1R - 427-351

WORKPLANS

Date:
4-17-12

Rice Environmental Consulting & Safety
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

CERTIFIED MAIL
RETURN RECEIPT NO. 7007 2560 0000 4569 9453

April 17th, 2012

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

RE: **Report of Further Investigation and Corrective Action Plan (CAP)**
Rice Operating Company – EME SWD System
EME H-7 EOL (1R427-351): UL/H sec. 7 T20S R37E
(formerly EME I-7 EOL)

Mr. Hansen:

RICE Operating Company (ROC) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced site in the EME Salt Water Disposal (SWD) system. The site was previously referred to as EME I-7 EOL. However, GIS mapping shows the site to be located within unit letter H rather than unit letter I. To reflect the geographical location of the site, the name has been changed to EME H-7 EOL. All correspondence will reference EME H-7 EOL.

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/usage basis.

The site is located approximately 2.5 miles south-west of Monument, New Mexico at UL/H sec. 7 T20S R37E as shown on the Site Location Map (Figure 1). Monitor well sampling at the site shows groundwater to be located at 29 ft bgs.

Background and Previous Work

In 2010, ROC initiated work on the former EME H-7 EOL junction box. The site was delineated using a backhoe to form a 30 ft x 30 ft x 12 ft deep excavation and soil samples were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, the four-wall composite, the bottom composite and the backfill were taken to a commercial laboratory for analysis. Laboratory tests of the four-wall composite showed a chloride reading of 384 mg/kg and gasoline range organics (GRO) and diesel range organics (DRO) readings of non-detect. The bottom composite showed a chloride laboratory reading of 624 mg/kg and GRO and DRO readings of non-detect. The excavated soil was blended on site. Laboratory analysis of the blended backfill showed a

chloride reading of 352 mg/kg and GRO and DRO readings of non-detect. At 12-11 ft below ground surface (bgs), a 1 foot clay layer was installed to inhibit downward migration of chlorides in the soil and a clay compaction test was performed on March 25th, 2010. The remaining excavation was backfilled with the blended backfill to ground surface and the area was contoured to the surrounding landscape and seeded.

To further investigate the site, a soil bore was advanced 10 ft south of the former junction box (source) on June 10th, 2010 to 24 ft bgs with samples collected every three feet. The samples were field tested for both chlorides and hydrocarbons. The 21 ft and 24 ft samples were taken to a commercial laboratory to be analyzed, resulting in chloride concentrations of 912 mg/kg in the 21 ft sample and 1,120 mg/kg in the 24 ft sample. Both samples showed GRO and DRO readings of non-detect. The bore was plugged in entirety with bentonite.

NMOCD was notified of potential groundwater impact on October 5th, 2010 and a junction box disclosure report was submitted to NMOCD with all the 2010 junction box closures and disclosures.

As part of the Investigation and Characterization Plan approved by NMOCD on July 21st, 2011, seven soil bores (SB-2 through SB-8) were advanced at the site to a depth of 24 ft. The soil bores were sampled every three feet and the samples were field tested for chlorides and screened in the field with a photo-ionization detector for hydrocarbons. Representative samples from each bore were taken to a commercial laboratory for analysis of chlorides and hydrocarbons. Chloride readings ranged from a high of 1,060 mg/kg at 21 ft bgs in SB-8 to a low of 128 mg/kg at 24 ft bgs in SB-5. GRO readings at all depths in all bores were non-detect. DRO readings were also non-detect in all samples, except for at 24 ft bgs in SB-8 where the DRO reading was 11.9 mg/kg (Figure 4).

On August 30th, 2011, two monitor wells (MW-1 and MW-2) were installed at the site. MW-1, the near-source well, is located approximately 43 ft south-southeast from the former junction box site and MW-2, the up gradient well, is located approximately 101 ft northwest of the former junction box site. Soil samples were collected every three feet from each well as they were being advanced and field tested for chlorides and screened in the field with a photo-ionization detector (PID) for hydrocarbons. Representative soil samples from each well were taken to a commercial laboratory for analysis of chlorides and hydrocarbons. Laboratory chloride readings in MW-1 decreased from 736 mg/kg at 18 ft bgs to 576 mg/kg at 24 ft bgs. GRO and DRO readings were non-detect for both samples in MW-1. Chloride and TPH readings from MW-2 are representative of background concentrations in the area. Laboratory analysis resulted in a chloride concentration of 528 mg/kg at 12 ft and 128 mg/kg at 24 ft bgs. GRO and DRO readings were non-detect in the 12 ft sample. For the 24 ft sample, the GRO reading was non-detect and the DRO reading had a concentration of 16.5 mg/kg.

On September 15th, 2011, an ICP Report was submitted to NMOCD which was approved on October 20th, 2011. In the ICP Report, RECS proposed that ROC would sample and

analyze the two monitor wells installed at the site per NMOCD requirements. Once groundwater samples were obtained and groundwater quality fully delineated, ROC would submit a Corrective Action Plan (CAP) which would include a vadose zone remedy and groundwater remedy, if warranted.

The monitor wells have been sampled quarterly since their installation (Figure 2). The site is located within a regionally impacted groundwater area (Figure 3). During the last sampling event that occurred on February 10th, 2012, MW-2, the up gradient monitor well, showed a chloride concentration of 1,900 mg/L. The near source monitor well, MW-1, showed a chloride concentration of 2,300 mg/L (Appendix A). Although the groundwater coming onto the site is already impacted from chlorides, it is evident that the site also contributed to the degradation of groundwater.

To fully delineate the vadose zone, SB-9 through SB-11 were advanced at the site on November 8th, 2011 (Figure 4). The soil bores were sampled every three feet as they were advanced and were field tested for chlorides and hydrocarbons. Representative samples from each bore were taken to a commercial laboratory for confirmation of field numbers (Appendix B). In SB-9, the chloride value at 18 ft bgs was 800 mg/kg which decreased to 768 mg/kg at 24 ft bgs. In SB-10, the chloride value at 21 ft bgs was 688 mg/kg which decreased to 416 mg/kg at 24 ft bgs. In SB-11, the chloride value at 18 ft bgs was 848 mg/kg and the chloride value at 24 ft bgs was 1,140 mg/kg. The GRO and DRO values were non-detect in all three bores at all depths.

Corrective Action Plan (CAP)

Soil Remedy:
ROC proposes to excavate the site to the dimensions of 81 ft x 39 ft and properly seat a 20-mil reinforced poly liner at approximately 4-5 ft bgs (Figure 4). The liner will cover the existing clay layer installed at 12 ft bgs measuring 30 ft x 30 ft. The soils placed above the liner will have a laboratory chloride reading no greater than 500 mg/kg and a field PID reading below 100 ppm. Excavated soil will be evaluated for use as backfill and any soils requiring disposal will be properly disposed of at a NMOCD approved facility. Upon completion of backfilling, the site will be seeded with a native vegetative mix and soil amendments will be added as needed. 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 to groundwater.

