

1R - 426-127

WORKPLANS

Date:

6-20-13

Rice Environmental Consulting & Safety

P.O. Box 2948 Hobbs, NM 88241

Phone 575.393.2967

CERTIFIED MAIL

RETURN RECEIPT NO. 7008 1140 0001 3070 5771

June 20th, 2013

RECEIVED

Mr. Edward Hansen

New Mexico Energy, Minerals, & Natural Resources

Oil Conservation Division, Environmental Bureau

1220 S. St. Francis Drive

Santa Fe, New Mexico 87505

JUN 24 2013

Oil Conservation Division

1220 S. St. Francis Drive

Santa Fe, NM 87505

**RE: ICP Report and Corrective Action Plan (CAP)
Rice Operating Company – BD SWD System
BD Jct. P-30 west (1R426-127): UL/P sec. 30 T21S R37E
BD P-30 EOL (1R426-218): UL/P sec. 30 T21S R37E**

Mr. Hansen:

RICE Operating Company (ROC) has retained Rice Environmental Consulting and Safety (RECS) to address potential environmental concerns at the above-referenced sites in the BD Salt Water Disposal (SWD) system. ROC is the service provider (agent) for the BD 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.

ROC is requesting that the two sites be incorporated into one site and treated as such throughout the Corrective Action process. The sites are 44 ft apart from each other and are located approximately 2 miles west of Eunice, New Mexico at UL/P sec. 30 T21S R37E as shown on the Site Location Map (Figure 1). NM OSE records indicate that groundwater will likely be encountered at a depth of approximately 97 +/- feet.

Background and Previous Work - BD Jct. P-30 west

In 2006, ROC initiated work on the former BD P-30 west junction box as part of the system pipeline replacement/upgrade program. The site was delineated using a backhoe to form an excavation 30 ft x 30 ft x 12 feet deep and soil samples from the excavation were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, a 4-wall composite, bottom composite and backfill sample were collected for laboratory verification. Laboratory tests of the site showed negligible gasoline range organics (GRO) while diesel range organics (DRO) measured <10.0 mg/kg in the 4-wall composite, 20.9 mg/kg in the bottom composite, and 473.0 mg/kg in the backfill. However, chlorides concentrations from the excavation did not relent with depth or breadth. The chloride concentrations measured 832 mg/kg in the 4-wall

composite, 1,360 mg/kg in the bottom composite, and 592 mg/kg in the backfill. The excavation was backfilled to 6 ft bgs where a 1 ft thick clay barrier was installed. The remaining soil was backfilled into the excavation, and the area was contoured to the surrounding landscape. The site was seeded, and an identification plate was placed on the surface of the site to mark its location for future environmental considerations. NMOCD was notified of potential groundwater impact on November 17th, 2006 and a junction box disclosure report was submitted to NMOCD with all the 2006 junction box closures and disclosures.

Background and Previous Work - BD P-30 EOL

In 2008, ROC initiated work on the former BD P-30 EOL junction box, which was eliminated under the pipeline replacement/upgrade program. The site was delineated using a backhoe to form a 30 ft x 30 ft x 12 ft deep excavation. The soil samples were screened at regular intervals for both hydrocarbons and chlorides. From the excavation, a 4-wall composite, bottom composite and backfill composite sample was collected for laboratory verification. Laboratory tests of the site showed negligible gasoline range organics (GRO) in the bottom composite and backfill and 22 mg/kg in the 4-wall composite. Diesel range organics (DRO) measured 389 mg/kg in the 4-wall composite, 19.2 mg/kg in the bottom composite and 470 mg/kg in the backfill. Chlorides concentrations from the excavation measured 1,390 mg/kg in the 4-wall composite, 2,530 mg/kg in the bottom composite and 960 mg/kg in the backfill. The excavated soil was blended on site and returned to the excavation up to 6 ft below ground surface (bgs). At 6 ft bgs, a shelf was extended 15 ft out from the east wall and a 1 ft thick clay barrier was installed with a compaction test performed on January 31st, 2008. The remaining soil was backfilled over the clay barrier and was contoured to the surrounding landscape. An identification plate was placed on the surface of the site to mark its location for future environmental considerations. NMOCD was notified of potential groundwater impact on September 4th, 2008 and a junction box disclosure report was submitted to NMOCD with all the 2008 junction box closures and disclosures.

ROC proposed additional investigative work at the site to determine if there was a potential for groundwater degradation from residual chlorides at the site.

ICP Investigative Results - BD Jct. P-30 west

As part of the Investigation and Characterization Plan (ICP) submitted to NMOCD on September 20th, 2010 and approved on September 22nd, 2010, five soil bores were advanced through the former junction box site on November 18th, 2010 and November 22nd, 2010 (Figure 2). SB-1 was installed with an air rotary drilling rig and soil bores #2 – 5 were installed with a Geo-probe to avoid the high line electrical wires. Soil bore #2 – 5 could not advance below 25 ft bgs because of a hard stratum below 25 ft bgs. RECS personnel field tested the soil for chlorides and screened in the field with a photo-ionization detector (PID) for hydrocarbons. Representative samples from the bore were taken to a commercial laboratory for confirmation of chloride and hydrocarbon field numbers (Appendix A). Laboratory readings of SB-1 showed chloride readings of 1,700 mg/kg at 10 ft bgs, which decreased to 112 mg/kg at 70 ft bgs. Laboratory readings for GRO and DRO showed non-detect. SB-2 returned laboratory chloride readings of 1,800 mg/kg at 20 ft bgs and 2,480 mg/kg at 25 ft bgs. SB-3 returned laboratory chloride

readings of 2,800 mg/kg at 10 ft bgs and 2,040 mg/kg at 25 ft bgs. SB-4 returned laboratory chloride readings of 1,660 mg/kg at 15 ft bgs and 1,760 mg/kg at 25 ft bgs. SB-5 returned laboratory chloride readings of 1,310 mg/kg at 20 ft bgs, which decreased to 1,040 mg/kg at 25 ft bgs. In all four bores, GRO and DRO readings were non-detect.

