMPLING PO #: ZID: \* Y DATE X11.X OL THE : ЯЭНТО Company 7000/30 X Address: Phone #: State: Fax# (CID: Attn: CĮĘ. : A3HTO arnde E Men. by not Street S MATRIX 710 7105 **NASTEWATER** 1777Y Project Owner: [ 장기 전 **HEADUNDWATER** A.L.F. # CONTAINERS (G) RAB OR (C)OMP. State() [v Zip: , 09 \_ つ い 105 . ロ ブ (!) جو 0 Sample I.D. つこくた La Mar F. 12/0/2/ 30 HX. 10×3/5 347 3/1 ₹ • 103 ر د د Project Manager: かったか くし e 1 ġ. FOR LAB USE ONLY Project Location: Company Name: 1 ١ LAB 1.D. Project Name: 157 Project #: Address: Phone #: Fax #: CITY:

made in writing and received by Cardnal within 30 days after completion of the applicable loss of use, or loss of profits incurred by client, its subsidiaries halyses. At claims including those for negligance and any other cause whatsoever shall be LEASE NOTE: Lability and Camages. Cardinal's lability and clear's exchanges re-De. In no event shall Candinal be Isible

30 days past due at the rate of 24% per arrunt from the original date of involce, and all posts of colections, including attomay's fees. C No Additional Fax #: CHECKED BY: (Initials) Received By: (Lab St Sample Condition Cool Intact Received By: Date: \$ 10 16 Time; Sampler - UPS - Bus - Other: Delivered Bv. (Circle One) Relinguished By

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH P.O. BOX 1613 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/13/98

Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F230 MONITOR WELL

Project Location: NOT GIVEN

Sampling Date: 08/07/98

Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	Cl (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DAT	E:	08/11/98	08/12/98	08/11/98	08/11/98	08/11/98	08/11/98
H3777-1	MW # 5 10'	<10	71	<0.002	<0.002	<0.002	<0.006
H3777-2	MW # 5 20'	<10	196	<0.002	<0.002	<0.002	<0.006
H3777-3	MW # 5 30'	<10	178	<0.002	< 0.002	<0.002	<0.006
H3777-4	MW # 5 40'	<10	134	<0.002	< 0.002	<0.002	<0.006
H3777-5	MW # 5 50'	<10	98	<0.002	<0.002	<0.002	<0.006
H3777-6	MW # 5 60'	<10	107	<0.002	<0.002	<0.002	<0.006
H3777-7	MVV # 5 70'	<10	285	<0.002	< 0.002	<0.002	< 0.006
H3777-8	MW # 5 80'	<10	874	<0.002	< 0.002	<0.002	< 0.006
			1 1 1 1 1		٠. *		
Quality Control		267	1209	0.094	0.096	0.100	0.308
True Value QC		278	1319	0.100	0.100	0.100	0.300
% Accuracy		97,9	91.7	94.3	95.6	100	103
Relative Percer	nt Difference	6.1	4.4	9.0	3.0	1.8	2.3

METHODS: TRPHC-EPA 600/4-79-020, 418.1;CI-EPA 600/4-79-020 325.3 BTEX-EPA SW-846 8260

Burgess J. A. Cooke Ph. D.

Date

H3777-1.XLS



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH P.O. BOX 1613

HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98

Reporting Date: 08/13/98

Project Number: NOT GIVEN
Project Name: SOUTH JUSTIS F230 MONITOR WELL

Project Location: NOT GIVEN

Sampling Date: 08/07/98

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

					ETHYL	TOTAL
LAB NO.	SAMPLE ID	TPH	BENZENE	TOLUENE	BENZENE	XYLENES
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L).

ANALYSIS DATE:	08/10/98	08/1.0/98	08/10/98	08/10/98	08/10/98
H3777-9 MW # 5	<1.0	<0.002	< 0.002	<0.002	<0.006
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and the second of the second o	·				
Quality Control	209	0.103	0.093	0.098	0.301
True Value QC	200	0.100	0.100	0.100	0.300
% Recovery	105	103	92.7	98.4	100
Relative Percent Difference	1.2	12.6	5.9	2.5	1.5

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW-846 8260

Chemist Cosh

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH P.O. BOX 1613

HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98
Reporting Date: 08/13/98
Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F230 MONITOR WELL

Project Location: NOT GIVEN

Sampling Date: 08/07/98
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: AH

	Na	Ca	Mg	K	Conductivity	T-Alkalinity
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(u mhos/cm)	
ANALYSIS DATE:	08/13/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3777-9 MW #5	850	264	127	19	5740	164
Quality Control	NR	48.0	52.0	3.05	1402	NR
True Value QC	. NR	50.0	50.0	3.00	L	NR NR
% Accuracy	NR	96	104	102	99.2	NR.
Relative Percent Difference	NR	4.2	3.8	1.6		NR.
	l				!	
METHODS:	SM:	3500-Ca-D	3500-Mg E	8049	120.1	.310.1
	CI	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	pН	TDS
	(mg/L.)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS DATE:	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3777-9 MW #5	1950	138	0	` 200	7.14	3790
Quality Control	1209	48.92	112	221	7.00	NR
True Value QC	1319	50.00	124	259	<del></del>	NR NR
% Accuracy	91.7	98	90	85		NR
Relative Percent Difference	4.4	3.1		-	0.6	2.3
METHODS:	SM4500-CI-B	375.4	310.1	310.1	150.1	160.1

Chemist JA Jalasha

Date

0648-045 NOO

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

je4-9239-606

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM. 88240 ARDINAL LABORATORIES, INC.

(505) 393-2326 Fax (505) 393-2476 (915) 873-7001 Fax (915) 673-7020

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LAB I.D.	Sample 1.D.	G)RAB OR (C)OMP.	SABUINDINERS	RETAMONUORE RETEWATER	TIOS	710	STUDGE:	/CID:	7000/30	SABHTO	DATE	, <b>.</b>	501	X31 S	HJI	horion		<u> </u>			· · · · · · · · · · · · · · · · · · ·					<del></del>
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† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

Sampler - UPS - Bus - Other:

CHECKED BY: (Initials)



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 08/11/98
Reporting Date: 08/13/98
Project Number: NOT GIVEN
Project Name: SJU WIMBERLY
Project Location: NOT GIVEN

Sampling Date: 08/11/98
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

LAB NUMBER SAMPLE ID	Cl <sup>-</sup> (mg/L)	TDS (mg/L)	Conductivity (uS/cm)
111111111111111111111111111111111111111		1 22 2 2 2 2	

ANALYSIS DATE	08/11/98	08/12/98	08/11/98
H3780-1 TEST HOLE #1	29600	58260	61900
		T .	
Quality Control	1209	NR	1402
True Value QC	1319	NR	1413
% Accuracy	91.7	NR	99.2
Relative Percent Difference	4.4	2.3	0.1

METHODS: EPA 600/4-79-020 SM4500-CLB 160.1 120.1

Chemist J J Cash

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH 703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO:

Receiving Date: 08/11/98 Reporting Date: 08/13/98

Project Number: NOT GIVEN

Project Name: SJU WIMBERLY Project Location: NOT GIVEN

Sampling Date: 08/11/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: BC

LAB NO.

SAMPLE ID

**TPH** (mg/L)

(mg/L)

BENZENE TOLUENE (mg/L)

ETHYL BENZENE (mg/L)

**TOTAL XYLENES** (mg/L)

ANALYSIS DATE:	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3780-1 TEST HOLE #1	<1.0	0.044	0.004	<0.002	0.009
	<u> </u>			٠.	
· .					
Quality Control	207	0.094	0.096	0.1	0.308
True Value QC	200	0.1	0.1	0.1	0.3
% Recovery	104	94.3	95.6	100	103
Relative Percent Difference	0.1	9	3	1.8	2.3

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Page

101 East Mariand, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476

ARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020

ANALYSIS REQUEST										1707 5017 2017	イメヤー					Turns and Conditions: Herest will be charged on all socourts more than the charged on all socourts more than called or the accepte 30 days pay due at the rate of 24% per arrum from the original die of innote.	,	sult D Yes D No Additional Fax #: It: D Yes D No S:				
	BILL TO PO#	Company:	Attn:	Address:	City:	State: Zip:	Phone #:	Fax #:	PRES. SAMPLING	OTHER: OTHER: OTHER: TIME		+				PLEASE NOTE: Unably and Danagon. Curdinal's liability and clear's evolutive remody for any statim unlang wholes based in contract or tort, shall be limited to be smourt paid by the clear for the state whalesower shall be deemed whole theses made when the written and received by Cardinal within 30 days also conceived or the acceptance of the acceptance of the acceptance.	service, in ne event and Carding be fable for indontal or consequental danages, including without littledon, basives interresting to a consequental danages, including without littledon, basives shart and consequental danages of seasons and the performance of services hereunder by Cardinal, regardless of whether such dalm is based upon any of the above stated reasons or otherwise.	Sampler Relinquished:   Phone Result   Verelinquished:   Fax Result   Verelinquished:   Fax Result   Verelinquished:   Fax Result   Verelinquished:   Fax Result   Verelinquished:   Fax Result   Verelinquished:	3V: (Lab Staff)	10sh	5	(mittals)
		50	88240			mo Permi	いった。これで		MATRIX	(G)RAB OR (C)OMP. # CONTAINERS GROUNDWATER WASTEWATER SOIL OIL SLUDGE	X					salve remedy for any stalm unlaing whether based is second unless made in w	umages, including without limitation, business interest beneunder by Candinal, regardless of whether s	Received By:	パク Received	\ \ \	Sample Condition	/ idealul idoo
i Sect	BANIA.	3 C C C C C L - 1 5	State N Zip:	5 377.0	3-3-43R	Project Owner:	Sadt links (23			Sample I.D.	とれて			,		d Damages. Curdnal's lability and clerif's excha 3 those for negligance and any other dates what	urdral be liable for incidental or consequental daing out of or related to the performance of service	ilshed: Date:	1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1. 1	Time		
Company Name:	Project Manager:	Address: 7/2	City: & Danh	Phone #: 50	Fax# Con	1 🏗	Project Name:	Project Location:	FOR LAB USE ONLY	LAB I.D.	H 3787-1					PLEASE NOTE: Usulty and unelyses. All deline including	service. In no event shall Call affiliates or euccessors afisin	Sarmier Relinqu	Relinquished By:	•	Delivered By: (Circle One)	300

† Cardinal cannot accept verbal changes. Please fax written changes to 915-573-7020.



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH 703 W. CLINTON SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/12/98 Reporting Date: 08/13/98

Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F-230 UNIT IDA W.

**Project Location: NOT GIVEN** 

Sampling Date: 08/12/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC Analyzed By: AH/GP

		TDS	CI
LAB NUMBER	SAMPLE ID	( mg/L )	(mg/L)

ANALYSIS DATE:	08/13/98	08/12/98
H3787-1 MW #7	13496	5015
	•	
and the second s		
Quality Control	NR	1209
True Value QC	NR	1319
% Recovery	NR	91.7
Relative Percent Difference	2.3	4.4

METHODS: EPA 600/4-79-02 160.1 325.3

bujett A Cashi\_ Chemist |

Date

H3787-1.XLS



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH

703 W. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/12/98

Reporting Date: 08/13/98

**Project Number: NOT GIVEN** 

**Project Location: NOT GIVEN** 

Project Name: SOUTH JUSTIS F-230 UNIT IDA W.

Sampling Date: 08/12/98

Sample Type: GROUNDWATER

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

					ETHYL	TOTAL
LAB NO.	SAMPLE ID	TPH	BENZENE	TOLUENE	BENZENE	XYLENES
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)

ANALYSIS DATE:	08/13/98	08/12/98	08/12/98	08/12/98	08/12/98
H3787-1 MW #7	48.7	0.013	0.002	<0.002	<0.006
			-		
				et e e e e	3
					·
Quality Control	200	0.088	0.088	0.092	0.281
True Value QC	200	0.100	0.100	0.100	0.300
% Recovery	100	88.2	88.5	91.6	93.7
Relative Percent Difference	2.6	6.9	8.0	9.4	9.6

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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Page\_\_\_\_

3812

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240

(915) 673-7001 Fax (915) 673-7020

ARDINAL LABORATORIES, INC.

(505) 393-2326 Fax (505) 393-2476

ANALYSIS REQUEST										X	Hd.	'] 8										Terms and Conditions: Interest will be charged on all accounts more than 30 days past due at the rate of 24% par arrum from the original date of involce,	and all costs of colections, including attorney's fees.	D No Additional Fax #:					
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	#	T.				•			LING		<u>-'-</u>	TIME	2:30m	, , ,						_		the amount paid by the cl in 30 days after completi	lis incurred by ollers, its a above stated reasons or	Phone Result 🗆 Yes	Fax Result:	KEMAKKS:	<u> </u>		
	TL TO PO#:	Company: SE		Address:	2.	e: Zip:	Phone #:	#	PRES. SAMPLING		COOF	ACID: OTHE DATE	<del>k-</del> -			7	_	7				ir based in contract or tort, shall be lintled to the amount paid by the client for the made in writing and received by Cardhal within 30 days wher completion of the a	ness interruptions, togs of use, or loss of profits incurried by client, its subsidentes whether such claim is based upon any of the above stated ressons or otherwise.				, west		CHECKED BY: (Initials)
1/a		, 103 Con	Attn:	Add	Clty:	State:	oud.	Fax #:	MATRIX		TEWAT	TIOS TIOS TIOS										izim arising whether based in oor led walved unless made in wilding	out Imitation, business interruptional, regardess of whether such that	tecelved Bv:	÷ .		Received By: (Lab Staff)	Milky	Sample Condition
+ ENVICAMENTA	le V	16 54, to	State: MM Zlp: 8824		2	Project Owner: ACC	7.0 1	~				(CO)	~	3	3 //	3	3	3,	3/			int's exclusive remedy for any cause whatecever shall be deen	quental damages, including with of services hereunder by Card	Date; 7 19	8-45-70	Som	Date:	Time:	
Safety TE		E. Chart	State	397-0510	8887-8388	Projec	18 Winberl	74.00			Sample I.D.		MUE	ハノギス	MUEZ	FFMW	MWZS	9×MW	C#1140			ages. Cardna's labity and ols i for nedigence and any other or	be lighe for incidental or conser- of or related to the performance	;pe	/ / /			`.	ircle One)
Company Name:	Project Manager:	Address: 703	City: Hobbs	_	Fax#: (505)3	Project#: /7	Project Name: Id	Project Location:	1	, ,	LAB I.D.		H3811-1	-2-	1-1	7-	7	0)_	1			PLEASE NOTEL LIALITY and Danagas, Cardrad's labity and clerifs exclusive remady for any datin arising whether based in contract or tori, shall be limited to the sincust paid by the clerk for the analysis of the received by Cardrad within 30 days after completion of the applicable	service, in ne event shall Cardinal be lattle for incidental or consequental damages, include without firmitation, business interruptions, loss of profits incurried by ofest, its subaldaries, effect consequents of the above stated reasons or otherwise.	Sampler Refinguished: Date; Date; 2 Received By:	(		Refinguished By:		Delivered By: (Circle One

† Cardinal cannot accept verbal changes. Please fax written changes to 915-873-7020.

Sampler - UPS - Bus - Other:



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 08/25/98 Reporting Date: 09/01/98 Project Number: 17

Project Name: IDA WIMBERLY PIT Project Location: SOUTH JUSTIS

Sampling Date: 08/25/98

Sample Type: GROUNDWATER
Sample Condition: COOL AND INTACT

Sample Received By: AH

Analyzed By: AH

	Na	Ca	Mg	K Conductivity	T-Alkalinity
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L) (u mhos/cm)	(mgCaCO <sub>3</sub> /L)

ANALYSIS DAT	E:	08/31/98	08/26/98	08/26/98	08/26/98	08/26/98	08/26/98
H3812-1	MW #1	850	317	112	8.8	6273	204
H3812-2	MW #2	. 1202	476	214	42.3	19010	448
H3812-3	MW #3	 2229	360	187	31.7	13960	455
H3812-4	MW #4	3921	472	248	50.5	21750	708
H3812-5	MW #5	1094	320	153	10.0	7877	. 159
H3812-6	MW #6	11269	2120	1239	, 101	68740	180
H3812-7	MW #7	1763	460	175	25.0	1,1910	236
Quality Control	<del></del>	 	48	52	3.05	1402	NR
True Value QC		 . NR	50	50	3	1413	NR
% Accuracy		NR	96	104	102	99.2	NR
Relative Percent	t Difference	NR	4.2	3.8	1.6	0.1	NR
METHODS:		 SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1

CI	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	pН	TDS
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(ma/L)

ANALYSIS [	DATE:	08/26/98	08/26/98	08/26/98	08/26/98	08/26/98	08/26/98
H3812-1	MW #1	1839	305	0	249	6.384	4380
H3812-2	MW #2	2731	426	0	. 547	6.303	12240
H3812-3	MW #3	4124	279	0	556	6.402	8840
H3812-4	MW #4	6910	335	. 0	864	6.64	13960
H3812-5	MW #5	2396	274	0	195	7.216	5430
H3812-6	MW #6	24186	750	0	220	6.829	58260
H3812-7	MW #7	3288	832	. 0	288	7.326	8170
							· · · · ·
Quality Cont	rol	1209	48.92	112	221	6.979	NR
True Value C	ac .	1319	50.00	124	259	7.000	NR
% Accuracy		91.7	97.8	90.3	85.4	. 100	NR
Relative Per	cent Difference	4.4	3.1	-	-	0.1	2.3
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1	160.1

Chemist Chemist

0/1/18

PLEASTICITY, ListHitzend Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including lifes for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 08/25/98

Reporting Date: 09/01/98

Project Name: IDA V

Project Name: IDA WIMBERLY PIT Project Location: SOUTH JUSTIS

Sampling Date: 08/25/98

Sample Type: GROUNDWATER

Sample Condition: COOL AND INTACT

Sample Received By: AH

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANAL VOIC	DATE	08/28/08	09/25/09	08/25/09	08/25/08	08/25/08

ANALYSIS DATE:	08/28/98	08/25/98	08/25/98	08/25/98	08/25/98
H3812-1 MW #1	42.9	<0.002	<0.002	<0.002	<0.006
H3812-2 MW #2	14.0	<0.002	<0.002	<0.002	<0.006
H3812-3 MW #3	24.6	0.002	<0.002	<0.002	<0.006
H3812-4 MW #4	11.8	0.046	<0.002	0.012	<0.006
H3812-5 MW #5	11.0	<0.002	<0.002	<0.002	<0.006
H3812-6 MW #6	6.8	0.007	<0.002	<0.002	<0.006
H3812-7 MW #7	7.1	0.003	<0.002	<0.002	<0.006
Quality Control	158	0.106	0.102	0.098	0.297
True Value QC	150	0.1	0.1	0.1	0.3
% Recovery	105	106	102	98.1	99.0
Relative Percent Difference	1.1	0.5	2.0	0.4	0.4

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

Chemist

Date



# **Safety & Environmental**

Solutions, Inc.

ARCO PERMIAN
South Justis Unit F-230
IdaWimberly Lease

Work Plan

Vadose Zone Remediation Lea County, New Mexico RECEIVED

FEB 1 6 1998 9

ENVIRONMENTAL BUREAU OIL CONSERVATION DIVISION

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

# Work Plan Vadose Zone Remediation Ida Wimberly Pit ARCO Permian

# **Purpose**

The purpose of this Work Plan is to cause the closure of the abandoned pit located at the Ida Wimberly lease in a manner that will protect the population, environment and groundwater of the area surrounding the subject location. The Ida Wimberly lease is located at the ARCO Permian (ARCO) South Justis Unit F-230 in Unit C, Section 25, T25S, R37E, Lea County, New Mexico.

# Background

In October 1997, ARCO secured the services of Safety and Environmental Solutions, Inc. to complete all necessary sampling and testing of the area covered by the abandoned pit located at the Ida Wimberly lease. ARCO owns the surface rights to Section 25 as well as part of the adjacent sections. ARCO owns the mineral rights in the NW 1/4 and the SW 1/4 NE 1/4. The remaining portion of the NE 1/4 are state mineral rights. The mineral rights of the south half of Section 25 are federal. ARCO controls the traffic on the surface of the property and also controls the disposition of the ground water under this property. (See Exhibit A- South Justis Unit Plat)

In the initial investigation, a borehole was drilled at the bottom of the pit area. The field analytical results indicated an elevated level of Total Petroleum Hydrocarbons (TPH). Knowledge of process indicates that the material in this area would be exempt oil field waste. Based upon this information, a work plan for installation of monitor wells to delineate contamination was developed. This information was reported to the New Mexico Oil Conservation Division in the report dated November 6, 1997, ARCO Permian Work Plan Investigation of Possible Groundwater Impact, Section 25 Township 25S Range 37 E, Lea County, New Mexico.

Upon approval of the work plan, three monitor wells were installed. The results revealed elevated levels of Chlorides and Total Dissolved Solids (TDS). This information was submitted to the New Mexico Oil Conservation Division in a report dated December 1997, ARCO Permian Installation of Monitor Wells and Investigative Results, Section 25 Township 25S Range 37 E, Lea County, New Mexico.

After review of these results, further delineation was deemed necessary. The installation of additional monitor wells was proposed and submitted to the New Mexico Oil Conservation Division in a report dated April 28, 1998, ARCO Permian Amended Work Plan Investigation of Possible Groundwater Impact, Section 25 Township 25S Range 37 E, Lea County, New Mexico. The results from this phase of the investigation are submitted under separate cover.

Shallow protectable groundwater in the area is scarce. There are two water wells within a one-mile radius of the pit. The water from these wells is currently used for livestock.

This pit has not been used since before 1991 when ARCO acquired the lease. During this time, the hydrocarbon has not migrated beyond the pit boundaries. It is reasonable to presume that the hydrocarbon will not migrate in the future.

## Method

ARCO proposes to cause the closure of this pit by installing an impermeable liner at the bottom of the existing excavation to shield the soils left in place from contact with any surface water. The liner will be covered with new clean soil to the grade of the surrounding property

## Source Removal

ARCO proposes to leave the source contamination in the subject pit area in place and limit the public exposure to this area through normal security measures in place at the lease. A liner will be installed to isolate the contaminated soils from influence from the surface. Any movement in the groundwater contamination will be monitored by ARCO as set out below.

# Liner System

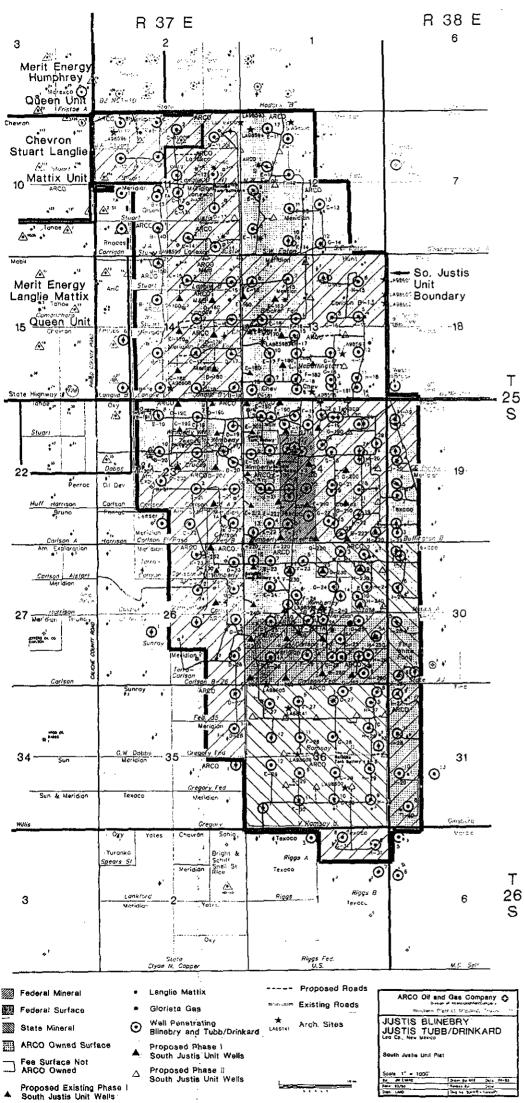
The bottom of the existing excavation will be prepared in such a manner that will provide a smooth surface for the liner to rest upon. The liner will be made of 20 mil polyethylene plastic with seams, if any, bound together with heat or adhesive methods in such a manner to prevent leakage or separation of the liner.

The liner will be installed at the bottom of the excavation and new clean soil will be back-filled over the liner to grade. This liner system will effectively encapsulate the stabilized source material and prevent the material from coming in contact with any surface moisture. The liner will extend past the horizontal extent of the contamination and form an umbrella, which will protect the stabilized material and the soil left in place from surface moisture.

# **Groundwater Monitoring Program**

ARCO agrees to sample existing groundwater monitor wells 2, 3, and 4 quarterly for a period of 18 months. Samples from these three monitor wells will be analyzed based upon initial analytical results. The initial samples will be analyzed for TPH, BTEX, Chlorides, major Cations and Anions, and Total Dissolved Solids with results filed with the NMOCD Santa Fe and Hobbs District offices. The quarterly samples will be analyzed for only contaminates identified in the initial sampling.

In the event, the hydrocarbon contamination is found to have migrated outside of the pit area, an appropriate plan for plume investigation and remediation will be developed at that time.





# Safety & Environmental

Solutions, Inc.

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FEB 1 6 1998/9

ENVIRONMENTAL BUREAU OIL CONSERVATION DIVISION

Arco Permian
South Justis Unit F-230

# Installation of Additional Monitor Wells and Investigation Results

Lea County, New Mexico

Corrected Report

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

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Background	
Work Performed	
Well # 4	
Well # 5	
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Well # 7	
Monitor Well Testing.	
Conclusions	
Figures and Appendices	

# I. Background

In October 1997 Arco Permian secured the services of Safety and Environmental Solutions, Inc. (SESI) to determine the vertical and horizontal extent of the abandoned pit site on the specified location. A work plan was formulated to drill three monitor wells around the pit area for definition of the extent of the pit area and to provide initial indications of the extent of any groundwater contamination. Upon completion of these wells, it was determined that the water showed elevated Chlorides and Total Dissolved Solids (TDS). Further delineation was required to determine the extent of elevated Chlorides and TDS levels. To this end, a new Work Plan was formulated to drill up to four additional monitor wells.

# II. Work Performed

Four additional monitor wells were drilled at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, NM according to the Approved Work Plan (GW-202 Pit Closure). SESI contracted Atkins Engineering of Roswell, NM to drill these wells on August 7 to August 12, 1998. Cardinal Laboratories of Hobbs, NM was also contracted to perform the laboratory analytical testing required for this project.

SESI sampled the first two additional monitor well hole soils (MW #4 & MW #5) at intervals of ten (10') feet using SOPs found in Environmental Protection Agency, 1984, Characterization of Hazardous Waste Site - A Methods Manual: Vol II. Field testing was performed on these soil samples for TPH, BTEX and Chlorides. The composite soil samples along with Chain of Custody were then delivered to the laboratory for confirmatory testing. The composite samples were analyzed for Total Petroleum Hydrocarbons (EPA Method 418.1), BTEX (EPA Method 8020) and Chlorides (EPA Method 600/4-79-020). The results of the BTEX, TPH and Chlorides were compared to the regulatory limits found in "Guidelines for Remediation of Leaks, Spills and Releases" New Mexico Oil Conservation Division - August 13, 1993.

# Well #4

Monitor Well #4 was drilled between Monitor Wells #2 and #3, upgradient of MW #3 on the south berm of the pit area with to a total depth of 80°.

A summary of the laboratory analyses of the soil samples for the well borehole is presented in the following table in **black** text; the laboratory analysis of the groundwater sample for the well borehole is presented in the following table in blue text:

ID/Depth	Lithology	TPH	CL	Benzene	Toluene	Ethyl	Total
				100,000		Benzene	Xylenes
41	Caliche	<b>410</b> `	<b>223</b>	<0.002	<0.002	<0.002	<0.006
10'							
4-2	Sandy	=<10	490	<0.002	<0.002	<0.002	<0.006
20'	Caliche			4			
4-3	Sand	<10	1462	<0.002	<0.002	<0.002	<0.006
307							
44	Red Sand	<10	1337	<0.002	<0.002	\$0,002	<0.006
40"				and the state of			
4-5	Silty Sand	., <10	1257	<0.002	<0.002	<0.002	<0.006
50"	w/gravel						
4-6	Silty Clayey	44.7	1195	<0.002	<0.002	<0.002	<0.006
60"	Sand						
4-7	Sandy	<b>≤10</b> .	1498	<0.002	<0.002	<0.002	<0.006
70"	Gravel						
4-8	Red Clay	- <10 ·	2283	<0.002	<0.002	> <0.002. s	<0.006
80"		A. 1					
TD	Ground	<1.0	9641	<0.033	<0.002	<0.007	<0.006
80"	water		#1678.05 (C				

The groundwater sampled at total depth (80') on Monitor Well #4, in addition to testing as shown above, was tested for Cations, Anions and Total Dissolved Solids (TDS). These results indicated no elevated levels except on Chlorides and TDS. (See Attached Analytical Results)

## Well #5

Monitor Well #5 was drilled northwest of Well #1 north of the pit area with total depth of 80°.

A summary of the laboratory analyses of the soil samples for the well borehole is presented in the following table in **black** text; the laboratory analysis of the groundwater sample for the well borehole is presented in the following table in **blue** text:

II/Septi	Lithology	- TPH	<b>CL</b>	Benzene	Toluene	Ethyl	Total
						Benzene	Xylenes
5-1 : 10'	Silty Caliche	<10	. ≥ <b>71</b>	<b>50.002</b>	<0.002	<0.002	<0.006
5-2 20'	Caliche	<10	196	.≠0, <b>0</b> 02	<0.002	<b>&lt;</b> 0.002	<0.006
5-3	Silty Clayey	<10	178	≤0,002	<0.002	<0.002	<0.006
302 5-4	Sand Silty	<10	134	<0.002	<0.002	<0:002	<0.006
40"	Clayey Sand			7,00			
5-5 50'	Silty Clayey	, <b>40</b>	98	<b>≤0.002</b>	<0.002	<0.002	<0.006
5-6	Sand Silty	<10.	107	<0.002	<0.002	<0.002	<0.006
60°	Clayey Sand						
5-7 70'	Sandy Gravel	<10	285	<0.002	<0.002	<0.902	<0.006
5-8 80'	Red Clayey	<10 ·	874	<0.002	<0.002	<0,002	<0.006
TD	Sand Ground	<1,0	1950	<0.002	<0.002	<0.002	<0.006
80*	water						

The groundwater sampled at total depth (80') on Monitor Well #5, in addition to testing as shown above, was tested for Cations, Anions and Total Dissolved Solids (TDS). These results indicated no elevated levels except on Chlorides and TDS. (See Attached Analytical Results)

# Well#6

Monitor Well #6 was drilled southeast of Monitor Wells #3 and #4, approximately 50 feet down-gradient of an existing produced water line, to a total depth of 80'. Testing was performed on the groundwater sampled at total depth (80') only.

A summary of the laboratory analysis of the groundwater sample for the well borehole is presented in the following table in **blue** text:

1D/Depth Litholog	y TPH CL	TDS Benzene	2.3 CHARLES STRONG SERVICE AND ACCOUNT OF THE CO. CO. CO. CO. CO. CO. CO. CO. CO. CO.	ibyl Total izene Xylenes
6-1 TD Ground 80° water	<1.0 29600	58260 0.044	0.004 <0	.002 0.009

## Well #7

Monitor Well #7 was drilled southwest of Monitor Wells #6 to a total depth of 75'. Testing was performed on the groundwater sampled at total depth (75') only.