Groundwater Remedy:
Based on the elevated chloride concentrations in the up gradient well (MW-2), ROC proposes to remove chloride impacted groundwater from the existing EME A-20 recovery system. Removed water will be used for pipeline and well maintenance. Our estimate conservatively reflects the net impact to groundwater at the site resulting from the former junction box site. It does not take into account other sources or regional groundwater conditions that may exist up gradient of the site.

- **Estimated chloride mass in the vadose zone**
  To determine if the residual chlorides in the vadose zone pose a threat to groundwater quality, ROC ran the U.S. Environmental Protection Agency Exposure Assessment Multimedia Model (MULTIMED Version 1.5, 2005). Data inputs and model outputs are included in Appendix C. With the proposed infiltration barrier measuring 81 ft x 39 ft, the model output concludes that the peak concentration of chlorides in groundwater contributed by the vadose zone soils would be approximately 28.6 mg/L in 116 years. Since the estimated increase in chloride concentrations in groundwater from residual chloride migration is below the WQCC standard of 250 mg/L, no further action will be warranted for the vadose zone of this site.

- **Estimated chloride mass in the groundwater**
  The estimated impact area at the site is approximately 3,159 square feet. The aquifer thickness is estimated to be 20 ft thick. The porosity of the soil is estimated at 0.25. The volume of the impacted groundwater beneath the site is determined by multiplying the impact area by the aquifer thickness by the porosity. The volume of impacted groundwater beneath the site is then 15,795 cubic feet. The result is then converted to liters giving a total of 447,264 liters. The chloride concentration added to the soil from the source is the difference between the most recent chloride concentration observed in MW-1 and the most recent chloride concentration in MW-2 which is determined to be 400 mg/L. The total chloride mass in the groundwater is then determined by multiplying the volume of impacted groundwater beneath the site by the chloride concentration added to the soil from the site. This then is converted to kilograms. Thus, the total chloride mass beneath the site is 179 kg.

Estimate of Chloride Mass in Groundwater

Parameter	Unit	Value	Description
Impact area	ft^2	3,159	Estimated Area of Impact
Aquifer Thickness	ft	20	NMOCD Approved Estimation
Porosity	%	0.25	Professional Estimate for Water Saturated Pore Volume
Volume of Impacted Groundwater Below Site	ft^3	15,795	Impact Area x Aquifer Thickness x Porosity
Volume of Impacted Groundwater Below Site	L	447,264	Conversion from ft^3 to Liters
Chloride Concentration from Source	mg/L	400	Difference between Concentrations in Monitor Wells (MW-1 = 2,300 mg/L and MW-2 = 1,900 mg/L)
TOTAL CHLORIDE MASS	**kg**	**179**	Volume of Impacted Groundwater Below Site x Chloride Concentration Added to Soil from Source

- **Estimated groundwater recovery system removal**
  Once this CAP is approved by NMOCD, ROC will begin water recovery at the EME A-20. Based on a recovery well chloride concentration of 3,400 mg/L, approximately 331 barrels of groundwater will need to be removed to equate to 179 kg of chloride. The system is expected to extract one gallon a minute, and it is estimated that the system will require a total of 23 days to extract the 331 barrels of groundwater equating to 179 kg.

Estimated Groundwater Recovery System Removal at the EME A-20

Parameter	Unit	Value	Description
Groundwater Concentration	mg/L	3,400	Groundwater Concentration from RW-1
Groundwater Concentration	kg/gal	0.0128705	Conversion from mg/L to kg/gal
Pumping Rate	gals/min	1	Given
Extraction Rate	kg/min	0.0128705	Pumping rate x Groundwater Concentration (kg/gal)
Extraction Rate	kg/day	7.7223	Conversion from kg/min to kg/day
Representative Total Chloride Mass	kg	179	From above
Volume Removal	gals	13,907	Pumping rate x Estimated Removal Time x 60 min/hour x 10 hr/day
Volume Removal	bbls	331	Conversion from gals to bbls
ESTIMATED REMOVAL TIME	**day**	**23**	Representative Total Chloride Mass/Extraction Rate

Once the CAP activities have been completed, RECS anticipates that ROC will submit a written report of the CAP activities and a request for 'remediation termination' of the regulatory file.

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

Sincerely,

Lara Weinheimer
Project Scientist
RECS
(575) 441-0431

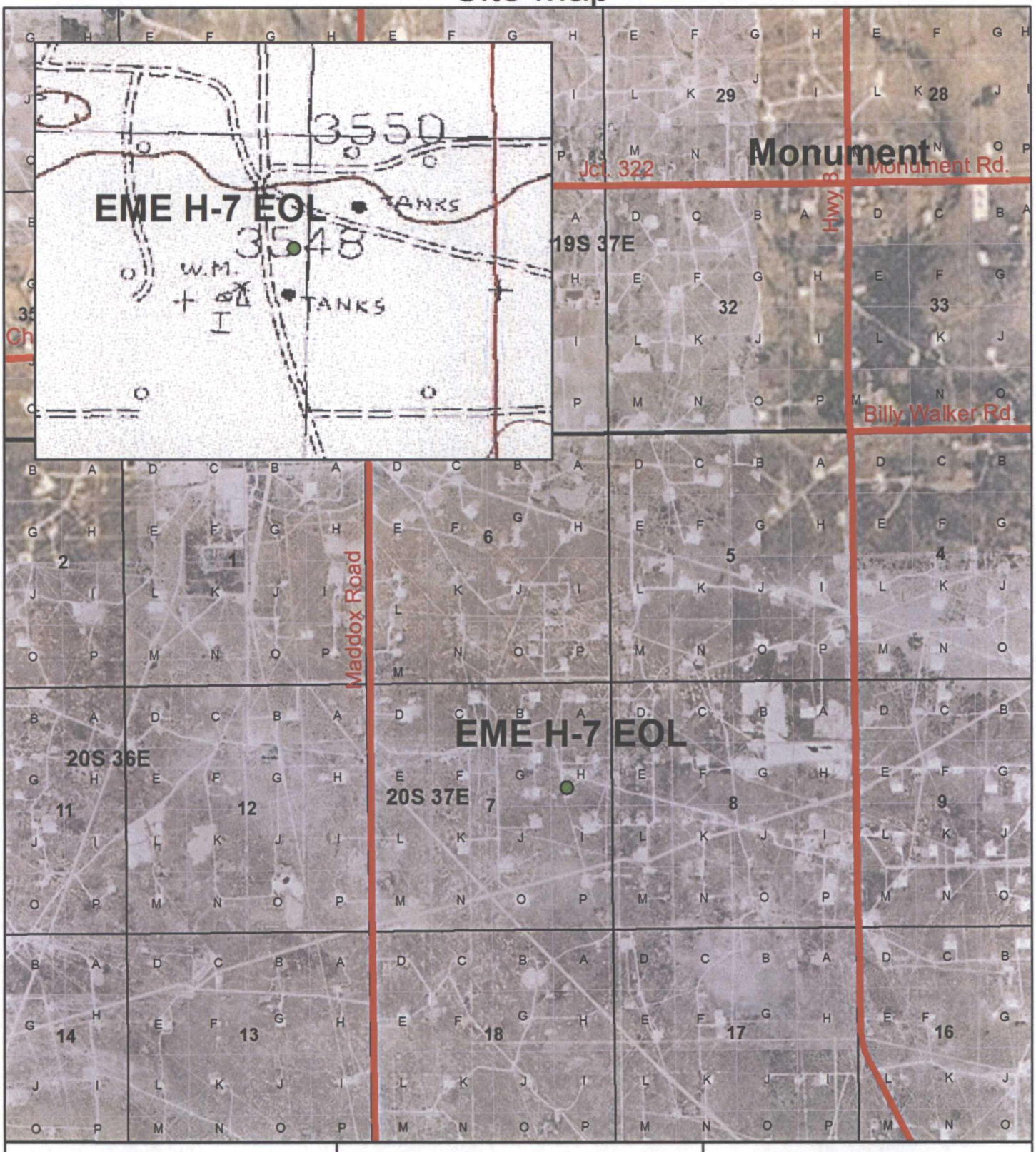
Attachments:

