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*By OCD; Dr. Oberding at 2:41 pm, Sep 15, 2015*

PO Box 2948 | Hobbs, NM 88241 | Phone 575.393.2967

**September 10, 2015**

**Dr. Tomas Oberding**

New Mexico Energy, Minerals, & Natural Resources  
Oil Conservation Division, Environmental Bureau  
1220 S. St. Francis Drive  
Santa Fe, New Mexico 87505

**RE: Corrective Action Plan (CAP)  
Rice Operating Company – EME SWD System  
EME L-20 AD (1R-1159): UL/L sec. 20 T19S R37E**

Dr. Oberding:

RICE Operating Company (ROC) has retained Basin Environmental Service Technologies (Basin) to address potential environmental concerns at the above-referenced site in the EME Salt Water Disposal (SWD) system.

ROC is the service provider (agent) for the EME SWD System and has no ownership of any portion of the pipeline, well, or facility. The system is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis.

### **Background and Previous Work**

The site is located approximately 1.6 miles northwest of Monument, New Mexico at UL/L sec. 20 T19S R37E as shown on the Geographical Location Map (Figure 1) and Area Map (Figure 2). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 31 +/- feet; however, non-ROC monitor wells in the area indicate that groundwater will be encountered at a depth of approximately 23 +/- feet (Figure 3).

On February 7<sup>th</sup>, 2007, ROC discovered an accidental discharge due to a cracked 6 inch AC line. Approximately 60 barrels of produced water were released and 30 barrels were recovered. An initial C-141 was submitted to NMOCD on February 8<sup>th</sup>, 2007 and approved on February 15<sup>th</sup>, 2007 (Appendix A).

Personnel were on site to begin soil delineation of the accidental discharge, with samples being collected at regular intervals and field tested for chlorides and hydrocarbons. A 5 point composite of the surface resulted in a chloride concentration of 1,125 mg/kg and a PID reading of 0.3 mg/kg. The edge of the leak area was hand augered and resulted in low chloride concentrations throughout.

Verticals were installed at the site and samples were collected in regular intervals and field tested for chlorides and hydrocarbons. Representative samples from each vertical were taken to a commercial laboratory for analysis. Vertical 1 resulted in a chloride concentration of 112 mg/kg at 7 ft bgs. Vertical 2 resulted in a chloride concentration of 320 mg/kg at 7 ft bgs. Vertical 3 resulted in a chloride concentration of 832 mg/kg at 5 ft bgs. Gasoline Range Organics (GRO) and Diesel Range Organics (DRO) were below detectable limits throughout (Figure 4).

To further delineate the site, two soil bores were installed on May 21<sup>st</sup>, 2015. As the bores were advanced, soil samples were taken at regular intervals and field tested for chlorides and hydrocarbons. Representative samples from each bore were taken to a commercial laboratory for analysis (Appendix B). Laboratory analysis of SB-1 returned chloride concentrations of 9,460 at the surface and decreased to 208 mg/kg at 9 ft bgs. SB-2 returned chloride concentrations of 32 mg/kg at the surface and below detectable limits at 6 ft bgs. GRO and DRO analysis returned values of non-detect in throughout. The bore holes were plugged in total with bentonite to the ground surface.

To determine if the residual chloride in the vadose zone pose a threat to groundwater quality, Basin ran the U.S. Environmental Protection Agency Exposure Assessment Multimedia Model (MULTIMED Version 1.5, 2005). The model output concludes that the peak concentration of chloride in groundwater contributed by the vadose zone soils would be approximately 99 mg/L in 90 years using the proposed liner. Since the estimated increase in chloride concentrations in groundwater from residual chloride migration is below the WQCC standard of 250 mg/L, Basin recommends the following corrective action (Appendix C).

### **Corrective Action Plan**

Based on the multimed analysis, Basin recommends that ROC install and properly seat a modified 20-mil reinforced poly liner at 5 – 4 ft bgs (Figure 4). The liner will cover an area of approximately 2,380 ft<sup>2</sup> and will inhibit the downward migration of constituents through the vadose zone. The soils placed above the liner will have a laboratory chloride reading no greater than 500 mg/kg and a field PID measurement below 100 ppm. Excavated soils will be evaluated for use as backfill and any soils that do not meet requirements will be properly disposed of at a NMOCD approved facility. The excavation will be backfilled to ground surface and contoured to the surrounding location. The soils over and surrounding the site will then be prepared with soil amendments as necessary and seeded with a native vegetative mix. Vegetation above the liner will also provide a natural infiltration barrier for the site since plants capture water through their roots thereby reducing the volume of water moving through the vadose zone.

Once the CAP work is completed by installing the 20-mil reinforced poly liner and seeding the site, ROC will submit a written report that will include a request for 'remediation termination' and site closure.