A summary of the laboratory analyses of the groundwater sample for the well borehole is presented in the following table in blue text:

ID/Depth Litholo	gy TPH CL 1	FDS Benzene To	luene Ethyl Total Benzene Xylenes
7-1 TD Groun 751 water		3496 0.013 0.	002 <0.002 <0.006

# III. Monitor Well Testing

Initial water sampling from each of the four wells was performed on August 25, 1998 according to SW- 846 methods and transported under Chain of Custody to the laboratory for analysis. The water samples were analyzed for BTEX (EPA Method 8020, 5030) as well as NMWQAC testing (Methods 625, 600/4-79-020, -206.2, -272.1,-213.1,-208.1, -218.1,-239.1,-245.1,-270.2, 600/4-78-020,-202.1,-220.1,-236.1,-243.1,-249.1,-289.1, 600/4-91-010,-212.1,-219.1,-246.1, SM4500-Cl-B, 375.4, 310.1, 150.1, 160.1, 120.1, 8049, 3500-Mg E, SM3500-Ca-D). (See Analytical Reports attached)

On August 25, 1998, the groundwater in all seven monitor wells were sampled again according to SW - 846 methods and transported under Chain of Custody to the laboratory for analysis. The water was analyzed for TPH, BTEX and major cations, anions, and TDS.

The results indicated high levels of Chlorides and TDS in all wells. The TPH in all wells was very low. Monitor well # 4 exhibited small amounts of Benzene and Ethyl Benzene and Monitor well # 7 exhibited a small amount of Benzene. Monitor well # 6 exhibits extremely high levels of Chlorides and TDS. These levels are 5.8 and 6.5 times higher than Monitor well # 3 which is only 55' upgradient. The uncharacteristically high levels of Chlorides and TDS may indicate another source of contamination other than the subject site. There is a saltwater disposal line that is located between Monitor well #3 and Monitor well #6. (See Monitor Wells Analytical Results - August 25, 1998 Diagram)

A summary of the laboratory analyses of the groundwater samples for all seven monitor wells is presented in the following table. The results that are in excess of NMWQCC Standards are presented in red text:

Analyte	MW#1	MW #2	MW #3	NW #4	MW #5	MW #6	MW #7
TPH	42,9ppm	14.0ppm :	24.6ррт	11.8ppm	11.0ppm	6.8ppm	7.1ppm
Benzene	<.002ppm	<.002ppm	.002ppm	-,046ppm	<.002ppm	,003 ppm	.003ppm
Toluene	<.002ppm	<:002ppm	<.002ppm	<.002ppm	<.002ppm	<.002ppm	<.002ppm
E Benzene	<.002ppm	<.002ppm	<.002ppm	.012ppm	<.002ppm	<602ppm	<.002ppm
<b>Xylenes</b>	<.006ppm	:=406ppm:	<.006ppm ?	<.006ppm	<.006ppm	<.006ppm	<.006ppm
Sodium	850ppm	1202ppm	2229ppm	3921 ppm	1094ppm	11269ppin	1763ppm
Calcium	317ppm	476ppm	360ppm	472ppm	320ppm	2120ppm	460ppm
Magnesium	112ppm	214ppm	187ppm	248ppm	153ppm	1239ppm	175ppm
Potassium -	8.8ppm	42.3ppin	31.7ppm	50.5ppm	10.0ppm	101 ppm	25.0ppm
Chlorides	1839ppm	2731 ppm	4124ppm	6910ppm 🛚	2396ppm	24186ppm	3288ppm
SO.	30Sppm	426ppm -	279ppm	335ppm	274ppm	. 750ppm	832ppm
CO,	Oppm	Oppno	Oppm	Oppm	- Oppm	Oppm	Oppm
HCO <sub>3</sub>	249ppm	547ppm	556ppm	864ppm	195ppm	220ppm .	288ppm
TDS	4380ppm	12240jipni *	8840ppm	13960ppm	5430ppm	58260ppm	8170ppm
pH	6.384	6.303	6.402	6.64	7.216	6.829	7.326

## IV. Conclusions

The gradient of the water table is established to be relatively flat but sloping slightly from the Northwest to the Southeast. The entire group of monitor well exhibits high levels of Chlorides and TDS indicates that the water in the whole area is not of very high quality. The horizontal extent of the contamination plume that results from the subject pit area appears to extend downgradient to monitor wells # 6 and #7. However, the extremely high levels of contaminants in well # 6 appears to indicate an additional source of contamination between well # 3 and well #6. It is our opinion that the completion of this phase of the plume investigation has satisfactorily delineated the plume caused by the subject pit.

# V. Figures and Appendices

# Figures:

Figure 1: Vicinity Map

Figure 2: South Justis Unit Plat

Figure 3: Survey Plat Figure 4: Driller's Log

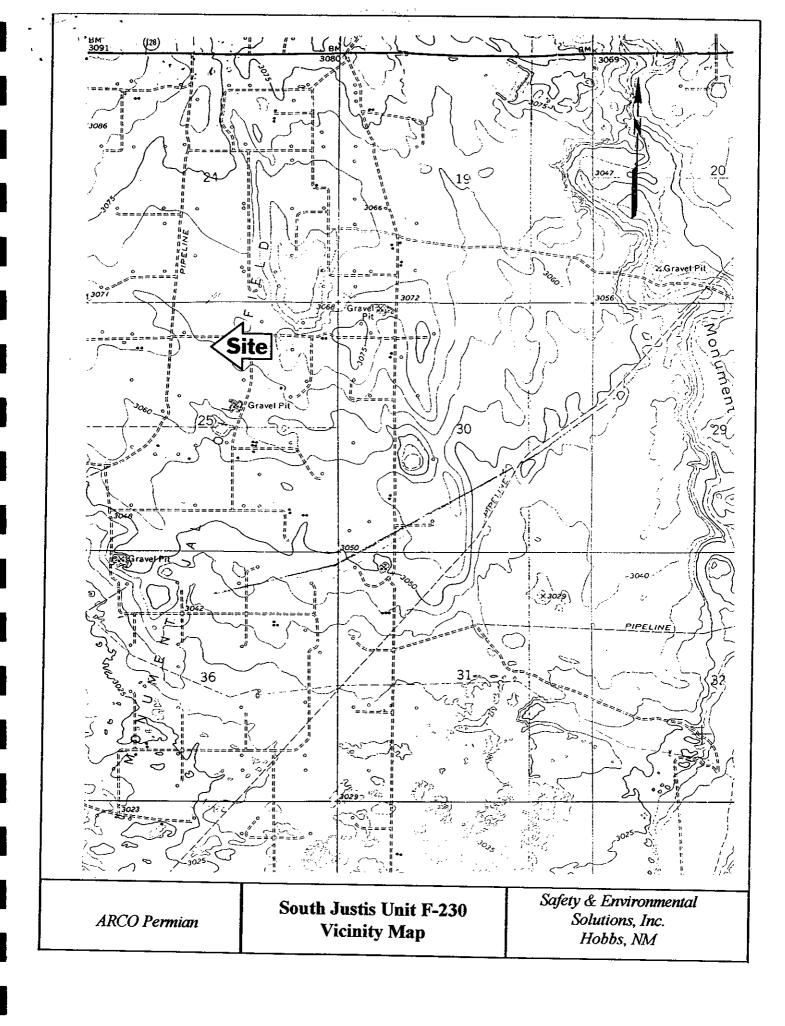
Figure 5: Monitor Wells Analytical Results - August 25, 1998 Diagram

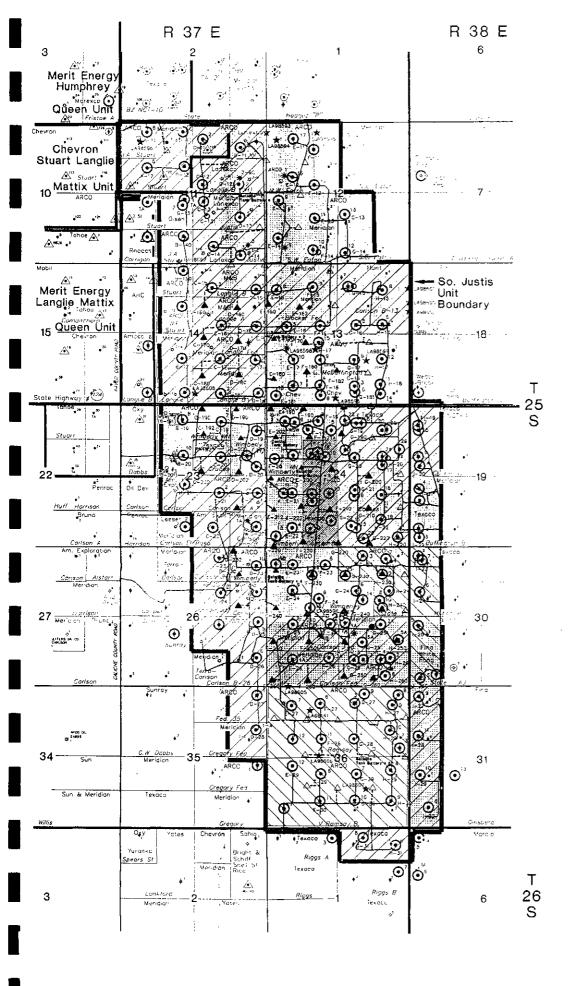
Figure 6: Water Contour and Flow Plan

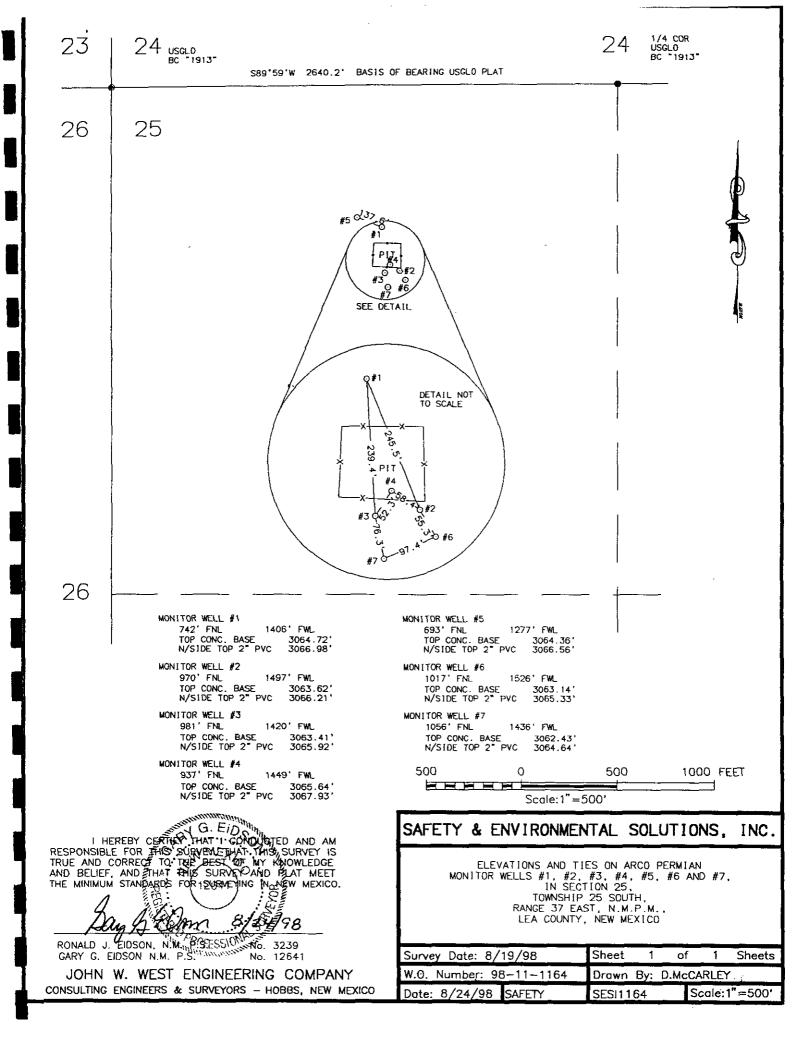
# Appendices:

Appendix 1: Monitor Well #4 Chain of Custody and Analytical Results
Appendix 2: Monitor Well #5 Chain of Custody and Analytical Results
Appendix 3: Monitor Well #6 Chain of Custody and Analytical Results
Appendix 4: Monitor Well #7 Chain of Custody and Analytical Results

Appendix 5: All Monitor Wells Groundwater Chain of Custody and Analytical Results







	Ro			Mexico 88202					(Page 1 of 2)
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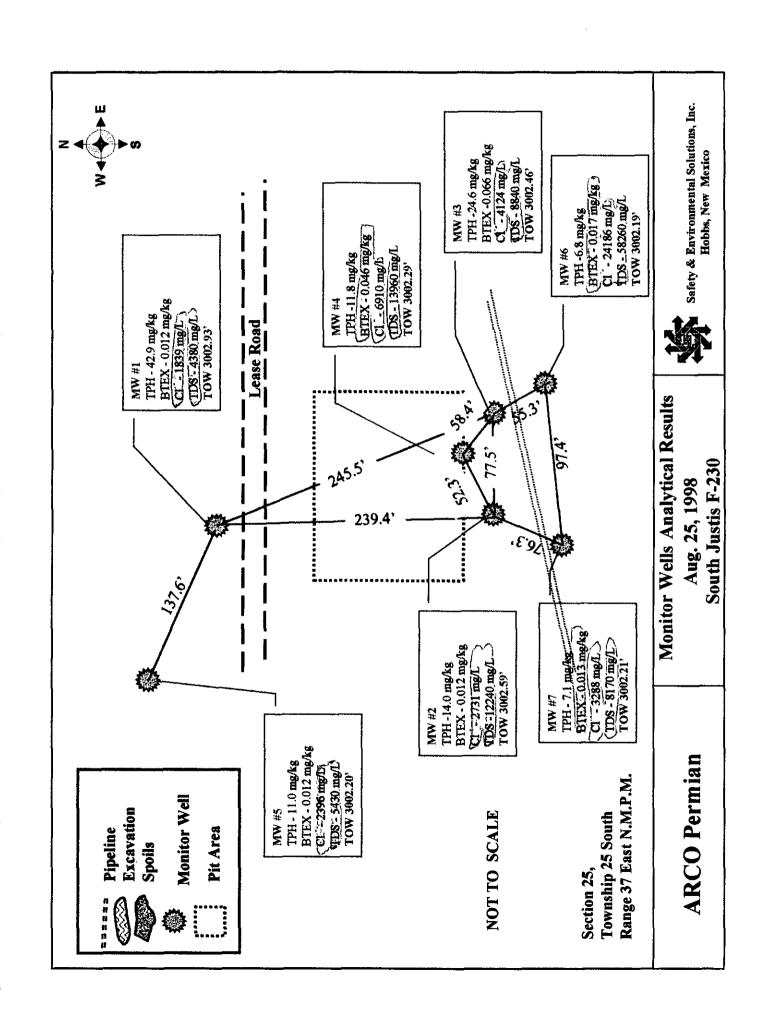
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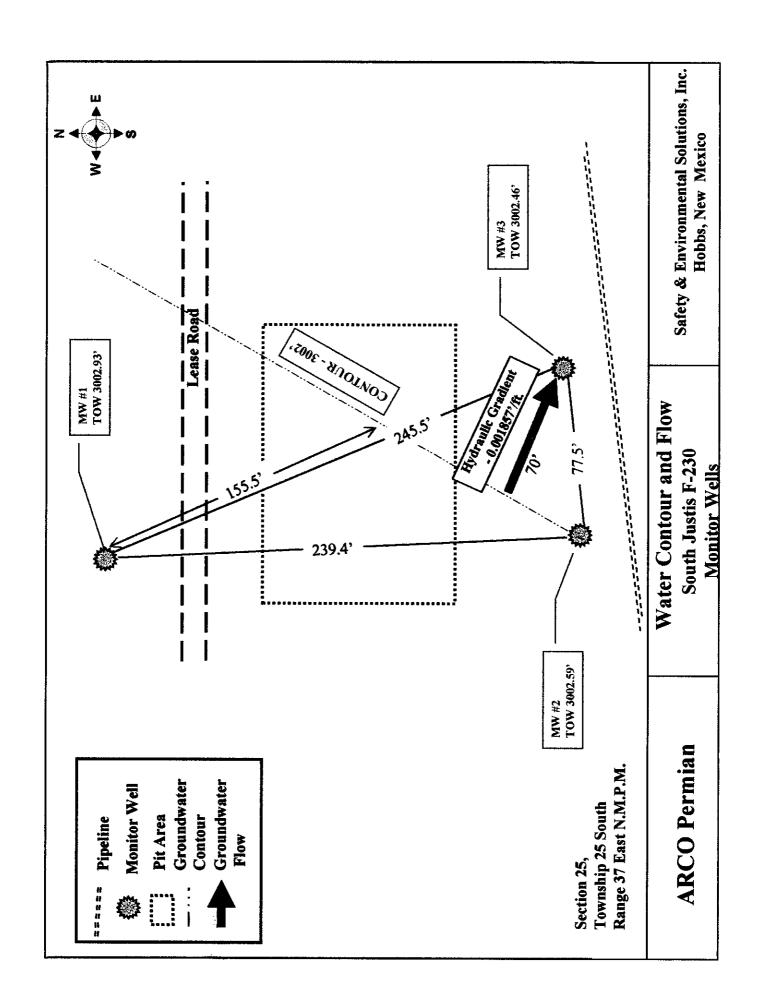
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	Atkin				ng Associates, Inc. ox 3156	LOG C	F BORING	G Sou	th Justice F	T 30 MW #7
ŀ	<del></del>	KC			Mexico 88202 Oil Co.			<u> </u>		(Page 1 of 2)
	· 		. J	al, Næ	w Mexico	Date Drill Start Drill End	: 8-11-98 : 1:55 P.M. : 6:45 P.M.		Site Location Auger Type Logged By	; 5 miles E. & 2 miles S. : Hollow Stern : Mort Bates
					fr. Bob Allen 8280.20	Boring Location	: 75 ft. S. of Pit			
							·	Well: M	W #7	
	Depth	우		S.				Elev.:		
	in feet	GRAPHIC	USCS	Samples	DES	CRIPTION			_ <sup></sup> 4" x 4" x 5' Metal \	Veli Cover
; 1		.ত	Ď	တိ		<u> </u>	·. ·			
į	0 -				Silty Clay w/Caliche, Tan,	Loose, Dry				
	-		CL							
	-		OL		· ·					
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•	-	26°98			Caliche, Tan, Loose, Dry					
	-	26.9								•
	10	200							r. a s	
	-	26.96	. •	 						
		26.95 26.95							*	
	15 :	26.90								
	-	X:X						:  :		
		28.98								
	20 -	86°97 96°97			Caliche Rock, White, Hard	i, Dry				
	-	26.06							·•_	
		26.90			Caliche w/Silty Clay, Tan,	Loose, Dry		-  -	Grout	
	25						ļ		-2" Sch. 40 PVC (	Casing
	]	08.00 \$0.30		ļ						
		4.7	SC		Clayey Sand, Reddish-Ta Gravel w/Sand, Tan, Firm		<del></del>			
	30	0				, 51,	}			
			GW		:					
	,	0	}							
ğ	35	فرو	ļ							
Vmw-7		1//	CL		Sandy Clay, Tan, Loose, I	Damp	Ì	-  :		
c:\mtech46\arco\mw-7.bor				}	Silty Sand, Tan, Loose, D	amp				
ntech4	40		SM		1					
5	I ***		1	1	1			1:11:3	<b>{</b>	

Atkins Engineering Associates, Inc. LOG OF BORING South Justice FT 30 MW #7 P.O. Box 3156 Roswell, New Mexico 88202 (Page 2 of 2) ARCO Oil Co. : 5 miles E. & 2 miles S. of Jal Date : 8-11-98 Site Location Jal, New Mexico **Drill Start** : 1:55 P.M. Auger Type : Hollow Stem Drill End : 6:45 P.M. Logged By : Mort Bates Contact: Mr. Bob Allen **Boring Location** : 75 ft. \$. of Pit Job #98280.20 Well: MW #7 GRAPHIC Elev.: Depth DESCRIPTION in feet 45 sw 50 Grout Cemented Silty Sand, White, Hard, Dry SM 55 Clayey Sand, Tan, Loose, Dry SC 2" Sch. 40 PVC Casing Clayey Sand w/Gravel, Tan, Firm, Dry 60 2' Bentonite Seal sc 65 Cemented Sand w/Gravel, Hard, Gray, Dry SM 8/16" Sand Pack Sand, Tan, Loose, Saturated 70 2" .020 Sch. 40 PVC Screen SP 75 TD = 75 ft. Below 75 ft. - Clay w/Gravel, Red, Firm, Wet 80 85 90





# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

2111 Beechwood, Abijene, TX 79603 101 East Marland, Hobbs, NM 88240 (915) 673-7001 Fax (915) 673-7001 (915) 673-7001

ANALYSIS REQUEST																						Towns and Confederate Miles defend on all accounts from from	he rade of 24% per errum fore, including efformer's h	1	□ No Add'l Fax#:					
	P.O. #:	Company: 5257	Attn: Reth Aldrid	Address: PO Px (61)	City: Hobbs	State: NIM 21p: 88240	Phone #: 505-397-0510	Fax#: 505-393-4390	SAMP		7	NBV2	ACIE OTH DATE TIME	15 7 730	>7.51 t/8	817 1945	512/2/8	8/7 3/10	19/1/40	97 600	05:9 12.18		by Cardinal within 30 days after composition of the applicable e, or loss of profile troumed by client, its subsidiaries.	e Result:	Fax Result:	)	1. 00	77	(initials)	
Company Name: < C < 7		Address: 703 L Clinton 10 BOX 1013	State: NM ZIP: 48240	o# 397-0510 Fax# 393-4380	Project Owner:			Lath Aldrich	FORUBUSE ONLY	Ы <u>.</u>	PER TAW PTER	O BA INTIN	SELU SOIL WAS GRO GRO		101. H # MW To	3   Ww 4 4 20'	1   X   1   30° 4 C W 1 7		イ M が 単年 501   1		4 mw #4 70'     X '	E SOC WITTE- In the conference Contact to the little and death and the contact to	h writing and receive temptions, loss of us	offices or expossion states out of or related to the performance of services havender by Cardini, regardless of whether such desirals based us. Sampolest Reliniquished: v/ 11 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	FT KIS 12	10.15c 10.00	Cacanaga Dy.	July hungh	Delivered By: (Circle One) Sarghe Condition Cool Intack	

<sup>†</sup> Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.





ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH P.O. BOX 1613 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/12/98 Project Number: NOT GIVEN Project Name: SJU F230

Project Location: JAL

Sampling Date: 08/07/98 Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By, BC

LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	CI (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DA	Γ <b>Ε</b> : .	08/10/98	08/11/98	08/10/98	08/10/98	08/10/98	08/10/98
H3775-1	MW#4TD	<10	2283	<0.002	<0.002	. <0.002	<0.006
H3775-2	MW # 4 10	<10	223	<0.002	< 0.002	< 0.002	< 0.006
H3775-3	MW # 4 20'	<10	490	<0.002	<0.002	< 0.002	< 0.006
H3775-4	MW # 4 30	<10	1462	<0.002	<0.002	<0.002	<0.006
H3775-5	MW # 4 40'	<10	1337	<0.002	<0.002	< 0.002	<0.006
H3775-6	MW # 4 50'	<10	1257	<0.002	< 0.002	< 0.002	< 0.006
H3775-7	MW # 4 60'	44.7	1195	<0.002	<0.002	< 0.002	<0.006
H3775-8	MW # 4 70'	<10	1498	<0.002	<0.002	<0.002	<0.006
Quality Control	· · · · · · · · · · · · · · · · · · ·	269	1209	0.103	0.093	0.098	0.301
True Value QC		273	1319	0.100	0.100	0.100	0.300
% Accuracy	·	97.4	91.7	103	92.7	98.4	100
Relative Percer	it Difference	6.1	4.4	12.6	5.9	2.5	1.9

METHODS:

TRPHC-EPA 600/4-79-020, 418.1;CI-EPA 600/4-79-020 325.3 BTEX-EPA SW-846-8020

Burgess J. A. Gooke. F

Data

H3775-1.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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ANALYSIS REQUEST

101 East Mariand, Hobbs, NM 88240 -1090/11/01-TIME (505) 393-2326 Fax (505) 393-2476 SAMPLING PO #: ZID DATE 1 BILLTO Attn: \a : ABHTO PRES Company: ICE I COOF Address: Phone #: State: Fax # ACID: Cff. язнто SLUDGE MATRIX Bris Penn ARDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020 State: Mr ZIp: 8 Ax (10 (G) RAB OR (C)OMP. C 1) Project Owner: Project Name: NOV. LE ELED! HIL Sample I.D. 188h 437 W W # 4 24,7 333 Project Location: Stutt Address: 703 50 S Project Manager: FOR LAB USE ONLY M2276-1 Company Name: Phone #: </ >> < City: 46/215 LABI.D. Project #: Fax #:

3181

Terms and Conditions; interest will be charged on all accounts more than 30 days past due at the rate of 24% per strumitron the original date of invoice, and all costs of collections, including altomety's fees. O No Additional Fax#: loss of profits incurred by client, its subsidiantes, EASE NOTE: Unbilty and Damages, Cardnafe Sabilty and client's exclus

Cool Intact
Yes 7 Yes

Sampler - UPS - Bus - Other: Delivered By: (Circle One)

ECKED BY:

mple Condition

Received By: (Lab Staff

Tige Of

Relinquished By

(Initials)

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC ATTN: BETH ALDRICH

P.O. BOX 1613 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98
Reporting Date: 08/13/98
Project Number: NOT GIVEN
Project Name: MONITOR WELL # 4
Project Location: SOUTH JUSTIS F-230

Sampling Date: 08/10/98
Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: JS Analyzed By: AH

Na Ca Mg K Conductivity T-Alkalinity

LAB NUMBER SAMPLE ID • (mg/L) (mg/L) (mg/L) (u mhos/cm) (mgCaCO<sub>3</sub>/L)

ANALYSIS DATE:	08/13/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3776-1 MW #4	5252	480	340	68	18190	360
						g (1) (1) (1) (4) (4)
Quality Control	, NR	48.0	52.0	3.05	1402	NR
True Value QC	NR	. 50.0	50.0	3.00	1413	NR
% Accuracy	NR	96	104	102	99.2	NR
Relative Percent Difference	NR	4.2	3.8	1.6	0.1	NR

METHODS:		 		·	SM3500-Ca-D B500-Mg E	 8049	-	120.1	310.1	
		 	•	•			•			

CI	SO₄⁻	ÇO <sub>3</sub>	HCO <sub>3</sub>	ρH	TDS
(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)

ANALYSIS DATE:	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3776-1 MW #4	9641	159	0	• 439	6.69	13580
Quality Control	1209	48.92	112	221	7.00	NR
True Value QC	1319	50.00	124	259	7.00	NR
% Accuracy	91.7	98	90	85	100	NR
Relative Percent Difference	4.4	3.1	-	-	0.6	2.3

METHODS: SM4500-CI-B 375.4 310.1 310.1 150.1 160.1

3/13/99

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH P.O. BOX 1613 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/13/98

Project Number: NOT GIVEN
Project Name: MONITOR WELL # 4

Project Location: SOUTH JUSTIS F-230

Sampling Date: 08/10/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: JS

Analyzed By: BC

LAB NO. SAMPLE ID .	TPH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS DATE:	08/10/98	08/10/98	08/10/98	08/10/98	08/10/98
H3776-1 MW #4	<1.0	0.033	<0.002	<0.007	<0.006
Quality Control	209	0.103	0.093	0.098	0.301
True Value QC	200	0.100	0.100	0.100	0.300
% Recovery	105	103	92.7	98.4	100
Relative Percent Difference	1.2	12.6	5.4	2.5	1.4

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

mist A College

Date

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

ARDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240

(505) 393-2326 Fax (505) 393-2476 (915) 673-7001 Fax (915) 673-7020

company name:								,	AIN	ANALYSIS	1	KEVUESI				1
Project Manager:	4600		<u> </u> 	BILL	, TO PO#:	ii.	-		_		_					
Address: 7777 C	28 6 Clarker # 183			Company:	. ė			٠		<u>.                                    </u>				· ·		
33	State(N) ZIp:	1777		Attn:	17			· _					· · ·			
Phone #: 505 3	347 05-10	•		Address:	, \	1	· · ·						·			
Fax#: < 0 > 0 > 5%	3.4380			Clty:						-		-		, <u> </u>		
Project #:	Project Owner: \$ 2763	:	De journe	State:	;diz					<u>.</u>	8	-			·	<del>-,</del>
Project Name: Sout	~ Ju this F 2 40	sald of mon	m. En mel	Phone #:						· <u></u>	70	•				
Project Location:	  -	,		Fax #:				•				· · · · · · · · · · · · · · · · · · ·			•	
FOR LAB USE ONLY			MATRIX	PRES.	SAMPLING	LING	<u>.</u> .				\$				٠.	
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LAB (.D.	Sample I.D.	<b>NIAT</b> V WQNL		1000	: ਮੁ	· <u>-</u>	110	7 7			<u>ک</u>	<u> </u>	<u> </u>			
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LASE NOTE: LINKINg and Demagne. Cardware instity and clerif's accidative remedy for any claim andaring whether based in contract or tool, shad be lamited to be amount paid by the clerif for the same and any other cause whateverse that becamed white the milk and processed for medicinal within 30 days after compellion of the at the compellion of the at the compellion of the at the compellion of the at the compellion of the same and any other cause whateverse that the compellion of the compellion of the compellion	ardnara inbity and clarife accusive pigence and any other cause whatever	enedy for any claim a er shall be deemed w	rising whether base shed unless made i	d in contract or ten, n witing and receive	what be smitted to ad by Cardinal with	d in contract or ton, what be smiled to be amount paid by the clert for the number gard received by Cardhall within 30 days after competion of the applicable	he clert for the pletton of the app	cable		Terms and 30 days pas	Terms and Conditions; trained will be gharged on all accounts more than 30 days past due if the rate of 24% are around from the original date of invoice.	terest will be a of 24% per	a mod manufa availment	I accounts m he original de	xe than te of involce,	
ener. In to ever ann deutsel de stae na hatomas de donaetjanas panagae, inducing whole antistor, punimes an Historio excession analog out di or mais di os im performance di services hereunden by Cardnal, regardiess di whethe	a na vicionical of consequence (grass) Lated to the performance of services hi	reunder by Cardinal, r	egardess of whethe	enqueens, rose of a r such claim is bes	ad upon any of the	endoors, rose or use, or rose or prossained by users, its expendance, or such claim is based upon any of the above stated reasons or pherwise.	ite euperganee, is or otherwise,	. 1		Made int Dura	and all come of conections, including suggests a ress.	including an	Growy a recei.			
ampler Relinquished:	Date:	TK Rec	Received By:			Phone Result	ult [] Yes		☐ No Additional Fax#	i Fax#					<i>'</i>	
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Relinquished By:	2.46	A & Rec	Received By: (1	ab Stath	_			-								
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Delivered By: (Circle One	a One)	နွှေ ပ	Sample Condition Cool Intact		CHECKED BY: (Initials)	<del></del>				•			٠.			<u>-:</u>

† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

Cool Intact

Sampler - UPS - Bus - Other:



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH P.O. BOX 1613

HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/13/98 Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F230 MONITOR WELL

Project Location: NOT GIVEN

Sampling Date: 08/07/98-Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

		•					
LAB NUMBER	SAMPLE ID	TPH (mg/Kg)	CI (mg/Kg)	BENZENE (mg/Kg)	TOLUENE (mg/Kg)	ETHYL BENZENE (mg/Kg)	TOTAL XYLENES (mg/Kg)
ANALYSIS DATI	<b>E:</b>	08/11/98	08/12/98	08/11/98	08/11/98	08/11/98	08/11/98
H3777-1	MW # 5 10'	<10	71	< 0.002	<0.002	< 0.002	<0.006
H3777-2	MW # 5 20'	<10	196	<0:002	<0.002	<0.002	< 0.006
H3777-3	MW # 5 30'	<10	178	<0.002	< 0.002	< 0.002	<0.006
H3777-4	MW # 5 40	<10	134	<0.002	<0.002	< 0.002	<0.006
H3777-5	MW # 5 50'	<10	98	<0.002	<0.002	<0.002	<0.006
H3777-6	MW # 5 60'	<10	107	<0.002	<0.002	< 0.002	<0.006
H3777-7	MW # 5 70'.	<10	285	<0.002	<0.002	<0.002	<0.006
H3777-8	MW # 5 80'	<10	874	<0.002.	<0.002	< 0.002	<0.006
- 4							
Quality Control		267	1209	0.094	0.096	0.100	0.308
True Value QC		278	.1319	0.100	0.100	0.100	0.300
% Accuracy		97.9	91.7	94.3	95.6	100	103
Relative Percent	Difference	6.1	4.4	9.0	3.0	1.8	2.3

METHODS:

TRPHC-EPA 600/4-79-020, 418.1;CI-EPA 600/4-79-020 325.3 BTEX-EPA SW-846 8260

Burgess J. A. Cooke Ph. D.