ICP Investigative Results - BD P-30 EOL

As part of the Investigation and Characterization Plan submitted to NMOCD on September 10th, 2010 and approved on September 15th, 2010, seven soil bores were advanced through the former junction box site on November 19th, 2010 and November 22nd, 2010. Soil bore #1 - 5 were installed with an air rotary drilling rig and soil bores #6 - 7 were installed with a Geo-probe to avoid the high line electrical wires. Soil bore #6 - 7 could not be advanced below 25 ft bgs because of a hard stratum below 25 ft bgs (Figure 3). RECS personnel field tested the soil for chlorides and screened in the field with a photo-ionization detector (PID) for hydrocarbons. Representative samples from the bores were taken to a commercial laboratory for confirmation of chloride and hydrocarbon field numbers (Appendix B). SB-1 returned laboratory chloride results of 5,040 mg/kg, which decreased to 784 mg/kg at 90 ft bgs. SB-2 returned laboratory chloride results of 3,600 mg/kg at 20 ft bgs, which decreased to 176 mg/kg at 70 ft bgs. SB-3 returned laboratory chloride readings of 3,160 mg/kg at 15 ft bgs, which decreased to 928 mg/kg at 90 ft bgs. SB-4 returned laboratory chloride results of 2,520 mg/kg at 30 ft bgs, which decreased to 752 mg/kg at 90 ft bgs. SB-5 returned laboratory chloride results of 2,720 mg/kg at 30 ft bgs, which decreased to 1,060 mg/kg at 90 ft bgs. SB-6 returned laboratory chloride readings of 6,080 mg/kg at 10 ft bgs, which decreased to 4,160 mg/kg at 25 ft bgs. SB-7 returned laboratory chloride readings of 4,960 mg/kg at 5 ft bgs, which decreased to 1,680 mg/kg at 25 ft bgs. In all bores at all depth, GRO and DRO readings were non-detect.

To further delineate the site, trenches were installed with a backhoe north, west, and south of the combined sites on February 4th and 7th, 2011 (Figure 4). The trenches to the north showed a decrease in chlorides from the 30 ft north trench to the 35 ft north trench. Laboratory confirmation of the 5 ft bgs sample of the 35 ft north trench showed a chloride concentration of 144 mg/kg. The trenches to the west also showed a decrease in chlorides from the 43 ft west trench to the 48 ft west trench. Laboratory confirmation of the 1 ft bgs sample of the 48 ft west trench showed a chloride reading of 64 mg/kg and the 7 ft bgs sample showed a chloride reading of 1,630 mg/kg. The south trench showed a laboratory reading of 848 mg/kg at 5 ft bgs and a chloride reading of 2,840 mg/kg at 10 ft bgs (Appendix C).

On October 11th, 2010, Trident Environmental completed a study of the background chloride concentrations in the region for the NMOCD terminated site BD jct. P-30 (1R0426-124). Given that the BD jct. P-30 west and the P-30 EOL are approximately 230 ft east from the BD jct. P-30 site (Figure 5), the background chloride concentrations determined for the BD jct. P-30 site are valid for the BD jct. P-30 west and the P-30 EOL (Appendix D). Based on the analysis of monitor wells in the area, Trident determined that the upper limit for background chloride concentration is 570 mg/L.

Corrective Action Plan

Groundwater Remedy

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 E. With the proposed infiltration barrier measuring 120 ft x 80 ft, the model output concludes that the peak concentration of chlorides in groundwater contributed by the vadose zone soils would be approximately 113.7 mg/L in 80 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 groundwater at this site.

Vadose Zone Remedy

ROC proposes to excavate the site to the dimensions of 120 ft x 80 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 layers installed at 6.5 ft bgs measuring 30 ft x 30 ft at the BD jct. P-30 west site and 30 ft x 45 ft at the BD P-30 EOL site. 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 soils 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.

Upon completion of the CAP work elements, we anticipate ROC 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 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 Location Map
- Figure 2 – Soil Bore Installation BD jct. P-30 west

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Figure 3 – Soil Bore Installation BD P-30 EOL

Figure 4 – Proposed Liner with Soil Data

Figure 5 – Overview Site Location Map

Appendix A – BD jct. P-30 west Soil Bore Installation Documentation

Appendix B – BD P-30 EOL Soil Bore Installation Documentation

Appendix C – Trenching Laboratory Analyses

Appendix D – Background Characterization Report

Appendix E – Multimed Report

Figures

RICE Environmental Consulting and Safety (RECS)
P.O. Box 2948, Hobbs, NM 88241
Phone 575.393.2967

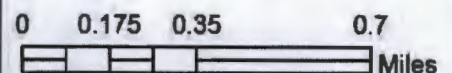
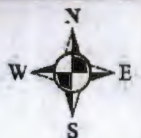
Site Location Map