Figure 1 – Site Map
Figure 2 – Monitor Well Sampling Data
Figure 3 – EME Groundwater Contamination
Figure 4 – Proposed Liner
Appendix A – Monitor Well Sampling Lab
Appendix B – SB-9 through SB-11 Logs and Lab
Appendix C – U.S. EPA MULTIMED Inputs, Outputs and Graph

Figures

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

Site Map



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

RECS

EME H-7 EOL

LEGALS: UL/H sec. 7
T20S R37E

NMOCD Case #: 1R427-351

Figure 1

N
W E
S

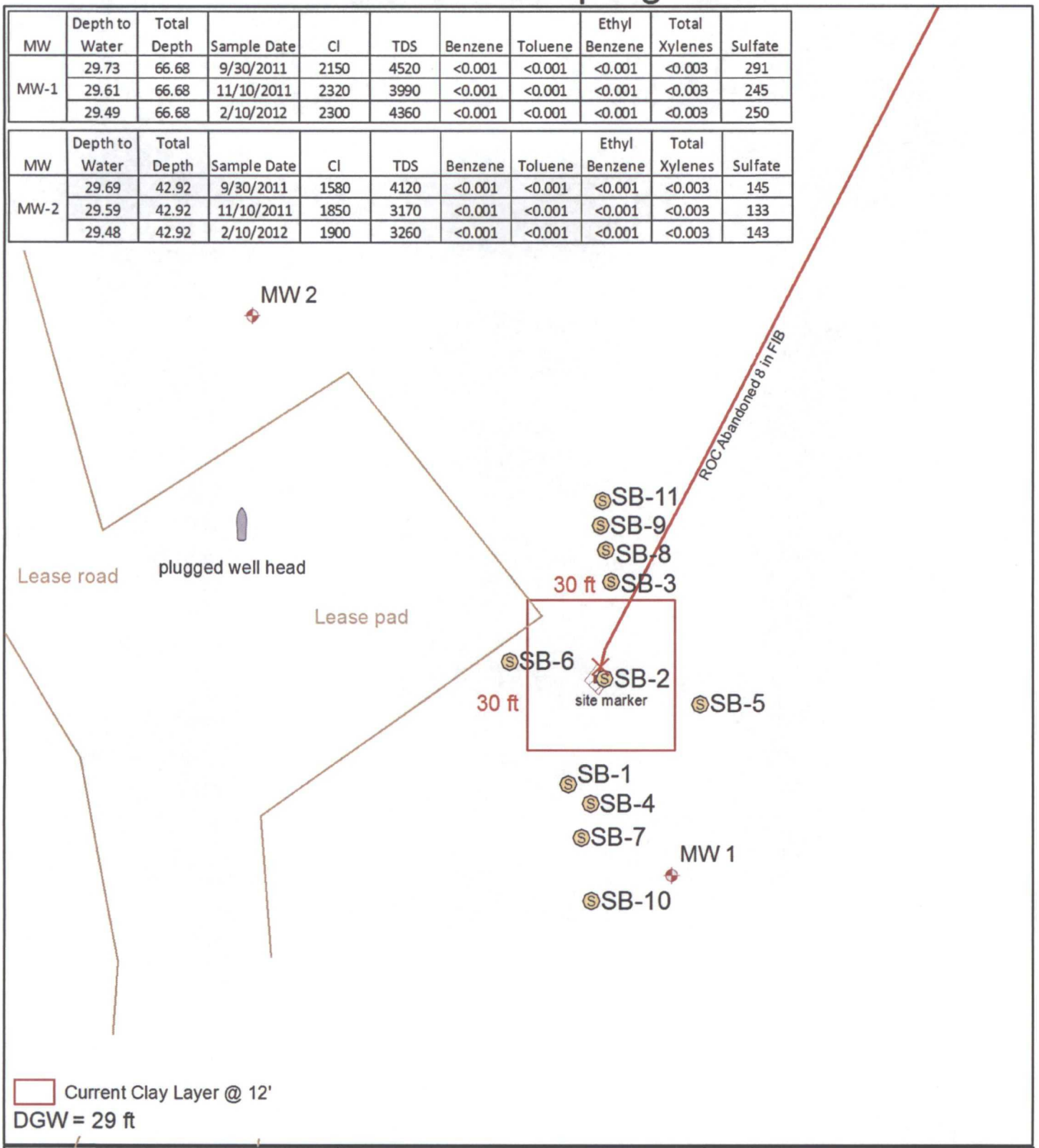
0 1,350 2,700 5,400
Feet

Drawing date: 5-23-11
Drafted by: L. Weinheimer

Monitor Well Sampling Data

MW	Depth to Water	Total Depth	Sample Date	Cl	TDS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Sulfate
MW-1	29.73	66.68	9/30/2011	2150	4520	<0.001	<0.001	<0.001	<0.003	291
	29.61	66.68	11/10/2011	2320	3990	<0.001	<0.001	<0.001	<0.003	245
	29.49	66.68	2/10/2012	2300	4360	<0.001	<0.001	<0.001	<0.003	250

MW	Depth to Water	Total Depth	Sample Date	Cl	TDS	Benzene	Toluene	Ethyl Benzene	Total Xylenes	Sulfate
MW-2	29.69	42.92	9/30/2011	1580	4120	<0.001	<0.001	<0.001	<0.003	145
	29.59	42.92	11/10/2011	1850	3170	<0.001	<0.001	<0.001	<0.003	133
	29.48	42.92	2/10/2012	1900	3260	<0.001	<0.001	<0.001	<0.003	143