Basin appreciates the opportunity to work with you on this project. Please call Katie Jones Davis at (575) 393-9174 or me if you have any questions or wish to discuss the site.

Sincerely,

A handwritten signature in cursive script, appearing to read "L. Flores".

Laura Flores  
Environmental Project Manager  
Basin Environmental

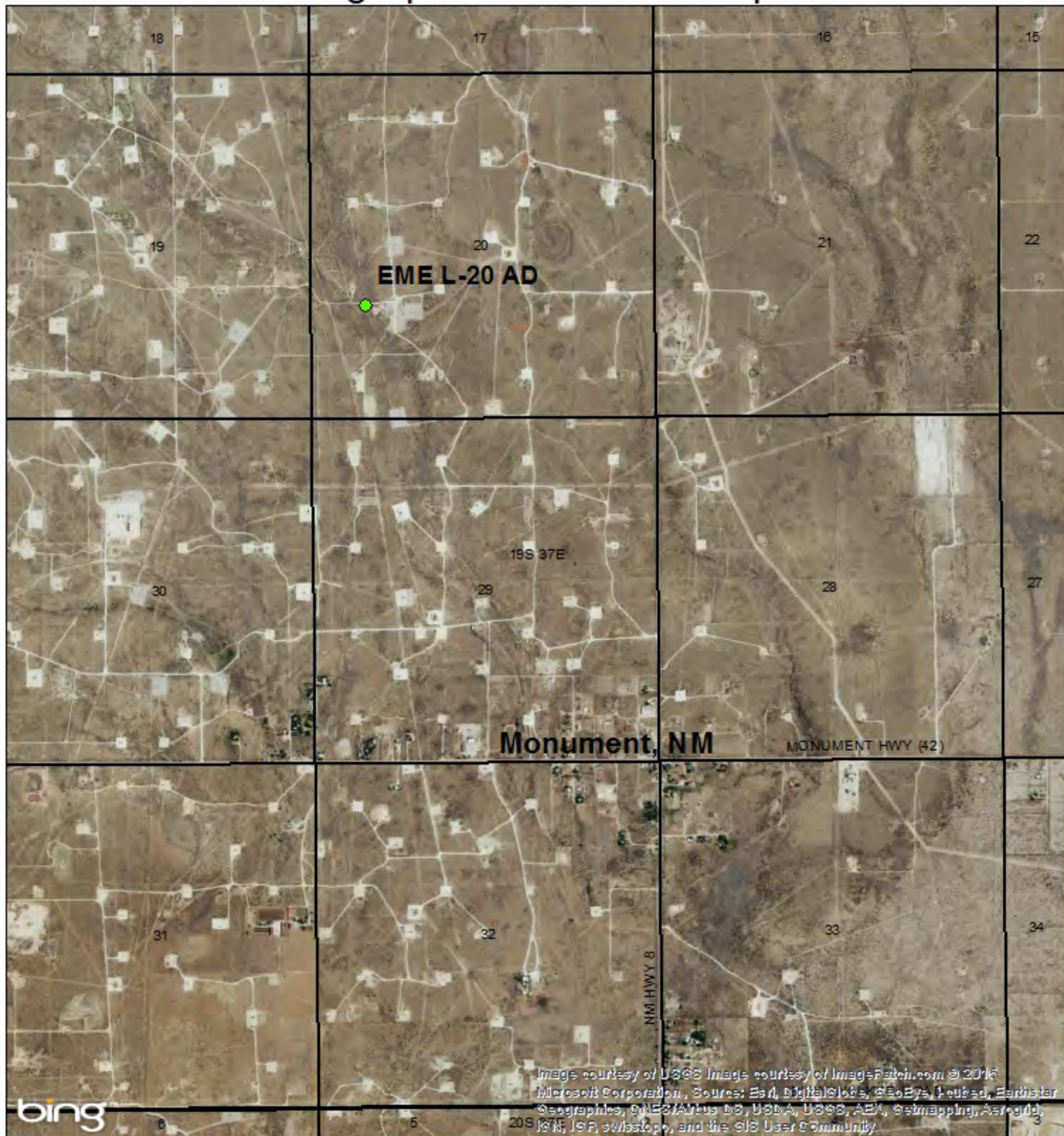
Attachments:

- Figure 1 – Geographical Location Map
- Figure 2 – Area Map
- Figure 3 – Surrounding Monitor Well Locations
- Figure 4 – Proposed Liner Installation
- Appendix A – Initial C-141
- Appendix B – Soil Bore Installation Documentation
- Appendix C – Multimed Output and Graph