BD jct. P-30 west
BD P-30 EOL

Legals: UL/P sec. 30
T21S R37E

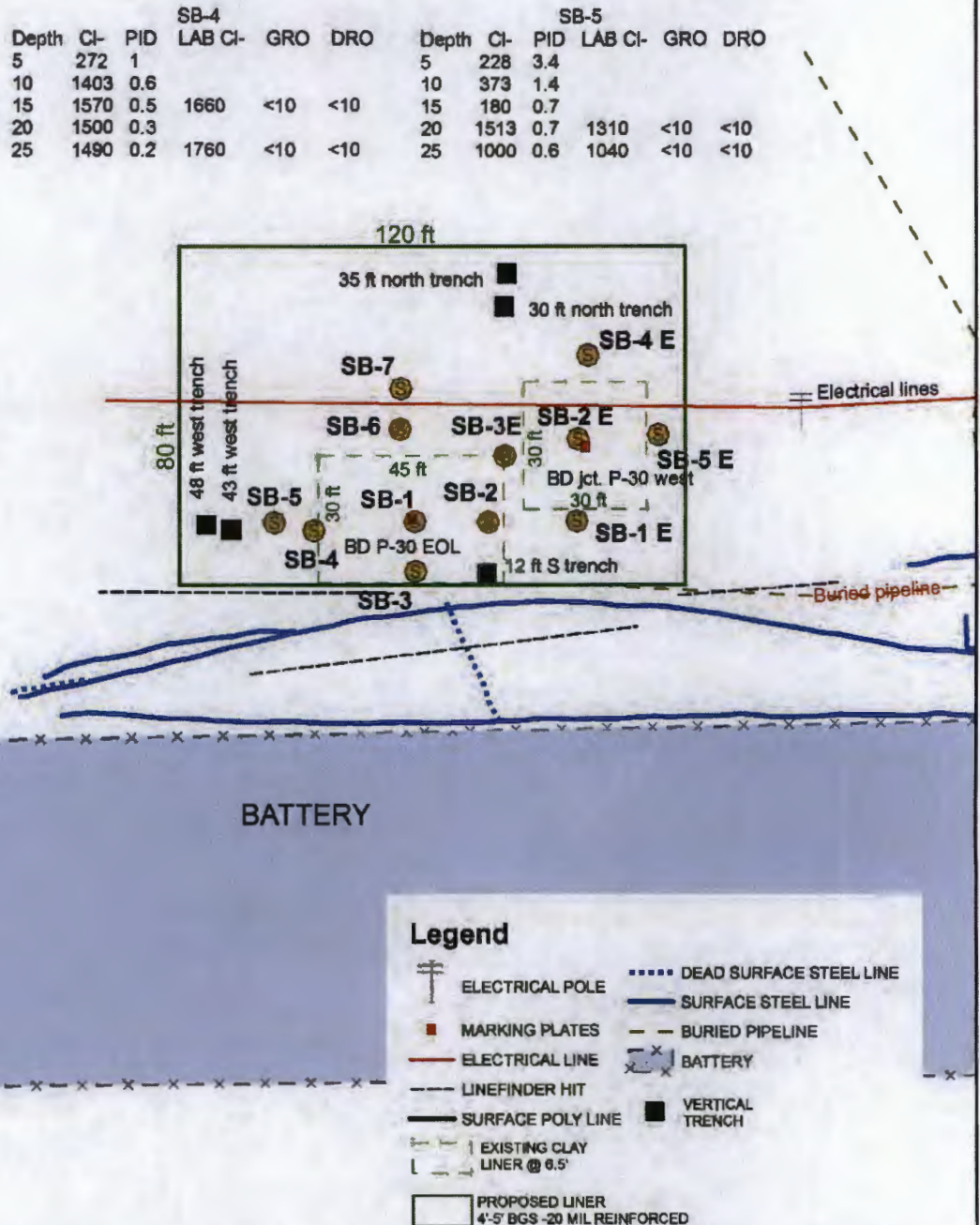
Figure 1



Drawing date: 5-13-11
 Drafted by: L. Weinheimer

Soil Bore Installation

SB-1						SB-2						SB-3					
Depth	CI-	PID	LAB CI-	GRO	DRO	Depth	CI-	PID	LAB CI-	GRO	DRO	Depth	CI-	PID	LAB CI-	GRO	DRO
5	288	0				5	665	1.2				5	1125	0.8			
10	1417	0	1700	<10	<10	10	378	0.7				10	2317	0.6	2800	<10	<10
15	1294	0				15	762	0.4				15	1823	0.2			
20	1066	0				20	1581	0.6	1800	<10	<10	20	1216	0.2			
25	1224	0				25	2524	0.3	2480	<10	<10	25	1483	0.3	2040	<10	<10
30	839	0															
35	732	0															
40	694	0															
45	314	0.1															
50	280	0.3															
55	323	0.2															
60	273	0.4															
65	229	0.6															
70	149	0.9	112	<10	<10												

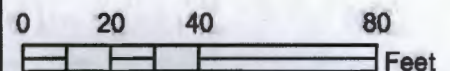


BD jct. P-30 west

Legals: UL/P sec. 30
T21S R37E

NMOCD Case#: 1R426-127

Figure 2



Drawing date: 6/18/13
Drafted by: L. Weinheimer

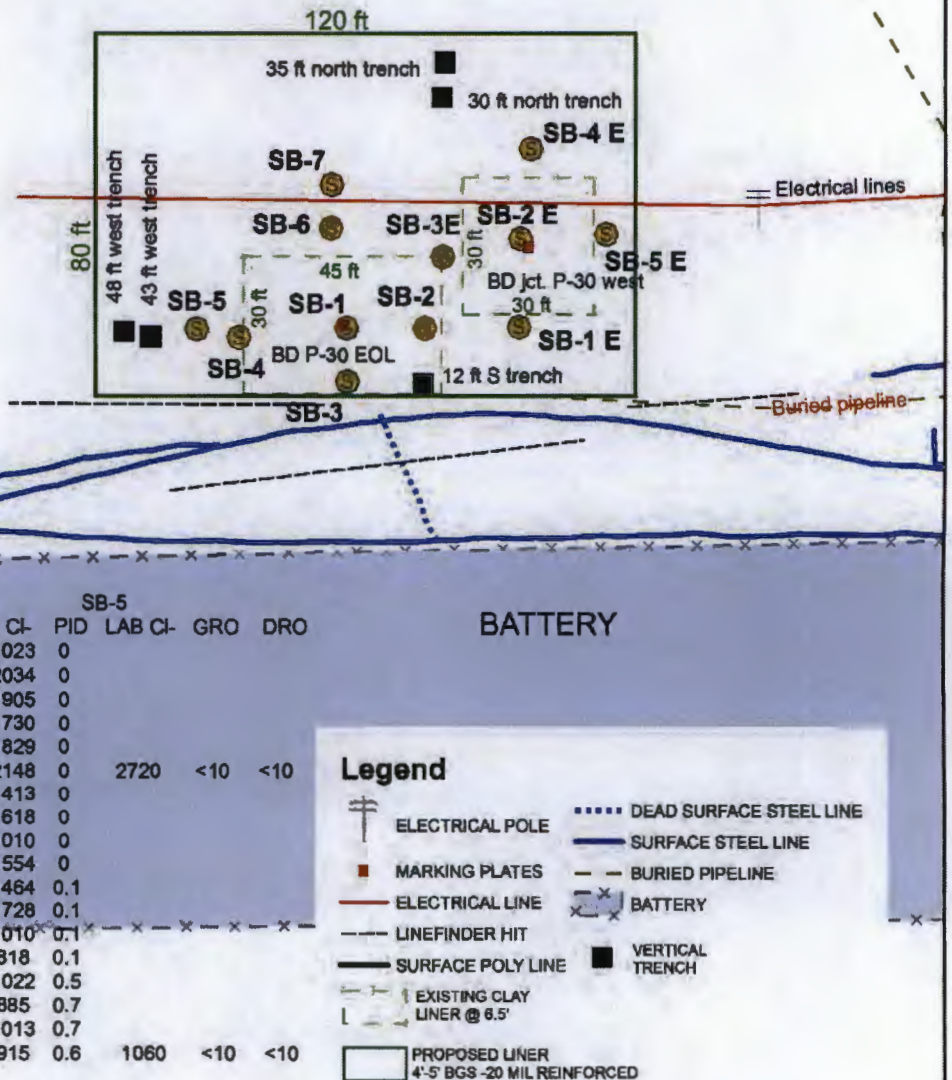
Soil Bore Installation

SB-1					SB-2					SB-6				
Depth	CI-	PID	LAB CI-	GRO DRO	Depth	CI-	PID	LAB CI-	GRO DRO	Depth	CI-	PID	LAB CI-	GRO DRO
15	3446	0.3	5040	<10 <10	5	1224	0.7			5	295	0		
20	2295	0.2			10	1208	0.5			10	4955	0	6080	<10 <10
25	1888	0.1			15	3512	0.6			15	4729	0		
30	2089	0.1			20	3535	0.5	3600	<10 <10	20	3689	0		
35	2007	0.1			25	2444	0.2			25	3861	0	4160	<10 <10
40	1964	0.1			30	1258	0.1							
45	1614	0.1			35	418	0.5							
50	1580	0.2			40	334	0.5							
55	1298	0.1			45	283	0.7							
60	1565	0.1			50	258	0.4							
65	1243	0.1			55	227	0.4							
70	880	0.1			60	195	0.4							
75	660	0.2			65	197	0.2							
80	607	0.3			70	174	0.2	176	<10 <10					
85	768	0.1												
90	790	0.1	784	<10 <10										

