1R - 2498

# WORKPLANS

Date:

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# Rice Environmental Consulting & Safety

P.O. Box 5630 Hobbs, NM 88241 Phone 575.393.4411 Fax 575.393.0293

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October 11<sup>th</sup>, 2011

# 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: Corrective Action Plan Apache Corporation Walter Lynch Tank Battery (1R-2498): UL/F sec. 1 T22S R37E

Mr. Hansen:

Apache Corporation, Inc. (Apache) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced site.

# **Background and Previous Work**

This site is located approximately 2.5 miles south-east of Eunice, New Mexico at UL/F sec. 1 T22S R37E as shown on the Site Location Map (Figure 1 and 2). Monitor wells at the site indicate groundwater will be encountered at 54 +/- feet.

On August 26<sup>th</sup>, 2009, four soil bores were advanced at the site. Each soil bore was sampled every five feet and all samples were taken to a commercial laboratory for field test confirmation. SB-1 was drilled to a depth of 65 ft bgs and had laboratory chloride readings ranging from a high of 1,424 mg/kg at 35 ft bgs to a low of 96 mg/kg at 30 ft bgs. SB-2 was drilled to 65 ft bgs and had laboratory chloride readings ranging from a high of 1,860 mg/kg at 40 ft bgs to a low of 96 mg/kg at 55 ft bgs. SB-3 was drilled to a depth of 56 ft bgs to a low of non-detect at 5 ft bgs. Finally, SB-4 was drilled to 56 ft bgs and had laboratory chloride readings ranging from a high of 1,230 mg/kg at 25 ft bgs to a low of non-detect at 5 ft bgs. Finally, SB-4 was drilled to 56 ft bgs and had laboratory chloride readings ranging from a high of 672 mg/kg at 55 ft bgs to a low of 16 mg/kg at 5 ft bgs. BTEX, GRO, and DRO were all non-detect throughout all the bores and at all depths. All four soil bores were plugged and abandoned (P&A) on August 27<sup>th</sup>, 2009 in conformance with NMOCD Rules and Regulations.

On December 8-9<sup>th</sup>, 2009, three monitor wells were installed at the site. Two soil samples from each monitor well installation were sent to a commercial laboratory for verification of field numbers. From MW-1, samples from 10 ft bgs and 60 ft bgs were taken. The laboratory chloride reading from the 10 ft bgs sample was non-detect and from 60 ft bgs sample was 64 mg/kg. From MW-2, the 10 ft bgs and 60 ft bgs samples were taken for laboratory analysis. The chloride

reading for 10 ft bgs sample was non-detect and the reading from 60 ft bgs sample was 96 mg/kg. From MW-3, the 10 ft bgs and 57 ft bgs samples were taken for laboratory analysis. The chloride reading for the 10 ft bgs sample was 16 mg/kg and the chloride reading for 57 ft bgs sample was 96 mg/kg. BTEX, GRO, and DRO were non-detect in the soil samples for all the wells.

On December 11<sup>th</sup>, 2009, the three monitor wells were sampled for BTEX, sulfates, chloride, TDS and metals. MW-1 had laboratory readings of non-detect for BTEX and metals. The well had a TDS laboratory reading was 1,720 mg/L, a sulfate reading of 283 mg/L and a chloride reading of 680 mg/L. MW-2 had laboratory readings of non-detect for BTEX and all metals except mercury which had a reading of 0.002 mg/L. The TDS reading for MW-2 was 3,680 mg/L, with a sulfate reading of 310 mg/L, and a chloride reading of 1,980 mg/L. Finally MW-3 showed BTEX readings of non-detect. The well showed non-detect for all metals except mercury which showed a reading of 0.003 mg/L. The well showed a TDS reading of 1,400 mg/L, a sulfate reading of 190 mg/L, and a chloride reading of 610 mg/L.

On January 20<sup>th</sup>, 2010, Apache submitted a Notice of Groundwater Impact to the NMOCD District 1 office.

On February 10<sup>th</sup>, 2010, Apache submitted a Remediation Proposal to the NMOCD District 1 office. In that report, Apache agreed that it would excavate the entire area to 4 ft bgs. The sidewalls would be excavated to whatever distance necessary to achieve chloride numbers at or below 250 mg/kg. Once the site was excavated, a 20 mil-polyethylene liner would be installed along the bottom and up the sidewalls to inhibit chloride migration through the vadose zone to groundwater. The site would then be backfilled to bring the excavation to surface level and seeded. The remediation proposal was approved by NMOCD and the soil work was subsequently completed.

On April 25<sup>th</sup>, 2011, RECS sampled the three monitor wells at the site and sent the samples to a commercial laboratory for analysis of chloride and TDS (Figure 3). MW-1 had a laboratory chloride reading of 630 mg/L and a TDS reading of 1,700 mg/L. MW-2 had a laboratory chloride reading of 1,540 mg/L and a TDS reading of 3,000 mg/L. Finally, MW-3 had a laboratory chloride reading of 640 mg/L and a TDS reading of 1,530 mg/L (Appendix A).