# Figures



# Geographical Location Map



## EME L-20 AD

NMOCD Case #: 1RP-1159

UL L SECTION 20  
T-19-S R-37-E  
LEA COUNTY, NM

### Figure 1

Landowner: Jimmie T. Cooper  
DGW: 23 ft

GPS: 32.642727, -103.279111

0 1,400 2,800  
Feet

Drawing date: 4/15/2015  
Drafted by: L. Flores





# Area Map



## EME L-20 AD

NMOCD Case #: 1RP-1159

UL L SECTION 20  
T-19-S R-37-E  
LEA COUNTY, NM

### Figure 2

Landowner: Jimmie T. Cooper  
DGW: 23 ft

GPS: 32.642727, -103.279111

0 210 420  
Feet

Drawing date: 4/15/2015  
Drafted by: L. Flores





# Non - ROC Monitor Wells



## EME L-20 AD

NMOCD Case #: 1RP-1159

UL L SECTION 20  
T-19-S R-37-E  
LEA COUNTY, NM

### Figure 3

Landowner: Jimmie T. Cooper  
DGW: 23 ft

GPS: 32.642727, -103.279111

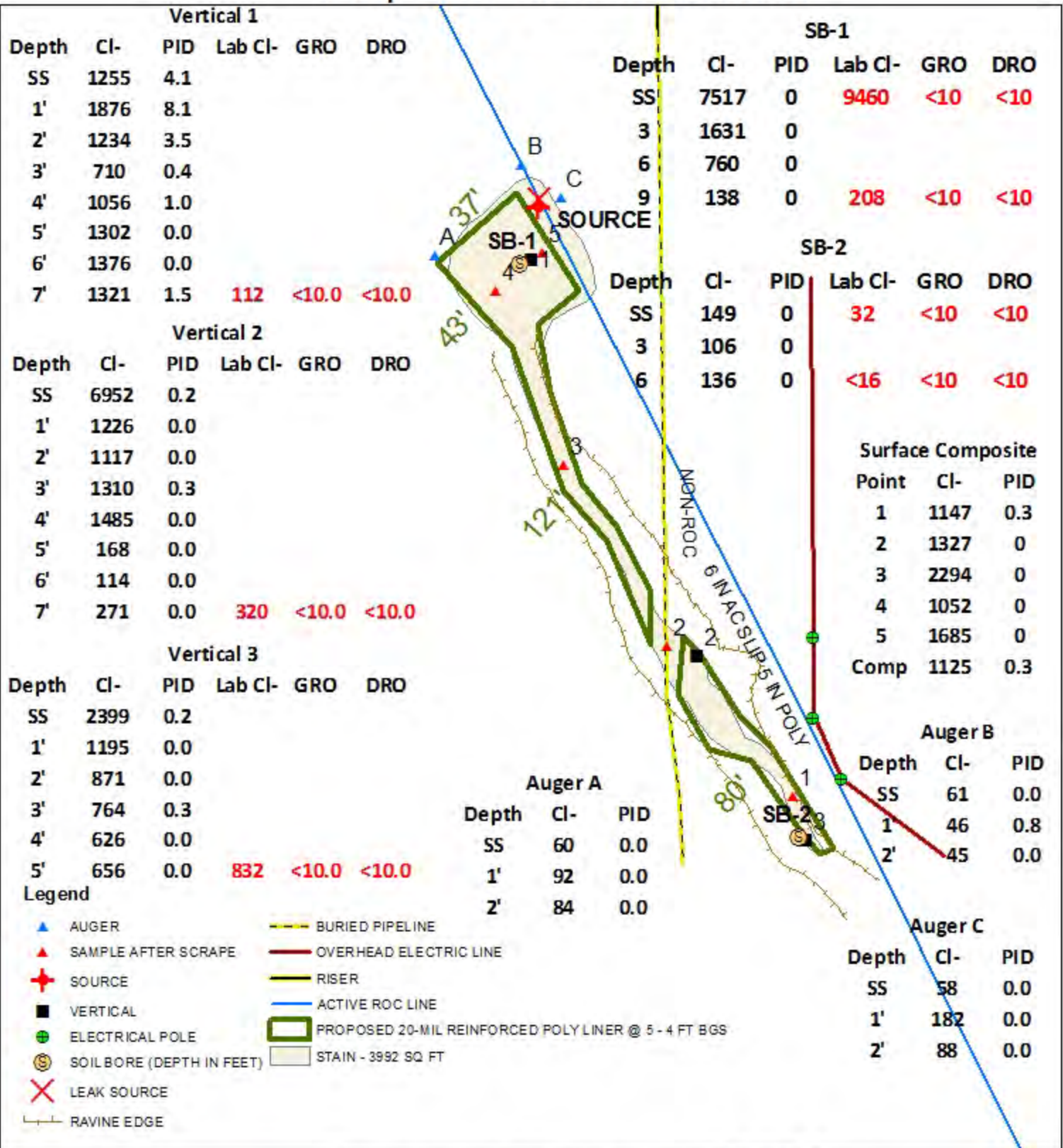
0 50 100  
Feet

GPS date: 5/12/15  
Drawing date: 5/13/15  
Drafted by: T. Grieco





# Proposed Liner Installation



## EME L-20 AD

NMOCD Case #: 1RP-1159

UL L SECTION 20  
T-19-S R-37-E  
LEA COUNTY, NM

Figure 4

Landowner: Jimmie T. Cooper  
DGW: 23 ft

GPS: 32.642727, -103.279111

0 25 50 Feet

GPS date: 7/8/15

Drawing date: 7/10/15

Drafted by: L. Weinheimer





# Appendix A

Initial C-141

**Basin Environmental Service Technologies**

P.O. Box 2948, Hobbs, NM 88241

Phone 575.393.2967

District I  
1625 N. French Dr., Hobbs, NM 88240  
District II  
1301 W. Grand Avenue, Artesia, NM 88210  
District III  
1000 Rio Brazos Road, Aztec, NM 87410  
District IV  
1220 S. St. Francis Dr., Santa Fe, NM 87505

State of New Mexico  
Energy Minerals and Natural Resources

Oil Conservation Division  
1220 South St. Francis Dr.  
Santa Fe, NM 87505

Form C-141  
Revised October 10, 2003

Submit 2 Copies to appropriate  
District Office in accordance  
with Rule 116 on back  
side of form

Release Notification and Corrective Action

OPERATOR

☒ Initial Report ☐ Final Report

Name of Company	Rice Operating	Contact	Tony Grieco
Address	122 W. Taylor St., Hobbs, NM 88240	Telephone No.	(505) 631-2532
Facility Name	EME L-20 Junction Box	Facility Type	Salt Water Gathering System

Surface Owner	Jimmie T. Cooper	Mineral Owner		Lease No.	