Date-



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH

P.O. BOX 1613 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/10/98 Reporting Date: 08/13/98 Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F230 MONITOR WEI

Project Location: NOT GIVEN

Sampling Date: 08/07/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: AH

	Na	Ca	Mg	к	Conductivity	T-Alkalinity
LAB NUMBER SAMPLE ID	• (mg/L)	(mg/L)	(mg/L)	(mg/L)	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DATE:	08/13/98	08/11/98	08/11/98	08/11/98	08/11/98	08/1.1/98
H3777-9 MW #5	850	264	127	19	5740	164
	1					And the second
Quality Control	NR	48.0	52.0	3.05	1402	NR
True Value QC	NR	50.0	.50.0	3.00	1413	NR.
% Accuracy	NR	96	. 104	102	99.2	NR
Relative Percent Difference	NR	4.2	3.8	1.6	0:1	NR
			: .			
METHODS:	SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1
	Cl.	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	, pH	TDS
•	(mg/L)	(mg/L)	(mg/L)	(mg/L)	. (s.u.)	(mg/L)
ANALYSIS DATE:	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3777-9 MW #5	1950	138	06/11/98	°200		3790
N3/11-9 MVV #3	1950	130	0	200	7.14	3790
Quality Control	1209	48.92	112	221	7.00	NR
True Value QC	1319	50.00	124	259	7.00	NR
% Accuracy	91.7	98	90	85	100	NR
Relative Percent Difference	4.4	3.1	-	-	0.6	2.3
METHODS:	OMMEGO OLD	. 275.4	040.4	240.4	450.4	400 4
IME LUODS:	SM4500-CI-B	375.4	310.1	310.1	150.1	160.1



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH P.O. BOX 1613 HOBBS, NM 88240

FAX TO: (505) 393-4380

Receiving Date: 08/10/98

Reporting Date: 08/13/98 Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F230 MONITOR WELL

Project Location: NOT GIVEN

Sampling Date: 08/07/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

LAB NO. SA	MPLE ID	TPH (mg/L)	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS DATE		08/10/98	08/10/98	08/10/98	08/10/98	08/10/98
H3777-9 M\	N # 5	<1.0	<0.002	<0.002	<0.002	<0.006
			3 74 . 1 4			
	-, -, -, -, -, -, -, -, -, -, -, -, -, -					
3 No. 1						
	· Programme and					
Quality Control		209	0.103	0.093	0.098	0.301
True Value QC		200	0.100	0.100	0.100	0.300
% Recovery		105	103	92.7	98.4	100
Relative Percent	Difference	1.2	12.6	5.9	2.5	1.5

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW-846 8260

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CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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of J

4RDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240

(505) 393-2326 Fax (505) 393-2476 (915) 673-7001 Fax (915) 673-7020

ANALYSIS KEQUESI											Cox	right TJ.	10									
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	₩.Od	- ,	Ż			Zipi			018101140	SAMPLIS		<u> </u>	DATE	1-11-98.		<u>`</u>		-			-	-
	BILL TO	Company	9	Address:			Phone #:	**	1 0200	יאבט.		EK: .COO!		¥	<u> </u>				-			
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† Cardinal cannot accept verbal changes. Please fax written changes to 915-873-7020.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 08/11/98 Reporting Date: 08/13/98 Project Number: NOT GIVEN

Project Name: SJU WIMBERLY

Project Location: NOT GIVEN

Sampling Date: 08/11/98

Sample Type: GROUNDWATER -Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: BC

LAB NO.	SAMPLE ID	<b>*</b> ·	TPH (mg/L)	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS E	DATE:	Section 1	08/11/98	08/11/98	08/11/98	08/11/98	08/11/98
H3780-1	TEST HOLE #1	· · · · · · · · · · · · · · · · · · ·	<1.0	0.044	0.004	<0.002	0.009
			<u>.                                    </u>			4.10 San (1997)	
		1					
		,					
Quality Cont	rol		207	0.094	0.096	0.1	0.308
True Value C	2C		200	0.1	0.1	0.1	0.3
% Recovery			104	94.3	95.6	100	103
Relative Per	cent Difference		0.1	9	3 .	1.8	2.3

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH 703 E. CLINTON, SUITE 103 HOBBS, NM 88240 FAX TO:

Receiving Date: 08/11/98 Reporting Date: 08/13/98 Project Number: NOT GIVEN

Project Name: SJU WIMBERLY

Project Location: NOT GIVEN

Sampling Date: 08/11/98

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

CI TDS Conductivity LAB NUMBER SAMPLE ID (mg/L) (mg/L) (uS/cm)

ANALYSIS DATE	08/11/98	08/12/98	08/11/98
H3780-1 TEST HOLE #1	29600	58260	61900
Quality Control	1209	NR	1402
True Value QC	1319	NR	1413
% Accuracy	91.7	NR	99.2
Relative Percent Difference	4.4	2.3	0.1

METHODS:	EPA 600/4-79-020	SM4500-CL <sup>-</sup> B	160.1	120.1

Chemist J. Cash

Date

H3780-2.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

ARDINAL LABORATORIES, INC.

2111 Beechwood, Abilene, TX (9603 101 East Mariand, Hobbs, NM 68240	(505) 393-2326 Fax (505) 393-2476
1 Beechwood, Abilene, IX /9503	(915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

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service. In no event shall Cardina in Mister or expression and long ou	service. In no evert and Curdinal be lable for incidental or consequental damages, including without Initiation, business interruptions, jors of uses, or loss of profits incurred by ofert, the subsidiaries, inflation and of or related to the cardinal parameter by Cardinal remembers of whether such daling in besid stonds and of the above stated reasons or phandes.	se, includ	ang withou	out Imitati	ion, bust	mees link	omundane and chall	bee of	vee, or loss	of the above	engitions, lose of use, or loss of profite incurred by offert, its subsidiaries residual to be sed upon any of the above stated reasons to otherwise	ort, its subs	Idanes.			PU3	io spico i	and all costs of sollections, including attorney's fees.	Including &	ttomey's fe				
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Received By:

Received By: (Lab Staff

Delivered By: (Circle One)
Sample Condition CHECKED BY:
Cool Intact
[Initials]
Sampler - UPS - Bus - Other:

† Cardinal cannot accept verbal changes. Please fax written changes to 915-573-7020.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

703 W. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/12/98

Reporting Date: 08/13/98

Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F-230 UNIT IDA W.

Project Location: NOT GIVEN

Sampling Date: 08/12/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

						ETHYL	TOTAL
LAB NO.	SAMPLE ID	45	TPH	BENZENE	TOLUENE	BENZENE	XYLENES
			(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)

ANALYSIS DATE:	08/13/98	08/12/98	08/12/98	08/12/98	08/12/98
H3787-1 MW #7	48.7	0.013	0.002	<0.002	<0.006
			-	-	
Quality Control	200	0.088	0.088	0.092	0.281
True Value QC	200	0.100	0.100	0.100	0.300
% Recovery	100	88.2	88.5	91.6	93.7
Relative Percent Difference	2.6	6.9	8.0	9.4	9.6

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

Chemis

Date



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH 703 W. CLINTON SUITE 103 HOBBS, NM 88240 FAX TO: (505) 393-4380

Receiving Date: 08/12/98 Reporting Date: 08/13/98 Project Number: NOT GIVEN

Project Name: SOUTH JUSTIS F-230 UNIT IDA W.

Project Location: NOT GIVEN

Sampling Date: 08/12/98

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC Analyzed By: AH/GP

LAB NUMBER SAMPLE ID

TDS ( mg/L ) CI

(mg/L)

ANALYSIS D	ATE:	08/13/98	08/12/98
H3787-1	MW #7	 13496	5015
:	<del></del>	 	
Quality Contro	ol	NR	1209
True Value Q	3	 NR	1319
% Recovery		 NR	91.7
Relative Perc	ent Difference	 2.3	4.4

METHODS: EPA 600/4-79-02 160.1 325.3

Buyett A Coh

Date

H3787-1.XLS

4RDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

3812 (505) 393-2326 Fax (505) 393-2476 (915) 673-7001 Fax (915) 673-7020 Company Name: Sofet + Environmental

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† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 08/25/98

Reporting Date: 09/01/98

Project Number: 17

Project Name: IDA WIMBERLY PIT Project Location: SOUTH JUSTIS

Sampling Date: 08/25/98

Sample Type: GROUNDWATER

Sample Condition: COOL AND INTACT

Sample Received By: AH

Analyzed By: BC

LAB NO.	SAMPLE ID	• \	TPH (mg/kg)	BENZENE (mg/kg)	TOLÜENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS I	DATE:		08/28/98	08/25/98	08/25/98	08/25/98	08/25/98
H3812-1	MW #1		42.9	<0.002	<0.002	< 0.002	<0.006
H3812-2	MW #2		14.0	<0.002	<0.002	<0.002	<0.006
H3812-3	MW #3		24.6	0.002	<0.002	< 0.002	<0.006
H3812-4	MW #4		. 11.8	0.046	<0.002	0.012	<0.006
H3812-5	MW-#5		11.0	<0.002	< 0.002	<0.002	<0.006
H3812-6	MW #6	·	6.8	0.007	<0.002	< 0.002	< 0.006
H3812-7	MW #7		7.1	0.003	<0.002	<0.002	<0.006
Quality Cont	rol		158	0.106	0.102	0.098	0.297
True Value (	3C		150	0.1	0.1	0.1	0.3
% Recovery			105	106	102	98.1	99.0
Relative Per	cent Difference		1.1	0.5	2.0	0.4	0.4

METHODS: TRPHC - EPA 600/7-79-020, 418.1; BTEX - EPA SW846-8020, 8260

Chemist (

Date



## Safety & Environmental

Solutions, Inc.

RECEIVED ARK 0 5 1999

ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

## **ARCO** Permian

Ida Wimberly
South Justis Unit F-230
Monitor Well Report
Lea County, New Mexico

June 17, 1999

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

## TABLE OF CONTENTS

L Background	2
II. Work Performed	2
III. Analytical Results	2
IV Figures and Annendices	3

### I. Background

The subject property is located at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, New Mexico. Safety & Environmental Solutions, Inc. (SESI) performed sampling and data collection on the seven (7) ground water monitor wells previously installed the site (See Vicinity Map). The casing size in all wells is 2".

### II. Work Performed

On June 17, 1999, SESI environmental technician W. Dee Whatley arrived at the site. Ground water samples were taken from each well after a hand bailer was used to develop the wells. Three to five casing volumes of water were removed from each well until pH and temperature of the water were stabilized. The water that was removed was placed in appropriate drums for disposal. The samples were obtained and placed in appropriate containers, preserved and transported under chain of custody to Cardinal Laboratories of Hobbs, New Mexico for analysis of the contaminants identified in the initial sampling. (See Analytical Data)

In addition to the sampling, SESI also measured the depth to the top of the water table and the total depth of each well. The depth to the top of ground water was measured using a Solinst water level indicator. The total depth of each well was measured in order to compute the proper casing volumes. A summary of this data follows:

ID	Date	Depth to Water	Well Total Depth	Free Product® Thickness
MW - 1	6/17/99	64.43'	66'	0.00
MW – 2	6/17/99	63.63'	71'	0.00
MW - 3	6/17/99	63.98'	71'	0.00
MW – 4	6/17/99	65.65'	82'	0.00
MW - 5	6/17/99	63.881	80'	0.00
MW - 6	6/17/99	63.29'	75'	0.00
MW - 7	6/17/99	62.51'	75'	0.00

### III. Analytical Results

The analysis of the groundwater samples performed by Cardinal Laboratories are summarized as follows:

Contaminant	WQCC Standard	MW #1 32.	MW   #2	/MW #3	MW #4
Chloride	250.0 ppm	1610ppm	3890ppm	7570ppm	4680ppm
SO <sub>4</sub>	600 ppm	N/A	N/A	N/A	N/A
TDS	1000 ppm	4560ppm	7490ppm	15180ppm	9400ppm

Benzene	0.01 ppm	N/A	N/A	N/A	0.003ppm
Toluene	0.75 ppm	N/A	N/A	N/A	<.002ppm
Ethyl Benzene	0.75 ppm	N/A	N/A	N/A	<.002ppm
Total Xylenes	0.62 ppm	N/A	N/A	N/A	<.006ppm

Contaminant	WQCC	MW	MW	$MW^{(n)}$
	Standard	#5	#6	#7
Chloride	250.0 ppm	2090ppm	25500ppm	5380ppm
SO <sub>4</sub>	600 ppm	N/A	1200ppm	142ppm
TDS	1000 ppm	5300ppm	53980ppm	10580ppm
Benzene	0.01 ppm	N/A	N/A	N/A
Toluene	0.75 ppm	N/A	N/A	N/A
Ethyl Benzene	0.75 ppm	N/A	N/A	N/A
Total Xylenes	0.62 ppm	N/A	N/A	N/A

## IV. Figures and Appendices

Figures:

Vicinity Map

Appendices:

**Analytical Results** 

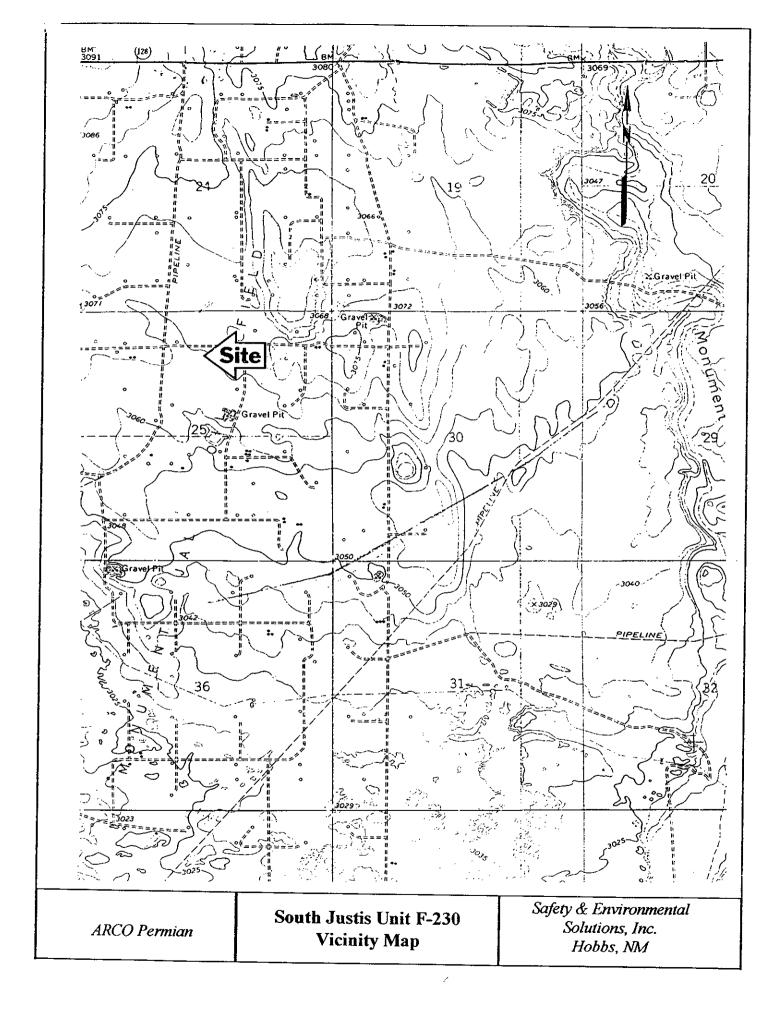


Figure 1 Vicinity Map

# Appendix A Analytical Results





ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 06/17/99

Reporting Date: 06/21/99 Project Owner: ARCO

Project Name: ARCO PERMIAN

Project Location: IDA WIMBERLY

Sampling Date: 06/17/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: BC

				ETHYL	TOTAL
LAB NO.	SAMPLE ID	BENZENE (mg/L)	TOLUENE (mg/L)	BENZENE (mg/L)	XYLENES (mg/L)

ANALYSIS I	DATE	06/18/99	06/18/99	06/18/99	06/18/99
H4186-4	MVV #4	0.003	<0.002	<0.002	<0.006
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<del></del>					
Quality Conf	trol	0.086	0.097	0.101	0.301
True Value	QC	0.100	0.100	0.100	0.300
% Recovery	,	86.0	97.4	101	100
Relative Per	cent Difference	0.1	1.1	1.8	2.7

METHOD: EPA SW 846-8021B, 5030, 5021 Gas Chromatography

JUL 0 6 1999

Chemist:

Date

H4186B.XLS





PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 06/17/99 Reporting Date: 06/21/99

Project Owner: ARCO

Project Name: ARCO PERMIAN

Project Location: IDA WIMBERLY

LAB NUMBER

Analysis Date: 06/18/99 Sampling Date: 06/17/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

SO4

46.4

50.0

93

2.8

(mg/L)

H4186-6	MW #6	1200
H4186-6 H4186-7	MW #7	142
	<u> </u>	

SAMPLE ID

METHOD: EPA 600/4-79-020 375.4

Relative Percent Difference

Chemist O Carlos

**Quality Control** 

True Value QC

% Recovery

Date

H4186C.XLS



PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

**TDS** 

NR

NR

NR

NR

(ma/L)

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 06/17/99
Reporting Date: 06/21/99

Project Owner: ARCO
Project Name: ARCO PERMIAN

Project Location: IDA WIMBERLY

LAB NUMBER SAMPLE ID

Sampling Date: 06/17/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

CI

(ma/L)

1325

1319

101

1.5

Analyzed By: AH

		( 3 )	( )
ANALYSIS [	DATE:	06/18/99	06/18/99
H4186-1	MW #1	4560	1610
H4186-2	MW #2	7490	3890
H4186-3	MW #3	15180	7570
H4186-4	MW #4	9400	4680
H4186-5	MW #5	5300	2090
H4186-6	MW #6	53980	25500
H4186-7	MW #7	10580	5380

\*Std. Methods

Relative Percent Difference

Surfest & Cooling Chemist & Cooling

**Quality Control** 

True Value QC

% Recovery

Date

H4186A.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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ARDINAL LABORATORIES, INC.	
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2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240 (915) 673-7001 Fax (915) 673-7020 (505) 393-2326 Fax (505) 393-2476

Company Name:	SEST			•	<u></u>			ANA	ANALYSIS RE	REOUEST		
Project Manager:	ا ا		BILL	TO PO#:		-		_	 			<u>.</u>
Address: 703	E. C.lizton #103		Company									
Clty: +15/245	3/mZlp:	6 40	Attn:	Š								
Phone #: 50	3150.796 3	)	Address:	29 me								
Fax#: 505	· 393. 4388		City:									
Project #:	Project Owner: /△ K C ○	KLO	State:	:d Z								
Project Name:	ALCO PESMINAL		Phone #:									
Project Location:	Ida Winbell		Fax #:			<b>Z</b> ,						-
FOR LAB USE ONLY		MATRIX	PRES.	SAMPLING		<del>,</del>	_					
LAB I.D.	Sample I.D.	SROUNDWATER SOULDWATER SUL	OTHER:	: A∃HTC	TIME	501	×318	105				
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PLEASE NOTE: Labity and Da analyses. As deline including the	PLEASE NOTE: LIABING and Damages. Cardinal's stating and deem's accessive namedy for any deling whether based in contract or fort, shall be smited to the amount pulled by the elect for the analyses. A deline includible to the any other questions which the demand with the delines much in welfage and recommending and recommended by Cardinal Within 30 days she completed on the supplicable and any any and any any and any and any and any and any and any and any and any any and any any and any any and any and any any and any any and any any and any any and any any and any any and any and any any and any any and any and any any and any any and any and any any and any and any any and any any and any and any and any and any any and any any and any any and any any and any and any any and any any and any any and any any and any any and any and any any and any any and any any and any any and any any and any any and any any and any any and any any and any any any and any any and any any and any any and any any any and any any and any any any any and any any any any any any any any any any	for any claim arteing whether base the desmed walved unless made story without forflation, hydrose in	ed in contract or for in writing and received recomplines these of	seed it control or too, shall be fulled to the amount paid by the clear for the by in writing and resolved by Candida within 50 days after completion of the app to incomplete the strike or took of monits too mad by also the subsidiation.	out paid by the c ye after complet and by place the	leat for the on of the app	Cath	- ~ a	arms and Condition: ) days past due at the pt at costs of collects	Terms and Conditions: Interest will be charged on all accounts more than 2d days past local the misso of 24% per annual from the original date of invoice, and all code oftens. Including strong views, then.	ped on all accounts mo militors the original data 's flees.	a than a of invoice,
emistes or successors arising ou	emisies of successors arising out of or related to the parformance of services hereunder by Cardnel, regardless of whe	r by Cardnal, regardless of wheth	er euch chaim is be	ther such claim is based upon any of the above stated ressons or otherwise.	tated reasons o	otherwise.						
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Relinquished By:	10 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	Received By:	(Lab Staff)									
Delivered By: (Circle One)	600	Sample Conditi	4	CHECKED BY:								
Sampler - UPS - Bus - Other:	us - Other:	CYAL CY Yes										

<sup>†</sup> Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.



# Safety & Environmental

Solutions, Inc.



ENVIRONMENTAL BUREAU OIL CONSERVATION DIVISION

# **ARCO Permian**

Ida Wimberly
South Justis Unit F-230
Monitor Well Report
Lea County, New Mexico

**September 28, 1999** 

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

# TABLE OF CONTENTS

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II Work Performed	2
III. Analytical Results	2
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### I. Background

The subject property is located at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, New Mexico. Safety & Environmental Solutions, Inc. (SESI) performed sampling and data collection on the seven (7) ground water monitor wells previously installed the site (See Vicinity Map). The casing size in all wells is 2".

### II. Work Performed

On September 24, 1999, SESI environmental technician W. Dee Whatley arrived at the site. Ground water samples were taken from each well after a hand bailer was used to develop the wells. Three to five casing volumes of water were removed from each well until pH and temperature of the water were stabilized. The water that was removed was placed in appropriate drums for disposal. The samples were obtained and placed in appropriate containers, preserved and transported under chain of custody to Cardinal Laboratories of Hobbs, New Mexico for analysis of the contaminants identified in the initial sampling. (See Analytical Data)

In addition to the sampling, SESI also measured the depth to the top of the water table and the total depth of each well. The depth to the top of ground water was measured using a Solinst water level indicator. The total depth of each well was measured in order to compute the proper casing volumes. A summary of this data follows:

İD	Date	Depth to	Well Total	Free Product
* 4		Water	Depth	Thickness
MW - 1	9/24/99	64.43'	66'	0.00
MW – 2	9/24/99	63.94'	71'	0.00
MW - 3	9/24/99	63.57'	71'	0.00
MW - 4	9/24/99	65.61'	82'	0.00
MW - 5	9/24/99	63.99°	80'	0.00
MW - 6	9/24/99	63,26'	75'	0.00
MW - 7	9/24/99	62.40'	75'	0.00

### П. Analytical Results

The analysis of the groundwater samples performed by Cardinal Laboratories are summarized as follows:

Conta-	MW	MW	MW	MW	MW	MW	MW
minant	# 1	#2	#3	#4	#5	#6	. #7
Sodium	1157 ppm	3611 ppm	2892 ppm	8521 ppm	1355 ppm	22692ppm	3553 ppm
Calcium	296 ppm	544 ppm	448 ppm	736 ppm	312 ppm	2480 ppm	600 ppm
Magnesium	126 ppm	258 ppm	214 ppm	272 ppm	112 ppm	1458 ppm	97 ppm
Potassium	24 ppm	62 ppm	55 ppm	76 ppm	20 ppm	98 ppm	66 ррт
Conductivity	1978 ppm	1715 ppm	1679 ppm	1603 ppm	1657 ppm	1482 ppm	1523 ppm
T-Alkalinity	188 ppm	376 ppm	376 ppm	508 ppm	196 ppm	192 ppm	136 ррт
Chlorides	2231 ppm	6590 ppm	5374 ррш	14600ррт	2535 ррт	42583ррт	6387 ppm
Sulfate (SO <sub>4</sub> )	455 ppm	666 ppm	397 ppm	488 ppm	429 ppm	1428 ppm	553 ppm
Carbonate	0 ppm	0 ррт	0 ppm	0 ppm	0 ppm	0 ppm	0 ppm
HCO <sub>3</sub>	229 ppm	459 ppm	459 ppm	620 ppm	239 ppm	234 ppm	166 ppm
TDS	4520 ppm	14270ppm	10330ррт	20020ppm	5100 ppm	71000ppm	12140ppm
pН	7.19	6.88	6.91	7.04	7.28	6.74	7.59
TPH	2.76 ppm	4.27 ppm	1.52 ppm	3.27 ppm	1.26 ppm	1.88 ppm	1.32 ppm
Benzene	<.002 ppm	0.003 ppm ·	0.005 ppm.	0.033 <b>ppm</b>	<.002 ppm	0.003 ppm	0.008 ppm
Toluene	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	<.002 ppm	<.002 ppm	<.002 ppm	0.006 ppm	<.002 ppm	<.002 ppm	<.002 ppm
T. Xylenes	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

### IV. Figures and Appendices

### Figures:

Vicinity Map Water Flow Diagram

### Appendices:

Cumulative Well Data Analytical Results Figure 1 Vicinity Map

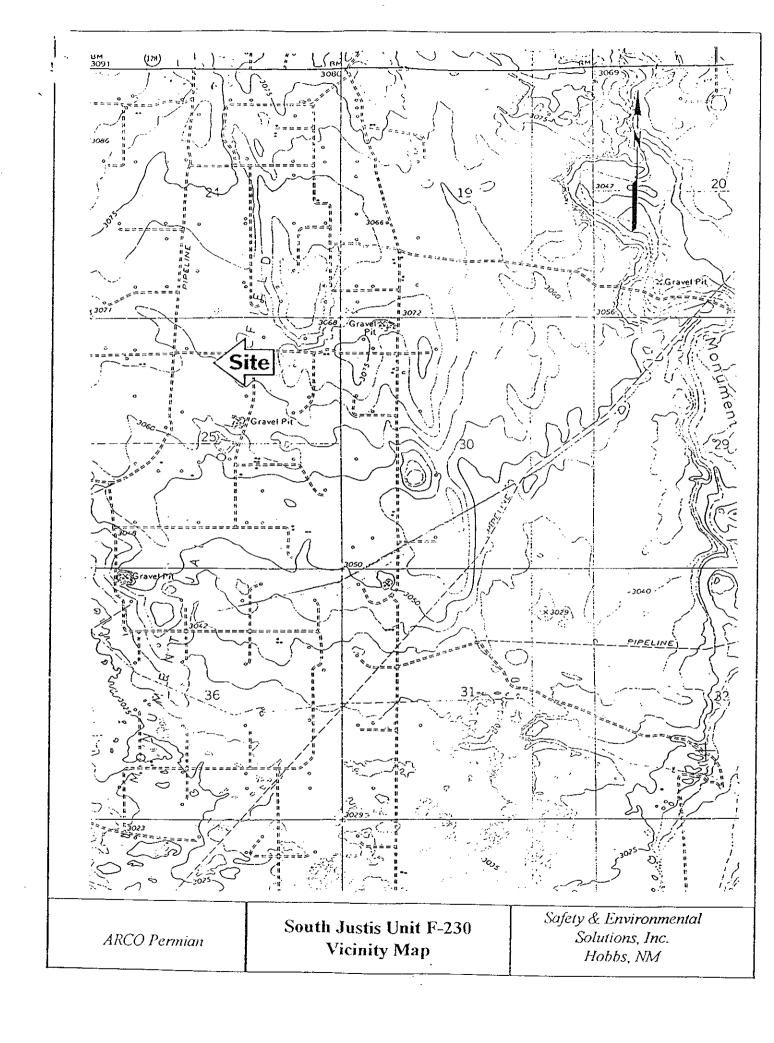
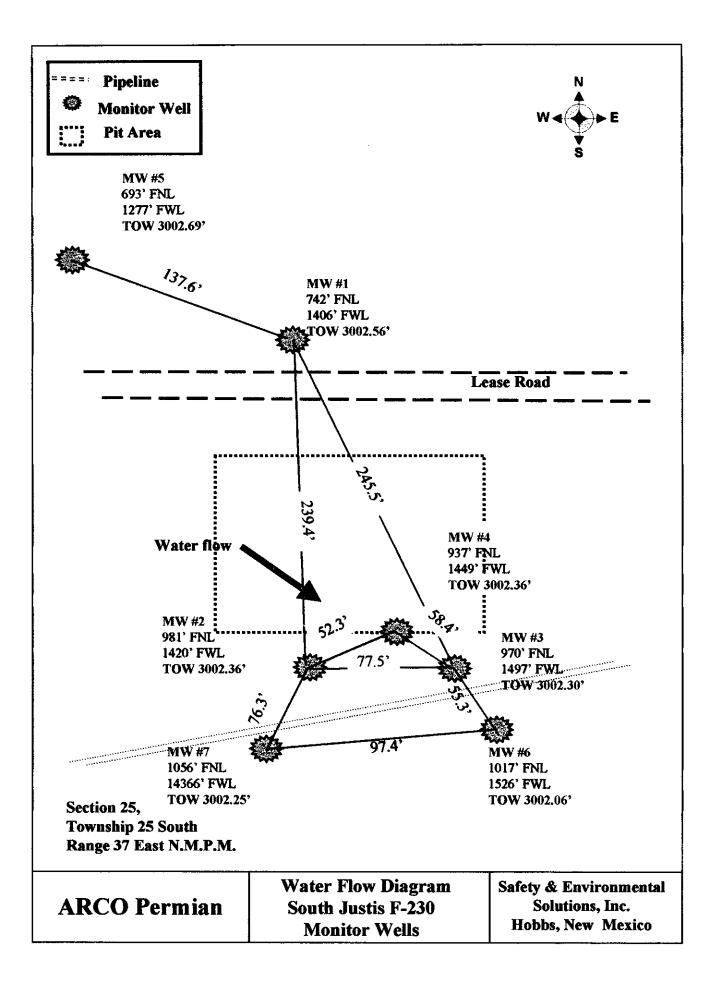


Figure 2
Water Flow Diagram



Appendix A
Cumulative Well Data

# **Ida Wimberly Cumulative Well Data**

Contaminant	WQCC	Initial		Test Date	
	Standard	Test 12/17/97	8/25/98	. 6/17/99	. 9/24/99
Aluminum	5.0 ppm	<0.2 ppm	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a
Chloride	250.0 ppm	1580 ppm	1839 ppm	1610 ppm	2231 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a
Iron	1.0 ppm	.388 ppm	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Manganese	0.2 ppm	0.345 ppm	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Sulfate	600 ppm	1050 ppm	305 ppm	n/a	455 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a
TDS	1000 ppm	3480 ppm	4380 ppm	4560 ppm	4520 ppm
pH	> 6 & <9	5.58	6.384	n/a	7.19 ppm
TPH	N/A	n/a	42.9 ppm	n/a	2.76 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	n/a	<.006 ppm