SB-3				
Depth	CI-	PID	LAB CI-	GRO DRO
5	1099	0		
10	1191	0		
15	2689	0	3160	<10 <10
20	1752	0		
25	1782	0.1		
30	1484	0.1		
35	940	0.1		
40	348	0.2		
45	326	0		
50	420	0		
55	293	0		
60	321	0		
65	378	0		
70	425	0		
75	602	0		
80	626	0		
85	777	0		
90	840	0.2	928	<10 <10

SB-4				
Depth	CI-	PID	LAB CI-	GRO DRO
5	572	0.2		
10	608	0.2		
15	947	0.1		
20	1023	0.1		
25	1238	0		
30	1878	0	2520	<10 <10
35	1677	0		
40	1399	0		
45	1295	0		
50	1373	0		
55	1461	0		
60	1291	0.1		
65	1196	0.1		
70	1216	0.1		
75	1100	0.1		
80	801	0.1		
85	606	0.1		
90	710	0.1	752	<10 <10

SB-5				
Depth	CI-	PID	LAB CI-	GRO DRO
5	1023	0		
10	2034	0		
15	1905	0		
20	1730	0		
25	1829	0		
30	2148	0	2720	<10 <10
35	1413	0		
40	1618	0		
45	1010	0		
50	1554	0		
55	1464	0.1		
60	1728	0.1		
65	1010	0.1		
70	818	0.1		
75	1022	0.5		
80	885	0.7		
85	1013	0.7		
90	915	0.6	1060	<10 <10



DGW = 97 ft



BD P-30 EOL

Legals: UL/P sec. 30
T21S R37E

NMOCD Case#: 1R426-218

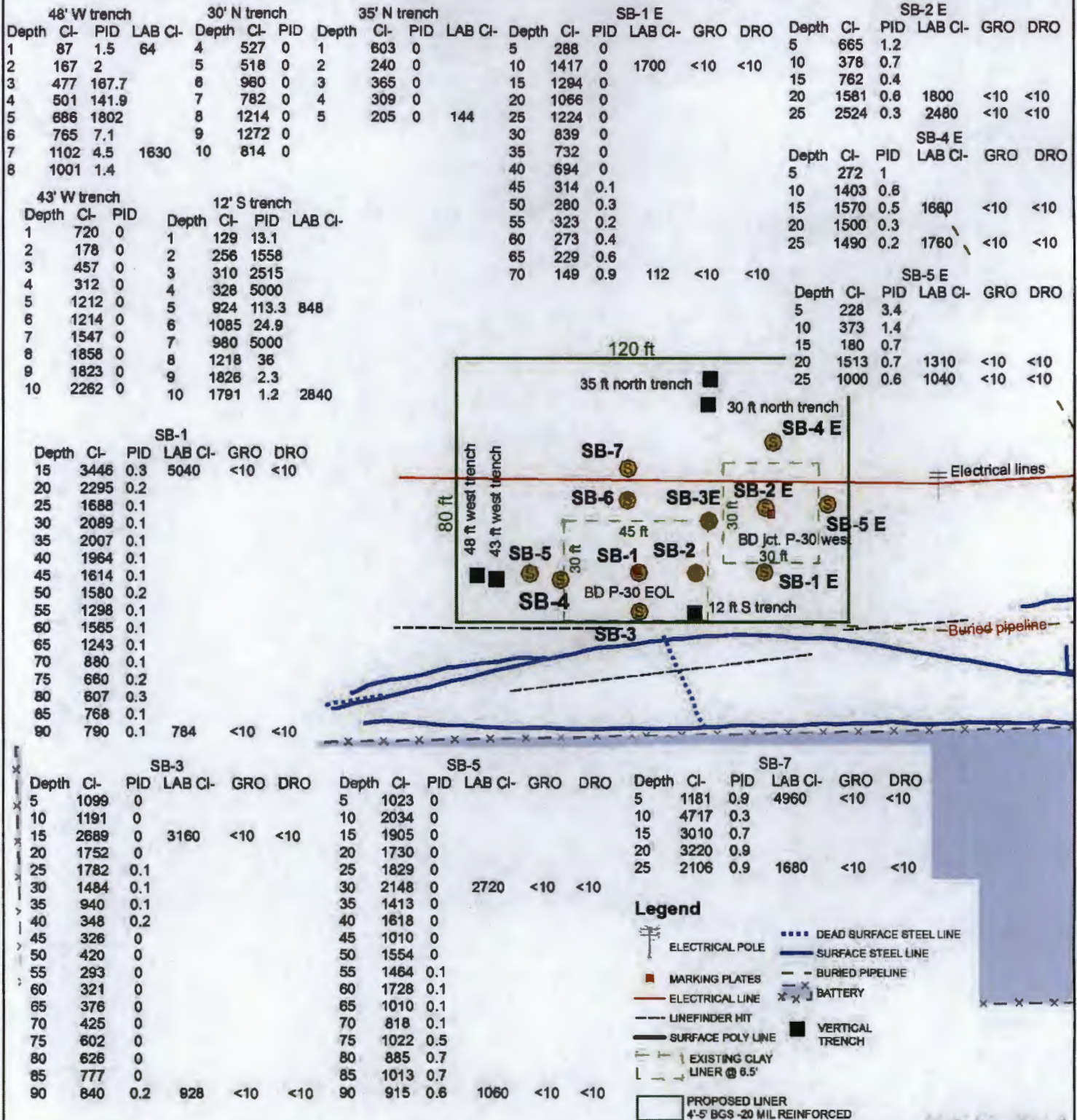
Figure 3



0 20 40 80
Feet

Drawing date: 6/18/13
Drafted by: L. Weinheimer

Proposed Liner with Soil Data



DGW = 97 ft



BD jct. P-30 west
 NMOCD Case#: 1R426-127
BD P-30 EOL
 NMOCD Case#: 1R426-218
 Legals: UL/P sec. 30
 T21S R37E