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

EME H-7 EOL

LEGALS: UL/H sec. 7
T20S R37E

NMOCD Case #: 1R427-351

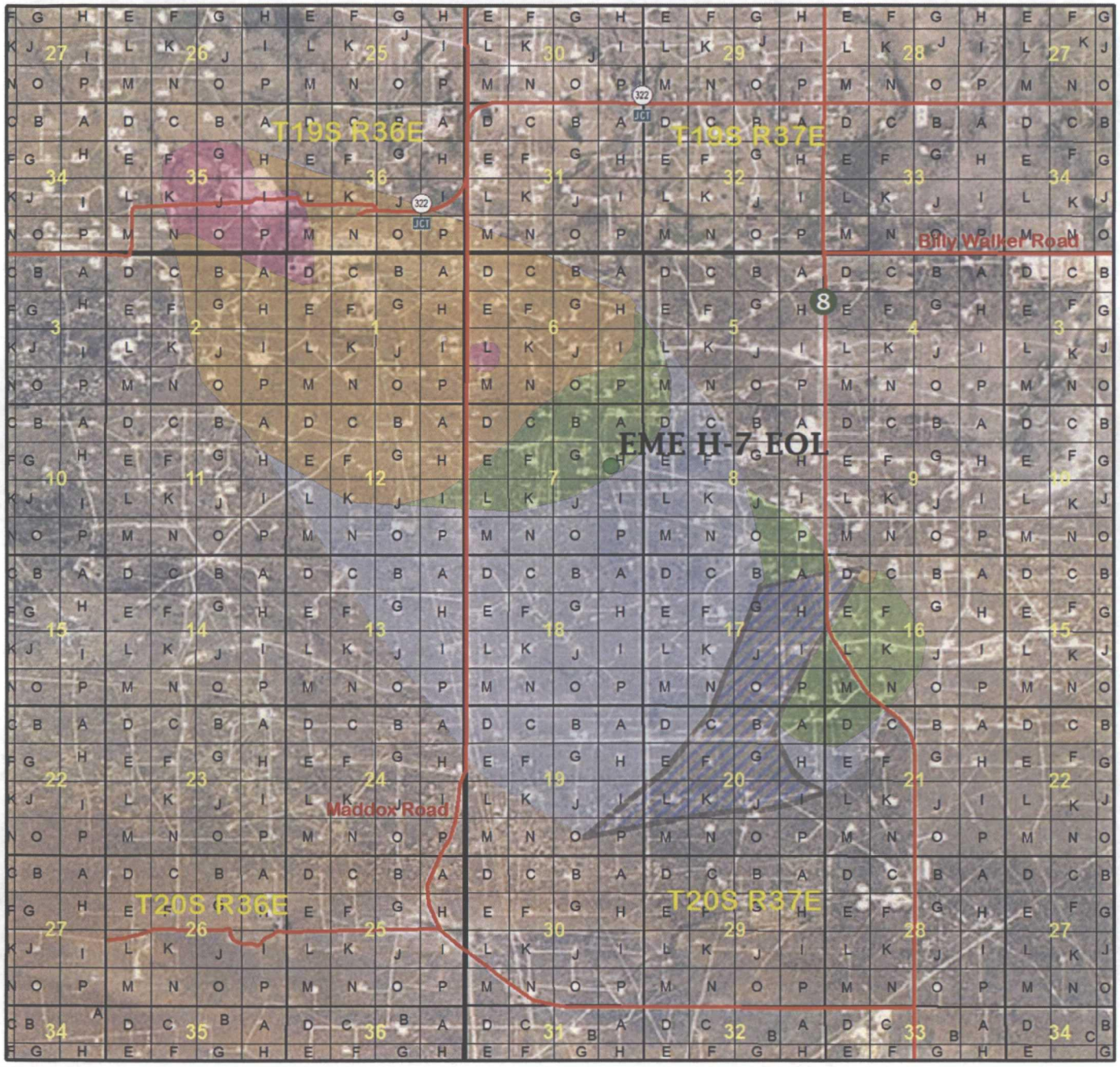
Figure 2

N W E S

0 12.5 25 50 Feet

Drawing date: 4-9-12
Drafted by: L. Weinheimer

EME Groundwater Contamination



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC
RECS

122 W. Taylor
Hobbs, NM 88240
Phone (575) 393-9174
Fax (575) 397-1471

- Cl- concentration > 10,000
- 10,000 > Cl- concentration > 5,000
- 5,000 > Cl- concentration > 2,000
- 2,000 > Cl- concentration > 700
- Hypothetical Cl- contamination area