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LOCATION OF RELEASE

Unit Letter	Section	Township	Range	Feet from the	North/South Line	Feet from the	East/West Line	County
L	20	19S	37E					

Latitude 32° 38.552 N Longitude 103° 16.720 W

NATURE OF RELEASE

Type of Release	Produced Water	Volume of Release	60 barrels	Volume Recovered	30 barrels
Source of Release	Broken 6" A-C Pipeline	Date and Hour of Occurrence	Unknown	Date and Hour of Discovery	2/7/07 10:00 AM
Was Immediate Notice Given?	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not Required	If YES, To Whom?	Pat Caperton		
By Whom?	Tony Grieco	Date and Hour	2/7/07 1:30 PM		
Was a Watercourse Reached?	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	If YES, Volume Impacting the Watercourse.			


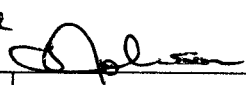
If a Watercourse was Impacted, Describe Fully.\*

Describe Cause of Problem and Remedial Action Taken.\*  
Cracked 6" A-C line. Line has been permanently repaired

Describe Area Affected and Cleanup Action Taken.\*

Area consisted of pasture and pipeline right-of-way. A water truck was called to the location and removed approx. 30 barrels of standing water. Delineation results and work plan to follow. Groundwater is between 40-50 ft bgs

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

Signature: 		OIL CONSERVATION DIVISION	
Printed Name: Tony Grieco		Approved by District Supervisor: 	
Title: Environmental Tech		Approval Date: 2-15-07	Expiration Date: 4-15-07
E-mail Address: tgrieco@riceswd.com		Conditions of Approval:	
Date: 2/8/07 Phone: (505) 631-2532		SUBMITTAL OF WORKPLAN w/	
		Attached <input type="checkbox"/>	

\* Attach Additional Sheets If Necessary

Facility - APAC0704652459  
Incident - n PAC0704652554

FULL DELINEATION FOR OCS APPROVAL  
application - PPAC0704652651

RP#1159



# Appendix B

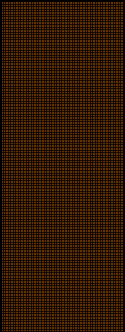
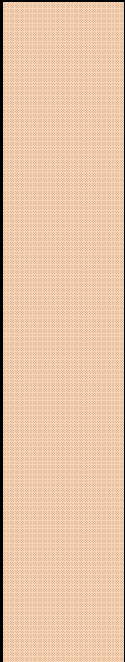

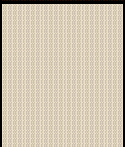
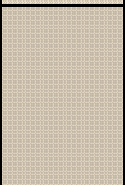
## Soil Bore Installation Documentation

**Basin Environmental Service Technologies**



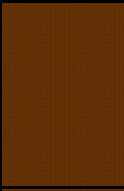
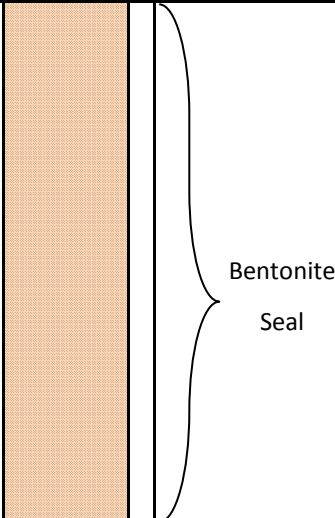
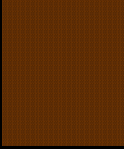