On July 29<sup>th</sup>, 2011, Apache submitted an Update Report on the site to NMOCD District 1office that described the activities conducted by Apache to remediate the site.

On September  $2^{nd}$ , 2011, MW-2 was plugged and abandoned per NMOCD requirements with a 1 – 3% bentonite slurry and a 3 foot concrete cap. It was replaced with a 4 inch recovery well (RW-1) located approximately 7 ft northwest of the former MW-2 (Figure 2 & Appendix B).

# Recommendations

The Walter Lynch Tank Battery site is located within a regionally impacted groundwater area. The up gradient monitor well (MW-1) shows chloride impacted water (630 mg/L) coming onto the site. However, it is apparent that although the up gradient groundwater is impaired before it moves across the site, it has also been affected by prior downward migration of residual soil chlorides from the vadose zone. The down gradient well (MW-2) showed evidence of these prior residual soil chlorides from the site with a laboratory chloride reading of 1,540 mg/L. However, since Apache installed a 20 mil-polyethylene liner, the subsequent effects to groundwater from the vadose zone will have become negligible. The liner will have virtually stopped the downward migration of water and thus the downward movement of chlorides. Therefore, only the chloride mass in the groundwater will be taken into account.

# Groundwater Remedy:

Apache proposes to remove chloride impacted water from the location using RW-1, a 4 inch recovery well, and placing a groundwater recovery system at the site. Removed groundwater will be utilized in production operations (e.g. pipeline and well maintenance). Our estimate conservatively reflects the impact to groundwater at the site resulting from the tank battery. 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 groundwater

The estimated impact area is again 13,000 square feet. The aquifer thickness is determined to be 15 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 48,750 cubic feet. The result is then converted to liters giving us 1,380,446.1 liters. The chloride concentration contributed from the source is the difference between the most recent concentrations observed in MW-2 and in MW-1 which is determined to be 910 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 is then converted to kilograms. Thus, the total chloride mass beneath the site is 1,256 kg.

Parameter	Unit	Value	Description
Impactorea	£+2	12,000	
impact area	IL	13,000	Estimated Area of Impact
Aquifer Thickness	ft	15	NMOCD Approved Estimation
Porosity	%	0.25	Professional Estimate for Water Saturated Pore Volume
Volume of Impacted			
Groundwater Below Site	ft <sup>3</sup>	48,750	Impact Area x Aquifer Thickness x Porosity
•			
Volume of Impacted			
Groundwater Below Site	L	1,380,446.1	<sup>7</sup> Conversion from ft <sup>3</sup> to Liters
Chloride Concentration			Difference between Concentrations in Monitor Wells
Contributed from Source	mg/I	910	(MW-1 = 630  mg/L  and  MW-2 = 1.540  mg/L)
	6/ L	510	
			Volume of Impacted Groundwater Below Site x Chloride
TOTAL CHLORIDE MASS	kg	1,256	Concentration Added to Groundwater from Source

Estimate of Chloride Mass in Groundwater

# • Estimated groundwater recovery system removal at MW-2

Groundwater recovery will extract water from RW-1, a 4 inch recovery well that replaced MW-2. The groundwater concentration of the water from MW-2 was 1,540 mg/L. Assuming a pumping rate of one gallon a minute for ten hours a day, we can expect an extraction rate of 3.5 kg/day. Since the total chloride mass is 1,256, it would take approximately 359 days to remove the chloride impact resulting from the leak. The volume of water that needs to be removed is determined by multiplying the pumping rate by the estimated removal time. This gives us a total of approximately 5,130 barrels that need to be removed from the site.

Estimated Groundwater Recove	stimated Groundwater Recovery System Removal at the							
Walter Lynch Tank Battery MW	V-2							
Parameter	Unit	Value	Description					
Groundwater Concentration	mg/L	1,540	Groundwater Concentration from MW-2					
Groundwater Concentration	kg/gal	0.0058296	Conversion from mg/L to kg/gal					
Pumping Rate	gals/min	1	Given					
Extraction Rate	kg/min	0.0058296	Pumping rate x Groundwater Concentration (kg/gal)					
Extraction Rate	kg/day	3.4977477	Conversion from kg/min to kg/day					
Representative Total Chloride Mass	kg	1,256	From above					
Volume Removal	gals	215,452	Pumping rate x Estimated Removal Time x 60 min/hour x 10 hr/day					
Volume Removal	bbls	5,130	Conversion from gals to bbls					
ESTIMATED REMOVAL TIME	day	359	Representative Total Chloride Mass/Extraction Rate					

Upon completion of the CAP work elements, we anticipate Apache will submit a written report which will include a request for "remediation termination" and the closure of the regulation file.

RECS appreciates the opportunity to work with you on this project. Please call Hack Conder at (575) 393-9174 or Natalie Gladden (575) 390-4186 if you have any questions or wish to discuss the site.