Contaminant	WQCC	Initial Test	Test Date	Test Date	Test Date
Соптанивант	Standard	12/17/97	8/25/98	6/17/99	9/24/99
Aluminum	5.0 ppm	<0.2 ppm	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a
Chloride	250.0 ppm	6200 ppm	2731 ppm	3890 ppm	6590 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Manganese	0.2 ppm	0.343 ppm	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Sulfate	600 ppm	1160 ppm	426 ppm	n/a	666 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a
TDS	1000 ppm	10490 ppm	12240 ppm	7490 ppm	14270 ppm
рН	> 6 & <9	7.84	6.303	n/a	6.88
TPH	N/A	n/a	14.0 ppm	10.3 ppm	4.27 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	<.002 ppm	.003 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 12/17/97	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99
Aluminum	5.0 ppm	<0.3 ppm	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a
Chloride	250.0 ppm	8500 ppm	4124 ppm	7570 ppm	5374 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n∕a
Соррег	1.0 ppm	<0.1 ppm	n/a	n/a	n/a
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Manganese	0.2 ppm	0.440 ppm	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Sulfate	600 ppm	1280 ppm	279 ppm	n/a	397 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a
TDS	1000 ppm	15300 ppm	8840 ppm	15180 ppm	10330 ppm
pН	> 6 & < 9	7.77	6.64	n/a	6.91
ТРН	N/A	n/a	24.6 ppm	n/a	n/a
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	<.002 ppm	.005 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

Contaminant	WQCC	Initial Test	Test Date	Test Date	Test Date
	Standard	8/10/98	8/25/98	6/17/99	9/24/99
Aluminum	5.0 ppm	<0.3 ppm	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a
Chloride	250.0 ppm	9641 ppm	6910 ppm	4680 ppm	14600 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Manganese	0.2 ppm	0.440 ppm	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Sulfate	600 ppm	159 ppm	335 ppm	n/a	488 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a
TDS	1000 ppm	13580 ppm	13960 ppm	9460 ppm	20020 ppm
pН	> 6 & < 9	6.69	6.64	n/a	7.04
TPH	N/A	<1.0 ppm	11.8 ppm	n/a	3.27 ppm
Benzene	0.01 ppm	0.033 ppm	0.046 ppm	0.003 ppm	0.033 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.007 ppm	.012 ppm	<.002 ppm	0.006 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 8/10/98	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99
Aluminum	5.0 ppm	<0.3 ppm	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a
Chloride	250.0 ppm	1950 ppm	2396 ppm	2090 ppm	2535 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a
Manganese	0.2 ppm	0.440 ppm	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a
Sulfate	600 ppm	138 ppm	274 ppm	n/a	429 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a
TDS	1000 ppm	3790 ppm	5430 ppm	5300 ppm	5100 ppm
pН	> 6 & < 9	7.14	7.216	n/a	7.28
TPH	N/A	<1.0 ppm	11.0 ppm	n/a	1.26 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	n/a	<.006 ppm

Contaminant	WQCC	Initial Test	Test Date	Test Date	Test Date
	Standard	8/11/98	8/25/98	6/17/99	9/24/99
Aluminum	5.0 ppm	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	n/a	n/a	n/a	n/a
Barium	1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	n/a	n/a	n/a	n/a
Chloride	250.0 ppm	29600 ppm	24186 ppm	25500 ppm	42583 ppm
Chromium	0.05 ppm	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	n/a	n/a	n/a	n/a
Соррег	1.0 ppm	n/a	n/a	n/a	n/a
Iron	1.0 ppm	n/a	n/a	n/a	n/a
Lead	0.05 ppm	n/a	n/a	n/a	n/a
Manganese	0.2 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	n/a	n/a	n/a	n/a
Selenium	0.05 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	n/a	n/a	n/a	n/a
Sulfate	600 ppm	n/a	750 ppm	1200 ppm	1428 ppm
Zinc	10.0 ppm	n/a	n/a	n/a	n/a
TDS	1000 ppm	58260 ppm	58260 ppm	53980 ppm	71000 ppm
pН	> 6 & < 9	n/a	6.829	n/a	6.74
TPH	N/A	<1.0 ppm	6.8 ppm	n/a	1.88 ppm
Benzene	0.01 ppm	0.044 ppm	0.007 ppm	n/a	0.003 ppm
Toluene	0.75 ppm	0.004 ppm	<.002 ppm	n/a	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
Total Xylenes	0.62 ppm	0.009ppm	<.006 ppm	n/a	<.006 ppm

Contaminant			Test Date	Test Date	Test Date
	Standard	8/12/98	8/25/98	6/17/99	9/24/99
Aluminum	5.0 ppm	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	n/a	n/a	n/a	n/a
Barium	1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	n/a	n/a	n/a	n/a
Chloride	250.0 ppm	5015 ppm	3288 ppm	5380 ppm	6387 ppm
Chromium	0.05 ppm	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	n/a	n/a	. n/a	n/a
Copper	1.0 ppm	n/a	n/a	n/a	n/a
Iron	1.0 ppm	n/a	n/a	n/a	n/a
Lead	0.05 ppm	n/a	n/a	n/a	n/a
Manganese	0.2 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	n/a	n/a	n/a	n/a
Selenium	0.05 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	n/a	n/a	n/a	n/a
Sulfate	600 ppm	n/a	832 ppm	142 ppm	553 ppm
Zinc	10.0 ppm	n/a	n/a	n/a	n/a
TDS	1000 ppm	13496 ppm	8170 ppm	10580 ppm	12140 ppm
pН	> 6 & <9	n/a	7.326	n/a	7.59
TPH	N/A	48.7 ppm	7.1 ppm	n/a	1.32 ppm
Benzene	0.01 ppm	0.013 ppm	0.003 ppm	n/a	0.008 ppm
Toluene	0.75 ppm	0.002ppm	<.002 ppm	n/a	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm
Total Xylenes	0.62 ppm	0.009ppm	<.006 ppm	n/a	<.006 ppm

Appendix B Analytical Results



PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 09/24/99

LADAIO

**Quality Control** 

True Value QC

Relative Percent Difference

% Recovery

Reporting Date: 09/28/99
Project Number: NOT GIVEN

Project Name: IDA WIMBERLY
Project Location: ARCO SOUTH JUSTIS

CARADIE ID

Sampling Date: 09/24/99

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

**ETHYL** 

0.100

0.100

99.6

6.7

TOTAL

0.304

0.300

101

5.3

Sample Received By: AH Analyzed By: BC/GP/JP

0.100

0.100

100

LAB NO.	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
ANALYSIS E	DATE:	09/27/99	09/24/99	09/24/99	09/24/99	09/24/99
H4360-1	MW #1	2.76	<0.002	<0.002	<0.002	<0.006
H4360-2	MW #2	4.27	0.003	<0.002	<0.002	<0.006
H4360-3	MW #3	1.52	0.005	<0.002	<0.002	<0.006
H4360-4	MW #4	3.27	0.033	<0.002	0.006	< 0.006
H4360-5	MW #5	1.26	<0.002	<0.002	<0.002	<0.006
H4360-6	MW #6	1.88	0.003	<0.002	<0.002	<0.006
H4360-7	MW #7	1.32	0.008	<0.002	<0.002	<0.006
	· ·	,				1

0.092

0.100

92.1

2.9

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260

41.3

40.0

103

0.6

Chemist LaCook

Date





Receiving Date: 09/24/99

Reporting Date: 09/28/99

Project Number: NOT GIVEN

Project Name: IDA WIMBERLY

Project Location: ARCO SOUTH JUSTIS

PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO: (505) 393-4388

Sampling Date: 09/24/99

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

			_				
		Na	Ca	Mg	K	Conductivity	T-Alkalinity
LAB NUMBER	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DAT	E:	09/24/99	09/27/99	09/27/99	09/27/99	09/27/99	09/24/99
H4360-1	MW #1	1157	296	126	24	1978	188
H4360-2	MW #2	3611	544	258	62	1715	376
H4360-3	MW #3	2892	448	214	55	1679	376
H4360-4	MW #4	8521	736	272	76	1603	508
H4360-5	MW #5	1355	312	112	20	1657	196
H4360-6	MW #6	22692	2480	1458	98	1482	192
H4360-7	MW #7	3553	600	.97	66	1523	136
					-	j <u></u> j	
Quality Control	· · · · · · · · · · · · · · · · · · ·	NR NR	48	49	4.96	1443	NR
True Value QC		NR	50	50	5.00	1413	NR
% Accuracy		NR NR	96	98	99	102	NR
Relative Percer	t Difference	NR	6.3	5.1	0	0.4	NR
METHODS:		SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1

		ci_	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	pН	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS [	DATE:	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/28/99
H4360-1	MW #1	2231	455	0	229	7.19	4520
H4360-2	MW #2	6590	666	0	459	6.88	14270
H4360-3	MW #3	5374	397	0	459	6.91	10330
H4360-4	MW #4	14600	488	0	620	7.04	20020
H4360-5	MW #5	2535	429	0	239	7.28	5100
H4360-6	MW #6	42583	1428	0	234	6.74	71000
H4360-7	MW #7	6387	553	0	166	7.59	12140
Quality Cont	trol	1024	47.47	112	221	6.99	NR
True Value (	2C	1000	50.00	124	259	7.00	NR
% Ассигасу		102	94.9	90.3	85.4	99.9	NR
Relative Per	cent Difference	9.8	5.2	-	-	1.4	NR
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1	160.1

Buy Hy Coch;

Date

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

5

ARDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603		j
ARDINAL LABORATORIES, 2111 Beechwood, Abilene, TX	MC.	
AARD	INAL LABORATORIES,	2111 Beechwood, Abilene, TX
	AARD	•

2111 Beechwood, Abilene, TX 79603 101 East Marland, Hobbs, NM 88240 (915) 673-7001 Fax (815) 673-7020 (505) 393-2326 Fax (505) 393-2476

Terms and Conditions; lissest will be alsoped on all seconds more than 30 days past due at the rate of 24% per serven from the original dete of involve, and at costs of coleculors, tecluding attending's test. REOUEST ANALYSIS O No Additional Fax# 1 and residved by Cardnal within 30 days after completion of the applicable ms, loss of use, or loss of profits incursed by clarit, its subplications. 8 TIME SAMPLING HILTO PO# DATE . 17.4.92 Zip: SAME HECKED BY: (Initials) : ЯЭНТО Company: PRES. Address: CE/COOF Phone #: Fax #: State: ACID: Received By: (Lab Sta Attn: Clty: : SEHTO **BOOTIS** MATRIX uratyses. At daime including those for ned pence and any other osues whatsoever shall be deemed watved unless m service. In no event what Cardnal be sate for incidental or consequental damagne, including without limitation, tradities ٦IC 7IOS MASTEWATER State: NM ZIp: 88240 Time: 9919cm (G)RAB OR (C)OMP. Project Owner: T. Mber #103 Sample I.D. # A CLINION 397-0510 MUTTS Sampler - UPS - Bus - Other: Fax#: (505) 393-4388 C#/10 Delivered By: (Circle One) 9#MW #/1/4 Sampler Relinguished ធា Phone #: (505) Project Manager: Project Location: Company Name: FOR LAB USE ONLY Relinquished By: Address: 703 LAB 1.0. Project Name: City: HOBBS Project #:

† Cardinal cannot accept verbal changes. Please fax written changes to 915-873-7020.

# ARCO Permian Monitor Well Report Ida Wimberly

DEC: 4 2000



South Justis Unit F-230 Unit C, Section 25, T25S, R37E Lea County, New Mexico

September19, 2000



Prepared for:

ARCO Permian P.O. Box 1610 Midland, Texas 79702

By:

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

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I. Background	2
II.Work Performed	2
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IV. Figures and Appendices	4

### I. Background

The subject property is located at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, New Mexico. Safety & Environmental Solutions, Inc. (SESI) performed sampling and data collection on the eight (8) ground water monitor wells previously installed at the site (See Vicinity Map). The casing size in all wells is 2".

### II. Work Performed

On September 19, 2000 SESI environmental technician, Sergio Contreras, Jr., arrived at the site. Ground water samples were taken from each well after a hand bailer was used to develop the wells. Three to five casing volumes of water were removed from each well until pH and temperature of the water were stabilized. The water that was removed was placed in appropriate drums for disposal. The samples were obtained and placed in appropriate containers, preserved and transported under chain of custody to Cardinal Laboratories of Hobbs, New Mexico for analysis of the contaminants identified in the initial sampling. (See Analytical Data)

In addition to the sampling, SESI also measured the depth to the top of the water table and the total depth of each well. The depth to the top of ground water was measured using a Solinst water level indicator. The total depth of each well was measured in order to compute the proper casing volumes. A summary of this data follows:

ID	DATE	TOP OF	DEPTH	POTENTIOMETRIC	TOTAL	FREE
		CASING	TO	ELEVATION	WELL	PRODUCT
		ELEVATION	WATER		DEPTH	THICKNESS
MW – 1	9-19-00	3,066.98'	64.53'	3,002.45'	66'	0.00
MW-2	9-19-00	3,065.92'	63.72'	3,002.20'	71'	0.00
MW-3	9-19-00	3,066.21'	64.07'	3,002.14'	71'	0.00
MW – 4	9-19-00	3,067.93'	65.73'	3,002.20'	82'	0.00
MW – 5	9-19-00	3,066.56'	63.99'	3,002.57	80'	0.00
MW – 6	9-19-00	3,065.33'	63.37'	3,001.96'	75'	0.00
MW - 7	9-19-00	3,064.64'	62.55'	3,002.09'	75'	0.00
MW – 8	9-19-00	3,062.68'	60.69'	3,001.99'	72'	0.25'

### III. Analytical Results

The analysis of the groundwater samples performed by Cardinal Laboratories are summarized as follows:

CONTAMINANT	MW #1	MW #2	MW #3	MW #4
Sodium	913ppm	2382ppm	6027ppm	3714ppm
Calcium	235ppm	288ppm	676ppm	300ppm
Magnesium	78ppm	126ppm	224ppm	135ppm
Potassium	5.29ppm	26.94ppm	49.62ppm	38.70ppm
Conductivity	5753ppm	12374ppm	29779ppm	17935ppm
T-Alkalinity	205ppm	461ppm	441ppm	738ppm
Chlorides	1651ppm	4274ppm	10490ppm	5925ppm
Sulfate (SO <sub>4</sub> )	369ppm	218ppm	540ppm	332ppm
Carbonate	0ppm	0ppm	0ppm	0ppm
HCO <sub>3</sub>	250ppm	563ppm	538ppm	900ppm
TDS	4290ppm	8080ppm	21050ppm	11220ppm
pН	7.26	6.97	6.89	7.26
TPH	<1.0ppm	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	<.002ppm	<.002ppm	<.002ppm	0.024ppm
Toluene	<.002ppm	<.002ppm	<.002ppm	<.002ppm
E. Benzene	<.002ppm	<.002ppm	<.002ppm	0.011ppm
T. Xylenes	<.006ppm	<.006ppm	<.006ppm	<.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	MW #5	MW #6	MW #7	
Sodium	1953ppm	13658ppm	1859ppm	
Calcium	350ppm	1792ppm	344ppm	
Magnesium	134ppm	695ppm	102ppm	
Potassium	6.32ppm	104ppm	13.54ppm	
Conductivity	10547ppm	66214ppm	10129ppm	
T-Alkalinity	205ppm	267ppm	297ppm	
Chlorides	3691ppm	25352ppm	3303ppm	
Sulfate (SO <sub>4</sub> )	265ppm	1143ppm	373ppm	
Carbonate	0ppm	0ppm	0ppm	
HCO <sub>3</sub>	250ppm	325ppm	363ppm	
TDS	7680ppm	50260ppm	7210ppm	
pН	7.41	6.75	7.18	
TPH	<1.0ppm	<1.0ppm	<1.0ppm	
Benzene	<.002ppm	0.011ppm	<.002ppm	
Toluene	<.002ppm	<.002ppm	<.002ppm	
E. Benzene	<.002ppm	<.002ppm	<.002ppm	
T. Xylenes	<.006ppm	<.006ppm	<.006ppm	

\*Red exceeds NM WQCC Ground Water Standards MW #8 not sampled due to Free Product

### IV. Figures and Appendices

### Figures:

Vicinity Map
Potentiometric Map

### **Appendices:**

Cumulative Well Water Quality Data Analytical Results Water Analysis Validation Figure 1 Vicinity Map

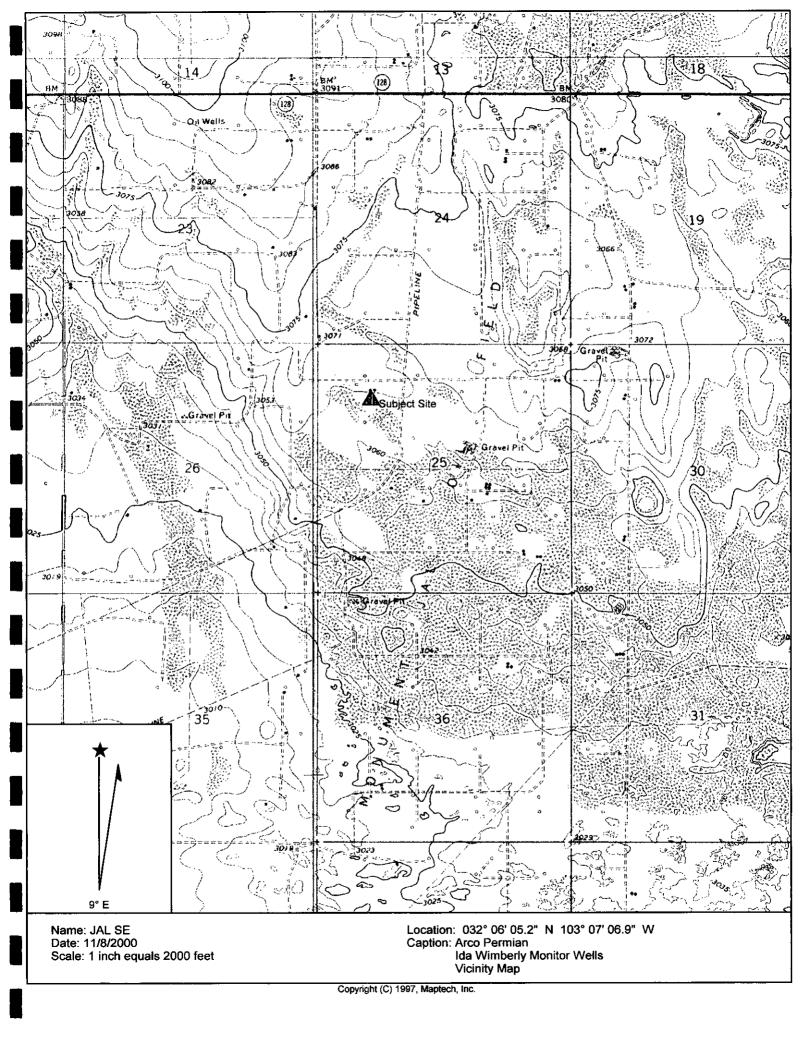
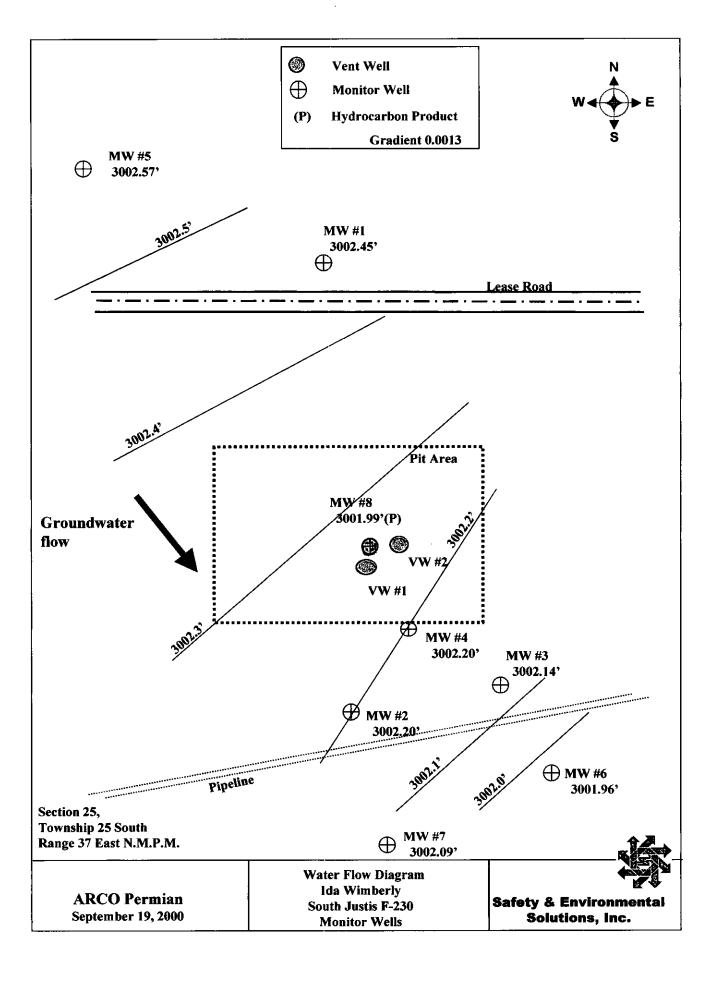


Figure 2
Potentiometric Map



# Appendix A Cumulative Well Water Quality Data

# Ida Wimberly Cumulative Well Data

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
		12/17/97	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	<0.2ppm	n/a	n/a	n/a	n/a
Arsenic	0.1ppm	<0.1ppm	n/a	n/a	n/a	n/a
Barium	1.0ppm	<1.0ppm	n/a	n/a	n/a	n/a
Boron	0.75ppm	<0.75ppm	n/a	n/a	n/a	n/a
Cadmium	0.01ppm	<0.01ppm	n/a	n/a	n/a	n/a
Calcium	n/a	296ppm	317ppm	n/a	296ppm	320ppm
Carbonate	n/a	0ppm	0ppm	n/a	0ppm	0ppm
Chloride	250.0ppm	1580ppm	1839ppm	1610ppm	2231ppm	1686ppm_
Chromium	0.05ppm	<0.05ppm	n/a	n/a	n/a	n/a
Cobalt	0.05ppm	<0.05ppm	n/a	n/a	n/a	n/a
Conductivity	n/a	6116	6273	n/a	1978	6187
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	122ppm	249ppm	n/a	229ppm	239ppm
Iron	1.0ppm	.388ppm	n/a	n/a	n/a	n/a
Lead	0.05ppm	<0.05ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	112ppm	112ppm	N/A	126ppm	126ppm
Manganese	0.2ppm	0.345ppm	n/a	n/a	n/a	n/a
Mercury	0.002ppm	<0.02ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0ppm	<0.2ppm	n/a	n/a	n/a	n/a
Nickel	0.2ppm	<0.2ppm	n/a	n/a	n/a	n/a
Potassium	n/a	22.5ppm	8.8ppm	n/a	24ppm	66ррт
Selenium	0.05ppm	<0.1ppm	n/a	n/a	n/a	n/a
Silver	0.05ppm	<0.1ppm	n/a	n/a	n/a	n/a
Sodium	n/a	1007ppm	850ppm	n/a	1157ppm	738ppm
Sulfate	600ppm	1050ppm	305ppm	n/a	455ppm	423ppm
T-Alkalinity	n/a	100	204	n/a	188	192
(MgCaCO <sub>3</sub> /L)						
TDS	1000ppm	3480ppm	4380ppm	4560ppm	4520ppm	2910ppm
Zinc	10.0ppm	<0.2ppm	n/a	n/a	n/a	n/a
рН	> 6 & < 9	5.58	6.384	n/a	7.19ppm	7.22ppm
TPH	n/a	n/a	42.9ppm	n/a	2.76ppm	<1.00ppm
Benzene	0.01ppm	<.002ppm	<.002ppm	n/a	<.002ppm	<.002ppm
Toluene	0.75ppm	<.002ppm	<.002ppm	n/a	<.002ppm	<.002ppm
E. Benzene	0.75ppm	<.002ppm	<.002ppm	n/a	<.002ppm	<.002ppm
Total Xylenes	0.62ppm	<.006ppm	<.006ppm	n/a	<.006ppm	<.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE	
		2/25/00	5/31/00	9/19/00	
Aluminum	5.0ppm	n/a	n/a	n/a	
Arsenic	0.1ppm	n/a	n/a	n/a	
Barium	1.0ppm	n/a	n/a	n/a	
Boron	0.75ppm	n/a	n/a	n/a	
Cadmium	0.01ppm	n/a	n/a	n/a	
Calcium	n/a	301ppm	321ppm	235ppm	
Carbonate	n/a	0ppm	0ppm	0ppm	
Chloride	250.0ppm	1570ppm	1973ppm	1651ppm	
Chromium	0.05ppm	n/a	n/a	n/a	
Cobalt	0.05ppm	n/a	n/a	n/a	
Conductivity (umhos/cm)	n/a	6155	5770	5753	
Copper	1.0ppm	n/a	n/a	n/a	
HCO <sub>3</sub>	n/a	229ppm	229ppm	250ppm	
Iron	1.0ppm	n/a	n/a	n/a	
Lead	0.05ppm	n/a	n/a	n/a	
Magnesium	n/a	n/a	n/a	78ppm	
Manganese	0.2ppm	n/a	n/a	n/a	
Mercury	0.002ppm	n/a	n/a	n/a	
Molybdenum	1.0ppm	n/a	n/a	n/a	
Nickel	0.2ppm	n/a	n/a	n/a	
Potassium	n/a	104.0ppm	49ppm	5.29ppm	
Sel <u>eniu</u> m	0.05ppm	n/a	n/a	n/a	
Silver	0.05ppm	n/a	n/a	n/a	
Sodium	n/a	995ppm	904ppm	913	
Sulfate	600ppm	1180ppm	351ppm	369ppm	
T-Alkalinity	n/a	188	188	205	
(MgCaCO <sub>3</sub> /L)					
TDS	1000ppm	3930ppm	4640ppm	4290ppm	
Zinc	10.0ppm	n/a	n/a	n/a	
pН	> 6 & <9	7.15	7.13	7.26	
TPH	n/a	<1.0	<1.0	<1.0	
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm	
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST DATE	TEST
	STANDARD	TEST 12/17/97	DATE 8/25/98	DATE 6/17/99	9/24/99	DATE 12/03/99
Aluminum	5.0ppm	<0.2ppm	n/a	n/a	n/a	n/a
Arsenic	0.1ppm	<0.1ppm	n/a	n/a	n/a	n/a
Barium	1.0ppm	<1.0ppm	n/a	n/a	n/a	n/a
Boron	0.75ppm	<0.75ppm	n/a	n/a	n/a	n/a
Cadmium	0.01ppm	<0.01ppm	n/a	n/a	n/a	n/a
Calcium	n/a	426ppm	476ppm	n/a	544ppm	760ppm
Carbonate	n/a	0ppm	0ppm	n/a	0ppm	0ppm
Chloride	250.0ppm	6200ppm	2731ppm	3890ppm	6590ppm	9552ppm
Chromium	0.05ppm	<0.05ppm	n/a	n/a	n/a	n/a
Cobalt	0.05ppm	<0.05ppm	n/a	n/a	n/a	n/a
Conductivity	n/a	17028	19010	n/a	1715	27600
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	404ppm	547ppm	n/a	459ppm	425ppm
Iron	1.0ppm	<.2ppm	n/a	n/a	n/a	n/a
Lead	0.05ppm	<0.05ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	193ppm	214ppm	n/a	258ppm	389ppm
Manganese	0.2ppm	0.343ppm	n/a	n/a	n/a	n/a
Mercury	0.002ppm	<0.02ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0ppm	<0.2ppm	n/a	n/a	n/a	n/a
Nickel	0.2ppm	<0.2ppm	n/a	n/a	n/a	n/a
Potassium	n/a	90ppm	42.3ppm	n/a	62ppm	132ppm
Selenium	0.05ppm	<0.1ppm	n/a	n/a	n/a	n/a
Silver	0.05ppm	<0.1ppm	n/a	n/a	n/a	n/a
Sodium	n/a	3700ppm	1202ppm	n/a	3611ppm	4979ppm
Sulfate	600ppm	1160ppm	426ppm	n/a	666ppm	663ppm
T-Alkalinity	n/a	404	448	n/a	376	348
(MgCaCO <sub>3</sub> /L)						
TDS	1000ppm	10490ppm	12240ppm	7490ppm	14270ppm	16260ppm
Zinc	10.0ppm	<0.2ppm	n/a	n/a	n/a	n/a
pH_	> 6 & < 9	7.84	6.303	n/a	6.88	7.00
ТРН	n/a	n/a	14.0ppm	10.3ppm	4.27ppm	<1.00ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm	.003ppm	.010ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE 2/25/00	TEST DATE 5/31/00	TEST DATE 9/19/00
Aluminum	5.0ppm	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a
Calcium	N/a	681ppm	373ppm	288ppm
Carbonate	N/a	0ppm	0ppm	0ppm
Chloride	250.0ppm	9000ppm	3758ppm	4274ppm
Chromium	0.05ppm	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	26494	11250	12374
Copper	1.0ppm	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	395ppm	488ppm	563ppm
Iron	1.0ppm	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a
Magnesium	N/a	437ppm	175ppm	126ppm
Manganese	0.2ppm	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a
Potassium	N/a	90ppm	1920ppm	26.94ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a
Sodium	N/a	3700ppm	1920ppm	2382ppm
Sulfate	600ppm	1080ppm	222ppm	218ppm
T-Alkalinity (MgCaCO <sub>3</sub> /L)	N/a	324	400	461
TDS	1000ppm	17610ppm	8440ppm	8080ppm
Zine	10.0ppm	N/a	N/a	N/a
pН	> 6 & <9	6.88	7.04	6.97
ТРН	N/A	<1.0	<1.0	<1.0
Benzene	0.01ppm	.004ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
		12/17/97	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	<0.3ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0 <b>ppm</b>	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	629ppm	360ppm	N/a	448ppm	640ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	8500ppm	4124ppm	7570ppm	5374ppm	8316ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	23846	13960	N/a	1679	22885
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	316ppm	556ppm	N/a	459ppm	434ppm
Iron	1.0ppm	<.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	302ppm	187ppm	N/a	214ppm	316ppm
Manganese	0.2ppm	0.440ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	118ppm	31.7ppm	N/a	55ppm	78ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	4875ppm	2229ppm	N/a	2892ppm	4441ppm
Sulfate	600 <b>pp</b> m	1280ppm	279ppm	N/a	397ppm	562ppm
T-Alkalinity	N/a	316	455	N/a	376	356
(mgCaCO <sub>3</sub> /L)						
TDS	1000ppm	15300ppm	8840ppm	15180ppm	10330ppm	13260ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
рН	> 6 & <9	7.77	6.64	N/a	6.91	6.84
ТРН	N/a	N/a	24.6ppm	N/a	N/a	<1.00ppm
Benzene	0.01ppm	<0.002 ppm	<0.002ppm	<0.002ppm	.005ppm	<0.002ppm
Toluene	0.75ppm	<0.002 ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75 ppm	<0.002 ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62 ppm	<0.006 ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE 2/25/00	TEST DATE 5/31/00	TEST DATE 9/19/00
Aluminum	5.0ppm	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a
Calcium	N/a	321ppm	581ppm	676ppm
Carbonate	N/a	0ppm	0ppm	0ppm
Chloride	250.0ppm	5300ppm	7140ppm	10490ppm
Chromium	0.05ppm	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	15760	20220	29779
Copper	1.0ppm	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	459ppm	449ppm	538ppm
Iron	1.0ppm	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a
Magnesium	N/a	292ppm	238ppm	224ppm
Manganese	0.2ppm	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a
Potassium	N/a	88.0ppm	114ppm	49.62ppm
Selenium	0.05ppm	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a
Sodium	N/a	3071ppm	3808ppm	6027ppm
Sulfate	600ppm	913ppm	414ppm	540ppm
T-Alkalinity	N/a	376	368	441
(mgCaCO <sub>3</sub> /L)				
TDS	1000ppm	10310ppm	15316ppm	21050ppm
Zinc	10.0ppm	N/a	N/a	N/a
pН	> 6 & <9	6.99	7.24	6.89
TPH	N/a	<1.0	<1.0	<1.0
Benzene	0.01ppm	.002ppm	.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC STANDARD	INITIAL TEST	TEST DATE	TEST DATE	TEST DATE	TEST DATE
	STANDARD	8/10/98	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	<0.3ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	480ppm	472ppm	N/a	736ppm	1160ppm
Carbonate	N/a	0ррт	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	9641ppm	6910ppm	4680ppm	14600ppm	16295ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	18190	21750	N/a	1603	44620
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	439ppm	864ppm	N/a	620ppm	476ppm
Iron	1.0ppm	<.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	340ppm	248ppm	N/a	272ppm	559ppm
Manganese	0.2ppm	0.440ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	68ppm	50.5ppm	N/a	76ppm	144ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	5252ppm	3921ppm	N/a	8521ppm	8529ppm
Sulfate	600ppm	159ppm	335ppm	N/a	488ppm	562ppm
T-Alkalinity	N/a	360	708	N/a	508	390
(mgCaCO <sub>3</sub> /L)						
TDS	1000ppm	13580ppm	13960ppm	9460ppm	20020ppm	30010ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
pН	> 6 & <9	6.69	6.64	N/a	7.04	7.01
ТРН	N/a	<1.0ppm	11.8ppm	N/a	3.27ppm	<1.00ppm
Benzene	0.01ppm	0.033ppm	0.046ppm	0.003ppm	0.033ppm	0.026ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.007ppm	0.012ppm	<0.002ppm	0.006ppm	0.012ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE
		2/25/00	5/31/00	9/19/00
Aluminum	5.0ppm	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a
Calcium	N/a	277ppm	733ppm	3714ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm
Chloride	250.0ppm	4500ppm	9958ppm	5925ppm
Chromium	0.05ppm	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a
Conductivity	N/a	13818	27980	17935ppm
(umhos/cm)	1.0	27/	<b>&gt;</b> 1/	27/
Copper	1.0ppm	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	761ppm	600ppm	900ppm
Iron	1.0ppm	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a
Magnesium	N/a	165ppm	328ppm	135ppm
Manganese	0.2ppm	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a
Potassium	N/a	107.0ppm	141ppm	38.7ppm
Selenium	0.05ppm	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a
Sodium	N/a	2929ppm	5367ppm	3714ppm
Sulfate	600ppm	877ppm	492ppm	332ppm
T-Alkalinity	N/a	624	492	738
(mgCaCO <sub>3</sub> /L)				
TDS	1000ppm	8810ppm	21688ppm	11220ppm
Zinc	10.0ppm	N/a	N/a	N/a
pН	> 6 & <9	7.19	7.37	7.26
TPH	N/a	<1.0	<1.0	<1.0
Benzene	0.01ppm	0.029ppm	0.021ppm	0.024ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	0.017ppm	0.010ppm	0.011ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
		8/10/98	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	<0.3ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	264ppm	320ppm	N/a	312ppm	320ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	1950ppm	2396ppm	2090ppm	2535ppm	2472ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	5740	7877	N/a	1657	7211
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	200ppm	195ppm	N/a	239ppm	220ppm
Iron	1.0ppm	<.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	127ppm	153ppm	N/a	112ppm	219ppm
Manganese	0.2ppm	0.440ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	19ppm	10ppm	N/a	20ppm	69ррт
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	850ppm	1094ppm	N/a	1355ppm	1078ppm
Sulfate	600ppm	138ppm	274ppm	N/a	429ppm	452ppm
T-Alkalinity	N/a	164	159	N/a	196	180
(mgCaCO <sub>3</sub> /L)		_				
TDS	1000ppm	3790ppm	5430ppm	5300ppm	5100ppm	4530ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
рН	> 6 & <9	7.14	7.216	N/a	7.28	7.25
TPH	N/a	<1.0ppm	11.0ppm	N/a	1.26ppm	<1.00ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	N/a_	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE
		2/25/00	5/31/00	9/19/00
Aluminum	5.0ppm	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a
Calcium	N/a	286ppm	329ppm	350ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm
Chloride	250.0ppm	2400ppm	2161ppm	3691ppm
Chromium	0.05ppm	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a
Conductivity	N/a	6966ppm	6400ppm	10547ppm
(umhos/cm)				
Copper	1.0ppm	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	229ppm	229ppm	250ppm
Iron	1.0ppm	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a
Magnesium	N/a	141ppm	134ppm	134ppm
Manganese	0.2ppm	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a
Potassium	N/a	78.0ppm	23ppm	6.32ppm
Selenium	0.05ppm	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a
Sodium	N/a	1 <b>466ppm</b>	1008ppm	1953ppm
Sulfate	600ppm	974ppm	348ppm	265ppm
T-Alkalinity	N/a	188	188	205
(mgCaCO <sub>3</sub> /L)				
TDS	1000ppm	4380ppm	5176ppm	7680ppm
Zinc	10.0ppm	N/a	N/a	N/a
рН	> 6 & < 9	7.28ppm	7.18ppm	7.41ppm
TPH	N/a	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC STANDARD	INITIAL TEST	TEST DATE	TEST DATE	TEST DATE	TEST DATE
		8/11/98	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	N/a	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a	N/a
Calcium	N/a	N/a	2120ppm	N/a	2480ppm	2760ppm
Carbonate	N/a	N/a	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	29600ppm	24186ppm	25500ppm	42583ppm	26521ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	61900	68740	N/a	1482	68310
Copper	1.0ppm	N/a	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	N/a	220ppm	N/a	234ppm	232ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a	N/a
Magnesium	N/a	N/a	1239ppm	N/a	1458ppm	1045ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a	N/a
Potassium	N/a	N/a	101ppm	N/a	98ppm	201ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a	N/a
Sodium	N/a	N/a	11269ppm	N/a	22692ppm	12550ppm
Sulfate	600ppm	N/a	750ppm	1200ppm	1428ppm	1149ppm
T-Alkalinity (mgCaCO <sub>3</sub> /L)	N/a	N/a	180	N/a	192	240
TDS	1000ppm	58260ppm	58260ppm	53980ppm	71000ppm	47980ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a	N/a
pH	> 6 & < 9	N/a	6.82	N/a	6.74	6.82
TPH	N/a	<1.0ppm	6.8ppm	N/a	1.88ppm	<1.00ppm
Benzene	0.01ppm	0.044ppm	0.007ppm	N/a	0.003ppm	0.007ppm
Toluene	0.75ppm	0.004ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	0.009ppm	<0.006ppm	N/a	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE
		2/25/00	5/31/00	9/19/00
Aluminum	5.0ppm	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a
Calcium	N/a	2610ppm	2325ppm	1792ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm
Chloride	250.0ppm	26300ppm	23580ppm	25352ppm
Chromium	0.05ppm	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a
Conductivity	N/a	69660ppm	63460ppm	66214ppm
(umhos/cm)				
Copper	1.0ppm	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	244ppm	268ppm	325ppm
Iron	1.0ppm	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a
Magnesium	N/a	1190ppm	1118ppm	695ppm
Manganese	0.2ppm	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a
Potassium	N/a	216.0ppm	211ppm	104ppm
Selenium	0.05ppm	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a
Sodium	N/a	12560ppm	11940ppm	13658ppm
Sulfate	600ppm	1690ppm	757ppm	1143ppm
T-Alkalinity	N/a	200	220	267
(mgCaCO <sub>3</sub> /L)				
TDS	1000ppm	49130ppm	59776ppm	50260ppm
Zinc	10.0ppm	N/a	N/a	N/a
pН	> 6 & < 9	6.81	7.38	6.75
TPH	N/a	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	0.01ppm	0.007ppm	0.007ppm	0.011ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
		8/12/98	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	N/a	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a	N/a
Calcium	N/a	N/a	460ppm	N/a	600ppm	440ppm
Carbonate	N/a	N/a	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	5015ppm	3288ppm	5380ppm	6387ppm	4328ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a	N/a
Conductivity	N/a	N/a	11910	N/a	1523	10580
(umhos/cm)						
Copper	1.0ppm	N/a	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	N/a		N/a	166ppm	293ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a	N/a
Magnesium	N/a	N/a	175ppm	N/a	97ppm	219ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a	N/a
Potassium	N/a	N/a	25ppm	N/a	66ррт	54ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a	N/a
Sodium	N/a	N/a	1763ppm	N/a	3553ppm	2219ppm
Sulfate	600ppm	N/a	832ppm	142ppm	553ppm	536ppm
T-Alkalinity	N/a	N/a	236	N/a	136	240
(mgCaCO <sub>3</sub> /L)						
TDS	1000ppm	13496ppm	8170ppm	10580ppm	12140ppm	7240ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a	N/a
pН	> 6 & <9	N/a	7.326	N/a	7.59	7.16
TPH	N/a	48.7ppm	7.1ppm	N/a	1.32ppm	<1.00ppm
Benzene	0.01ppm	0.013ppm	0.003ppm	N/a	0.008ppm	<0.002ppm
Toluene	0.75ppm	0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	0.009ppm	<0.006ppm	N/a	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD			TEST DATE
	SIANDARD	2/25/00	DATE 5/31/00	9/19/00
Aluminum	5.0ppm	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a
Calcium	N/a	2610ppm	425ppm	344ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm
Chloride	250.0ppm	4100ppm	3194ppm	3303ppm
Chromium	0.05ppm	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	11305ppm	9330ppm	10129ppm
Copper	1.0ppm	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	254ppm	298ppm	363ppm
Iron	1.0ppm	N/a_	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a
Magnesium	N/a	267ppm	185ppm	102ppm
Manganese	0.2ppm	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a
Potassium	N/a	88.0ppm	46ppm	13.54ppm
Selenium	0.05ppm	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a
Sodium	N/a	2.246ppm	1312ppm	1859ppm
Sulfate	600ppm	1070ppm	369ppm	373ppm
T-Alkalinity	N/a	208	244	297ppm
(mgCaCO <sub>3</sub> /L)	<u></u>			
TDS	1000ppm	8140ppm	7780ppm	7210ppm
Zinc	10.0ppm	N/a	N/a	N/a
рН	> 6 & <9	7.16	7.15	7.18
ТРН	N/a	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm

Appendix B Analytical Results





PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BOB ALLEN 703 E. CLINTON, #103 HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 09/19/00
Reporting Date: 09/21/00
Project Number: NOT GIVEN

Project Name: IDA WIMBERLY Project Location: JAL, NM

Sampling Date: 09/19/00

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

		Na	Ca	Mg	K	Conductivity	T-Alkalinity
LAB NUMBER	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mS/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DAT	E:	09/19/00	09/20/00	09/20/00	09/20/00	09/20/00	09/20/00
H5187-1	MONITOR WELL #1	913	235	78	5.29	5753	205
H5187-2	MONITOR WELL #2	2382	288	126	26.94	12374	461
H5187-3	MONITOR WELL #3	6027	676	224	49.62	29779	441
H5187-4	MONITOR WELL #4	3714	300	135	38.70	17935	738
H5187-5	MONITOR WELL #5	1953	350	134	6.32	10547	205
H5187-6	MONITOR WELL #6	13658	1792	695	104	66214	267
H5187-7	MONITOR WELL #7	1859	344	102	13.54	10129	297
Quality Control		1.829	42.0	45.0	5.05	1368	NR
True Value QC		2.000	50.0	50.0	5.00	1413	NR
% Recovery		91.5	84.0	90.9	101	96.7	NR
Relative Percer	t Difference	0.4	0	2.4	0	0.2	NR
METHODS:		SM3	3500-Ca-D	3500-Mg E	8049	120.1	310.1

		CI	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	pН	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS D	ATE:	09/20/00	09/20/00	09/20/00	09/20/00	09/20/00	09/21/00
H5187-1	MONITOR WELL #1	1651	369	0	250	7.26	4290
H5187-2	MONITOR WELL #2	4274	218	0	563	6.97	8080
H5187-3	MONITOR WELL #3	10490	540	0	538	6.89	21050
H5187-4	MONITOR WELL #4	5925	332	0	900	7.26	11220
H5187-5	MONITOR WELL #5	3691	265	0	250	7.41	7680
H5187-6	MONITOR WELL #6	25352	1143	0	325	6.75	50260
H5187-7	MONITOR WELL #7	3303	373	0	363	7.18	7210
Quality Conti	rol	964	51.5	NR	1088	7.03	NR
True Value C	C	1000	50.0	NR	1000	7.00	NR
% Recovery		96.4	103	NR	109	100	NR
Relative Perc	ent Difference	6.3	1.5	NR	8.1	0	NR
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1	160.1

Chemist

09/22/2000

Date





PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BOB ALLEN 703 E. CLINTON, #103 HOBBS, NM 88240

FAX TO: (5050 393-4388

Receiving Date: 09/19/00

Reporting Date: 09/21/00
Project Number: NOT GIVEN

Project Name: IDA WIMBERLY

Project Location: JAL, NM

Sampling Date: 09/19/00

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH (mg/L)	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS	DATE:	09/20/00	09/20/00	09/20/00	09/20/00	09/20/00
H5187-1	MONITOR WELL #1	<1.0	<0.002	<0.002	<0.002	<0.006
H5187-2	MONITOR WELL #2	<1.0	<0.002	<0.002	<0.002	<0.006
H5187-3	MONITOR WELL #3	<1.0	<0.002	<0.002	<0.002	<0.006
H5187-4	MONITOR WELL #4	<1.0	0.024	<0.002	0.011	<0.006
H5187-5	MONITOR WELL #5	<1.0	<0.002	<0.002	<0.002	<0.006
H5187-6	MONITOR WELL #6	<1.0	0.011	<0.002	< 0.002	<0.006
H5187-7	MONITOR WELL #7	<1.0	<0.002	<0.002	<0.002	<0.006
Quality Con	itrol	10.6	0.099	0.105	0.104	0.314
True Value	QC	12.0	0.100	0.100	0.100	0.300
% Recovery	7	88.7	99.3	105	104	105
Relative Pe	rcent Difference	9.0	2.5	1.2	1.2	1.9

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260

Surjour a Cook

Date

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

(915) 673-7001 Fax (915) 673-7020 (	2111 Beechwood, Abilene, TX 79603	ARDINAL LABORATORIES, INC.	
(S)	o o		

)5) 393-2326 Fax (505) 393-2476 East Marland, Hobbs, NM 88240

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† Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.

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## Appendix C Water Analysis Validation

### **Portrait**

	Ca	tions and	d Anions (	Calculati	on Uneck			
	Sample Name	H5187-1	H5187-2	H5187-3	H5187-4	H5187-5	H5187-6	H5187-7
	Well Number	MW1	MW2	MW3	MW4	MW5	MW6	MW7
	Date	09/19/00	09/19/00	09/19/00	09/19/00	09/19/00	09/19/00	09/19/0
Equivalent								
Weight:	Lab	Cardinal	Cardinal	Cardinal	Cardinal	Cardinal	Cardinal	Cardina
22.99	Sodium (mg/L)	913	2,382	6,027	3,714	1,953	13,658	1,859
20.04	Calcium (mg/L)	235	288	676	300	350	1,792	344
12.15	Magnesium (mg/L)	78	126	224	135	134	695	102
39.09	Potassium (mg/L)	5.3	26.9	49.6	38.7	6.3	104.0	13.5
35.45	Chloride (mg/L)	1,651	4,274	10,490	5,925	3,691	25,352	3,303
48.04	Sulfate (mg/L)	369	218	540	332	265	1,143	373
30.00	Carbonate (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
61.01	Bicarbonate (mg/L)	250	563	538	900	250	325	363
50.04	Alkalinity (mg/L CaCO3)	205	461	441	738	205	267	297
62.00	Nitrate (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
	Sum Cations (meq/L)	58.0	129.0	315.6	188.6	113.6	743.4	106.8
	Sum Anions (meg/L)	58.4	134.3	316.0	188.8	113.7	744.3	106.9
	Percent Difference	0.3	2.0	0.1	0.0	0.1	0.1	0.0
	Measured TDS (evap., mg/L)	4,290	8,080	21,050	11,220	7,680	50,260	7,210
	TDS (calc. USGS sum, mg/L)	3,374	7,592	18,271	10,888	6,522	42,904	6,173
	TDS (meas.) / TDS (calc. USGS)	1.3	1.1	1.2	1.0	1.2	1.2	1.2
<u></u>	TDS (calc. sum, mg/L)	3,501	7,878	18,545	11,345	6,649	43,069	6,358
	Elect. Conductivity (umhos/cm)	5,753	12,374	29,779	17,935	10,547	66,214	10,129
	TDS (C*0.7, mg/L)	4,027	8,662	20,845	12,555	7,383	46,350	7,090
	TDS (calc. USGS) / Conductivity	0.59	0.61	0.61	0.61	0.62	0.65	0.61
	Test Criteria							
			Anion	Max %				
. Anion-Ca	ation Balance:		Sum	diff.				
_			0 - 3.0	± 0.2				
		,	3.0 - 10.0	±2				
			10.0 - 800	± 5				
. TDS, Me	asured to Calculated:		1.0 < (meas	ured TDS/c	alculated T	DS) < 1.2		



# Safety & Environmental

Solutions, Inc.

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APR 0 7 2000

ENVIRONMENTAL BUREAU OIL CONSERVATION DIVISION

Arco Permian
South Justis Unit F-230



# Installation of Additional Monitor Well and Vent Wells and Investigation Results

Lea County, New Mexico March 10, 2000

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

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Work Performed	
Well # 8	
Vent Wells	3
Monitor Well Testing	
Conclusions	6
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### I. Background

In October 1997 Arco Permian secured the services of Safety and Environmental Solutions, Inc. (SESI) to determine the vertical and horizontal extent of the abandoned pit site on the specified location. To date, seven monitor wells have been drilled to delineate the extent of any groundwater contamination, namely the elevated levels of Total Dissolved Solids (TDS) and Chlorides which was identified in the initial monitor well sampling program. The New Mexico Oil Conservation Division on December 30, 1999 approved a revised Work Plan dated November 15, 1999, to drill an additional monitor well in the bottom center of the existing pit area and two vent wells. The vent wells were drilled inside the pit area, one south of the new monitor well and one east of the new monitor well (See Monitor Well #8/Vent Well Site Plan) for passive venting.

### II. Work Performed

An additional monitor well was drilled at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, NM according to the Approved Work Plan. SESI contracted Atkins Engineering of Roswell, NM to drill this well on December 3, 1999. Cardinal Laboratories of Hobbs, NM was also contracted to perform the laboratory analytical testing required for this project.

SESI sampled the additional monitor well hole soils (MW #8) at intervals of ten (10') feet using SOPs found in Environmental Protection Agency, 1984, Characterization of Hazardous Waste Site - A Methods Manual: Vol II. Field testing was performed on these soil samples for Total Petroleum Hydrocarbons (TPH). The composite soil samples along with Chain of Custody were then delivered to the laboratory for confirmatory testing. The composite samples were analyzed for TPH (EPA Method 418.1), BTEX (EPA Method 8020) and Major Cations and Anions. The results of the BTEX, TPH and Chlorides were compared to the regulatory limits found in "Guidelines for Remediation of Leaks, Spills and Releases" New Mexico Oil Conservation Division - August 13, 1993.

### **Monitor Well #8**

Monitor Well #8 was drilled in the approximate center of the existing pit area to a total depth of 73'. (See Monitor Well #8/Vent Wells Site Plan) The monitor well was completed by Atkins Engineering as per the approved work plan. (See Log of Boring)

The field test results for TPH in the soil samples are presented in the following table in **black** text; the laboratory analysis of the soil samples for the well borehole is presented in the following table in blue text. The test results are reported in parts per million (ppm):

	Lithology	TTH.	CL	Bewere	Toluene	Ediyl	Total
Depth 8-1	Sandy Caliche	8800				Benzene	Xylenes
10° 8-2	Sandy Caliche	14500	180	0:014	<0.010	4.19	8.73
207 8-3	Clay Sand	15600 1 <b>360</b> 0	135	-0.417 -	<0.010	3.85	6.46
30° 8-4	Tan Sand	12300 6160	180	×0:010	≤0.010	0.743	1.69
40° 8-3	Sand w/gravel	10700 <b>3200</b>	180	0.003	0.005	0.042	0.076
<b>(50)</b>		12200					0.07.0
8-6 60'	Tan Sand	<b>1240</b> -8990	225	-0,003	0.005	0.075	0.089
627 702	Reddish Sand	404					
TD- 73:	Red Clay Sand	98 98.0	2787	• 0.007	<0.002	0.035	0.033

### Vent Wells

On January 7, 2000 SESI personnel W. Dee Whatley and Sergio Contreras, Jr. returned to the site to install the passive vapor extraction vent wells. These wells were completed over a two day period. The wells were completed with 15' of slotted screen for aeration, then packed with 20' of pea gravel and a 5' bentonite plug with grout to surface.

The soils in each borehole were sampled at 5' intervals. Field testing was performed on these samples at 5' intervals for TPH (EPA Method 418.1).

These results are as follows:

### Vent Well #1

E ID/Depth	Litho	logy	TOPH -
#1 <b>-5</b>	Stained G	rey Sand	2090ppm.
#1 - 102	Grey Cla	and the second of the second o	3630ppm
#L=15'	Grey San	7 - 1157 - 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	
	Greyish Wh		2310ppm=
#1 - 20	ಕ್ಷ್ಮೆ 'ಉದ್ಯಾಪ್ ಬರ್ಚಿ ಕೊಡ್ಡು ಕನ್ನಡ ಕನ್ನಡ		_2970ppm
.= - #1 = 25'	Caliche Red San		: 4350ppii .
#1=30	Red S		E160
	MADAR TAKEN MICHIELE	I sa waxa a Babara iliya iliya ili	5160ppm=
#1 - 355	Red S		4900ppm
#1 = 40?=	Red S	1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1	4000ppm
#1=452	Red Sand	w/Gravel	_5670ppm=

### Vent Well #2

(I)/D/egiti	L	thology	T	1911
#2-5	Staine	d Grey Sand	<b>9114</b>	ionna Ionna
#2 - 10	Grey	Clayey Sand	100000000000000000000000000000000000000	Oppm:
#215'		aliche to 12'/	463	Оррт:
		d/Caliche to 1:	5'	
#2=20'=	Mell de matemblekke	Caliche/Sand		<u> Մարտ</u>
#2=25	Edit Marchille (1986)	nc/Red Sand		Oppm.,
+12=30	(NO) The secretarity of the contraction of the cont	ed Sand		Oppm
42-35%	0.0000.0000.44.44.44	ed Sand	MANAGEMENT (1997)	Oppm=
T#2=40'=	the state of the state of the state of the	ed Sand		Oppm
#2=45	Red Sa	ınd w/Gravel	609	0ppm =

As per a discussion with Margaret Lowe of ARCO Permian, the 30' and bottom (45') field samples from each vent well were taken under Chain of Custody to Cardinal Laboratories for Chlorides testing. These results are as follows:

#ID/Depth	Chlorides
#1 <b>- 30</b> } ; :	727ppm
#1 - 453	162ppm
#2=30	194ppm
#2=45	145ppm

### III. Monitor Well Testing

After a recovery period, Monitor Well #8 was sampled on December 11, 1999. Samples were taken both before the well was purged and after purging to check for any free product within the well bore and transported under Chain of Custody to the laboratory for analysis. The groundwater at Monitor Well #8 was tested for TPH, BTEX, Cations and Anions. (See Analytical Results)

The results indicated high levels of Chlorides and TDS in both samples. The TPH in the monitor well was very low with the results lower after purging. Monitor well # 8 exhibited small amounts of Benzene and Ethyl Benzene both before and after purging. As noted with the prior monitor wells, the uncharacteristically high levels of Chlorides and TDS may indicate another source of contamination other than the subject site. There is a saltwater disposal line that is located between Monitor Well #3 and Monitor Well #6. A summary of the laboratory analyses of the groundwater samples for Monitor Well #8 is presented in the following table. The results that are in excess of NMWQCC Standards are presented in red text:

Austylé	MW #8-Before Purging	MW-HE-Alter Pargine
TPB	15.4ppm	2.61 ppm.
Benzene	.052ррт	
Toloene	<002ppm	<.062ppm
E Beuzene	.012ррн	OC ppm
Xylenes	<.006ppm 2746ppm	<006ppm 6157ppm
Sodium Calcium	2.4оррш 142ppm	550pom
Magnesium	116ppm	265ppm
Potassium	63.0ppm	659ppm
Chlorides	4240ppm	70890ppm
<b>80,</b>	130ppm	407.ррга.
· CO <sub>a</sub> ·	Oppm	Oppm
, eco,	946ppm	366ppm
TOS	7968ppm 7. <b>8</b> 7	21772ppm 7.30

### IV. Conclusions

The gradient of the water table is established to be relatively flat but sloping slightly from the Northwest to the Southeast. This monitor well as well as the entire group of prior monitor wells exhibits high levels of Chlorides and TDS which indicates that the water in the entire area is not of very high quality.

### V. Figures and Appendices

### Figures:

Figure 1: Vicinity Map

Figure 2: Monitor Well #8/Vent Wells Site Plan

Figure 3: Driller's Log of Boring

### **Appendices:**

Appendix A: Monitor Well #8 Analytical Results

Appendix B: Vent Wells Analytical Results

Figure 1 Vicinity Map

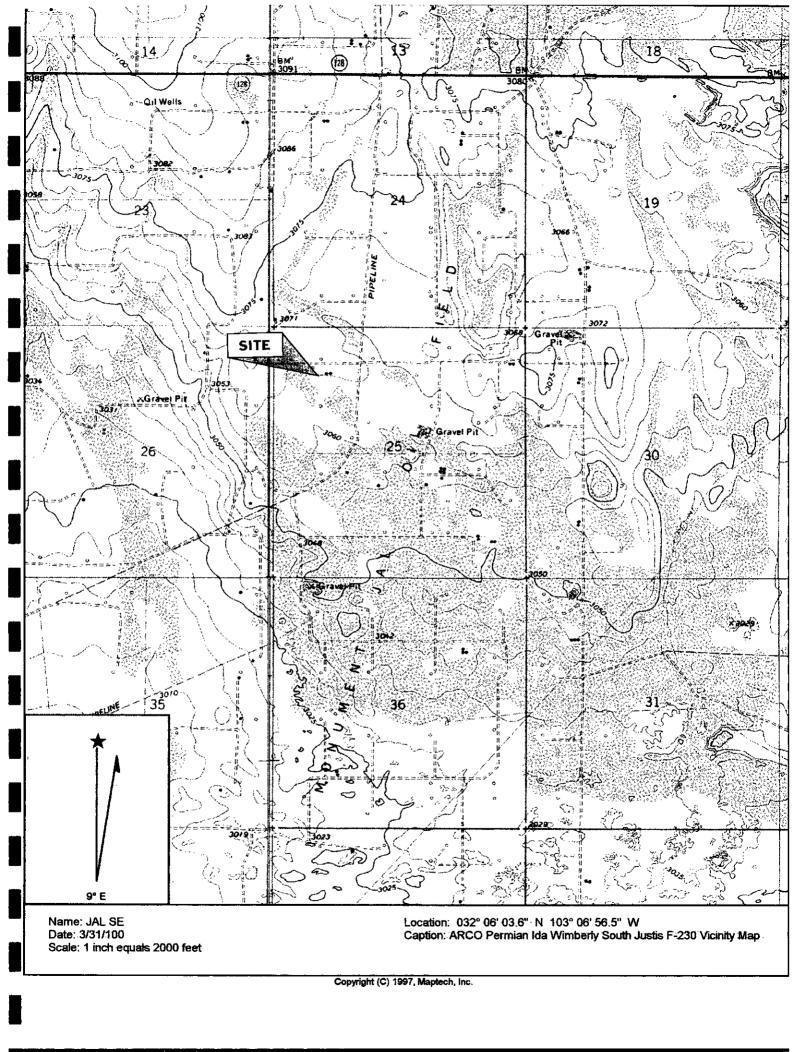


Figure 2
Monitor Well #8/Vent Wells
Site Plan

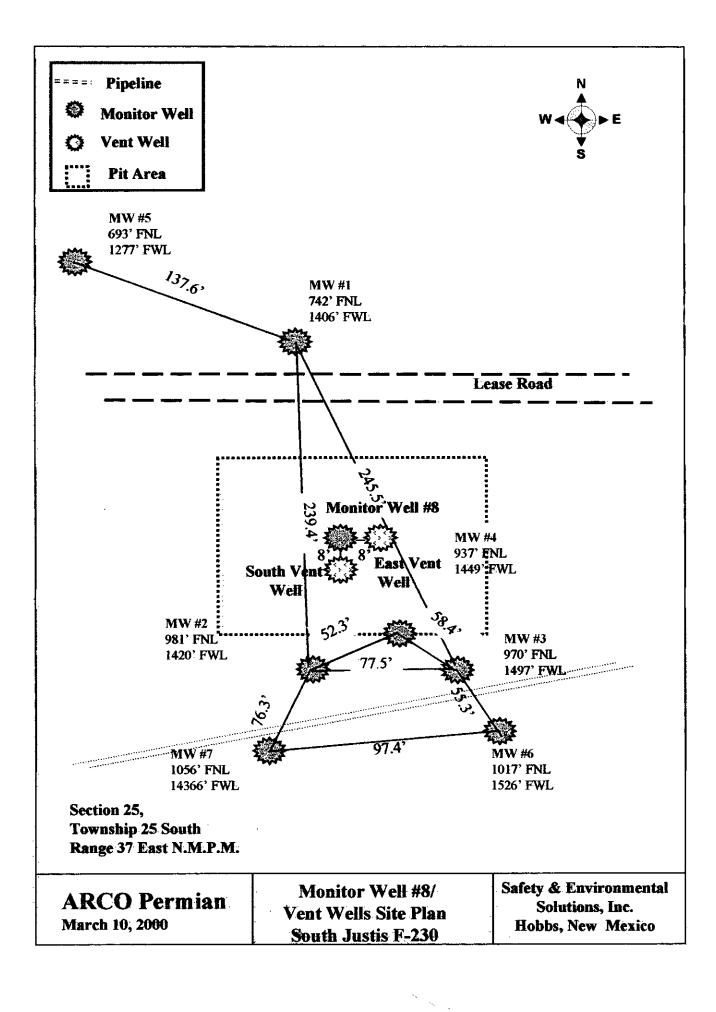


Figure 3
Driller's Log of Boring

Atkins Engineering Associates, Inc. LOG OF BORING SOUTH JUSTICE PIL MW P.O. Box 3156 رح (Page 1 of **2** Roswell, New Mexico 88202 Co. Name Areo Oil Co. Co. Address Jal. New Miexico :5 miles E. of Jal :12-3-99 Site Location Date :0900 : Hollow Stem Drill Slart **Auger Type** Drill End :1430 : Mort Bates Logged By Contact: Bob Allen **Boring Location** Center of Pit North of 99360 Job# M/W #4 Depth PID DESCRIPTION ρρπ-ν feet y" AUL cosing Lab 0 Stantad crilling inside of Pit 817 deep 5 Calocke ycley TAN FIRM ARY 10 SANDY Caliche for to gray Louse DRY 15 20 Great 25 Chy sund TAN LOOSE ARY 30 35 SANGU Clay TAH LOOSE BAMP

Atkin		F	P.O. B	ng Associates, Inc. ox 3156 Mexico 88202	LOG	OF BORII	، <i>کے</i>	» H	Ju.	, He	<u>Pj+</u> m/w (Page 2 of ₹)
Co. Na. Co. Ad  Contac  Job #	dress	ß	コス	O OILCO	Date Drill Start Drill End Boring Location	: 12/30 : 1632 : Cont	•	Auger Logge	d By		:5 MI EOF TA :Hollow Stem :Mort Bates MW-4
Depth in foot	GRAPHIC	nscs	Samples		CRIPTION		Lab	PID ppm-v	Blows/Ft		
45 -				Soul Tan L	ore As-p						Bentonite Plug Tor of 8/14
				sme & BRAUCH	TAN FRAM AC	~~/					Top of zar
55 -			5								SCREEN
60 -				SANC TAN LOOM	se samp						
65				Sand Reddish Ta	" soft wet						
70			N N	Chy sand Red TIO 73 Ft							
80 -						***************************************					

# Appendix A Monitor Well #8 Analytical Results



PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH 703 E. CLINTON, SUITE #103

**HOBBS, NM 88240** FAX TO: (505) 393-4388

Receiving Date: 12/03/99 Reporting Date: 12/07/99 Project Owner: ARCO

Project Name: NOT GIVEN

Project Location: [DA WIMBERLY-PIT BOTTOM

Sampling Date: 12/03/99 Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: AH

		Na	Ca	Mg	к	Conductivity	T-Alkalinity
LAB NUMBER	SAMPLE ID	(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(u mhos/cm)	(mgCaCO <sub>3</sub> /Kg)
ANALYSIS DA	TE:	12/07/99	12/06/99	12/06/99	12/06/99	12/06/99	12/06/99
H4492-1	BH #1-20'	0	272	68	35	555	336
H4492-2	BH #2-30'	0	96	68	56	412	336
H4492-3	BH #3-40'	555	80	87	4	139	1504
H4492-4	BH #4-50'	265	64	78	9	153	800
H4492-5	BH #5-60'	201	0	68	9	285	400
H4492-6	BH #6-75'	1506	144	107	51	2321	128
Quality Control		NR NR	48	49	4.96	1443	NR
True Value QC		NR	50	50	5.00	1413	NR
% Accuracy		NR	96	98	99	102	NR
Relative Percer	nt Difference	NR	6.3	5.1	0	0.4	NR
METHODS:		SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1

		CI <sup>-</sup>	SO <sub>4</sub>	CO <sub>3</sub>	НСО₃	pН
		(mg/Kg)	(mg/Kg)	(mg/Kg)	(mg/Kg)	(s.u.)
ANALYSIS I	DATE:	12/06/99	12/06/99	12/06/99	12/06/99	12/06/99
H4492-1	BH #1-20'	180	10	0	410	7.83
H4492-2	BH #2-30'	135	11	0	410	8.25
H4492-3	BH #3-40'	180	10	154	1523	9.31
H4492-4	BH #4-50'	180	13	173	625	9.24
H4492-5	BH #5-60'	225	12	134	215	9.84
H4492-6	BH #6-75'	2787	82	0	156	8.25
Quality Con	trol	978	50.06	112	221	7.03
True Value (	20	1000	50.00	124	259	7.00
% Ассигасу		98	100	90	85	100
Relative Per	cent Difference	2.2	5.2	-	-	0.1
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1

NOTE: Analyses performed on 1:4 w:v aqueous extracts.