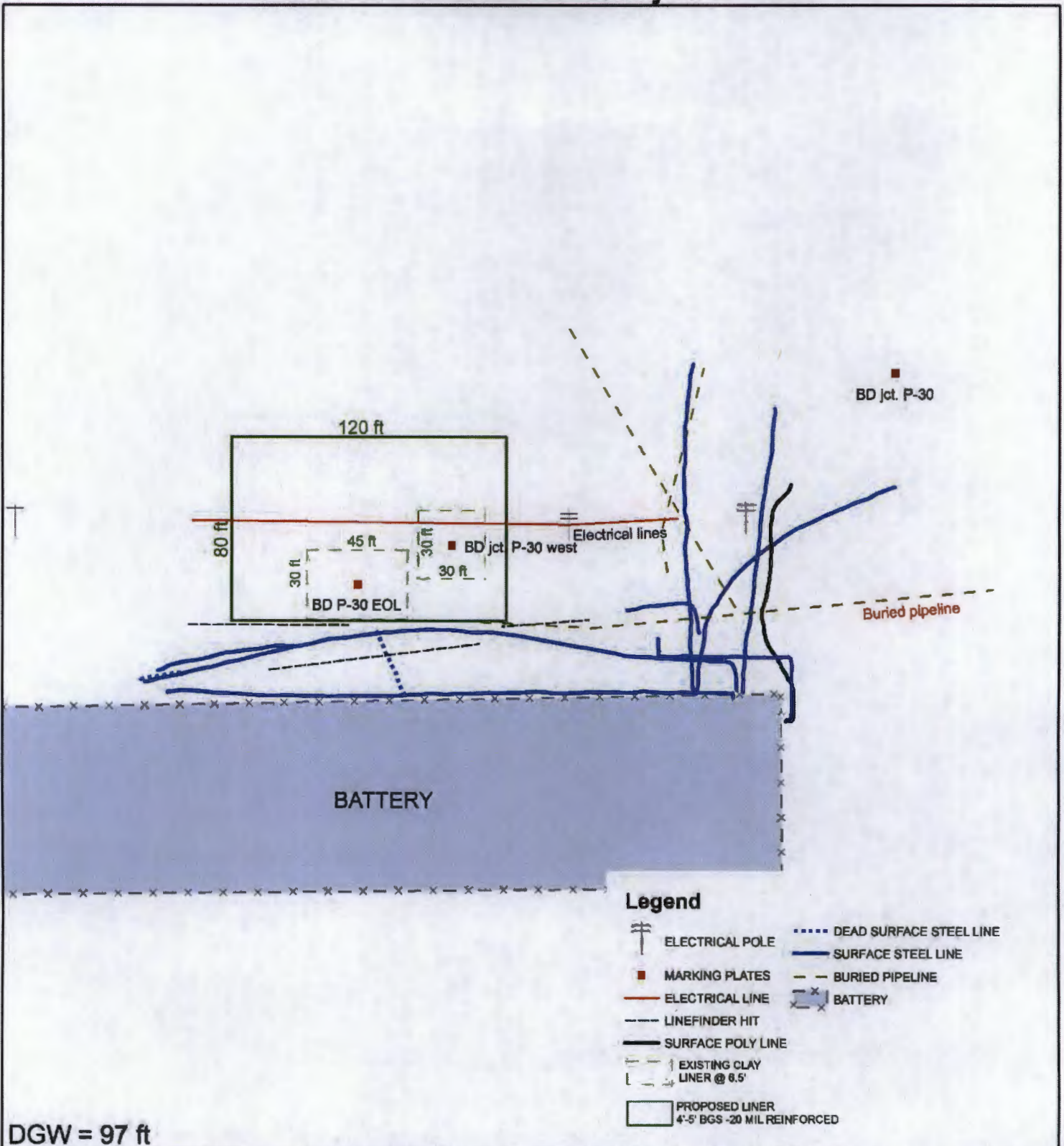
Figure 4



0 20 40 80 Feet

Drawing date: 8/18/13
 Drafted by: L. Weinheimer

Sites in relation to BD jct. P-30



BD jct. P-30 west
 NMOCD Case #: 1R426-127
BD P-30 EOL
 NMOCD Case #: 1R426-218
 Legals: UL/P sec. 30
 T21S R37E

Figure 5



0 25 50 100
 Feet

Drawing date: 6/18/13
 Drafted by: L. Weinheimer

Appendix A

BD jct. P-30 west Soil Bore Installation Documentation

RICE Environmental Consulting and Safety (RECS)
P.O. Box 2948 Hobbs, NM 88241
Phone 575.393.2967

Logger:	Jordan Woodfin				
Driller:	Harrison & Cooper, Inc.				
Drilling Method:	Air rotary				
Start Date:	11/18/2010				
End Date:	11/18/2010	Project Name: BD jct. P-30 west Well ID: SB-1 Project Consultant: RECS			
Comments: Located 17 ft south of the former junction box site.		Location: UL/P sec. 30 T21S R37E			
DRAFTED BY: L. Weinheimer		Lat: 32°26'42.017"N		County: LEA	
TD = 70 ft		GW = 97 ft		Long: 103°11'47.486"W	
State: NM					

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Dark brown to red clay and sand mix		
5 ft	288		0			
10 ft	1417	Cl- 1700	0	Brown fine sand with intermitten clay		
		GRO <10				
		DRO <10				
15 ft	1294		0			
20 ft	1066		0			
25 ft	1224		0	White to tan very fine sandy silt (hard drilling)		
30 ft	839		0	Light brown very fine sand with caliche fragments		
35 ft	732		0	Light brown very fine sand		bentonite seal
40 ft	694		0			
45 ft	314		0.1			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Light brown very fine sand (slightly moist)		
50 ft	280		0.3			
55 ft	323		0.2			
				Light brown very fine sand		
60 ft	273		0.4			
65 ft	229		0.6			
70 ft	149	CI- 112	0.9			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		
Start Date:	11/22/2010		
End Date:	11/22/2010		Project Name: BD jct. P-30 west Well ID: SB-2 Project Consultant: RECS
Comments: Located at the source of the former junction box site. Could not penetrate deeper than 25 ft with the Geo-probe. DRAFTED BY: L. Weinheimer TD = 25 ft GW = 97 ft			Location: UL/P sec. 30 T21S R37E Lat: 32°26'42.212"N County: LEA Long: 103°11'47.479"W State: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Predominantly brownish red clay with some very fine sand		
5 ft	665		1.2			
				Predominantly brown clay with some fine grain sand		
10 ft	378		0.7			
				Slightly consolidated brown very fine sand		
15 ft	762		0.4			
				Slightly consolidated very fine light brown to tan sand		
20 ft	1581	CI-1800	0.6			
		GRO <10				
		DRO <10				
25 ft	2524	CI-2480	0.3			
		GRO <10		Loosely consolidated light brown very fine sand with large caliche fragments (hard drilling)		
		DRO <10				