Sincerely,

Lara Weinheimer **Project Scientist** RECS (575) 441-0431

Attachments:

Figure 1 – Site location map

Figure 2 – Close up of site location map

Figure 3 – Monitor well sampling map

Appendix A – Monitor well sampling analysis April 25 &  $26^{\text{th}}$ , 2011 Appendix B – Plug and abandon MW-2 and install RW-1

cc. Geoffrey Leking, NMOCD – District 1



# Figures

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

# Site Map



NMOCD Case #: 1R-2498 Drafted by: L. Weinheimer



# MW Sampling Data

MW 1 •



# Appendix A Monitor well sampling analysis April 25 & 26th, 2011

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



April 29, 2011

NATALIE GLADDEN APACHE - EUNICE P. O. BOX 1849 EUNICE, NM 88231

RE: APACHE WALTER LYNCH TANK BATTERY

Enclosed are the results of analyses for samples received by the laboratory on 04/27/11 8:05.

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. Keine

Celey D. Keene Lab Director/Quality Manager



# Analytical Results For:

APACHE - EUNICE NATALIE GLADDEN P. O. BOX 1849 EUNICE NM, 88231 Fax To: 394-2425

Received:	04/27/2011	Sampling Date:	04/25/2011
Reported:	04/29/2011	Sampling Type:	Water
Project Name:	APACHE WALTER LYNCH TANK BATTERY	Sampling Condition:	Cool & Intact
Project Number: Project Location:	NONE GIVEN NOT GIVEN	Sample Received By:	Jodi Henson

# Sample ID: MW - 1 (H100865-01)

Chloride, SM4500CI-B	mg	/L	Analyze	d By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	630	4.00	04/27/2011	ND	112	112	100	3.64	
TDS 160.1	mg	/L	Analyze	d By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	1700	5.00	04/27/2011	ND				1.28	

# Sample ID: MW - 2 (H100865-02)

Chloride, SM4500Cl-B	mg.	/L	Analyze	d By: HM					1
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1540	4.00	04/27/2011	ND	112	112	100	3.64	
TDS 160.1	mg	/L	Analyze	d By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	3000	5.00	04/27/2011	ND				1.28	

# Sample ID: MW - 3 (H100865-03)

Chloride, SM4500Cl-B	mg	/L	Analyze	d By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	640	4.00	04/27/2011	ND	112	112	100	3.64	
TDS 160.1	mg	/L	Analyze	d By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
TDS	1530	5.00	04/27/2011	ND				1.28	

### Cardinal Laboratories

### \*=Accredited Analyte

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Celez D. Kune

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 SM4500CI-B does not require samples be received at or below $6^{\circ}C$
	Samples reported on an as received basis (wet) unless otherwise noted on report

### **Cardinal Laboratories**

### \*=Accredited Analyte

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Celeg D. Kune

Celey D. Keene, Lab Director/Quality Manager

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# Appendix B Plug and abandon MW-2 and install RW-1

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



Logger: Driller:		K Harriso	Kyle Norm	nan per, Inc.			Pilet Solite	RECS	
Drilling Start Date	Method: e: ::		Mud rota 9/1/201 <sup>-</sup> 9/1/201	ry 1	the transfer	Com Proje Wa	pany: Apac ect Name: liter Lynch Ta	che Corporat	ion <b>Well ID:</b> RW-1
No sam	pling occ	curred	on this DRAF ft	well. Sa on TED BY: I	imples were taken for lithology ly. L. Weinheimer GW = 56 ft	Loca Lat: Long	ect Consult ition: UL/F 32 °25'25.48 g: 103 °7'12.	tant: RECS sec. 1 T22S 32"N 763"W	R37E County: Lea State: NM
Depth (feet)	chlori field te	ide ests	LAB	PID	Description	Li	thology	Well C	Construction
5 ft					Tan sand				
10 ft									
			1. K. 1		Brown sand with some caliche				
15 ft									
20 ft	1. g				Tan sand				
25 ft					Tan sand with some caliche				seal
30 ft								in PVC	
35 ft								4	
	2				Caliche with tan sand				
40 ft									
45 ft									

feet)	chloride field tests	LAB	PID	Description	Lithology	Well Con	struction
		-		Tan sand			
50 ft							
55 ft	1997 - 1997 1997 - 1997						
				Red sandy clay			
60 ft							
65 ft							
				NO SAMPLES TAKEN			
70 ft							sand
75 ft							pack
80 ft							
05.4							
85 11							
90 ft							
95 ft							
108							

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Apache Walter Lynch Tank Battery Plug and abandon MW-2 and install RW-1 Unit F, Section 1, T-22-S, R-37-E



Plugging MW-2, facing south

9/2/11



Drilling RW-1, facing north

9/2/11



Plugging MW-2 with a 1-3% bentonite slurry, facing north 9/2/11



MW-2 plugged, facing north

9/2/11



Using mud rotary to complete drill, facing north 9/2/11



Installing the casing, facing north

9/2/11



Installing the sand pack, facing north 9/2/11



Completed RW-1, facing north

9/2/11



Installing the bentonite seal, facing north



Concreting the well in, facing NW 9/2/11