Gayle A. Potter, Chemist

12/08/99 Date



PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH 703 E. CLINTON, SUITE #103

HOBBS, NM 88240 FAX TO: (505)

Receiving Date: 12/03/99

3/99 Sampling Date: 12/03/99 7/99 Sample Type: SOIL

Reporting Date: 12/07/99 Project Owner: ARCO

Sample Condition: COOL & INTACT

Project Name: NOT GIVEN

Sample Received By: GP

Project Location: IDA WIMBERLY-PIT BOTTOM

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS	DATE:	12/06/99	12/04/99	12/04/99	12/04/99	12/04/99
H4492-1	BH #1-20'	15600	0.014	<0.010	4.19	8.73
H4492-2	BH #2-30'	12300	0.417	<0.010	3.85	6.46
H4492-3	BH #3-40'	10700	<0.010	<0.010	0.743	1.69
H4492-4	BH #4-50'	12200	0.003	0.005	0.042	0.076
H4492-5	BH #5-60'	8990	0.003	0.005	0.075	0.089
H4492-6	BH #6-75'	98.0	0.007	<0.002	0.035	0.033
Quality Control		231	0.088	0.100	0.094	0.288
True Value	QC	240	0.100	0.100	0.100	0.300
% Recover	у	96.3	88.0	. 100	94.2	95.9
Relative Percent Difference		2.9	0.6	2.8	2.0	1.4

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260

diemist)

Date

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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ANALYSIS REOUEST

101 East Marland, Hobbs, NM 88240 10/10 1777 TIME (505) 393-2328 Fax (505) 393-2476 30 BILL TO PO#: DATE ZIP SAME : ABHTO PRES. Company: CE \ COOF Address: Phone #: State: -Tit Botton Fax#; /CID: Attn: City: : ЯЭНТО BOOME MATRIX 1 KC ARDINAL LABORATORIES, INC. 2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020 **NASTEWATER** State: NM Zlp: 88240 5 (G) KAB OR (C)OMP. Project Owner: Sample I.D. Address: 703 E. CLINTON, #103 397-0510 (505) 393-4388 Company Name: SEST Phone #: (505) Project Location: Project Manager: FOR LAB USE ONLY y LAB 1.D. Project Name: City: HOBBS Project #: Fax #:

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

703 E. CLINTON, SUITE #103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 12/13/99

Reporting Date: 12/15/99 Project Owner: ARCOPERMIAN

Project Name: IDA WIMBERLY Project Location: EAST OF JAL

Sampling Date: 12/11/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH	BENZENE	TOLUENE	ETHYL BENZENE	XYLENES
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mg/L)
ANALYSIS	DATE:	12/13/99	12/14/99	12/14/99	12/14/99	12/14/99
H4505-1	MW #8-1	15.4	0.052	<0.002	0.012	<0.006
H4505-2	MW #8-2	2.61	0.072	<0.002	0.007	<0.006
Quality Cor	ttrol	3.93	0.089	0.101	0.099	0.302
True Value QC		4.00	0.100	0.100	0.100	0.300
% Recover	y	98.1	88.7	101	99.1	101
Relative Percent Difference		5.6	1.2	9.6	7.3	5.6

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260

Russia Cook

Date



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH 703 E. CLINTON, SUITE #103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 12/13/99 Reporting Date: 12/17/99

Project Owner: ARCO PERMIAN Project Name: IDA WIMBERLY Project Location: EAST OF JAL Sampling Date: 12/11/99

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: GP

		Na	Ca	Mg	к	Conductivity	T-Alkalinity
LAB NUMBER	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DAT	E:	12/17/99	12/14/99	12/14/99	12/14/99	12/15/99	12/14/99
H4505-1	MW #8-1	2746	142	116	63.0	11800	775
H4505-2	MW #8-2	6157	550	265	65.9	27900	300
Quality Control	_ <del></del> -	NR	80	49	4.96	1392	NR
True Value QC		NR	80	50	5.00	1413	NR
% Accuracy		NR	100	98	99	99	NR
Relative Percen	t Difference	NR	0	2.0	0	0.2	NR
		n	<del> </del>				
METHODS:		SM3	3500-Ca-D	SOUU-Mg E	8049	120.1	310.1
		ci_	SO <sub>4</sub>	CO₃	HCO₃	рН	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS DAT	E:	12/14/99	12/15/99	12/14/99	12/14/99	12/15/95	12/15/99
H4505-1	MW #8-1	4240	130	0	946	7.87	7968
H4505-2	MW #8-2	10800	407	0	366	7.39	21772
Quality Control		1010	48.63	NR	971	7.02	NR
True Value QC		1000	50.00	NR	1000	7.00	NR
		101	97	NR	97	100	NR
% Accuracy		1011	<b>0,</b>				
% Accuracy Relative Percen	t Difference	2.0	2.9	NR		0.1	NR

Gayle A Potter, Chemist

Date

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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Company Name: CECT	Project Manager:	Address: 703 E.	city: HOBBS	Phone #: (505) 397-0510	Fax#: (505) 393-4388	Project #:	Project Name:	Project Location:	FOR LAB USE ONLY	LAB 1.D.	5-58	7					PLEASE HOTE: Uselly and Dan unalyses, Al dalms including thos

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Appendix B Vent Wells Analytical Results



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

703 E. CLINTON, SUITE #103

HOBBS, NM 88240

FAX TO: (505) 393-4388

Receiving Date: 01/13/00

Reporting Date: 01/14/00

Project Number: NOT GIVEN

Project Name: IDA WIMBERLY-ARCO

Project Location: EAST OF JAL

Analysis Date: 01/14/00 Sampling Date: 01/13/00

Sample Type: SOIL

Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: GP

		CIT
LAB NUMBER	SAMPLE ID	(mg/L)
H4577-1	B.H. #1 30'	727
H4577-2	B.H. #1 45'	162
H4577-3	B.H. #2 30'	194
H4577-4	B.H. #2 45'	145
Quality Control	<del></del>	. 1010
True Value QC		1000
% Recovery		101
Relative Percent	10.0	
ETHOD: Standard	I Methods	4500-CIB

NOTE: Analyses performed on 1:4 w:v aqueous extracts.

Chemis( / /

Date

H4577.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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	(915) 673-7001 Fax (915) 673-7020	873-7020 (505) 3	393-2326 Fe	93-2326 Fax (505) 393-2476			Γ
Company Name:	SEST				7	ANALYSIS REQUEST	Ţ
Project Manager:	١			HILTO PO#:		- 1-10	
Address: 203	G. Clinton #103		Company:				
CHy: 16665	1/10	8240	Attn:		-		
Phone #: /525	0150-165 (		Address:				
Fax#: (505)	393-4388		Cffy:				
Project #:	Project Owner:		State:	Zip:			
Project Name:	de 11 linberdu - A	74CO	Phone #:				
Project Location:	ct of 14/		Fax #:		5		
FOR LAB USE ONLY		MATRIX	PRES.	SAMPLING	70		
	(C)ONE	Rate			170/0		
. LABI.D.	Sample I. D.	# CONTAIN GROUNDW SOIL SOIL OIL SLUDGE	OTHER:	OFFER TI	TIME		
HKSJH	13.4.41 30' 6		X	1-12-00 11.	Sthy X		
۲-	9 , Sh 1# #8	×	λ		λ (		
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† Cardinal cannot accept verbal changes. Please fax written changes to 915-873-7020.



# Safety & Environmental

Solutions, Inc.

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ENVIRONMENTAL BUREAU
OIL CONSERVATION DIVISION

# **ARCO** Permian



Ida Wimberly
South Justis Unit F-230
Monitor Well Report
Lea County, New Mexico

For Year Ending December 31, 1999

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510

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### I. Background

The subject property is located at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, New Mexico. Safety & Environmental Solutions, Inc. (SESI) performed sampling and data collection on the seven (7) ground water monitor wells previously installed at the site (See Vicinity Map). An additional monitor well was installed on December 3, 1999. The casing size in all wells is 2".

### II. Work Performed

Beginning in the second quarter of 1999, SESI environmental personnel sampled the seven monitor wells on a quarterly basis. In addition, in December of 1999, an eighth monitor well was installed in the bottom of the pit area and sampled. Ground water samples were taken from each well after a hand bailer was used to develop the wells. Three to five casing volumes of water were removed from each well until pH and temperature of the water were stabilized. The water that was removed was placed in appropriate drums for disposal. The samples were obtained and placed in appropriate containers, preserved and transported under chain of custody to Cardinal Laboratories of Hobbs, New Mexico for analysis of the contaminants identified in the initial sampling, namely Total Petroleum Hydrocarbons (TPH), Major Cations and Anions and BTEX (Benzene, Toluene, Ethyl Benzene and Xylenes). (See Analytical Data)

In addition to the sampling, SESI also measured the depth to the top of the water table and the total depth of each well. The depth to the top of ground water was measured using a Solinst water level indicator. The total depth of each well was measured in order to compute the proper casing volumes. (See Cumulative Depth to Water Table)

### III. Summary

The analysis of the groundwater samples performed by Cardinal Laboratories indicated elevated levels of Chlorides and Total Dissolved Solids (TDS) in all wells as well as elevated levels of Sulfate in Monitor Wells #2 and #6 throughout the test period. Additionally, Monitor Well #4 and the new Monitor Well #8 exhibited elevated levels of Benzene throughout the period when sampling was done. (See Cumulative Well Data)

Based on these results, the elevated levels of both TDS and Chlorides appear to be indigent to the waters of this area and the elevated levels of Benzene are found only within the pit area boundaries, in Monitor Well #4 on the south berm of the pit area and in Monitor Well #8, in the center of the excavated pit area.

# IV. Figures and Appendices

Figures: Vicinity Map Water Flow Diagrams

Appendices: Cumulative Water Elevation Table Cumulative Well Data Analytical Results Figure 1 Vicinity Map

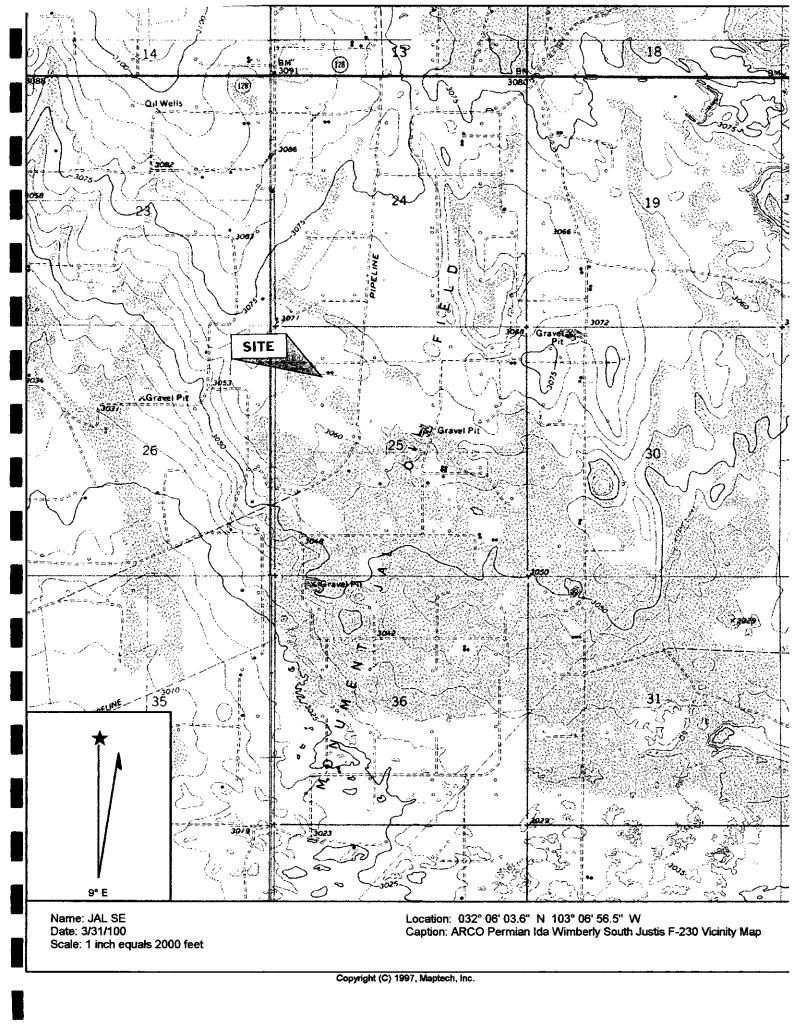
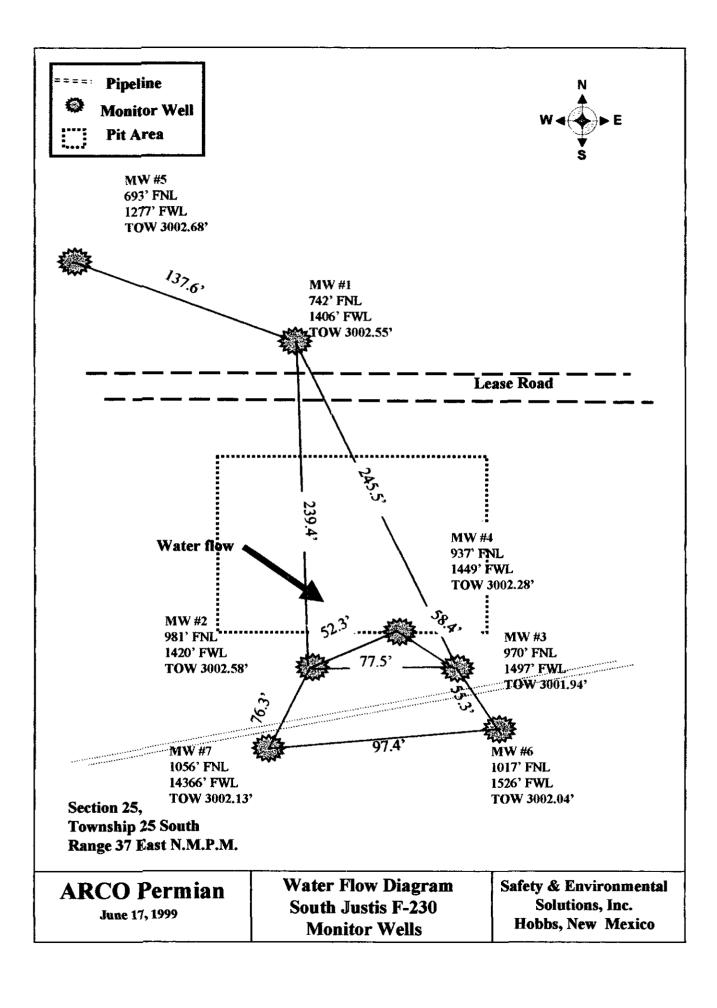
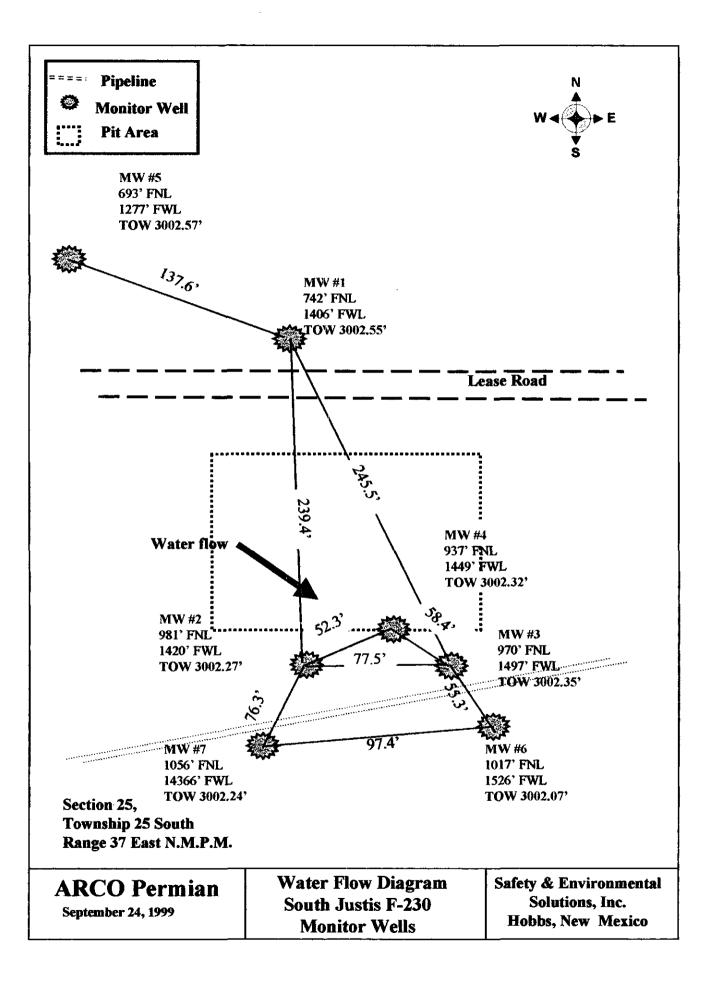
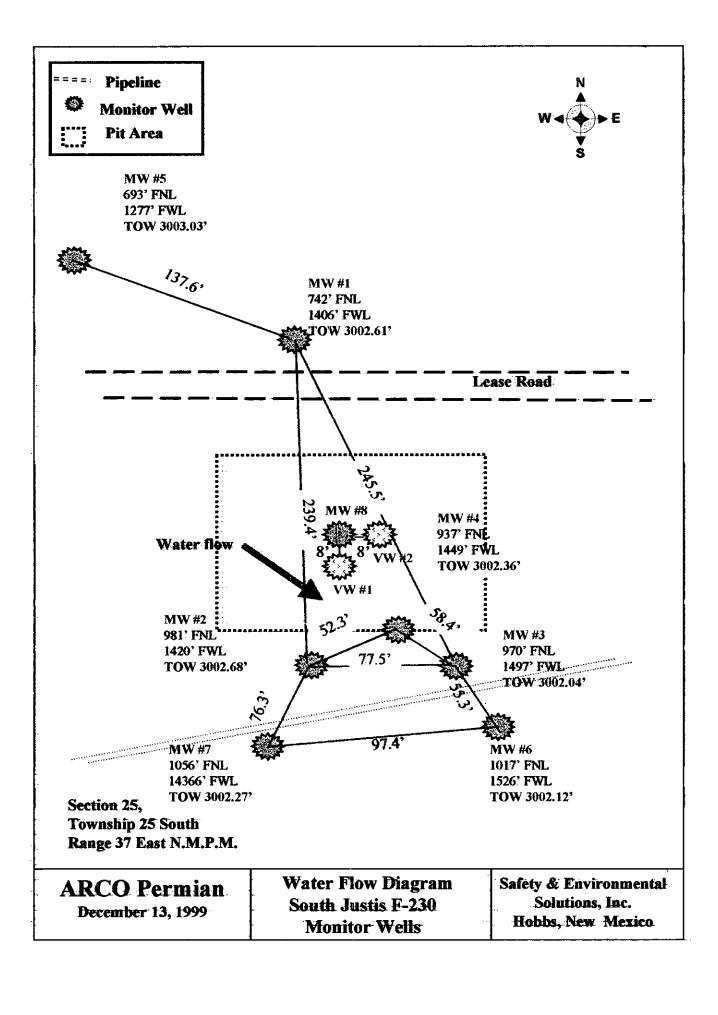


Figure 2
Water Flow Diagram







# Appendix A Cumulative Water Elevation Table

# **Ida Wimberly Cumulative Water Elevation Table**

Monitor Well	Casing Elevation	Water Elevation 6/17/99	Water Elevation 9/24/99	Water Elevation 12/03/99	Water Elevation 12/11/99
#1	3066.98'	3.002.55	3002.55'	3002.61'	n/a.
#2	3066:213	3002.58'	3002.27	3002:68	n/a
#3	3065.92	3001.94	3002.353	3002.04	n/a
#4	3067.93°	3002.283	3002.323	. 3002.36'	n/a
#5	3066.56?	3002.68 <sup>2</sup>	3002.57	3003.03	n/a
#6	3065.33°	3002.04	3002.07	3002.12	n/a
#7	3065.64'	3002.13'	3002.24	3002.27	n/a
#8*	TD - 73'	n/a	n/a	n/a	TOW - 60.31'

<sup>\*</sup>Monitor Well #8 has not been surveyed, therefore only Total Depth of the well and the Top of Water in the well are available.

# Appendix B Cumulative Well Data

# **Ida Wimberly Cumulative Well Data**

Contaminant	WQCC Standard	Initial Test 12/17/97	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a	n/a
Calcium	n/a	296 ppm	317 ppm	n/a	296 ppm	320 ppm
Carbonate	n/a	0 ppm	0 ppm	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	1580 ppm	1839 ppm	1610 ppm	2231 ppm	1686 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Conductivity (umhos/cm)	n/a	6116	6273	n/a	1978	6187
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	122 ppm	249 ppm	n/a	229 ppm	239 ppm
Iron	1.0 ppm	.388 ppm	n/a	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	112 ppm	112 ppm	n/a	126 ppm	126 ppm
Manganese	0.2 ppm	0.345 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Potassium	n/a	22.5 ppm	8.8 ppm	n/a	24 ppm	66 ppm
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Sodium	n/a	1007 ppm	850 ppm	n/a	1157 ppm	738 ppm
Sulfate	600 ppm	1050 ppm	305 ppm	n/a	455 ppm	423 ppm
T-Alkalinity (MgCaCO <sub>3</sub> /L)	n/a	100	204	n/a	188	192
TDS	1000 ppm	3480 ppm	4380 ppm	4560 ppm	4520 ppm	2910 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
рН	> 6 & < 9	5.58	6.384	n/a	7.19 ppm	7.22 ppm
TPH	N/A	n/a	42.9 ppm	n/a	2.76 ppm	<1.00 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	n/a	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 12/17/97	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a	n/a
Calcium	n/a	426 ppm	476 ppm	n/a	544 ppm	760 ppm
Carbonate	n/a	0 ppm	0 ppm	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	6200 ppm	2731 ppm	3890 ppm	6590 ppm	9552 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Conductivity (umhos/cm)	n/a	17028	19010	n/a	1715	27600
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	404 ppm	547 ppm	n/a	459 ppm	425 ppm
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	193 ppm	214 ppm	n/a	258 ppm	389 ppm
Manganese	0.2 ppm	0.343 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Potassium	n/a	90 ppm	42.3 ppm	n/a	62 ppm	132 ppm
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Sodium	n/a	3700 ppm	1202 ppm	n/a	3611 ppm	4979 ppm
Sulfate	600 ppm	1160 ppm	426 ppm	n/a	666 ppm	663 ppm
T-Alkalinity (MgCaCO <sub>3</sub> /L)	n/a	404	448	n/a	376	348
TDS	1000 ppm	10490 ppm	12240 ppm	7490 ppm	14270 ppm	16260 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
pH	> 6 & < 9	7.84	6.303	n/a	6.88	7.00
TPH	N/A	n/a	14.0 ppm	10.3 ppm	4.27 ppm	<1.00 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	<.002 ppm	.003 ppm	.010 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 12/17/97	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	<0.3 ppm	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a	n/a
Calcium	n/a	629 ppm	360 ppm	n/a	448 ppm	640 ppm
Carbonate	n/a	0 ppm	0 ppm	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	8500 ppm	4124 ppm	7570 ppm	5374 ppm	8316 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Conductivity (umhos/cm)	n/a	23846	13960	n/a	1679	22885
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	316 ppm	556 ppm	n/a	459 ppm	434 ppm
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	302 ppm	187 ppm	n/a	214 ppm	316 ppm
Manganese	0.2 ppm	0.440 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Potassium	n/a	118 ppm	31.7 ppm	n/a	55 ppm	78 ppm
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Sodium	n/a	4875 ppm	2229 ppm	n/a	2892 ppm	4441 ppm
Sulfate	600 ppm	1280 ppm	279 ppm	n/a	397 ppm	562 ppm
T-Alkalinity (mgCaCO <sub>3</sub> /L)	n/a	316	455	n/a	376	356
TDS	1000 ppm	15300 ppm	8840 ppm	15180 ppm	10330 ppm	13260 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
pН	> 6 & <9	7.77	6.64	n/a	6.91	6.84
TPH	N/A	n/a	24.6 ppm	n/a	n/a	<1.00 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	<.002 ppm	.005 ppm	<.002 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 8/10/98	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	<0.3 ppm	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Barium	1.0 ppm	<1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	<0.01 ppm	n/a	n/a	n/a	n/a
Calcium	n/a	480 ppm	472 ppm	n/a	736 ppm	1160 ppm
Carbonate	n/a	0 ppm	0 ppm	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	9641 ppm	6910 ppm	4680 ppm	14600 ppm	16295 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Conductivity (umhos/cm)	n/a	18190	21750	n/a	1603	44620
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	439 ppm	864 ppm	n/a	620 ppm	476 ppm
Iron	1.0 ppm	<.2 ppm	n/a	n/a	n/a	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	340 ppm	248 ppm	n/a	272 ppm	559 ppm_
Manganese	0.2 ppm	0.440 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Potassium	n/a	68 ppm	50.5 ppm	n/a	76 ppm	144 ppm
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Sodium	n/a	5252 ppm	3921 ppm	n/a	8521 ppm	8529 ppm
Sulfate	600 ppm	159 ppm	335 ppm	n/a	488 ppm	562 ppm
T-Alkalinity	n/a	360	708	n/a	508	390
(mgCaCO <sub>3</sub> /L)						
TDS	1000 ppm		13960 ppm	9460 ppm	20020 ppm	30010 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
pH	> 6 & < 9	6.69	6.64	n/a	7.04	7.01
TPH	N/A	<1.0 ppm	11.8 ppm	n/a	3.27 ppm	<1.00 ppm
Benzene	0.01 ppm	0.033 ppm	0.046 ppm	0.003 ppm	0.033 ppm	0.026 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.007 ppm	0.012 ppm	<.002 ppm	0.006 ppm	0.012 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 8/10/98	Test Date 8/25/98	Test Date 6/17/99	Test Date 5 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	<0.3 ppm	n/a	n/a	n/a	n/a
Arsenic			n/a	n/a	n/a	n/a
Barium	0.1 ppm 1.0 ppm	<0.1 ppm <1.0 ppm	n/a	n/a	n/a	n/a
Boron	0.75 ppm	<0.75 ppm	n/a	n/a	n/a	n/a
Cadmium		<0.73 ppm	n/a	n/a	n/a	n/a
Calcium	0.01 ppm n/a	<0.01 ppm		n/a		
Carbonate	n/a	264 ppm	320 ppm	n/a	312 ppm	320 ppm
Chloride		0 ppm	0 ppm		0 ppm	0 ppm
	250.0 ppm	1950 ppm	2396 ppm	2090 ppm	2535 ppm	2472 ppm
Chromium	0.05 ppm	<0.05 ppm	n/a	n/a	<u>n/a</u>	n/a
Cobalt	0.05 ppm	<0.05 ppm	n/a	n/a_	n/a	n/a
Conductivity	n/a	5740	7877	n/a	1657	7211
(umhos/cm)	1.0	-0.1			- /-	/-
Copper	1.0 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	200 ppm	195 ppm	n/a	239 ppm	220 ppm
Iron	1.0 ppm	<.2 ppm	n/a	n/a	<u>n/a</u>	n/a
Lead	0.05 ppm	<0.05 ppm	n/a	n/a	n/a	n/a
Magnesium	n/a	127 ppm	153 ppm	n/a	112 ppm	219 ppm
Manganese	0.2 ppm	0.440 ppm	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	<0.02 ppm	n/a	n/a	<u>n/a</u>	n/a
Molybdenum	1.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
Potassium	n/a	19 ppm	10 ppm	n/a	20 ppm	69 ppm
Selenium	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Silver	0.05 ppm	<0.1 ppm	n/a	n/a	n/a	n/a
Sodium	n/a	850 ppm	1094 ppm	n/a	1355 ppm	1078 ppm
Sulfate	600 ppm	138 ppm	274 ppm	n/a	429 ppm	452 ppm
T-Alkalinity	n/a	164	159	n/a	196	180
(mgCaCO <sub>3</sub> /L)				_		
TDS	1000 ppm	3790 ppm	5430 ppm	5300 ppm	5100 ppm	4530 ppm
Zinc	10.0 ppm	<0.2 ppm	n/a	n/a	n/a	n/a
pН	> 6 & < 9	7.14	7.216	n/a	7.28	7.25
TPH	N/A	<1.0 ppm	11.0 ppm	n/a	1.26 ppm	<1.00 ppm
Benzene	0.01 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
Toluene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm	n/a	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 8/11/98	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	n/a	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	n/a	n/a	n/a	n/a	n/a
Barium	1.0 ppm	n/a	n/a	n/a	n/a	n/a
Boron	0.75 ppm	n/a	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	n/a	n/a	n/a	n/a	n/a
Calcium	n/a	n/a	2120 ppm	n/a	2480 ppm	2760 ppm
Carbonate	n/a	n/a	0 ppm	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	29600 ppm	24186 ppm	25500 ppm	42583 ppm	26521 ppm
Chromium	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Conductivity	n/a	61900	68740	n/a	1482	68310
(umhos/cm)	11/4	01900	06740	11/4	1702	00510
Copper	1.0 ppm	n/a	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	n/a	220 ppm	n/a	234 ppm	232 ppm
Iron	1.0 ppm	n/a	n/a	n/a	n/a	n/a
Lead	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Magnesium	n/a	n/a	1239 ppm	n/a	1458 ppm	1045 ppm
Manganese	0.2 ppm	n/a	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	n/a	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	n/a	n/a	n/a	n/a	n/a
Nickel		n/a	n/a	n/a	n/a	n/a
Potassium	0.2 ppm n/a	n/a	101 ppm	n/a	98 ppm	201 ppm
Selenium	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Silver		n/a	n/a	n/a	n/a	n/a
Sodium	0.05 ppm n/a	n/a	11269 ppm	n/a		12550 ppm
Sulfate					22692 ppm	
	600 ppm n/a	n/a	750 ppm 180	1200 ppm n/a	1428 ppm 192	1149 ppm 240
T-Alkalinity (mgCaCO <sub>3</sub> /L)	ıı/a	n/a	160	11/a	192	240
TDS	1000 ppm	58260 ppm	58260 ppm	53980 ppm	71000 ppm	47980 ppm
			n/a		****	
Zinc	10.0 ppm > 6 & <9	n/a	6.829	n/a	n/a 6.74	n/a 6.82
pH TPH	N/A	n/a		n/a n/a		
<u> </u>		<1.0 ppm	6.8 ppm		1.88 ppm	<1.00 ppm
Benzene	0.01 ppm	0.044 ppm	0.007 ppm	n/a	0.003 ppm	0.007 ppm
Toluene	0.75 ppm	0.004 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
E. Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	0.009ppm	<.006 ppm	n/a	<.006 ppm	<.006 ppm