P.O. Box 2948, Hobbs, NM 88241

Phone 575.393.2967

<b>Logger:</b>	Chris Flores			
<b>Driller:</b>	Harris & Cooper Inc.			
<b>Drilling Method:</b>	Air Rotary		<b>Company:</b> ROC	
<b>Start Date:</b>	5/21/2015		<b>Project Name:</b> EME L-20 AD	<b>Well ID:</b> SB-1
<b>End Date:</b>	5/21/2015		<b>Project Consultant:</b> Basin Environmental	
Comments: All samples taken from cuttings. SB-1 is located 26 FT south of the source. DRAFTED BY: Brian Cooper TD = 9 FT                      GW = 31 FT			<b>Location:</b> UL/L Sec. 20 T19S R37E <b>Lat:</b> 32°38'33.579"N <b>County:</b> Lea <b>Long:</b> 103°16'44.882"W <b>State:</b> NM	

Depth (feet)	Chloride field tests	LAB	PID	Description	Lithology	Well Construction		
SS	7517	CI-9460	0	Brown Sand with Clay, Dry, No Odor				Bentonite Seal
		GRO <10						
		DRO <10						
3 ft	1631		0					
				Caliche, Dry, No Odor				
6 ft	760		0					
				Caliche with Sandstone, Dry, No Odor				
9 ft	138	CI-208	0					
		GRO <10						
		DRO <10						



<b>Logger:</b>	Chris Flores					
<b>Driller:</b>	Harris & Cooper Inc.		<b>Company:</b> ROC			
<b>Drilling Method:</b>	Air Rotary		<b>Project Name:</b> EME L-20 AD			
<b>Start Date:</b>	5/21/2015		<b>Well ID:</b> SB-2			
<b>End Date:</b>	5/21/2015	<b>Project Consultant:</b> Basin Environmental				
<b>Comments:</b> All samples taken from cuttings. SB-2 is located 256 FT south of the source. <b>DRAFTED BY:</b> Brian Cooper TD = 6 FT GW = 31 FT			<b>Location:</b> UL/M Sec. 20 T19S R37E			
			<b>Lat:</b> 32°38'31.46"N			
			<b>Long:</b> 103°16'43.703"W			
			<b>County:</b> Lea			
			<b>State:</b> NM			
<b>Depth (feet)</b>	<b>Chloride field tests</b>	<b>LAB</b>	<b>PID</b>	<b>Description</b>	<b>Lithology</b>	<b>Well Construction</b>
SS	149	CI-32	0	Brown Sand, Dry, No Odor		
		GRO <10				
		DRO <10				
3 ft	106		0	Brown Sand with Caliche, Muddy, No Odor		
6 ft	136	CI-16	0	Caliche, Dry, No Odor		
		GRO <10				
		DRO <10				



PHONE (575) 393-2326 ° 101 E. MARLAND ° HOBBS, NM 88240

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May 29, 2015

KATIE JONES

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: EME L-20 AD

Enclosed are the results of analyses for samples received by the laboratory on 05/21/15 16:55.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-13-5. Accreditation applies to drinking water, non-potable water and solid and chemical materials. All accredited analytes are denoted by an asterisk (\*). For a complete list of accredited analytes and matrices visit the TCEQ website at [www.tceq.texas.gov/field/qa/lab\\_accred\\_certif.html](http://www.tceq.texas.gov/field/qa/lab_accred_certif.html).

Cardinal Laboratories is accredited through the State of Colorado Department of Public Health and Environment for:

Method EPA 552.2	Haloacetic Acids (HAA-5)
Method EPA 524.2	Total Trihalomethanes (TTHM)
Method EPA 524.4	Regulated VOCs (V1, V2, V3)

Accreditation applies to public drinking water matrices.

This report meets NELAP requirements and is made up of a cover page, analytical results, and a copy of the original chain-of-custody. If you have any questions concerning this report, please feel free to contact me.