Logger:	Jordan Woodfin					
Driller:	Harrison & Cooper, Inc.					
Drilling Method:	Geo-probe		Project Name:	Well ID:		
Start Date:	11/22/2010		BD jct. P-30 west	SB-3		
End Date:	11/22/2010		Project Consultant: RECS			
Comments: Located 19 ft west of the former junction box site. Could not penetrate deeper than 25 ft with the Geo-probe.		Location: UL/P sec. 30 T21S R37E				
DRAFTED BY: L. Weinheimer		Lat: 32°26'42.174"N		County: LEA		
TD = 25 ft		Long: 103°11'47.686"W		State: NM		
GW = 97 ft						
Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brown slightly consolidated moist clay and some fine sand		
5 ft	1,125		0.8			
				Slightly consolidated brown fine sand and clay		
10 ft	2,317	CI-2800	0.6			
		GRO <10		Red slightly consolidated very fine sand		
		DRO <10				
15 ft	1,823		0.2			
				Light brown to tan very fine sand. Loosely consolidated		
20 ft	1,216		0.2			
				Slightly consolidated tan fine sand with large caliche fragments (hard drilling)		
25 ft	1,483	CI-2040	0.3			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin				
Driller:	Harrison & Cooper, Inc.			Project Name: BD jct. P-30 west Well ID: SB-4	
Drilling Method:	Geo-probe			Project Consultant: RECS	
Start Date:	11/22/2010			Location: UL/P sec. 30 T21S R37E	
End Date:	11/22/2010			Lat: 32°26'42.408"N Long: 103°11'47.449"W	
Comments: Located 21 ft north of the former junction box site. Could not penetrate deeper than 25 ft with the Geo-probe.		DRAFTED BY: L. Weinheimer		County: LEA State: NM	
TD = 25 ft		GW = 97 ft			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Well consolidated clay with fine brown sand		
5 ft	272		1			
				Slightly consolidated tan fine silty sand and mostly small but some large caliche fragments		
10 ft	1403		0.6			
				Tan to red slightly consolidated silt and some very fine sand		
15 ft	1570	CI-1660	0.5			
		GRO <10		Light brown slightly consolidated silty sand		
		DRO <10				
20 ft	1500		0.3	Light brown loosely consolidated silty sand and small caliche fragments (hard drilling)		
25 ft	1490	CI-1760	0.2			
		GRO <10				
		DRO <10				

bentonite seal

Logger:	Jordan Woodfin			
Driller:	Harrison & Cooper, Inc.			
Drilling Method:	Geo-probe		Project Name:	Well ID:
Start Date:	11/22/2010		BD jct. P-30 west	SB-5
End Date:	11/22/2010	Project Consultant: RECS		Location: UL/P sec. 30 T21S R37E
Comments: Located 18 ft east of the former junction box site. Could not penetrate deeper than 25 ft with the Geo-probe. DRAFTED BY: L. Weinheimer TD = 25 ft GW = 97 ft		Lat: 32°26'42.219"N County: LEA Long: 103°11'47.252"W State: NM		

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Dark brown and purple clay (moist)		
5 ft	228		3.4			
				Dark brown fine sand and clay (moist)		
10 ft	373		1.4			
				Red slightly consolidated very fine sand		bentonite seal
15 ft	180		0.7			
20 ft	1513	CI-1310	0.7	Tan silty sand non consolidated with caliche fragments (hard drilling)		
		GRO <10				
		DRO <10				
25 ft	1000	CI-1040	0.6			
		GRO <10				
		DRO <10				



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

November 21, 2010

Hack Conder
Rice Operating Company
112 W. Taylor
Hobbs, NM 88240

RE: BD P-30 WEST

Enclosed are the results of analyses for samples received by the laboratory on 11/19/10 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 Hydrocarbons

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

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

Received: 11/19/2010
Reported: 11/21/2010
Project Name: BD P-30 WEST
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 11/18/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #1 @ 10 FT (H021340-01)
Chloride, SM4500Cl-B
mg/kg
Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1700	16.0	11/21/2010	ND	416	104	400	0.00	

TPH 8015M
mg/kg
Analyzed By: AB

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/21/2010	ND	194	96.8	200	13.6	
DRO >C10-C28	<10.0	10.0	11/21/2010	ND	225	113	200	17.3	

Surrogate: 1-Chlorooctane 91.7 % 70-130

Surrogate: 1-Chlorooctadecane 95.2 % 70-130

Sample ID: SB #1 @ 70 FT (H021340-02)
Chloride, SM4500Cl-B
mg/kg
Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	112	16.0	11/21/2010	ND	416	104	400	0.00	

TPH 8015M
mg/kg
Analyzed By: AB

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/21/2010	ND	194	96.8	200	13.6	
DRO >C10-C28	<10.0	10.0	11/21/2010	ND	225	113	200	17.3	

Surrogate: 1-Chlorooctane 94.4 % 70-130

Surrogate: 1-Chlorooctadecane 98.1 % 70-130

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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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Celey D. Keene, Lab Director/Quality Manager

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[illegible]

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

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

November 30, 2010

Hack Conder
Rice Operating Company
112 W. Taylor
Hobbs, NM 88240

RE: BD P-30 WEST

Enclosed are the results of analyses for samples received by the laboratory on 11/23/10 9:26.

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 Hydrocarbons

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

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 (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



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Analytical Results For:

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

Received: 11/23/2010
Reported: 11/30/2010
Project Name: BD P-30 WEST
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 11/22/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #2 @ 20 FT (H021384-01)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1800	16.0	11/25/2010	ND	432	108	400	3.77		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660		
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61		
Surrogate: 1-Chlorooctane			96.7 %	70-130						
Surrogate: 1-Chlorooctadecane			99.9 %	70-130						

Sample ID: SB #2 @ 25 FT (H021384-02)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	2480	16.0	11/25/2010	ND	432	108	400	3.77		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660		
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61		
Surrogate: 1-Chlorooctane			108 %	70-130						
Surrogate: 1-Chlorooctadecane			109 %	70-130						

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Celey D. Keene, Lab Director/Quality Manager



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Analytical Results For:

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

Received: 11/23/2010
Reported: 11/30/2010
Project Name: BD P-30 WEST
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 11/22/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #3 @ 10 FT (H021384-03)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	2800	16.0	11/25/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg		Analyzed By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	
Surrogate: 1-Chlorooctane	105 %	70-130							
Surrogate: 1-Chlorooctadecane	109 %	70-130							

Sample ID: SB #3 @ 25 FT (H021384-04)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	2040	16.0	11/25/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg		Analyzed By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	
Surrogate: 1-Chlorooctane	89.8 %	70-130							
Surrogate: 1-Chlorooctadecane	92.6 %	70-130							

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Celey D. Keene, Lab Director/Quality Manager





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Analytical Results For:

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

Received: 11/23/2010
Reported: 11/30/2010
Project Name: BD P-30 WEST
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 11/22/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #4 @ 15 FT (H021384-05)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1660	16.0	11/25/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	
Surrogate: 1-Chlorooctane	98.2 %	70-130							
Surrogate: 1-Chlorooctadecane	102 %	70-130							

Sample ID: SB #4 @ 25 FT (H021384-06)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1760	16.0	11/25/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	
Surrogate: 1-Chlorooctane	91.9 %	70-130							
Surrogate: 1-Chlorooctadecane	94.5 %	70-130							