Contaminant	WQCC Standard	Initial Test 8/12/98	Test Date 8/25/98	Test Date 6/17/99	Test Date 9/24/99	Test Date 12/03/99
Aluminum	5.0 ppm	n/a	n/a	n/a	n/a	n/a
Arsenic	0.1 ppm	n/a	n/a	n/a	n/a	n/a
Barium	1.0 ppm	n/a	n/a	n/a	n/a	n/a
Boron	0.75 ppm	n/a	n/a	n/a	n/a	n/a
Cadmium	0.01 ppm	n/a	n/a	n/a	n/a	n/a
Calcium	n/a	n/a	460 ppm	n/a	600 ppm	440 ppm
Carbonate	n/a	n/a	0 ppm	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	5015 ppm	3288 ppm	5380 ppm	6387 ppm	4328 ppm
Chromium	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Cobalt	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Conductivity (umhos/cm)	n/a	n/a	11910	n/a	1523	10580
Copper	1.0 ppm	n/a	n/a	n/a	n/a	n/a
HCO <sub>3</sub>	n/a	n/a		n/a	166 ppm	293 ppm
Iron	1.0 ppm	n/a	n/a	n/a	n/a	n/a
Lead	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Magnesium	n/a	n/a	175 ppm	n/a	97 ppm	219 ppm
Manganese	0.2 ppm	n/a	n/a	n/a	n/a	n/a
Mercury	0.002 ppm	n/a	n/a	n/a	n/a	n/a
Molybdenum	1.0 ppm	n/a	n/a	n/a	n/a	n/a
Nickel	0.2 ppm	n/a	n/a	n/a	n/a	n/a
Potassium	n/a	n/a	25 ppm	n/a	66 ppm	54 ppm
Selenium	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Silver	0.05 ppm	n/a	n/a	n/a	n/a	n/a
Sodium	n/a	n/a	1763 ppm	n/a	3553 ppm	2219 ppm
Sulfate	600 ppm	n/a	832 ppm	142 ppm	553 ppm	536 ppm
T-Alkalinity	n/a	n/a	236	n/a	136	240
(mgCaCO <sub>3</sub> /L)		i			· · · · · · · · · · · · · · · · · · ·	·
TDS		13496 ppm	8170 ppm	10580 ppm	12140 ppm	7240 ppm
Zinc	10.0 ppm	n/a	n/a	n/a	n/a	n/a
pH	>6&<9	n/a	7.326	n/a	7.59	7.16
TPH	N/A	48.7 ppm	7.1 ppm	n/a	1.32 ppm	<1.00 ppm
Benzene	0.01 ppm	0.013 ppm	0.003 ppm	n/a	0.008 ppm	<.002 ppm
Toluene	0.75 ppm	0.002ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
E Benzene	0.75 ppm	<.002 ppm	<.002 ppm	n/a	<.002 ppm	<.002 ppm
Total Xylenes	0.62 ppm	0.009ppm	<.006 ppm	n/a	<.006 ppm	<.006 ppm

Contaminant	WQCC	Initial Test	2nd Test
	Standard	12/11/99	12/11/99
Aluminum	5.0 ppm	n/a	n/a
Arsenic	0.1 ppm	n/a	n/a
Barium	1.0 ppm	n/a	n/a
Boron	0.75 ppm	n/a	n/a
Cadmium	0.01 ppm	n/a	n/a
Calcium	n/a	142 ppm	550 ppm
Carbonate	n/a	0 ppm	0 ppm
Chloride	250.0 ppm	4240 ppm	10800 ppm
Chromium	0.05 ppm	n/a	n/a
Cobalt	0.05 ppm	n/a	n/a
Conductivity	n/a	11800	27900
(umhos/cm)	_		
Соррег	1.0 ppm	n/a	n/a
HCO <sub>3</sub>	n/a	946 ppm	366 ppm
Iron	1.0 ppm	n/a	n/a
Lead	0.05 ppm	n/a	n/a
Magnesium	n/a	116 ppm	265 ppm
Manganese	0.2 ppm	n/a	n/a
Mercury	0.002 ppm	n/a	n/a
Molybdenum	1.0 ppm	n/a	n/a
Nickel	0.2 ppm	n/a	n/a
Potassium	n/a	63.0 ppm	65.9 ppm
Selenium	0.05 ppm	n/a	n/a
Silver	0.05 ppm	n/a	n/a
Sodium	n/a	2746 ppm	6157 ppm
Sulfate	600 ppm	130 ppm	407 ppm
T-Alkalinity	n/a	775	300
(mgCaCO <sub>3</sub> /L)			
TDS	1000 ppm	7968 ppm	21772 ppm
Zinc	10.0 ppm	n/a	n/a
pH	> 6 & < 9	7.87	7.39
TPH	N/A	15.4 ppm	2.61 ppm
Benzene	0.01 ppm	0.052 ppm	0.072 ppm
Toluene	0.75 ppm	<.002ppm	<.002 ppm
E. Benzene	0.75 ppm	.012 ppm	.007 ppm
Total Xylenes	0.62 ppm	<.006 ppm	<.006 ppm

Appendix C Analytical Results



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 06/17/99 Reporting Date: 06/21/99

Project Owner: ARCO
Project Name: ARCO PERMIAN

Project Name: ARCO PERMIAN
Project Location: IDA WIMBERLY

Sampling Date: 06/17/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: BC

				ETHYL	TOTAL
		BENZENE	TOLUENE	BENZENE	XYLENES
LAB NO.	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)

ANALYSIS DATE	06/18/99	06/18/99	06/18/99	06/18/99
H4186-4 MW #4	0.003	<0.002	<0.002	<0.006
				<u> </u>
			<del></del>	
		<del> </del>	<del> </del>	<u> </u>
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Quality Control	0.086	0.097	0.101	0.301
True Value QC	0.100	0.100	0.100	0.300
% Recovery	86.0	97.4	101	100
Relative Percent Difference	0.1	1.1	1.8	2.7

METHOD: EPA SW 846-8021B, 5030, 5021 Gas Chromatography

est fly Circle

JUL 0 6 1999

Chemist

Date

H4186B.XLS

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.





ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, SUITE 103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 06/17/99 Reporting Date: 06/21/99

Project Owner: ARCO

Project Name: ARCO PERMIAN

Project Location: IDA WIMBERLY

Analysis Date: 06/18/99 Sampling Date: 06/17/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

LAB NUMBER SAMPLE ID SO<sub>4</sub><sup>=</sup> (mg/L)

H4186-6 N	/W #6	1200
H4186-7 N	/W #7	142
,		
·		
Quality Control		46.4
True Value QC	,	50.0
% Recovery		93
Relative Percent Dif	fference	2.8

METHOD: EPA 600/4-79-020 375.4

Chemist A Cable

Date

H4186C.XLS



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** FAX TO: (505) 393-4388

Receiving Date: 06/17/99 Reporting Date: 06/21/99

Project Owner: ARCO

Project Name: ARCO PERMIAN

Project Location: IDA WIMBERLY

Sampling Date: 06/17/99

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

		TDS	Cl
LAB NUMBER	SAMPLE ID	( mg/L )	(mg/L)

ANALYSIS DA	TE:	06/18/99	06/18/99
H4186-1	MW #1	4560	1610
H4186-2	MW #2	7490	3890
H4186-3	MW #3	15180	7570
H4186-4	MW #4	9400	4680
H4186-5	MW #5	5300	2090
H4186-6	MW #6	53980	25500
H4186-7	MW #7	10580	5380
Quality Control		NR	1325
True Value QC		NR	1319
% Recovery		NR	101
Relative Percer	nt Difference	NR	1.5

·	METHODS: EPA 600/4-79-02	160.1	4500-CIB*	
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\*Std. Methods

H4186A.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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2111 Beechwood, Abilene, TX 79603 101 East Mariand, Hobbs, NM 88240 (915) 873-7001 Fax (915) 873-7020 (505) 393-2326 Fax (505) 393-2476

Company Name:	SESE		į			_							ļ	AN.	ANALYSIS		REQUEST	ST				
Project Manager:	Dee Whatley						BILL	OJT	} Po#:	.,				_					$\vdash$	-	├	
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(Initials)

<sup>†</sup> Cardinal cannot accept verbal changes. Please fax written changes to 915-673-7020.





ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** 

FAX TO: (505) 393-4388

Receiving Date: 09/24/99

Reporting Date: 09/28/99

Project Number: NOT GIVEN Project Name: IDA WIMBERLY

Project Location: ARCO SOUTH JUSTIS

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: AH

Sampling Date: 09/24/99

Analyzed By: BC/GP/JP

ETHYL TOTAL LAB NO. SAMPLE ID TPH BENZENE TOLUENE BENZENE **XYLENES** (mg/L)(mg/L) (mg/L) (mg/L) (mg/L)

ANALYSIS DATE:	09/27/99	09/24/99	09/24/99	09/24/99	09/24/99
H4360-1 MW #1	2.76	<0.002	<0.002	<0.002	<0.006
H4360-2 MW #2	4.27	0.003	<0.002	<0.002	<0.006
H4360-3 MW #3	1.52	0.005	<0.002	<0.002	<0.006
H4360-4 MW #4	3.27	0.033	<0.002	0.006	<0.006
H4360-5 MW #5	1.26	<0.002	<0.002	<0.002	<0.006
H4360-6 MW #6	1.88	0.003	<0.002	<0.002	<0.006
H4360-7 MW #7	1.32	0.008	<0.002	<0.002	<0.006
Quality Control	41.3	0.092	0.100	0.100	0.304
True Value QC	40.0	0.100	0.100	0.100	0.300
% Recovery	103	92.1	100	99.6	101
Relative Percent Difference	0.6	2.9	6.0	6.7	5.3

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260



Receiving Date: 09/24/99

Reporting Date: 09/28/99

Project Number: NOT GIVEN

Project Name: IDA WIMBERLY

Project Location: ARCO SOUTH JUSTIS

PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY

703 E. CLINTON, SUITE 103

**HOBBS, NM 88240** 

FAX TO: (505) 393-4388

Sampling Date: 09/24/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: AH

Analyzed By: AH

		Na	Ca	Mg	K	Conductivity	T-Alkalinity
LAB NUMBE	R SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS D	ATE:	09/24/99	09/27/99	09/27/99	09/27/99	09/27/99	09/24/99
H4360-1	MW #1	1157	296	126	24	1978	188
H4360-2	MW #2	3611	544	258	62	1715	376
H4360-3	MW #3	2892	448	214	55	1679	376
H4360-4	MW #4	8521	736	272	76	1603	508
H4360-5	MW #5	1355	312	112	20	1657	196
H4360-6	MW #6	22692	2480	1458	98	1482	192
H4360-7	MW #7	3553	600	97	66	1523	136
Quality Cont	rol	NR	48	49	4.96	1443	NR
True Value C	)C	NR	50	50	5.00	1413	NR
% Accuracy		NR	96	98	99	102	NR
Relative Pero	cent Difference	NR	6.3	5.1	0	0.4	NR
METHODS:		SM	3500-Ca-D	3500-Mg E	8049	120.1	310.1

		CI	SO <sub>4</sub>	CO <sub>3</sub>	HCO <sub>3</sub>	рН	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS D	ATE:	09/27/99	09/27/99	09/27/99	09/27/99	09/27/99	09/28/99
H4360-1	MW #1	2231	455	0	229	7.19	4520
H4360-2	MW #2	6590	666	0	459	6.88	14270
H4360-3	MW #3	5374	397	0	459	6.91	10330
H4360-4	MW #4	14600	488	0	620	7.04	20020
H4360-5	MW #5	2535	429	0	239	7.28	5100
H4360-6	MW #6	42583	1428	0	234	6.74	71000
H4360-7	MW #7	6387	553	0	166	7.59	12140
Quality Conti	rol	1024	47.47	112	221	6.99	NR
True Value C	iC	1000	50.00	124	259	7.00	NR
% Accuracy		102	94.9	90.3	85.4	99.9	NR
Relative Perc	ent Difference	9.8	5.2	_	-	1.4	NR
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1	160.1

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# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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2111 Beechwood, Abliene, TX 79803 101 East Mariand, Hobbs, NM 88240 (915) 873-7001 Fax (815) 873-7020 (505) 393-2328 Fax (505) 393-2476

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† Cardinal cannot accept verbal changes. Please fax written changes to 915-873-7020.



ANALYTICAL RESULTS FOR SAFETY & ENVIRONMENTAL SOLUTIONS, INC. ATTN: BETH ALDRICH

703 E. CLINTON, SUITE #103

HOBBS, NM 88240

FAX TO: (505) 393-4388

Sampling Date: 12/03/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: AH

Receiving Date: 12/03/99
Reporting Date: 12/07/99
Project Number: NOT GIVEN
Project Name: ARCO
Project Location: IDA WIMBERLY

		Na	Ca	Mg	K	Conductivity	.T-Alkalinity
LAB NUMBER	SAMPLE !D	(mg/L)	(mg/L)	(mg/L)	(mg/ <u>L</u> )	(u mhos/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DAT	TE:	12/07/99	12/06/99	12/06/99	12/06/99	12/06/99	12/06/99
H4491-1	MW #1	738	320	126	66	6187	192
H4491-2	MW #2	4979	760	389	132	27600	348
H4491-3	MW #3	4441	640	316	78	22885	356
H4491-4	MW #4	8529	1160	559	144	44620	390
H4491-5	MW #5	1078	320	219	69	7211	180
H4491-6	MW #6	12550	2760	1045	201	68310	190
H4491-7	MW #7	2219	440	219	54	10580	240
Quality Control		NR	48	49	4.96	1443	NR
True Value QC		NR	50	50	5.00	1413	NR
% Ассигасу		NR	96	98	99	102	NR
Relative Percer	nt Difference	NR	6.3	5.1	0	0.4	NR
METHODS:		SM:	3500-Ca-D	3500-Mg E	8049	120.1	310.1

	·	Cl <sup>-</sup>	SO <sub>4</sub>	CO <sub>3</sub>	HCO₃	рН	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS I	DATE:	12/06/99	12/06/99	12/06/99	12/06/99	12/06/99	12/07/99
H4491-1	MW #1	1686	423	0	234	7.22	2910
H4491-2	MW #2	9552	663	0	425	7.00	16260
H4491-3	E# WM	8316	562	0	434	6.84	13260
H4491-4	MW #4	16295	562	0	476	7.01	30010
H4491-5	MW #5	2472	452	0	220	7.25	4530
H4491-6	MW #6	26521	1149	0	232	6.82	47980
H4491-7	MW #7	4328	536	0	293	7.16	7240
Quality Con	trol	978	50.06	112	221	7.03	NR
True Value (	QC	1000	50.00	124	259	7.00	NR
% Accuracy		98	100	90	85	100	NR
Relative Per	cent Difference	2.2	5.2	-	-	0.1	
METHODS:		SM4500-CI-B	375.4	310.1	310.1	150.1	160.1

Gayle A. Petter, Chemist

12/08/99 Date



ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

703 E. CLINTON, SUITE #103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 12/03/99

Reporting Date: 12/08/99
Project Number: NOT GIVEN

Project Name: ARCO

Project Location: IDA WIMBERLY

Sampling Date: 12/03/99

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: GP

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH (mg/kg)	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS	DATE:	12/07/99	12/04/99	12/04/99	12/04/99	12/04/99
H4491-1	MW #1	<1.0	<0.002	<0.002	<0.002	<0.006
H4491-2	MW #2	<1.0	0.010	<0.002	<0.002	<0.006
H4491-3	MW #3	<1.0	<0.002	< 0.002	<0.002	<0.006
H4491-4	MW #4	<1.0	0.026	<0.002	0.012	<0.006
H4491-5	MW #5	<1.0	<0.002	<0.002	< 0.002	<0.006
H4491-6	MW #6	<1.0	0.007	<0.002	<0.002	<0.006
H4491-7	MW #7	<1.0	<0.002	<0.002	<0.002	<0.006
Quality Cor	ntrol	3.93	0.088	0.100	0.094	0.288
True Value	QC	4.00	0.100	0.100	0.100	0.300
% Recover		98.1	88.0	100	94.2	95.9
	ercent Difference	5.6	0.6	2.8	2.0	1.4

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260

Chemiso Hy Cash

Date

H4491A.XLS

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

ARDINAL LABORATORIES, INC.

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PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH 703 E. CLINTON, SUITE #103

HOBBS, NM 88240 FAX TO: (505) 393-4388

Receiving Date: 12/13/99 Reporting Date: 12/17/99

Project Owner: ARCO PERMIAN Project Name: IDA WIMBERLY Project Location: EAST OF JAL Sampling Date: 12/11/99

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: GP

	Na	Са	Mg	к	Conductivity	T-Alkalinity
LAB NUMBER SAMPLE ID	(mg/L)	(mg/L)	(mg/L)		(u mhos/cm)	•
ANALYSIS DATE:	12/17/99	12/14/99	12/14/99	12/14/99	12/15/99	12/14/99
H4505-1 MW #8-1	2746	142	116	63.0	11800	775
H4505-2 MW #8-2	6157	550	265	65.9	27900	300
Quality Control	NR	80	49	4.96	1392	NR
True Value QC	NR	80:	50	5.00	1413	NR
% Accuracy	NR	100	98	99	99	NR
Relative Percent Difference	NR	0	2.0	0	0.2	NR
METHODS:	SM3	3500-Ca-D	3500-Mg E	8049	120.1	310.1
	cı <sup>-</sup>	SO <sub>4</sub>	CO <sub>3</sub>	HCO₃	pН	TDS
•	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(ຮ.ປ.)	(mg/L)
ANALYSIS DATE:	12/14/99	12/15/99	12/14/99	12/14/99	12/15/95	12/15/99
	4.5.40				-	
H4505-1 MW #8-1	4240	130	0	946	7.87	7968
H4505-1 MW #8-1 H4505-2 MW #8-2	10800	130 407	0	946 366	7.87 7.39	7968 21772
H4505-2 MW #8-2	10800	407	0	366	7.39	21772
H4505-2 MW #8-2 Quality Control	10800	407 48.63	0 NR	366 971	7.39 7.02	21772 NR
H4505-2 MW #8-2  Quality Control  True Value QC	10800 1010 1000	48.63 50.00	0 NR NR	366 971 1000	7.39 7.02 7.00	21772 NR NR

Gayle A Potter, Chemist

Date



PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

**ANALYTICAL RESULTS FOR** 

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BETH ALDRICH

703 E. CLINTON, SUITE #103

**HOBBS, NM 88240** FAX TO: (505) 393-4388

Receiving Date: 12/13/99

Reporting Date: 12/15/99 Project Owner: ARCOPERMIAN

Project Name: IDA WIMBERLY Project Location: EAST OF JAL Sampling Date: 12/11/99

Sample Type: GROUNDWATER Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

LAB NO.	SAMPLE ID	TPH (mg/L)	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS	DATE:	12/13/99	12/14/99	12/14/99	12/14/99	12/14/99
H4505-1	MW #8-1	15.4	0.052	<0.002	0.012	<0.006
H4505-2	MW #8-2	2.61	0.072	<0.002	0.007	<0.006
Quality Con	rtrol	3.93	0.089	0.101	0.099	0.302
True Value	QC	4.00	0.100	0.100	0.100	0.300
% Recovery	y	98.1	88.7	101	99.1	101
Relative Pe	rcent Difference	5.6	1.2	9.6	7.3	5.6

METHODS: TRPHC - EPA 600/4-79-020, 418.1; BTEX - EPA SW-846 8260

August Cooks

# CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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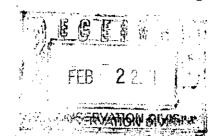
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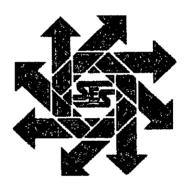
† Cardinal cannot accept verbal changes. Please fax written changes to 915-873-7020.

### ARCO Permian Monitor Well Report Ida Wimberly



South Justis Unit F-230 Unit C, Section 25, T25S, R37E Lea County, New Mexico

January 2, 2001



Prepared for:

ARCO Permian P.O. Box 1610 Midland, Texas 79702

By:

Safety & Environmental Solutions, Inc. 703 E. Clinton Suite 103 Hobbs, New Mexico 88240 (505) 397-0510



### TABLE OF CONTENTS

I. Background	2
II.Work Performed	2
III. Analytical Results	3
IV. Figures and Appendices	4

### I. Background

The subject property is located at the Arco Permian South Justis Unit F-230 located in Unit C, Section 25, T25S, R37E, Lea County, New Mexico. Safety & Environmental Solutions, Inc. (SESI) performed sampling and data collection on the eight (8) ground water monitor wells previously installed at the site (See Vicinity Map). The casing size in all wells is 2".

### II. Work Performed

On January 2, 2001 a SESI environmental technician arrived at the site. Ground water samples were taken from each well after a hand bailer was used to develop the wells. Three to five casing volumes of water were removed from each well until pH and temperature of the water were stabilized. The water removed was placed in appropriate drums for disposal. The samples were obtained and placed in appropriate containers, preserved and transported under chain of custody to Cardinal Laboratories of Hobbs, New Mexico for analysis of the contaminants identified in the initial sampling. (See Analytical Data)

In addition to the sampling, SESI also measured the depth to the top of the water table and the total depth of each well. The depth to the top of ground water was measured using a Solinst water level indicator. The total depth of each well was measured in order to compute the proper casing volumes. A summary of this data follows:

ID	DATE	TOP OF	DEPTH	POTENTIOMETRIC	TOTAL	FREE
		CASING	TO	ELEVATION	WELL	PRODUCT
		ELEVATION	WATER		DEPTH	THICKNESS
MW – 1	1/2/01	3,066.98'	64.60'	3,002.38'	66'	0.00
MW – 2	1/2/01	3,065.92'	63.80'	3,002.12	71'	0.00
MW – 3	1/2/01	3,066.21'	64.13	3,002.08'	71'	0.00
MW - 4	1/2/01	3,067.93	65.81'	3,002.12'	82'	0.00
MW – 5	1/2/01	3,066.56'	64.05'	3,002.51'	80'	0.00
MW - 6	1/2/01	3,065.33	63.43'	3,001.90'	75'	0.00
MW - 7	1/2/01	3,064.64'	62.63'	3,002.01	75'	0.00
MW - 8	1/2/01	3,062.68'	60.73	3,001.95'	72.01'	0.11'

### III. Analytical Results

The analysis of the groundwater samples performed by Cardinal Laboratories are summarized as follows:

CONTAMINANT	MW #1	MW #2	MW #3	MW #4
Sodium	817ppm	2858ppm	2292ppm	2254ppm
Calcium	335ppm	472ppm	343ppm	300ppm
Magnesium	96ррт	208ppm	312ppm	143ppm
Potassium	20.17ppm	75.02ppm	31.14ppm	75.54ppm
Conductivity	6189ppm	15210ppm	13923ppm	12648ppm
T-Alkalinity	214ppm	401ppm	382ppm	937ppm
Chlorides	1760ppm	5383ppm	4451ppm	3623ppm
Sulfate (SO <sub>4</sub> )	327ppm	347ppm′	493ppm	284ppm
Carbonate	0ppm	0ppm	0ppm	0ppm
HCO <sub>3</sub>	262ppm	489ppm	466pm	1143ppm
TDS	3788ppm	9286ppm	8380ppm	7012ppm
pН	7.43	7.03	7.05	7.3
TPH	<1.0ppm	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	<0.002ppm	<0.002ppm	<0.002ppm	0.0326ppm
Toluene	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	<0.002ppm	<0.002ppm	<0.002ppm	0.0139ppm
T. Xylenes	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

·			<del></del>
CONTAMINANT	MW #5	MW #6	MW #7
Sodium	529ppm	12114ppm	1521ppm
Calcium	322ppm	2916ppm	442ppm
Magnesium	146ppm	910ppm	200ppm
Potassium	711ppm	142ppm	24.87ppm
Conductivity	6833ppm	66924ppm	10893ppm
T-Alkalinity	205ppm	261ppm	266ppm
Chlorides	2070ppm	25671ppm	3312ppm
Sulfate (SO <sub>4</sub> )	331ppm	1088ppm	323ppm
Carbonate	0ppm	0ppm	0ppm
HCO <sub>3</sub>	250ppm	318ppm	324ppm
TDS	4234ppm	52084ppm	6706ppm
pН	7.32	6.59	7.13
TPH	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	<0.002ppm	0.0156ppm	<0.002ppm
Toluene	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	<0.002ppm	<0.002ppm	<0.002ppm
T. Xylenes	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards MW #8 not sampled due to Free Product

### IV. Figures and Appendices

### Figures:

Vicinity Map Potentiometric Map

### Appendices:

Cumulative Well Water Quality Data Analytical Results Water Analysis Validation Figure 1 Vicinity Map

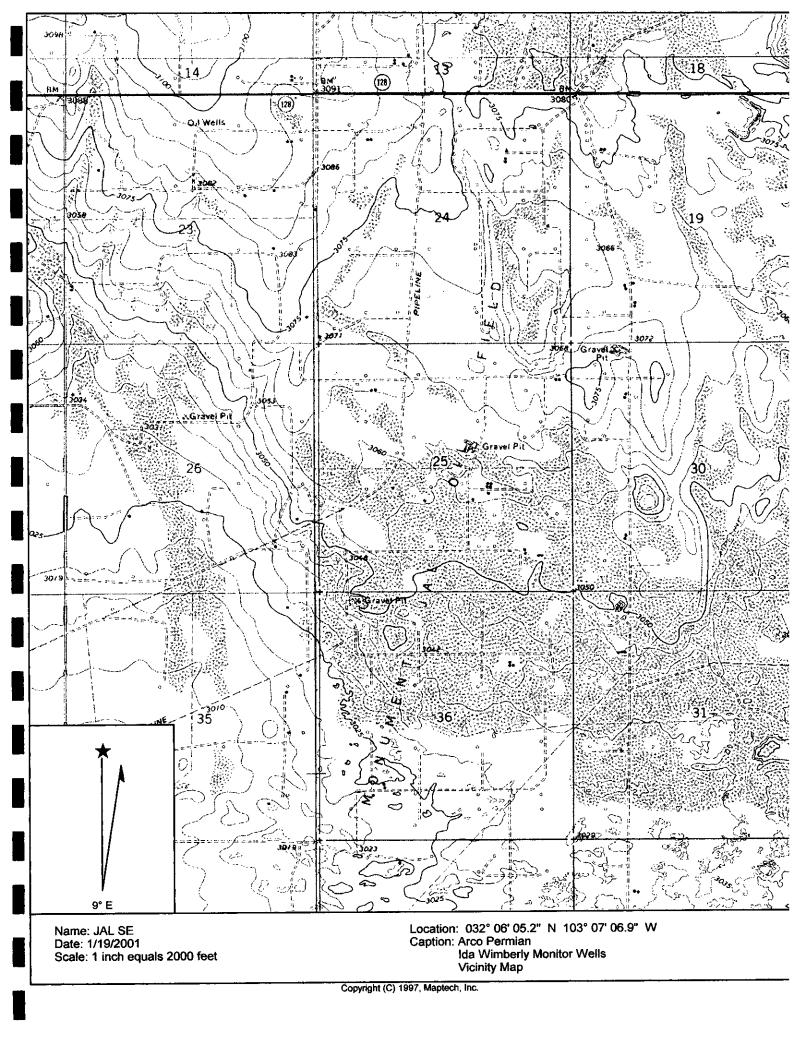
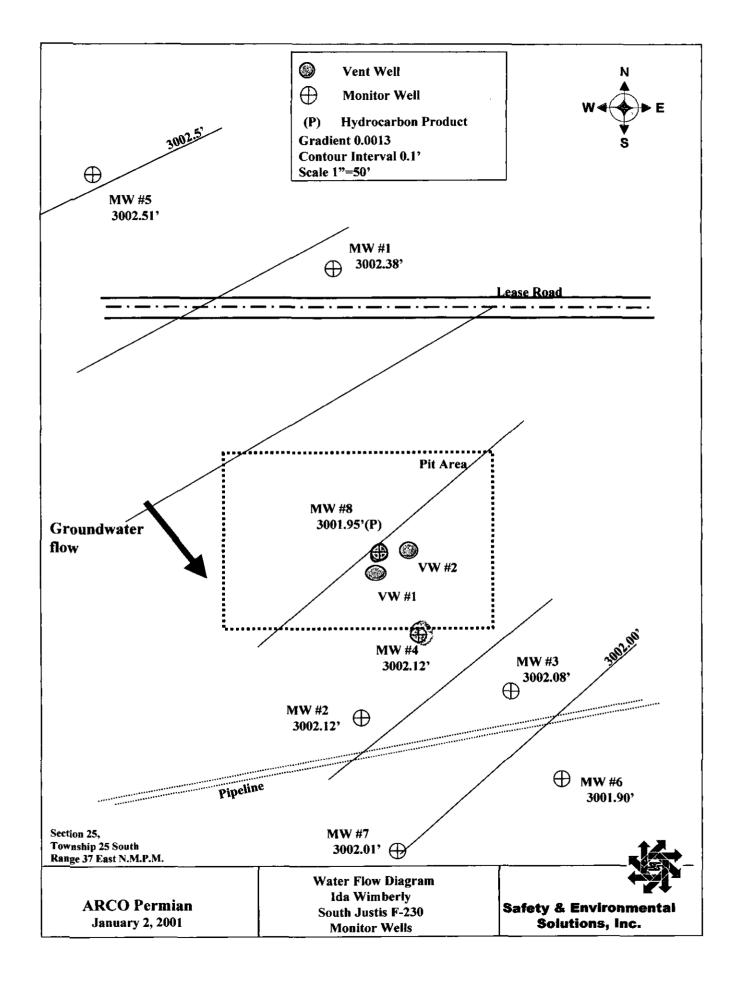