Sincerely,

Celey D. Keene

Lab Director/Quality Manager



**Analytical Results For:**

Rice Operating Company  
KATIE JONES  
112 W. Taylor  
Hobbs NM, 88240  
Fax To: (575) 397-1471

Received:	05/21/2015	Sampling Date:	05/21/2015
Reported:	05/29/2015	Sampling Type:	Soil
Project Name:	EME L-20 AD	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NONE GIVEN		

**Sample ID: SB 1 (VERT) 1 @ SS (H501288-01)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	9460	16.0	05/27/2015	ND	432	108	400	7.69	
TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	05/22/2015	ND	177	88.4	200	0.142	
DRO >C10-C28	<10.0	10.0	05/22/2015	ND	194	96.9	200	1.15	
Surrogate: 1-Chlorooctane	96.7 %	47.2-157							
Surrogate: 1-Chlorooctadecane	108 %	52.1-176							

**Sample ID: SB 1 (VERT) 1 @ 9' (H501288-02)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	208	16.0	05/27/2015	ND	432	108	400	7.69	
TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	05/22/2015	ND	177	88.4	200	0.142	
DRO >C10-C28	<10.0	10.0	05/22/2015	ND	194	96.9	200	1.15	
Surrogate: 1-Chlorooctane	101 %	47.2-157							
Surrogate: 1-Chlorooctadecane	114 %	52.1-176							

Cardinal Laboratories

\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

**Analytical Results For:**

Rice Operating Company  
KATIE JONES  
112 W. Taylor  
Hobbs NM, 88240  
Fax To: (575) 397-1471

Received:	05/21/2015	Sampling Date:	05/21/2015
Reported:	05/29/2015	Sampling Type:	Soil
Project Name:	EME L-20 AD	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NONE GIVEN		

**Sample ID: SB 2 (VERT) 3 @ SS (H501288-03)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	32.0	16.0	05/27/2015	ND	432	108	400	7.69	
TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	05/22/2015	ND	177	88.4	200	0.142	
DRO >C10-C28	<10.0	10.0	05/22/2015	ND	194	96.9	200	1.15	
Surrogate: 1-Chlorooctane	97.6 %	47.2-157							
Surrogate: 1-Chlorooctadecane	108 %	52.1-176							

**Sample ID: SB 2 (VERT) 3 @ 6' (H501288-04)**

Chloride, SM4500Cl-B		mg/kg		Analyzed By: AP					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	<16.0	16.0	05/27/2015	ND	432	108	400	7.69	
TPH 8015M		mg/kg		Analyzed By: MS					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	05/22/2015	ND	177	88.4	200	0.142	
DRO >C10-C28	<10.0	10.0	05/22/2015	ND	194	96.9	200	1.15	
Surrogate: 1-Chlorooctane	100 %	47.2-157							
Surrogate: 1-Chlorooctadecane	117 %	52.1-176							

Cardinal Laboratories

\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

**Notes and Definitions**

ND	Analyte NOT DETECTED at or above the reporting limit
RPD	Relative Percent Difference
**	Samples not received at proper temperature of 6°C or below.
***	Insufficient time to reach temperature.
-	Chloride by SM4500Cl-B does not require samples be received at or below 6°C Samples reported on an as received basis (wet) unless otherwise noted on report

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Cardinal Laboratories

\*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager



# CARDINAL LABORATORIES

101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603  
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325) 673-7020

## CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name: Rice Operating				<b>BILL TO</b>				<b>ANALYSIS REQUEST</b>																													
Project Manager: Katie Jones / Jacob Kamplain / Laura Flores				P.O. #:				<div>Chlorides</div> <div>TPH 8015 M</div> <div>BTEX</div> <div>Texas TPH</div> <div>Complete Cations/Anions</div> <div>TDS</div>																													
Address: 419 W Cain				Company:																																	
City: Hobbs		State: NM Zip: 88240		Attn:																																	
Phone #: 575-393-2967		Fax #: 575-393-0293		Address:																																	
Project #:		Project Owner:		City:																																	
Project Name: Roc				State: Zip:																																	
Project Location: EME L-20 AD				Phone #:																																	
Sampler Name: Cmts Flores				Fax #:																																	
FOR LAB USE ONLY																																					
Lab I.D.		Sample I.D.		(G)RAB OR (C)OMP.		# CONTAINERS		MATRIX		PRESERV.		SAMPLING																									
				GROUNDWATER		WASTEWATER		SOIL		OIL		SLUDGE		OTHER:		ACID/BASE:		ICE / COOL		OTHER:		DATE		TIME													
H501288		1 SB1 (vert) 1 @ SS		G		1		✓								✓						5-21-15		12:30		✓✓											
		2 SB1 (vert) 1 @ G-		G		1		✓								✓						=		12:45		✓✓											
		3 SB2 (vert) 3 @ SS		G		1		✓								✓						=		1:05		✓✓											
		4 SB2 (vert) 3 @ 6-		G		1		✓								✓						=		1:15		✓✓											

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 the client for the 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 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.