N
W E
S

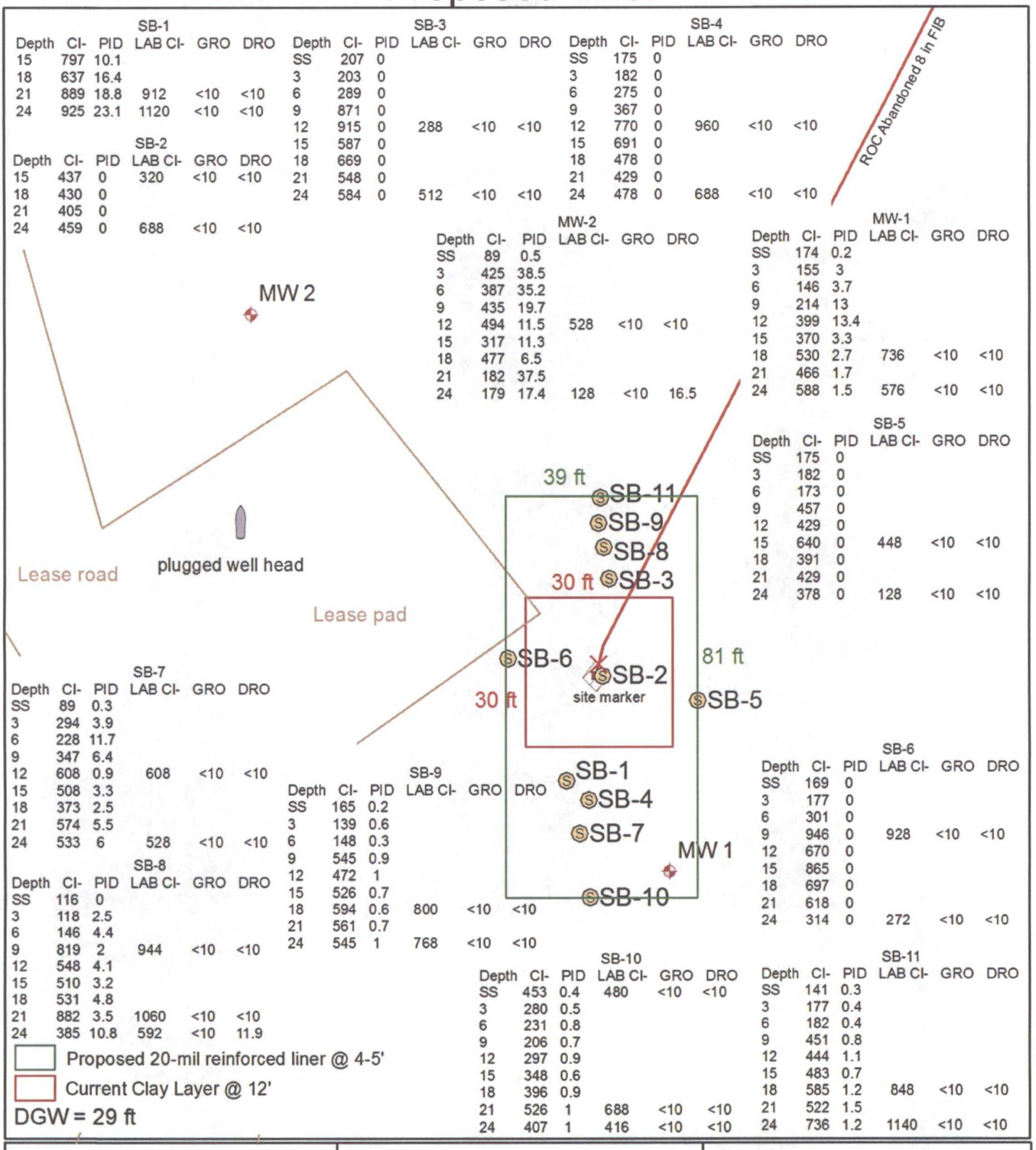
0 0.5 1 Miles

This map was prepared for Rice Operating Company. This map represents the known chloride impact concentrations in the groundwater as of 2011. As conditions change and/or new monitor wells are added, the contamination plume will undergo permutations that will be reflected in future maps. Rice Operating Company does not assume any responsibility for the use of this information by others.

Drawing date: 12-15-09
Revision date: 2-24-12
Drafted by: Lara Weinheimer

Figure 3

Proposed Liner



SB-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO
15	797	10.1			
18	637	16.4			
21	889	18.8	912	<10	<10
24	925	23.1	1120	<10	<10

SB-2

Depth	Cl-	PID	LAB Cl-	GRO	DRO
15	437	0	320	<10	<10
18	430	0			
21	405	0			
24	459	0	688	<10	<10

SB-3

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	207	0			
3	203	0			
6	289	0			
9	871	0			
12	915	0	288	<10	<10
15	587	0			
18	669	0			
21	548	0			
24	584	0	512	<10	<10

SB-4

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	175	0			
3	182	0			
6	275	0			
9	367	0			
12	770	0	960	<10	<10
15	691	0			
18	478	0			
21	429	0			
24	478	0	688	<10	<10

MW-2

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	89	0.5			
3	425	38.5			
6	387	35.2			
9	435	19.7			
12	494	11.5	528	<10	<10
15	317	11.3			
18	477	6.5			
21	182	37.5			
24	179	17.4	128	<10	16.5

MW-1

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	174	0.2			
3	155	3			
6	146	3.7			
9	214	13			
12	399	13.4			
15	370	3.3			
18	530	2.7	736	<10	<10
21	466	1.7			
24	588	1.5	576	<10	<10

SB-5

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	175	0			
3	182	0			
6	173	0			
9	457	0			
12	429	0			
15	640	0	448	<10	<10
18	391	0			
21	429	0			
24	378	0	128	<10	<10

SB-7

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	89	0.3			
3	294	3.9			
6	228	11.7			
9	347	6.4			
12	608	0.9	608	<10	<10
15	508	3.3			
18	373	2.5			
21	574	5.5			
24	533	6	528	<10	<10

SB-8

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	116	0			
3	118	2.5			
6	146	4.4			
9	819	2	944	<10	<10
12	548	4.1			
15	510	3.2			
18	531	4.8			
21	882	3.5	1060	<10	<10
24	385	10.8	592	<10	11.9

SB-9

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	165	0.2			
3	139	0.6			
6	148	0.3			
9	545	0.9			
12	472	1			
15	526	0.7			
18	594	0.6	800	<10	<10
21	561	0.7			
24	545	1	768	<10	<10

SB-6

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	169	0			
3	177	0			
6	301	0			
9	946	0	928	<10	<10
12	670	0			
15	865	0			
18	697	0			
21	618	0			
24	314	0	272	<10	<10

SB-10

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	453	0.4	480	<10	<10
3	280	0.5			
6	231	0.8			
9	206	0.7			
12	297	0.9			
15	348	0.6			
18	396	0.9			
21	526	1	688	<10	<10
24	407	1	416	<10	<10

SB-11

Depth	Cl-	PID	LAB Cl-	GRO	DRO
SS	141	0.3			
3	177	0.4			
6	182	0.4			
9	451	0.8			
12	444	1.1			
15	483	0.7			
18	585	1.2	848	<10	<10
21	522	1.5			
24	736	1.2	1140	<10	<10

RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC

EME H-7 EOL

LEGALS: UL/H sec. 7
T20S R37E

NMOCD Case #: 1R427-351

Figure 4

N W E S

0 12.5 25 50 Feet

Drawing date: 4-9-12
Drafted by: L. Weinheimer

Appendix A

Monitor Well Sampling Lab

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

CARDINAL Laboratories

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

February 22, 2012

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: EME H-7 EOL

Enclosed are the results of analyses for samples received by the laboratory on 02/15/12 13:21.

Cardinal Laboratories is accredited through Texas NELAP under certificate number T104704398-11-3. 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.

Cardinal Laboratories is accreditated 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

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	02/15/2012	Sampling Date:	02/10/2012
Reported:	02/22/2012	Sampling Type:	Water
Project Name:	EME H-7 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	T20S-R37E-SEC7 H-LEA CTY., NM		

Sample ID: MONITOR WELL #1 (H200408-01)

BTEX 8260B mg/L Analyzed By: MS

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	02/21/2012	ND	0.022	108	0.0200	10.8	
Toluene*	<0.001	0.001	02/21/2012	ND	0.020	102	0.0200	9.28	
Ethylbenzene*	<0.001	0.001	02/21/2012	ND	0.022	110	0.0200	10.5	
Total Xylenes*	<0.003	0.003	02/21/2012	ND	0.068	113	0.0600	10.5	

Surrogate: Dibromofluoromethane	*108 %*	*59.8-161*
Surrogate: Toluene-d8	*109 %*	*75.2-115*
Surrogate: 4-Bromofluorobenzene	*106 %*	*53.7-120*

Chloride, SM4500Cl-B mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride*	**2300**	4.00	02/18/2012	ND	104	104	100	0.00	