Figure 2
Potentiometric Map



## Appendix A Cumulative Well Water Quality Data

1/2

### **Ida Wimberly Cumulative Well Data**

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
	<u> </u>	12/17/97	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	296ppm	317ppm	N/a	296ppm	320ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	1580ppm	1839ppm	1610ppm	2231ppm	1686ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	6116	6273	N/a	1978	6187
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	122ppm	249ppm	N/a	229ppm	239ppm
Iron	1.0ppm	.388ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	112ppm	112ppm	N/a	126ppm	126ppm
Manganese	0.2ppm	0.345ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	22.5ppm	8.8ppm	N/a	24ppm	66ррт
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	1007ppm	850ppm	N/a_	1157ppm	738ppm
Sulfate	600ppm	1050ppm	305ppm	N/a	455ppm	423ppm
T-Alkalinity	N/a	100	204	N/a	188	192
(MgCaCO <sub>3</sub> /L)		<u> </u>	<u> </u>			
TDS	1000ppm	3480ppm	4380ppm	4560ppm	4520ppm	2910ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
рН	> 6 & <9	5.58	6.384	N/a_	7.19ppm	7.22ppm
TPH	N/a	N/a	42.9ppm	N/a	2.76ppm	<1.00ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	N/a	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE	TEST DATE
	STANDARD	2/25/00	5/31/00	9/19/00	1/2/01
Aluminum	5.0ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	301ppm	321ppm	235ppm	817ppm
Carbonate	N/a	0ppm	0ppm	0ppm	0ppm
Chloride	250.0ppm	1570ppm	1973ppm	1651ppm	1760ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	6155	5770	5753	6189
(umhos/cm)				<u>.</u>	
Copper	1.0ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	229ppm	229ppm	250ppm	262ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	N/a	N/a	78ppm	96ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	104.0ppm	49ppm	5.29ppm	20.17ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	995ppm	904ppm	913ppm	817ppm
Sulfate	600ppm	1180ppm	351ppm	_369ppm	327ppm
T-Alkalinity	N/a	188	188	205	214
(MgCaCO <sub>3</sub> /L)					
TDS	1000ppm	3930ppm	4640ppm	4290ppm	3788ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
pН	> 6 & <9	7.15	7.13	7.26	7.43
ТРН	N/a	<1.0	<1.0	<1.0	<1.0
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
		12/17/97	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	426ppm	476ppm	N/a	544ppm	760ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	6200ppm	2731ppm	3890ppm	6590ppm	9552ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	17028	19010	N/a	1715	27600
(umhos/cm)	<u> </u>					
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	404ppm	547ppm	N/a	459ppm	425ppm
Iron	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	193ppm	214ppm	N/a	258ppm	389ppm
Manganese	0.2ppm	0.343ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	90ppm	42.3ppm	N/a	62ppm	132ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	3700ppm	1202ppm	N/a	3611ppm	4979ppm
Sulfate	600ppm	1160ppm	426ppm	N/a_	666ppm	663ppm
T-Alkalinity	N/a	404	448	N/a	376	348
(MgCaCO <sub>3</sub> /L)	ļ					
TDS	1000ppm	10490ppm	12240ppm	7490ppm	14270ppm	16260ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
pН	> 6 & < 9	7.84	6.303	N/a	6.88	7.00
TPH	N/a	N/a	14.0ppm	10.3ppm	4.27ppm	<1.00ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm	.003ppm	.010ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC	TEST	TEST	TEST	TEST
	STANDARD	DATE	DATE	DATE	DATE
		2/25/00	5/31/00	9/19/00	1/2/01
Aluminum	5.0ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	681ppm	373ppm	288ppm	472ppm
Carbonate	N/a	0ppm	0ppm	0ppm	0ppm
Chloride	250.0ppm	9000ppm	3758ppm	4274ppm	5383ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	26494	11250	12374	15210
(umhos/cm)		27/			37.
Copper	1.0ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	395ppm	488ppm	563ppm	489ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	437ppm	175ppm	126ppm	208ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a
Potassium	N/a	90ppm	1920ppm	26.94ppm	75.02ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	3700ppm	1920ppm	2382ppm	2858ppm
Sulfate	600ppm	1080ppm	222ppm	218ppm	347ppm
T-Alkalinity	N/a	324	400	461	401
(MgCaCO <sub>3</sub> /L)					
TDS	1000ppm	17610ppm	8440ppm	8080ppm	9286ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
pН	> 6 & < 9	6.88	7.04	6.97	7.03
TPH	N/A	<1.0	<1.0	<1.0	<1.0
Benzene	0.01ppm	.004ppm	<0.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST 12/17/97	DATE 8/25/98	DATE 6/17/99	DATE 9/24/99	DATE 12/03/99
Aluminum	5.0ppm	<0.3ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	629ppm	360ppm	N/a	448ppm	640ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	8500ppm	4124ppm	7570ppm	5374ppm	8316ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	23846	13960	N/a	1679	22885
(umhos/cm)						
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	316ppm	556ppm	N/a	459ppm	434ppm
Iron	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	302ppm	187ppm	N/a	214ppm	316ppm
Manganese	0.2ppm	0.440ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	118ppm	31.7ppm	N/a	55ppm	78ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	4875ppm	2229ppm	N/a	2892ppm	4441ppm
Sulfate	600ppm	1280ppm	279ppm	N/a	397ppm	562ppm
T-Alkalinity	N/a	316	455	N/a	376	356
(mgCaCO <sub>3</sub> /L)						L
TDS	1000ppm	15300ppm	8840ppm	15180ppm	10330ppm	13260ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
pН	> 6 & < 9	7.77	6.64	N/a	6.91	6.84
TPH	N/a	N/a	24.6ppm	N/a	N/a	<1.00ppm
Benzene	0.01ppm	<0.002 ppm	<0.002ppm	<0.002ppm	.005ppm	<0.002ppm
Toluene	0.75ppm	<0.002 ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75 ppm	<0.002 ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62 ppm	<0.006 ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC	TEST	TEST	TEST	TEST
	STANDARD	DATE	DATE	DATE	DATE
		2/25/00	5/31/00	9/19/00	1/2/01
Aluminum	5.0ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	321ppm	581ppm	676ppm	343ppm
Carbonate	N/a	0ppm	0ppm	0ppm	0ppm
Chloride	250.0ppm	5300ppm	7140ppm	10490ppm	4451ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	15760	20220	29779	13923
(umhos/cm)					
Copper	1.0ppm	N/a	N/a	N/a_	N/a
HCO <sub>3</sub>	N/a	459ppm	449ppm	538ppm	466ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	292ppm	238ppm	224ppm	312ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	88.0ppm	114ppm	49.62ppm	31.14ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	3071ppm	3808ppm	6027ppm	2292ppm
Sulfate	600ppm	913ppm	414ppm	540ppm	493ppm
T-Alkalinity	N/a	376	368	441	382
(mgCaCO <sub>3</sub> /L)					
TDS	1000ppm	10310ppm	15316ppm	21050ppm	8380ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
рН	> 6 & <9	6.99	7.24	6.89	7.05
TPH	N/a	<1.0	<1.0	<1.0	<1.0
Benzene	0.01ppm	.002ppm	.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	INITIAL TEST 8/10/98	TEST DATE 8/25/98	TEST DATE 6/17/99	TEST DATE 9/24/99	TEST DATE 12/03/99
Aluminum	5.0ppm	<0.3ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	480ppm	472ppm	N/a	736ppm	1160ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	9641 ppm	6910ppm	4680ppm	14600ppm	16295ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	18190	21750	N/a	1603	44620
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	439ppm	864ppm	N/a	620ppm	476ppm
Iron	1.0ppm	<.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	340ppm	248ppm	N/a	272ppm	559ppm
Manganese	0.2ppm	0.440ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	68ppm	50.5ppm	N/a	76ppm	144ppm
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	5252ppm	3921ppm	N/a	8521ppm	8529ppm
Sulfate	600ppm	159ppm	335ppm	N/a	488ppm	562ppm
T-Alkalinity (mgCaCO <sub>3</sub> /L)	N/a	360	708	N/a	508	390
TDS	1000ppm	13580ppm	13960ppm	9460ppm	20020ppm	30010ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
pН	> 6 & < 9	6.69	6.64	N/a	7.04	7.01
TPH	N/a	<1.0ppm	11.8ppm	N/a	3.27ppm	<1.00ppm
Benzene	0.01ppm	0.033ppm	0.046ppm	0.003ppm	0.033ppm	0.026ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.007ppm	0.012ppm	<0.002ppm	0.006ppm	0.012ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC	TEST	TEST	TEST	TEST
	STANDARD	DATE 2/25/00	DATE	DATE	DATE
Aluminum	5.0ppm	2/25/00 N/a	5/31/00 N/a	9/19/00 N/a	1/2/01 N/a
L				L	
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	277ppm	733ppm	3714ppm	300ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm	0ppm
Chloride	250.0ppm	4500ppm	9958ppm	5925ppm	3623ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	13818	27980	17935	12648
Copper	1.0ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	761ppm	600ppm	900ppm	1143ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	165ppm	328ppm	135ppm	143ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	107.0ppm	141ppm	38.7ppm	75.54ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	2929ppm	5367ppm	3714ppm	2254ppm
Sulfate	600ppm	877ppm	492ppm	332ppm	284ppm
T-Alkalinity	N/a	624	492	738	937
(mgCaCO <sub>3</sub> /L)	<b></b>	-	1		
TDS	1000ppm	8810ppm	21688ppm	11220ppm	7012ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
рН	> 6 & < 9	7.19	7.37	7.26	7.3
TPH	N/a	<1.0	<1.0	<1.0	<1.0
Benzene	0.01ppm	0.029ppm	0.021ppm	0.024ppm	0.0326ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	0.017ppm	0.010ppm	0.011ppm	0.0139ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST 8/10/98	DATE 8/25/98	DATE 6/17/99	DATE 9/24/99	DATE 12/03/99
Aluminum	5.0ppm	<0.3ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	<0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	<1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	<0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	<0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	264ppm	320ppm	N/a	312ppm	320ppm
Carbonate	N/a	0ppm	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	1950ppm	2396ppm	2090ppm	2535ppm	2472ppm
Chromium	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	5740	7877	N/a	1657	7211
Copper	1.0ppm	<0.1ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	200ppm	195ppm	N/a	239ppm	220ppm
Iron	1.0ppm	<.2ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	<0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	127ppm	153ppm	N/a	112ppm	219ppm
Manganese	0.2ppm	0.440ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	<0.02ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	<0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	19ppm	10ppm	N/a	20ppm	69ррт
Selenium	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	<0.1ppm	N/a	N/a	N/a	N/a
Sodium	N/a	850ppm	1094ppm	N/a	1355ppm	1078ppm
Sulfate	600ppm	138ppm	274ppm	N/a	429ppm	452ppm
T-Alkalinity (mgCaCO <sub>3</sub> /L)	N/a	164	159	N/a	196	180
TDS	1000ppm	3790ppm	5430ppm	5300ppm	5100ppm	4530ppm
Zinc	10.0ppm	<0.2ppm	N/a	N/a	N/a	N/a
pН	> 6 & < 9	7.14	7.216	N/a	7.28	7.25
ТРН	N/a	<1.0ppm	11.0ppm	N/a	1.26ppm	<1.00ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	N/a	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE	TEST DATE
		2/25/00	5/31/00	9/19/00	1/2/01
Aluminum	5.0ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	286ppm	329ppm	350ppm	322ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm	0ppm
Chloride	250.0ppm	2400ppm	2161ppm	3691ppm	2070ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	6966ppm	6400ppm	10547ppm	6833ppm
(umhos/cm)					
Copper	1.0ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	229ppm	229ppm	250ppm	250ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	141ppm	134ppm	134ppm	146ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	78.0ppm	23ppm	6.32ppm	711ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	1466ppm	1008ppm	1953ppm	529ppm
Sulfate	600ppm	974ppm	348ppm	265ppm	331ppm
T-Alkalinity	N/a	188	188	205	205
(mgCaCO <sub>3</sub> /L)					
TDS	1000ppm	4380ppm	5176ppm	7680ppm	4234ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
pН	> 6 & <9	7.28ppm	7.18ppm	7.41ppm	7.32ppm
ТРН	N/a	<1.0ppm	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC	INITIAL	TEST	TEST	TEST	TEST
	STANDARD	TEST	DATE	DATE	DATE	DATE
		8/11/98	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	N/a	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a	N/a
Calcium	N/a	N/a	2120ppm	N/a	2480ppm	2760ppm
Carbonate	N/a	N/a	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	29600ppm	24186ppm	25500ppm	42583ppm	26521ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a	N/a
Conductivity (umhos/cm)	N/a	61900	68740	N/a	1482	68310
Copper	1.0ppm	N/a	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	N/a	220ppm	N/a	234ppm	232ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a	N/a
Magnesium	N/a	N/a	1239ppm	N/a	1458ppm	1045ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a	N/a
Potassium	N/a	N/a	101ppm	N/a	98ppm	201ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a	N/a
Sodium	N/a	N/a	11269ppm	N/a	22692ppm	12550ppm
Sulfate	600ppm	N/a	750ppm	1200ppm	1428ppm	1149ppm
T-Alkalinity (mgCaCO <sub>3</sub> /L)	N/a	N/a	180	N/a	192	240
TDS	1000ppm	58260ppm	58260ppm	53980ppm	71000ppm	47980ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a	N/a
рН	> 6 & < 9	N/a	6.82	N/a	6.74	6.82
TPH	N/a	<1.0ppm	6.8ppm	N/a	1.88ppm	<1.00ppm
Benzene	0.01ppm	0.044ppm	0.007ppm	N/a	0.003ppm	0.007ppm
Toluene	0.75ppm	0.004ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	0.009ppm	<0.006ppm	N/a	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC	TEST	TEST	TEST	TEST
	STANDARD	DATE	DATE	DATE	DATE
		2/25/00	5/31/00	9/19/00	1/2/01
Aluminum	5.0ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	2610ppm	2325ppm	1792ppm	2916ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm	0ppm
Chloride	250.0ppm	26300ppm	23580ppm	25352ppm	25671ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	69660ppm	63460ppm	66214ppm	66924ppm
(umhos/cm)					
Copper	1.0ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	244ppm	268ppm	325ppm	318ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	1190ppm	1118ppm	695ppm	910ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	216.0ppm	211ppm	104ppm	142ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	12560ppm	11940ppm	13658ppm	12114ppm
Sulfate	600ppm	1690ppm	757ppm	1143ppm	1088ppm
T-Alkalinity	N/a	200	220	267	261
(mgCaCO <sub>3</sub> /L)					
TDS	1000ppm	49130ppm	59776ppm	50260ppm	52084ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
pН	> 6 & < 9	6.81	7.38	6.75	6.59
ТРН	N/a	<1.0ppm	<1.0ppm	<1.0ppm	<1.0
Benzene	0.01ppm	0.007ppm	0.007ppm	0.011ppm	0.0156ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

CONTAMINANT	WQCC STANDARD	INITIAL TEST	TEST DATE	TEST DATE	TEST DATE	TEST DATE
		8/12/98	8/25/98	6/17/99	9/24/99	12/03/99
Aluminum	5.0ppm	N/a	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a	N/a
Calcium	N/a	N/a	460ppm	N/a	600ppm	440ppm
Carbonate	N/a	N/a	0ppm	N/a	0ppm	0ppm
Chloride	250.0ppm	5015ppm	3288ppm	5380ppm	6387ppm	4328ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a	N/a
Conductivity	N/a	N/a	11910	N/a	1523	10580
(umhos/cm)						
Copper	1.0ppm	N/a	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	N/a		N/a	166ppm	293ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a	N/a
Magnesium	N/a	N/a	175ppm	N/a	97ppm	219ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a	N/a
Potassium	N/a	N/a	25ppm	N/a	66ppm	54ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a	N/a
Sodium	N/a	N/a	1763ppm	N/a	3553ppm	2219ppm
Sulfate	600ppm	N/a	832ppm	142ppm	553ppm	536ppm
T-Alkalinity	N/a	N/a	236	N/a	136	240
(mgCaCO <sub>3</sub> /L)						
TDS	1000ppm	13496ppm	8170ppm	10580ppm	12140ppm	7240ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a	N/a
pН	> 6 & <9	N/a	7.326	N/a	7.59	7.16
ТРН	N/a	48.7ppm	7.1ppm	N/a	1.32ppm	<1.00ppm
Benzene	0.01ppm	0.013ppm	0.003ppm	N/a	0.008ppm	<0.002ppm
Toluene	0.75ppm	0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	N/a	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	0.009ppm	<0.006ppm	N/a	<0.006ppm	<0.006ppm

<sup>\*</sup>Red exceeds NM WQCC Ground Water Standards

CONTAMINANT	WQCC STANDARD	TEST DATE	TEST DATE	TEST DATE	TEST DATE
	STANDARD	2/25/00	5/31/00	9/19/00	1/2/01
Aluminum	5.0ppm	N/a	N/a	N/a	N/a
Arsenic	0.1ppm	N/a	N/a	N/a	N/a
Barium	1.0ppm	N/a	N/a	N/a	N/a
Boron	0.75ppm	N/a	N/a	N/a	N/a
Cadmium	0.01ppm	N/a	N/a	N/a	N/a
Calcium	N/a	2610ppm	425ppm	344ppm	442ppm
Carbonate	N/a	0.0ppm	0.0ppm	0.0ppm	0ppm
Chloride	250.0ppm	4100ppm	3194ppm	3303ppm	3312ppm
Chromium	0.05ppm	N/a	N/a	N/a	N/a
Cobalt	0.05ppm	N/a	N/a	N/a	N/a
Conductivity	N/a	11305ppm	9330ppm	10129ppm	10893ppm
(umhos/cm)					
Copper	1.0ppm	N/a	N/a	N/a	N/a
HCO <sub>3</sub>	N/a	254ppm	298ppm	363ppm	324ppm
Iron	1.0ppm	N/a	N/a	N/a	N/a
Lead	0.05ppm	N/a	N/a	N/a	N/a
Magnesium	N/a	267ppm	185ppm	102ppm	200ppm
Manganese	0.2ppm	N/a	N/a	N/a	N/a
Mercury	0.002ppm	N/a	N/a	N/a	N/a
Molybdenum	1.0ppm	N/a	N/a	N/a	N/a
Nickel	0.2ppm	N/a	N/a	N/a	N/a
Potassium	N/a	88.0ppm	46ppm	13.54ppm	24.87ppm
Selenium	0.05ppm	N/a	N/a	N/a	N/a
Silver	0.05ppm	N/a	N/a	N/a	N/a
Sodium	N/a	2.246ppm	1312ppm	1859ppm	1521ppm
Sulfate	600ppm	1070ppm	369ppm	373ppm	323ppm
T-Alkalinity	N/a	208	244	297ppm	266ppm
(mgCaCO <sub>3</sub> /L)					
TDS	1000ppm	8140ppm	7780ppm	7210ppm	6706ppm
Zinc	10.0ppm	N/a	N/a	N/a	N/a
рН	> 6 & <9	7.16	7.15	7.18	7.13
ТРН	N/a	<1.0ppm	<1.0ppm	<1.0ppm	<1.0ppm
Benzene	0.01ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Toluene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
E. Benzene	0.75ppm	<0.002ppm	<0.002ppm	<0.002ppm	<0.002ppm
Total Xylenes	0.62ppm	<0.006ppm	<0.006ppm	<0.006ppm	<0.006ppm

Appendix B Analytical Results





PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, STE 103 HOBBS, NM 88240 FAX TO: (505) 397-4388

Receiving Date: 01/02/01

Reporting Date:

Project Number: NOT GIVEN

Project Name: IDA WIMBERLY-ARCO

Project Location: JAL

Sampling Date: 12/30/00

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: AH

•		Na	Ca	Mg	K	Conductivity	T-Alkalinity
LAB NUMBER	SAMPLE ID	(mg/L)	(mg/L)	(mg/L)	(mg/L)	(mS/cm)	(mgCaCO <sub>3</sub> /L)
ANALYSIS DAT	Ë:	01/04/00	01/02/01	01/02/01	01/02/00	01/03/01	01/02/01
H5481-1	MW #1	817	335	96	20.17	6189	214
H5481-2	MW #2	2858	472	208	75.02	15210	401
H5481-3	MW #3	2292	343	312	31.14	13923	382
H5481-4	MW #4	2254	300	143	75.54	12648	937
H5481-5	MW #5	529	322	146	711	6833	205
H5481-6	MW #6	12114	2916	910	142	66924	261
H5481-7	MW #7	1521	442	200	24.87	10893	266
Quality Control		NR	51	52	4.94	1489	NR
True Value QC		NR	50	50	5.00	1413	NR
% Recovery		NR	102	104	98.8	105	NR
Relative Percen	t Difference	NR	0	1.9	1.6	0.3	NR
METHODS:		CM.	2500 C- D	0500 M- E	9040	100.4	240.4
METHODS:			3500-Ca-D		8049	120.1	310.1
		CIT	SO <sub>4</sub>	CO₃	HCO <sub>3</sub>	pН	TDS
		(mg/L)	(mg/L)	(mg/L)	(mg/L)	(s.u.)	(mg/L)
ANALYSIS DAT		01/02/01	01/03/01	01/02/01	01/02/01	01/03/01	01/04/01
H5481-1	MW #1	1760	327	0	262	7.43	3788
H5481-2	MW #2	5383	347	0	489	7.03	9286
H5481-3	MW #3	4451	493	0	466	7.05	8380
H5481-4	MW #4	3623	284	0	1143	7.3	7012
H5481-5	MW #5	2070	331	0	250	. 7.32	4234
H5481-6	MW #6	25671	1088	0	318	6.59	52084
H5481-7	MW #7	3312	323	0	324	7.13	6706
Quality Control		1004	53.19	NR	995	7.01	NR
True Value QC		1000	50.00	NR	1000	7.00	NR
% Recovery	· · · · · · · · · · · · · · · · · · ·	100	106	NR	99.5	100	NR
Relative Percen	t Difference	7.2		NR	0	0.1	
METHODS:		SM4500-CI-B	375.4	310.1	210 4	150.1	160.1
WETHODS.		31V143UU-UI-B	3/0.4	310.7	310.1	100.1	100, 1

Gayle A. Pøtter, Chemist

01/05/2001 Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affilial to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.



### PHONE (915) 673-7001 • 2111 BEECHWOOD • ABILENE, TX 79603

PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

ANALYTICAL RESULTS FOR

SAFETY AND ENVIRONMENTAL SOLUTIONS, INC.

ATTN: BOB ALLEN

703 E. CLINTON, SUITE 103

HOBBS, NM 88240

FAX TO:

Receiving Date: 01/02/01 Reporting Date: 01/04/01 Project Number: NOT GIVEN Project Name: NOT GIVEN

Project Location: JAL

Sampling Date: 12/30/00

Sample Type: GROUNDWATER Sample Condition: COOL, INTACT

Sample Received By: BC

Analyzed By: JA

LAB NUMBER	SAMPLE ID	BENZENE (ug/L)	TOLUENE (ug/L)	ETHYL BENZENE (ug/L)	TOTAL XYLENES (ug/L)
ANALYSIS DAT	E	01/03/01	01/03/01	01/03/01	01/03/01
H5481-1	MW #1	<2.00	<2.00	<2.00	<6.00
H5481-2	MW #2	<2.00	<2.00	<2.00	<6.00
H5481-3	MW #3	<2.00	<2.00	<2.00	<6.00
H5481-4	MW #4	32.6	<2.00	13.9	<6.00
H5481-5	MW #5	<2.00	<2.00	<2.00	<6.00
H5481-6	MW #6	15.6	<2.00	<2.00	<6.00
H5481-7	MW #7	<2.00	<2.00	<2.00	<6.00
Quality Control		91.6	102	89.8	283
True Value QC	72 1100 1100 1100	100	100	100	300
% Accuracy		91.6	102	89.8	94.3
Relative Percent	Difference	1.9	1.2	2.3	3.2

METHOD: EPA SW 846-8020, 5030, Gas Chromatography

Chémist

/- 4- 0 / Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incruded by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise.





PHONE (505) 393-2326 • 101 E. MARLAND • HOBBS, NM 88240

**ANALYTICAL RESULTS FOR** 

SAFETY & ENVIRONMENTAL SOLUTIONS, INC.

ATTN: DEE WHATLEY 703 E. CLINTON, STE 103

HOBBS, NM 88240 FAX TO: (505) 397-4388

Receiving Date: 01/02/01

Reporting Date: 01/05/01 Project Number: NOT GIVEN

Project Name: IDA WIMBERLY-ARCO

Project Location: JAL

Analysis Date: 01/04/00

Sampling Date: 12/30/00

Sample Type: GROUNDWATER
Sample Condition: COOL & INTACT

Sample Received By: BC

Analyzed By: BC

LAB NUMBER	SAMPLE ID	TPH
		(mg/L)

H5481-1	MW #1	<1.0
H5481-2	MW #2	<1.0
H5481-3	MW #3	<1.0
H5481-4	MW #4	<1.0
H5481-5	MW #5	<1.0
H5481-6	MW #6	<1.0
H5481-7	MW #7	<1.0
Quality Contr	ol	5.65
True Value Q	C	6.00
% Recovery		94.2
Relative Perc	ent Difference	8.2

METHOD: EPA 600/4-79-020 418.1

Date

Buy late A Cook

ARDINAL LABORATORIES, 2111 Beechwood, Abilene, TX 79603 (915) 673-7001 Fax (915) 673-7020	ORATORIE: \bilene, TX 7960 av /915) 673-702	_	/NC. 101 East Marland, Hobbs, NM 882 (505) 393-2326 Fax (505) 393-2476		<u> </u>	່ນ <b>ຂ</b>	26 교	î Ş	<u> </u>	ŠĚ	ر ال	မှ ₹	2 E	INC. 101 East Marland, Hobbs, NM 88240 (505) 393-2326 Fax (505) 393-2476												70	Page		Ĺ	<u>유</u>		ı		LI	+1	Ţ
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erapes, As seems statutely more as implyment and my some service, in no event shall Cardinal be Judio for incidental or com- officials or successors printing out of or initials to the performan	equertal damages, includi 20 of services increamder it	g veltore ferbation, busing Cardinal, regardless of		V	Y A	and interrup	9 9		1 2		1	se, or less of profile incu ed upon any of the above			eductaries, er otherwise.							1	and all costs of collections, including attorney's fees.	4 0		1			1	1		1		1		•
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<sup>†</sup> Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476.

## Appendix C Water Analysis Validation

### Portrait

Sample Name	116401 1			1			
	H5481-1	H5481-2	H5481-3	H5481-4	H5481-5	H5481-6	H5481-7
Well Number	MWI	MW2	MW3	MW4	MW5	MW6	MW7
Date	01/02/01	01/02/01	01/02/01	01/02/01	01/02/01	01/02/01	01/02/01
Lab	Cardinal	<del></del>		Cardinal	Cardinal		Cardina
	817	2,858		<del></del>	529		1,521
<del></del>							442
· <u> </u>		L					200
<del></del> ,		l		<del></del>	·	<u> </u>	24.9
Chloride (mg/L)	1,760	<del> </del>			2,070	25,671	3,312
Sulfate (mg/L)	327			<del></del>	331	1,088	323
Carbonate (mg/L)	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Bicarbonate (mg/L)	262	489	466	1143	250	318	324
Alkalinity (mg/L CaCO3)	214	401	382	937	205	261	266
<del></del>	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Sum Cations (meq/L)	60.7	166.9	143.3	126.7	69.3	751.0	105.3
Sum Anions (meq/L)		167.1	143.5	126.8	69.4	752.0	105.5
Percent Difference	0.1	0.1	0.1	0.0	0.1	0.1	0.1
Measured TDS (evap.,							
mg/L)	3,788	9,286	8,380	7,012	4,234	52,084	6,706
,							
	3,484	9,584	8,151	7,242	4,232	42,998	5,982
	1 1	1.0	1.0	1.0	1.0	1.2	1 1
USGS)	!.!	1.0	1.0	1.0	1.0	1.2	1.1
TDS (calc. sum, mg/L)	3,617	9,832	8,388	7,823	4,359	43,159	6,147
		,			7	, ,	
(umhos/cm)	6,189	15,210	13,923	12,648	6,833	66,924	10,893
TDS (C*0.7, mg/L)	4,332	10,647	9,746	8,854	4,783	46,847	7,625
TDS (calc. USGS) /			121				
Conductivity	0.56	0.63	0.59	0.57	0.62	0.64	0.55
est Criteria				<u> </u>			
		Anion	Max %	_ <del>_</del>			-
tion Balance:		Sum	diff.				
		3.0 - 10.0	± 2	1			
		10.0 - 800	± 5				
sured to Calculated:		1.0 < (meas	ured TDS/c	alculated T	DS) < 1.2	<u> </u>	
		· · · · · · · · · · · · · · · · · · ·	, <u>-</u>				
	Lab Sodium (mg/L) Calcium (mg/L) Magnesium (mg/L) Potassium (mg/L) Chloride (mg/L) Sulfate (mg/L) Carbonate (mg/L) Bicarbonate (mg/L) Alkalinity (mg/L CaCO3) Nitrate (mg/L) Sum Cations (meq/L) Percent Difference Measured TDS (evap., mg/L) TDS (calc. USGS sum, mg/L) TDS (calc. USGS sum, mg/L) Elect. Conductivity (umhos/cm) TDS (C*0.7, mg/L) TDS (calc. USGS) / Conductivity  Cest Criteria tion Balance:	Lab Cardinal Sodium (mg/L) 817 Calcium (mg/L) 335 Magnesium (mg/L) 96 Potassium (mg/L) 20.2 Chloride (mg/L) 1,760 Sulfate (mg/L) 327 Carbonate (mg/L) 0.0 Bicarbonate (mg/L) 262 Alkalinity (mg/L CaCO3) 214 Nitrate (mg/L) 0.0  Sum Cations (meq/L) 60.7 Sum Anions (meq/L) 60.7 Percent Difference 0.1  Measured TDS (evap., mg/L) 3,788 TDS (calc. USGS sum, mg/L) 3,484  TDS (meas.) / TDS (calc. USGS) 1.1  TDS (calc. sum, mg/L) 3,617 Elect. Conductivity (umhos/cm) 6,189 TDS (C*0.7, mg/L) 4,332 TDS (calc. USGS) / Conductivity 0.56  Cest Criteria  tion Balance:	Lab   Cardinal   Cardinal   Sodium (mg/L)   817   2,858   Calcium (mg/L)   335   472   Magnesium (mg/L)   96   208   Potassium (mg/L)   20.2   75.0   Chloride (mg/L)   1,760   5,383   Sulfate (mg/L)   0.0   0.0   0.0   Bicarbonate (mg/L)   262   489   Alkalinity (mg/L CaCO3)   214   401   Nitrate (mg/L)   0.0   0.0   0.0   Sum Cations (meq/L)   60.7   166.9   Sum Anions (meq/L)   60.7   167.1   Percent Difference   0.1   0.1     Measured TDS (evap., mg/L)   3,788   9,286   TDS (calc. USGS sum, mg/L)   3,484   9,584   TDS (meas.) / TDS (calc. USGS)   1.1   1.0   TDS (calc. sum, mg/L)   3,617   9,832   Elect. Conductivity (umhos/cm)   6,189   15,210   TDS (calc. USGS) / Conductivity   0.56   0.63   Cest Criteria   Anion   Sum   Conductivity   0.56   0.63   Cest Criteria   Anion   Sum   Conductivity   0.56   0.63   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria   Cest Criteria	Lab         Cardinal         Cardinal         Cardinal           Sodium (mg/L)         817         2,858         2,292           Calcium (mg/L)         335         472         343           Magnesium (mg/L)         96         208         312           Potassium (mg/L)         20.2         75.0         31.1           Chloride (mg/L)         1,760         5,383         4,451           Sulfate (mg/L)         327         347         493           Carbonate (mg/L)         0.0         0.0         0.0           Bicarbonate (mg/L)         262         489         466           Alkalinity (mg/L CaCO3)         214         401         382           Nitrate (mg/L)         0.0         0.0         0.0           Sum Cations (meq/L)         60.7         166.9         143.3           Sum Anions (meq/L)         60.7         167.1         143.5           Percent Difference         0.1         0.1         0.1           TDS (calc. USGS sum, mg/L)         3,788         9,286         8,380           TDS (calc. sum, mg/L)         3,617         9,832         8,388           Elect. Conductivity (umhos/cm)         6,189         15,210         13,923	Lab   Cardinal   Cardinal   Cardinal   Sodium (mg/L)   817   2,858   2,292   2,254	Lab         Cardinal         Cardinal Cardinal Sodium (mg/L)         Cardinal Ring         Cardinal Cardinal Cardinal Cardinal Sodium (mg/L)         Cardinal Ring         Cardinal Cardinal Cardinal Sodium (mg/L)         Cardinal Sodium (mg/L)         Cardinal Sodium (mg/L)         Cardinal Sodium (mg/L)         Cardinal Sodium (mg/L)         Cardinal Sodium (mg/L)         Sodium (mg/L)	Lab