Relinquished By:		Date: 5-21-2015		Received By:		Phone Result: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Add'l Phone #:	
Relinquished By:		Date: 5-21-15		Received By:		Fax Result: <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No		Add'l Fax #:	
Time: 4:55						REMARKS:			
Delivered By: (Circle One)		Sample Condition		CHECKED BY: (Initials)		email results:			
Sampler - UPS - Bus - Other: 5.40c		Cool <input checked="" type="checkbox"/> Yes <input type="checkbox"/> No				hconder@basinenv.com; knorman@basinenv.com; jkamplain@basinenv;			
		Intact <input type="checkbox"/> Yes <input checked="" type="checkbox"/> No				lflores@basinenv; lweinheimer@basinenv; cursanic@basinenv;			
						sedwards@basinenv			
						environmental tech: c.flores@basinenv			
						company: kjones@riceswd.com			

† Cardinal cannot accept verbal changes. Please fax written changes to 505-393-2476

#54



# RICE ENVIRONMENTAL CONSULTING & SAFETY

122 West Taylor Hobbs, NM 88240  
PHONE: (505) 393-9174 FAX: (505) 397-1471  
PID METER CALIBRATION & FIELD REPORT FORM

CK.	<input checked="" type="checkbox"/>	MODEL: PGM 7300	SERIAL NO: 590-000508
MODEL	<input type="checkbox"/>	MODEL: PGM 7300	SERIAL NO: 590-000504
NO.	<input type="checkbox"/>	MODEL: PGM 7320	SERIAL NO: 592-903318
	<input type="checkbox"/>	MODEL: PGM 7300 X	SERIAL NO: 590-902553

GAS COMPOSITION: ISOBUTYLENE 100PPM / AIR: BALANCE

LOT NO : THAN -248-100-3	7/12/2017
METER READING ACCURACY: 100PPM	


ACCURACY : +/- 2%

<b>COMPANY</b>
ROC

SITE	UNIT	SECTION	TOWN SHIP	RANGE
ROC EME L-20 AD	L	20	19-S	37-E

SAMPLE ID	PID	SAMPLE ID	PID
SB 1 SS	0		
SB 1 3'	0		
SB 1 6'	0		
SB 1 9'	0		

I verify that I have calibrated the above instrument in accordance to the manufacture operation manual.

SIGNATURE: 

DATE: 5-21-15

# RICE ENVIRONMENTAL CONSULTING & SAFETY

122 West Taylor Hobbs, NM 88240  
PHONE: (505) 393-9174 FAX: (505) 397-1471  
PID METER CALIBRATION & FIELD REPORT FORM

CK.		MODEL: PGM 7300	SERIAL NO: 590-000508
MODEL		MODEL: PGM 7300	SERIAL NO: 590-000504
NO.		MODEL: PGM 7320	SERIAL NO: 592-903318
		MODEL: PGM 7300	SERIAL NO: 590-000183

GAS COMPOSITION: ISOBUTYLENE 100PPM / AIR: BALANCE

LOT NO :	EXPIRATION DATE:
METER READING ACCURACY:	


ACCURACY : +/- 2%

<b>COMPANY</b>
ROC

SITE	UNIT	SECTION	TOWN SHIP	RANGE
ROC EME L-20 AD	L	20	19-S	37-E

SAMPLE ID	PID	SAMPLE ID	PID
SB 2 SS	0		
SB 2 3'	0		
SB 2 6'	0		

I verify that I have calibrated the above instrument in accordance to the manufacture operation manual.

SIGNATURE: 

DATE: 5-21-15

# Appendix C

Multimed Output and Graph

## U. S. ENVIRONMENTAL PROTECTION AGENCY

## EXPOSURE ASSESSMENT

## MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

1  
Run options  
--- -----

Rice EME L-20 AD

1R-1159  
Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models  
Run was DETERMIN  
Infiltration Specified By User: 1.524E-02 m/yr  
Run was transient  
Well Times: Entered Explicitly  
Reject runs if Y coordinate outside plume  
Reject runs if Z coordinate outside plume  
Gaussian source used in saturated zone model

1  
1  
UNSATURATED ZONE FLOW MODEL PARAMETERS  
(input parameter description and value)

NP	- Total number of nodal points	240
NMAT	- Number of different porous materials	1
KPROP	- Van Genuchten or Brooks and Corey	1
IMSHGN	- Spatial discretization option	1
NVFLAYR	- Number of layers in flow model	1

OPTIONS CHOSEN  
-----  
Van Genuchten functional coefficients  
User defined coordinate system

## Layer information

-----  
LAYER NO. LAYER THICKNESS MATERIAL PROPERTY  
-----  
1 4.88 1



# VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.	-999.	-999.
Unsaturated zone porosity	--	CONSTANT	0.250	-999.	-999.	-999.
Air entry pressure head	m	CONSTANT	0.700	-999.	-999.	-999.
Depth of the unsaturated zone	m	CONSTANT	4.88	0.000	0.000	0.000

DATA FOR MATERIAL 1

## VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Residual water content	--	CONSTANT	0.116	-999.	-999.	-999.
Brook and Corey exponent, EN	--	CONSTANT	-999.	-999.	-999.	-999.
ALFA coefficient	1/cm	CONSTANT	0.500E-02	-999.	-999.	-999.
Van Genuchten exponent, ENN	--	CONSTANT	1.09	-999.	-999.	-999.