Sulfate 375.4 mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate*	**250**	10.0	02/17/2012	ND	19.5	97.5	20.0	3.53	

TDS 160.1 mg/L Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS*	**4360**	5.00	02/16/2012	ND	225	93.8	240	2.62	

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	02/15/2012	Sampling Date:	02/10/2012
Reported:	02/22/2012	Sampling Type:	Water
Project Name:	EME H-7 EOL	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	T20S-R37E-SEC7 H-LEA CTY., NM		

Sample ID: MONITOR WELL #2 (H200408-02)

BTEX 8260B mg/L **Analyzed By: MS**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Benzene*	<0.001	0.001	02/21/2012	ND	0.022	108	0.0200	10.8	
Toluene*	<0.001	0.001	02/21/2012	ND	0.020	102	0.0200	9.28	
Ethylbenzene*	<0.001	0.001	02/21/2012	ND	0.022	110	0.0200	10.5	
Total Xylenes*	<0.003	0.003	02/21/2012	ND	0.068	113	0.0600	10.5	

Surrogate: Dibromofluoromethane	*113 %*	*59.8-161*
Surrogate: Toluene-d8	*109 %*	*75.2-115*
Surrogate: 4-Bromofluorobenzene	*102 %*	*53.7-120*

Chloride, SM4500Cl-B mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride*	**1900**	4.00	02/18/2012	ND	104	104	100	0.00	

Sulfate 375.4 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Sulfate*	**143**	10.0	02/17/2012	ND	19.5	97.5	20.0	3.53	

TDS 160.1 mg/L **Analyzed By: HM**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS*	**3260**	5.00	02/16/2012	ND	234	97.5	240	0.00	

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

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

Celey D. Keene, Lab Director/Quality Manager

101 East Marland ~ Hobbs, New Mexico 88240
Tel (575) 393-2326
Fax (575) 393-2476

Cardinal Laboratories, Inc.

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

LAB Order ID # _____

Company Name:	BILL TO Company:	PO#
RICE Operating Company	RICE Operating Company	
Project Manager:	**Address:** (Street, City, Zip)	
Hack Conder	122 W Taylor Street ~ Hobbs, New Mexico 88240	
Address: (Street, City, Zip)	**Phone#:**	**Fax#:**
122 W Taylor Street ~ Hobbs, New Mexico 88240	(575) 393-9174	(575)397-1471
Phone #:	**Fax #:**	
(575) 393-9174	(575)397-1471	
Project #:	**Project Name:**	
	EME H-7 EOL	
Project Location:	**Sampler Signature:**	Rozanne Johnson (575)631-9310
T20S-R37E-Sec 7 H ~ Lea County New Mexico		rozanne@valornet.com

LAB # (LAB USE ONLY 120103)	FIELD CODE	(G)rab or (C)omp	# CONTAINERS	MATRIX: WATER	SOIL	AIR	SLUDGE	PRESERVATIVE METHOD: HCL (2 40ml VOA)	HNO_3	$NaHSO_4$	H_2SO_4	ICE (1-1Liter HDPE)	NONE	SAMPLING: DATE (2012)	TIME
1	Monitor Well #1	G	3	X				2				1		2-10	11:10
2	Monitor Well #2	G	3	X				2				1		2-10	8:30

ANALYSIS REQUEST
(Circle or Specify Method No.)

MTBE 8021B/602	BTEX 8021B/602	TPH 418.1/TX1005 / TX1005 Extended (C35)	PAH 8270C	Total Metals Ag As Ba Cd Cr Pb Se Hg 6010B/200.7	TCLP Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Volatiles	TCLP Semi Volatiles	TCLP Pesticides	RCI	GC/MS Vol. 8260B/624	GC/MS Semi. Vol. 8270C/625	PCB's 8082/608	Pesticides 8081A/608	BOD, TSS, pH	Moisture Content	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	Sulfates	Total Dissolved Solids	Chlorides	Turn Around Time ~ 24 Hours
	X																	X	X	X	
	X																	X	X	X	

Relinquished by:	Date:	Time:	Received by:	Date:	Time:
Rozanne Johnson	2-15-12	13:20	Jodi Henson	2/15/12	13:21
Relinquished by:	Date:	Time:	Received By: (Laboratory Staff)	Date:	Time:

Phone Results:	Yes	No	
Fax Results	Yes	No	Additional Fax Number:

REMARKS:

Email Results to: hconder@riceswd.com
lweinheimer@rice-ecs.com
kbrost@riceswd.com
rozanne@valornet.com

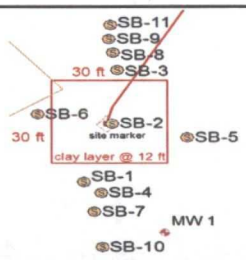
Delivered By: (Circle One)	Sample Condition				CHECKED BY:
	Cool		Intact		
Sampler - UPS - Bus - Other:	Yes	✓	Yes	✓	(Initials)
	No		No		

#26

Appendix B

SB-9 through SB-11 Logs and Lab

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

Logger:	Kyle Norman		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		**Project Name:** EME H-7 EOL **Well ID:** SB-9
Start Date:	11/8/2011		
End Date:	11/8/2011		**Project Consultant:** RECS

Comments: SB-9 is located 30 ft north of the former junction box site. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

TD = 24 ft GW = 26 ft

Location: UL/H sec. 7 T20S R37E

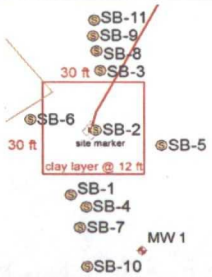
Lat: 32°35'19.225"N **County**: Lea

Long: 103°17'6.597"W **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Fine Silt
SS	165		0.2	
				Tan Fine Silt With Some Caliche
3 ft	139		0.6	
				Tan Fine Silt
6 ft	148		0.3	
9 ft	545		0.9	
				Tan Fine Silt With Some Caliche
12 ft	472		1.0	
15 ft	526		0.7	
				Tan Fine Silt
18 ft	594	Cl- 800	0.6	
		GRO <10		
		DRO <10		
21 ft	561		0.7	
				Tan Fine Silt With Some Caliche
24 ft	545	Cl- 768	1.0	
		GRO <10		
		DRO <10		

Lithology

Well Construction: bentonite seal

Logger:	Kyle Norman		RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.		**Project Name:** EME H-7 EOL **Well ID:** SB-10
Drilling Method:	Air rotary		**Project Consultant:** RECS
Start Date:	11/8/2011		
End Date:	11/8/2011		

Comments: SB-10 is located 45 ft south of the former junction box site. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