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Celestine D. Keene

Celestine D. Keene, Lab Director/Quality Manager



Analytical Results For:

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

Received: 11/23/2010
Reported: 11/30/2010
Project Name: BD P-30 WEST
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 11/22/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #5 @ 20 FT (H021384-07)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1310	16.0	11/25/2010	ND	432	108	400	3.77		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660		
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61		
Surrogate: 1-Chlorooctane	89.4 %	70-130								
Surrogate: 1-Chlorooctadecane	94.2 %	70-130								

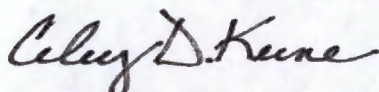
Sample ID: SB #5 @ 25 FT (H021384-08)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1040	16.0	11/25/2010	ND	448	112	400	0.00		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660		
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61		
Surrogate: 1-Chlorooctane	90.8 %	70-130								
Surrogate: 1-Chlorooctadecane	95.5 %	70-130								

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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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Celey D. Keene, Lab Director/Quality Manager

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

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

Company Name: Rice Operating Company				BILL TO				ANALYSIS REQUEST									
Project Manager: Hack Conder				P.O. #:													
Address: 122 West Taylor				Company:													
City: Hobbs				Attn:													
Phone #: 575-393-9174				Address:													
Project #:				City:													
Project Name: BD P-30 West				State: NM													
Project Location: BD P-30 West				Zip:													
Sampler Name: Jordan Woodfin				Phone #:													
Fax #:				Project Owner:													

Lab I.D.	Sample I.D.	FOR LAB USE ONLY	MATRIX			PRESERV.	SAMPLING	DATE	TIME	Chlorides	TPH 8015 M	BTX	Texas TPH	Complete Cations/Anions	TPH 8015 M Extended Thru C40
			GROUNDWATER	WASTEWATER	SLUDGE										
1	SB # 2 @ 20ft	1	✓	✓	✓	✓	✓	09:00	✓	✓	✓	✓	✓	✓	✓
2	SB # 2 @ 25ft	1	✓	✓	✓	✓	✓	09:30	✓	✓	✓	✓	✓	✓	✓
3	SB # 3 @ 10ft	1	✓	✓	✓	✓	✓	10:00	✓	✓	✓	✓	✓	✓	✓
4	SB # 3 @ 25ft	1	✓	✓	✓	✓	✓	10:30	✓	✓	✓	✓	✓	✓	✓
5	SB # 4 @ 15ft	1	✓	✓	✓	✓	✓	01:00	✓	✓	✓	✓	✓	✓	✓
6	SB # 4 @ 25ft	1	✓	✓	✓	✓	✓	01:30	✓	✓	✓	✓	✓	✓	✓
7	SB # 5 @ 20ft	1	✓	✓	✓	✓	✓	02:00	✓	✓	✓	✓	✓	✓	✓
8	SB # 5 @ 25ft	1	✓	✓	✓	✓	✓	02:30	✓	✓	✓	✓	✓	✓	✓

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Relinquished By: <i>Jordan Woodfin</i>	Date: 1/23/10	Received By: <i>Jodi Henderson</i>	Date: 1/23/10
Relinquished By:	Date:	Relinquished By:	Date:
Delivered By: (Circle One)	Sample Condition	Checked By: <i>JH</i>	
Sampler - UPS - Bus - Other:	Cool ☐ Intact ☐		
	Yes ☐ No ☐		

NEED SAMPLES BACK, PLEASE

Appendix B

BD P-30 EOL Soil Bore Installation Documentation

RICE Environmental Consulting and Safety (RECS)
P.O. Box 2948 Hobbs, NM 88241
Phone 575.393.2967

Logger:	Jordan Woodfin				
Driller:	Harrison & Cooper, Inc.			Project Name:	Well ID:
Drilling Method:	Air rotary			BD P-30 EOL	SB-1
Start Date:	11/19/2010			Project Consultant: RECS	
End Date:	11/19/2010			Location: UL/P sec. 30 T21S 37E	
Comments: Located at the source of the former junction box site.				Lat: 32°26'42.018"N County: LEA	
DRAFTED BY: L. Weinheimer				Long: 103°11'47.94"W State: NM	
TD = 90 ft				GW = 97	

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Red to light brown fine sand with caliche fragments		
15 ft	3446	CI-5040	0.3			
		GRO <10				
		DRO <10		Light brown fine and caliche fragments		
20 ft	2295		0.2			
				Tan fine silty sand with caliche fragments (hard drilling)		
25 ft	1688		0.1			
				Tan very fine sand		
30 ft	2089		0.1			
35 ft	2007		0.1			
40 ft	1964		0.1			
45 ft	1614		0.1			
50 ft	1580		0.2			

bentonite seal

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Light brown very fine sand		
55 ft	1298		0.1			
60 ft	1565		0.1			
65 ft	1243		0.1			
70 ft	880		0.1			
75 ft	660		0.2			
80 ft	607		0.3			
85 ft	768		0.1			
90 ft	790	CI- 784	0.1			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		
Start Date:	11/19/2010		
End Date:	11/19/2010		Project Name: BD P-30 EOL Well ID: SB-2 Project Consultant: RECS
Comments: Located 17 ft east of the former junction box site.			Location: UL/P sec. 30 T21S 37E
DRAFTED BY: L. Weinheimer TD = 70 ft GW = 97			Lat: 32°26'42.016"N County: LEA Long: 103°11'47.733"W State: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Reddish brown sand and clay		
5 ft	1224		0.7			
10 ft	1208		0.5	Light brown very fine sand		
15 ft	3512		0.6			
				Very fine tan silty sand (hard drilling)		
20 ft	3535	CI-3600 GRO <10 DRO <10	0.5			
25 ft	2444		0.2	Light brown very fine sand		bentonite seal
30 ft	1258		0.1			
				Light brown very fine sand		
35 ft	418		0.5			
40 ft	334		0.5			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	283		0.7			
50 ft	258		0.4			
55 ft	227		0.4	Light brown to red very fine sand		
60 ft	195		0.4			
65 ft	197		0.2			
70 ft	174	Cl- 176	0.2			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		
Start Date:	11/19/2010		
End Date:	11/19/2010		Project Name: BD P-30 EOL Well ID: SB-3 Project Consultant: RECS
Comments: Located 12 ft south of the former junction box site.			Location: UL/P sec. 30 T21S 37E
DRAFTED BY: L. Weinheimer TD = 90 ft GW = 97			Lat: 32°26'41.906"N County: LEA Long: 103°11'47.939"W State: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brown silty clay		
5 ft	1,099		0			
10 ft	1,191		0	Light brown fine sand with caliche fragments		
15 ft	2,689	CI-3160 GRO <10 DRO <10	0			
20 ft	1,752		0	Tan very fine silty sand (hard drilling)		
25 ft	1,782		0.1			
30 ft	1,484		0.1			
35 ft	940		0.1			
40 ft	348		0.2			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	326		0			bentonite seal
50 ft	420		0			
55 ft	293		0			
60 ft	321		0			
65 ft	376		0			
70 ft	425		0			
75 ft	602		0			
80 ft	626		0			
85 ft	777		0			
90 ft	840	CI-928	0.2			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin			
Driller:	Harrison & Cooper, Inc.			
Drilling Method:	Air rotary		Project Name:	Well ID:
Start Date:	11/19/2010		BD P-30 EOL	SB-4
End Date:	11/19/2010	Project Consultant: RECS		
Comments: Located 24 ft west of the former junction box site.		Location: UL/P sec. 30 T21S 37E		
DRAFTED BY: L. Weinheimer		Lat: 32°26'42.003"N		County: LEA
TD = 90 ft		Long: 103°11'48.224"W		State: NM
GW = 97				