1

## UNSATURATED ZONE TRANSPORT MODEL PARAMETERS

NLAY	- Number of different layers used	1
NTSTPS	- Number of time values concentration calc	40
DUMMY	- Not presently used	1
ISOL	- Type of scheme used in unsaturated zone	2
N	- Stehfest terms or number of increments	18
NTEL	- Points in Lagrangian interpolation	3
NGPTS	- Number of Gauss points	104
NIT	- Convolution integral segments	2
IBOUND	- Type of boundary condition	3
ITSGEN	- Time values generated or input	1
TMAX	- Max simulation time	-- 0.0
WTFUN	- Weighting factor	-- 1.2

## OPTIONS CHOSEN

-----  
 Convolution integral approach  
 Exponentially decaying continuous source  
 Computer generated times for computing concentrations

1

DATA FOR LAYER 1

## VADOSE TRANSPORT VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Thickness of layer	m	CONSTANT	4.88	-999.	-999.	-999.
Longitudinal dispersivity of layer	m	DERIVED	-999.	-999.	-999.	-999.
Percent organic matter	--	CONSTANT	0.000	-999.	-999.	-999.
Bulk density of soil for layer	g/cc	CONSTANT	1.99	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

#### CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Solid phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	DERIVED	-999.	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	1/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	1/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Reference temperature	C	CONSTANT	25.0	-999.	-999.	-999.
Normalized distribution coefficient	ml/g	CONSTANT	0.000	-999.	-999.	-999.
Distribution coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Biodegradation coefficient (sat. zone)	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Air diffusion coefficient	cm2/s	CONSTANT	-999.	-999.	-999.	-999.
Reference temperature for air diffusion	C	CONSTANT	-999.	-999.	-999.	-999.
Molecular weight	g/M	CONSTANT	-999.	-999.	-999.	-999.
Mole fraction of solute	--	CONSTANT	-999.	-999.	-999.	-999.
Vapor pressure of solute	mm Hg	CONSTANT	-999.	-999.	-999.	-999.
Henry`s law constant	atm-m^3/M	CONSTANT	-999.	-999.	-999.	-999.
Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000	0.000	1.00
Not currently used		CONSTANT	0.000	0.000	0.000	0.000
Not currently used		CONSTANT	0.000	0.000	0.000	0.000

#### SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.152E-01	-999.	-999.	-999.
Area of waste disposal unit	m^2	CONSTANT	139.	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	0.100E-08	-999.	-999.	-999.
Spread of contaminant source	m	DERIVED	-999.	-999.	-999.	-999.
Recharge rate	m/yr	CONSTANT	0.000	-999.	-999.	-999.
Source decay constant	1/yr	CONSTANT	0.250E-01	0.000	0.000	0.000
Initial concentration at landfill	mg/l	CONSTANT	642.	-999.	-999.	-999.
Length scale of facility	m	DERIVED	-999.	-999.	-999.	-999.
Width scale of facility	m	DERIVED	-999.	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

## AQUIFER SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	-999.	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.300E-02	-999.	-999.	-999.
Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.	-999.	-999.
Retardation coefficient	--	DERIVED	-999.	-999.	-999.	-999.
Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Transverse dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Vertical dispersivity	m	FUNCTION OF X	-999.	-999.	-999.	-999.
Temperature of aquifer	C	CONSTANT	20.0	-999.	-999.	-999.
pH	--	CONSTANT	7.00	-999.	-999.	-999.
Organic carbon content (fraction)		CONSTANT	0.000	-999.	-999.	-999.
Well distance from site	m	CONSTANT	1.00	-999.	-999.	-999.
Angle off center	degree	CONSTANT	0.000	-999.	-999.	-999.
Well vertical distance	m	CONSTANT	0.000	-999.	-999.	-999.

TIME            CONCENTRATION

-----

0.100E+02	0.00000E+00
0.200E+02	0.00000E+00
0.300E+02	0.72416E-02
0.400E+02	0.55809E+00
0.500E+02	0.57462E+01
0.600E+02	0.26909E+02
0.700E+02	0.58921E+02
0.800E+02	0.86508E+02
0.900E+02	0.99391E+02
0.100E+03	0.97707E+02
0.110E+03	0.86452E+02
0.120E+03	0.72373E+02
0.130E+03	0.58575E+02
0.140E+03	0.46440E+02
0.150E+03	0.36515E+02
0.160E+03	0.28568E+02
0.170E+03	0.22300E+02
0.180E+03	0.17409E+02
0.190E+03	0.13631E+02
0.200E+03	0.10535E+02

# Chloride Concentration At The Receptor Well

Rice EME L-20 AD