TD = 24 ft GW = 26 ft

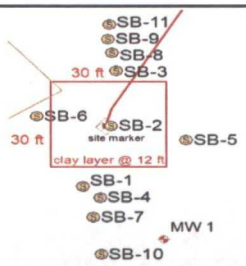
Location: UL/H sec. 7 T20S R37E

Lat: 32°35'18.486"N **Long:** 103°17'6.632"W **County**: Lea **State**: NM

Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Fine Silt
SS	453	Cl- 480	0.4	
		GRO <10		Tan Fine Silt
		DRO <10		
3 ft	280		0.5	
6 ft	231		0.8	
9 ft	206		0.7	
12 ft	297		0.9	
15 ft	348		0.6	
18 ft	396		0.9	
21 ft	526	Cl- 688	1.0	
		GRO <10		Brown Fine Silt
		DRO <10		
24 ft	407	Cl- 416	1.0	
		GRO <10		
		DRO <10		

Lithology

Well Construction: bentonite seal

Logger:	Kyle Norman		**Project Name:** EME H-7 EOL **Well ID:** SB-11
Driller:	Harrison & Cooper, Inc.		**Project Consultant:** RECS
Drilling Method:	Air rotary		**Location:** UL/H sec. 7 T20S R37E
Start Date:	11/8/2011		**Lat:** 32°35'19.279"N **County**: Lea
End Date:	11/8/2011		**Long:** 103°17'6.597"W **State**: NM

Comments: SB-11 is located 36 ft north of the former junction box site. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

TD = 24 ft GW = 26 ft

Depth (feet)	Chloride field tests	LAB	PID	Description
				Brown Fine Silt
SS	141		0.3	
				Tan Fine Silt
3 ft	177		0.4	
6 ft	182		0.4	
9 ft	451		0.8	
				Tan Fine Silt With some Caliche
12 ft	444		1.1	
15 ft	483		0.7	
				Tan Fine Silt
18 ft	585	Cl- 848	1.2	
		GRO <10		
		DRO <10		
21 ft	522		1.5	
				Tan Fine Silt
24 ft	736	Cl- 1140	1.2	
		GRO <10		
		DRO <10		

Lithology

Well Construction: bentonite seal

CARDINAL Laboratories

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

November 15, 2011

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: EME H-7 EOL (20/37)

Enclosed are the results of analyses for samples received by the laboratory on 11/08/11 15:53.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydorcarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Cardinal Laboratories is accreditated 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 (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

Celey D. Keene

Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	11/08/2011	Sampling Date:	11/08/2011
Reported:	11/15/2011	Sampling Type:	Soil
Project Name:	EME H-7 EOL (20/37)	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 10 @ SURFACE (H102425-01)

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**480**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	188	94.2	200	1.88	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	196	97.8	200	6.72	

Surrogate: 1-Chlorooctane	*74.8 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*91.2 %*	*57.6-158*

Sample ID: SB 10 @ 21' (H102425-02)

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**688**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	188	94.2	200	1.88	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	196	97.8	200	6.72	

Surrogate: 1-Chlorooctane	*75.9 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*94.9 %*	*57.6-158*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	11/08/2011	Sampling Date:	11/08/2011
Reported:	11/15/2011	Sampling Type:	Soil
Project Name:	EME H-7 EOL (20/37)	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 10 @ 24' (H102425-03)

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**416**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	188	94.2	200	1.88	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	196	97.8	200	6.72	

Surrogate: 1-Chlorooctane	*81.4 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*105 %*	*57.6-158*

Sample ID: SB 9 @ 18' (H102425-04)

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**800**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	188	94.2	200	1.88	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	196	97.8	200	6.72	

Surrogate: 1-Chlorooctane	*65.4 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*89.9 %*	*57.6-158*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	11/08/2011	Sampling Date:	11/08/2011
Reported:	11/15/2011	Sampling Type:	Soil
Project Name:	EME H-7 EOL (20/37)	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 9 @ 24' (H102425-05)

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**768**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	188	94.2	200	1.88	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	196	97.8	200	6.72	

Surrogate: 1-Chlorooctane	*68.5 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*90.5 %*	*57.6-158*

Sample ID: SB 11 @ 18' (H102425-06)

Chloride, SM4500Cl-B mg/kg **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**848**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	188	94.2	200	1.88	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	196	97.8	200	6.72	

Surrogate: 1-Chlorooctane	*70.0 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*90.4 %*	*57.6-158*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

Analytical Results For:

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

Received:	11/08/2011	Sampling Date:	11/08/2011
Reported:	11/15/2011	Sampling Type:	Soil
Project Name:	EME H-7 EOL (20/37)	Sampling Condition:	Cool & Intact
Project Number:	NONE GIVEN	Sample Received By:	Jodi Henson
Project Location:	NOT GIVEN		

Sample ID: SB 11 @ 24' (H102425-07)

Chloride, SM4500Cl-B **mg/kg** **Analyzed By: AP**

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	**1140**	16.0	11/11/2011	ND	464	116	400	3.51	

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	11/11/2011	ND	173	86.3	200	1.86	
DRO >C10-C28	<10.0	10.0	11/11/2011	ND	214	107	200	0.153	

Surrogate: 1-Chlorooctane	*106 %*	*55.5-154*
Surrogate: 1-Chlorooctadecane	*117 %*	*57.6-158*

Cardinal Laboratories *=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL Laboratories

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

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

Cardinal Laboratories

*=Accredited Analyte

Celey D. Keene, Lab Director/Quality Manager

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: Rice		BILL TO	
Project Manager: Hack Conder		P.O. #:	
Address:		Company:	
City:	State: NM Zip:	Attn:	
Phone #:	Fax #:	Address:	
Project #:	Project Owner:	City:	
Project Name:		State:	Zip:
Project Location: EME H-7 EOL 20-37		Phone #:	
Sampler Name: Kyle Norman		Fax #:	

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE:	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH	Complete Cations/Anions	TDS					
H02425																									
1	SB #0 @ Surface	G	1			✓					✓		11-8-11	8:15	✓	✓									
2	SB #0 @ 21'	G	1			✓					✓		11-8-11	8:25	✓	✓									
3	SB #0 @ 29'	G	1			✓					✓		11-8-11	8:40	✓	✓									
4	SB 9 @ 18'	G	1			✓					✓		11-8-11	9:30	✓	✓									
5	SB 9 @ 24'	G	1			✓					✓		11-8-11	9:50	✓	✓									
6	SB 11 @ 18'	G	1			✓					✓		11-8-11	10:40	✓	✓									
7	SB 11 @ 24'	G	1			✓					✓		11-8-11	11:00	✓	✓									

Relinquished By: Kyle N	Date: 11-8-11	Received By: Jodi Henson	Phone Result: ☐ Yes ☑ No	Add'l Phone #:	
	Time: 3:53		Fax Result: ☐ Yes ☑ No	Add'l Fax #:	
Relinquished By:	Date:	Received By:	REMARKS: email results kjones@riceswd.com; knorman@rice-ecs.com; Zconder@rice-ecs.com; Bbaker@rice-ecs.com; hconder@rice-ecs.com; Lweinheimer@rice-ecs.com		
	Time:				
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Sample Condition Cool: ☐ Yes ☐ No Intact: ☑ Yes ☐ No	CHECKED BY: (Initials)		

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

#26

Appendix C

U.S. EPA MULTIMED Inputs, Outputs and Graph

RICE Environmental Consulting and Safety (RECS)
P.O. Box 5630 Hobbs, NM 88241
Phone 575.393.4411 Fax 575.393.0293

MULTIMED V1.01 DATE OF CALCULATIONS: 10-APR-2012 TIME: 7:41:59

U. S. ENVIRONMENTAL PROTECTION AGENCY

EXPOSURE ASSESSMENT

MULTIMEDIA MODEL

MULTIMED (Version 1.50, 2005)

1

Run options

--- -------

EME H-7 EOL

437.9 Initial Concentration
Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 7.600E-03 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

1

Layer information

LAYER NO.	LAYER THICKNESS	MATERIAL PROPERTY
1	3.00	1

DATA FOR MATERIAL 1

VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS 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	3.00	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	PARAMETERS STD DEV	LIMITS MIN	LIMITS 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	3.00	-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	1.83	-999.	-999.	-999.
Biological decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.

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CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Solid phase decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Dissolved phase decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Overall chemical decay coefficient	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Acid catalyzed hydrolysis rate	l/M-yr	CONSTANT	0.000	-999.	-999.	-999.
Neutral hydrolysis rate constant	1/yr	CONSTANT	0.000	-999.	-999.	-999.
Base catalyzed hydrolysis rate	l/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

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SOURCE SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS		LIMITS	
			MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.760E-02	-999.	-999.	-999.
Area of waste disposal unit	m^2	DERIVED	297.	-999.	-999.	-999.
Duration of pulse	yr	DERIVED	50.0	-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	438.	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	24.4	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	12.2	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

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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	1.70	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone depth)	m	DERIVED	3.00	-999.	-999.	-999.
Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.	-999.	-999.
Gradient (hydraulic)		CONSTANT	0.400E-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.

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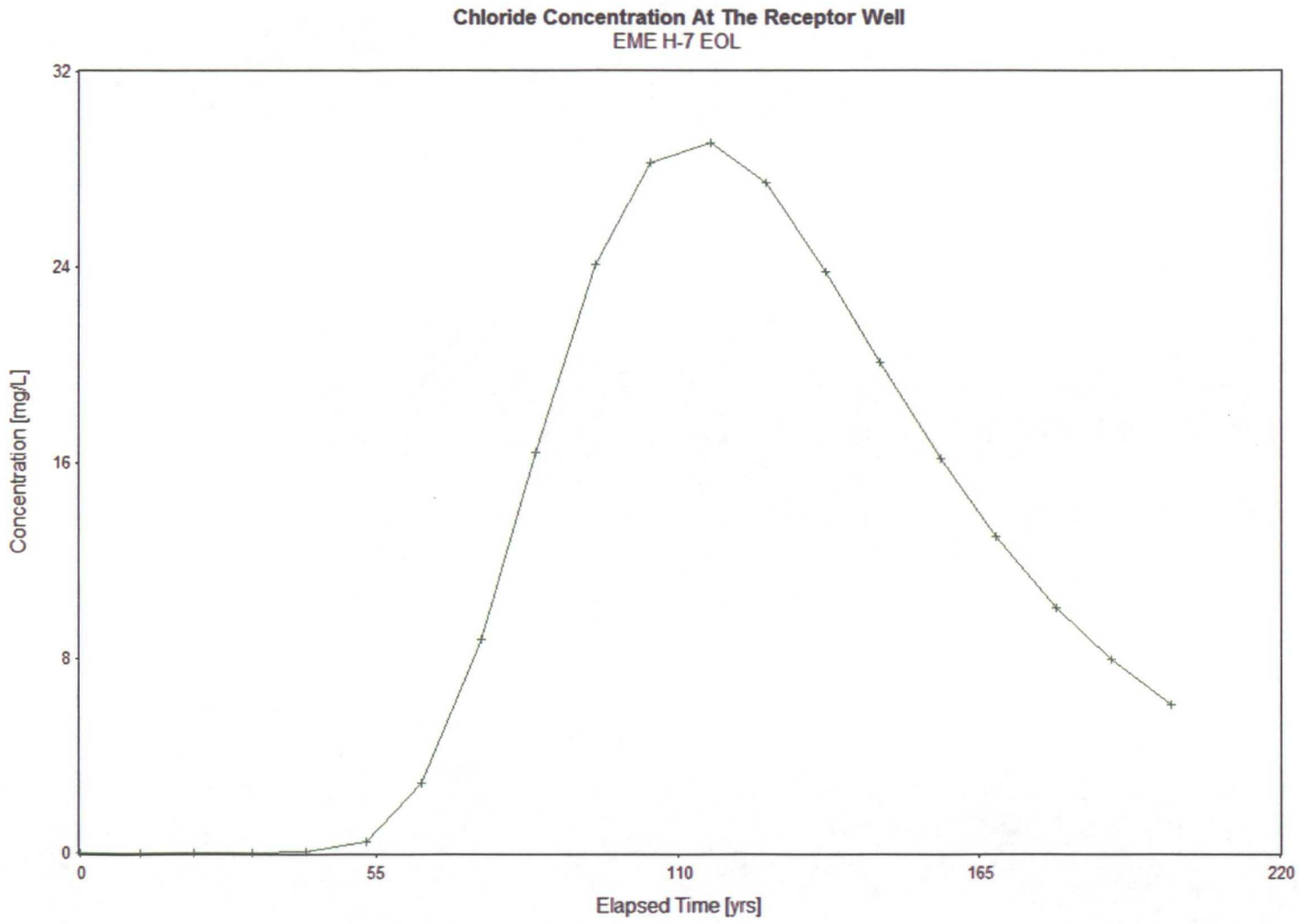
TIME	CONCENTRATION
0.000E+00	0.00000E+00
0.110E+02	0.00000E+00
0.210E+02	0.00000E+00
0.320E+02	0.33419E-03
0.420E+02	0.30766E-01
0.530E+02	0.43540E+00
0.630E+02	0.28372E+01
0.740E+02	0.86539E+01
0.840E+02	0.16168E+02
0.950E+02	0.23733E+02
0.105E+03	0.27820E+02
0.116E+03	0.28632E+02
0.126E+03	0.27028E+02
0.137E+03	0.23427E+02
0.147E+03	0.19781E+02
0.158E+03	0.15916E+02
0.168E+03	0.12788E+02
0.179E+03	0.99098E+01
0.189E+03	0.78258E+01
0.200E+03	0.59838E+01


Chloride Concentration At The Receptor Well
EME H-7 EOL
Concentration [mg/L]
32
24
16
8
0
0
55
110
165
220
Elapsed Time [yrs]