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brownish red sand clay		
5 ft	572		0.2			
10 ft	608		0.2	Red fine sand with caliche fragments		
15 ft	947		0.1			
20 ft	1023		0.1	Tan fine sand with caliche fragments (hard drilling)		
25 ft	1238		0			
30 ft	1878	CI-2520 GRO <10 DRO <10	0	Light brown very fine sand		
35 ft	1677		0			
40 ft	1399		0			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	1295		0			bentonite seal
50 ft	1373		0			
55 ft	1461		0			
60 ft	1291		0.1			
65 ft	1196		0.1			
70 ft	1216		0.1			
75 ft	1100		0.1			
80 ft	801		0.1			
85 ft	606		0.1			
90 ft	710	CI- 752	0.1			
		GRO <10				
		DRO <10				

Logger:	Jordan Woodfin		
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Air rotary		
Start Date:	11/19/2010		
End Date:	11/19/2010		Project Name: BD P-30 EOL Well ID: SB-5 Project Consultant: RECS
Comments: Located 33 ft west of the former junction box site.			Location: UL/P sec. 30 T21S 37E
DRAFTED BY: L. Weinheimer TD = 90 ft GW = 97			Lat: 32°26'42.021"N County: LEA Long: 103°11'48.332"W State: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Brown silty clay		
5 ft	1023		0			
				Light brown fine sand and caliche fragments		
10 ft	2034		0			
15 ft	1905		0	Tan fine sandy silt with caliche fragments (hard drilling)		
20 ft	1730		0			
25 ft	1829		0			
30 ft	2148	CI-2720 GRO <10 DRO <10	0	Light red very fine sand		
35 ft	1413		0			
				Tan very fine sand		
40 ft	1618		0			

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
45 ft	1010		0	Light red very fine sand		

Logger:	Jordan Woodfin		
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		
Start Date:	11/22/2010		
End Date:	11/22/2010		Project Name: BD P-30 EOL Well ID: SB-6 Project Consultant: RECS
Comments: Located 22 ft north of the former junction box site. 25 feet is all that could be penetrated with the Geo-probe. DRAFTED BY: L. Weinheimer TD = 25 ft GW = 97			Location: UL/P sec. 30 T21S 37E Lat: 32°26'42.24"N County: LEA Long: 103°11'47.98"W State: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
5 ft	295		0	Brownish red fine sand and clay (moist)		
10 ft	4955	Cl- 6080 GRO <10 DRO <10	0	Brown fine sand and clay		
15 ft	4729		0	Light brown fine sand and caliche		
20 ft	3689		0			
25 ft	3861	Cl- 4160 GRO <10 DRO <10	0	Tan caliche with some fine sand (hard drilling)		

bentontie
seal

Logger:	Jordan Woodfin		
Driller:	Harrison & Cooper, Inc.		
Drilling Method:	Geo-probe		
Start Date:	11/22/2010		
End Date:	11/22/2010		Project Name: BD P-30 EOL Well ID: SB-7 Project Consultant: RECS
Comments: Located 31 ft north of the former junction box site. 25 feet is all that could be penetrated with the Geo-probe. DRAFTED BY: L. Weinheimer TD = 25 ft GW = 97			Location: UL/P sec. 30 T21S 37E Lat: 32°26'42.335"N County: LEA Long: 103°11'47.977"W State: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
				Well consolidated red clay and fine sand		
5 ft	1181	CI-4960	0.9			
		GRO <10		Light brown to tan fine sand with caliche, slightly consolidated		
		DRO <10				
10 ft	4717		0.3			
				Tan very fine sand with caliche moderately consolidated		
15 ft	3010		0.7			
20 ft	3220		0.9			
				Tan very fine sand with caliche moderately consolidated (hard drilling)		
25 ft	2106	CI-1680	0.9			
		GRO <10				
		DRO <10				



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

November 30, 2010

Hack Conder
Rice Operating Company
112 W. Taylor
Hobbs, NM 88240

RE: BD P-30 EOL

Enclosed are the results of analyses for samples received by the laboratory on 11/22/10 13:30.

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 Hydrocarbons

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

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

Received: 11/22/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/19/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #1 @ 15 FT. (H021370-01)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	5040	16.0	11/30/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane 105 % 70-130

Surrogate: 1-Chlorooctadecane 112 % 70-130

Sample ID: SB #1 @ 90 FT. (H021370-02)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	784	16.0	11/30/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

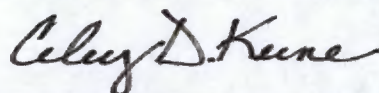
Surrogate: 1-Chlorooctane 134 % 70-130

Surrogate: 1-Chlorooctadecane 144 % 70-130

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 11/22/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/19/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #2 @ 20 FT. (H021370-03)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	3600	16.0	11/30/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	
Surrogate: 1-Chlorooctane		124 %	70-130						
Surrogate: 1-Chlorooctadecane		131 %	70-130						

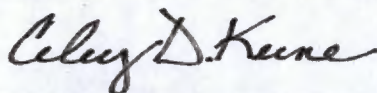
Sample ID: SB #2 @ 70 FT. (H021370-04)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: HM						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	176	16.0	11/30/2010	ND	432	108	400	3.77	
TPH 8015M		mg/kg	Analyzed By: AB						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	
Surrogate: 1-Chlorooctane		138 %	70-130						
Surrogate: 1-Chlorooctadecane		145 %	70-130						

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 11/22/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/19/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #3 @ 15 FT. (H021370-05)
Chloride, SM4500Cl-B
mg/kg
Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	3160	16.0	11/30/2010	ND	448	112	400	11.3	
TPH 8015M	mg/kg								

Analyzed By: AB

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	157	78.6	200	3.53	

Surrogate: 1-Chlorooctane 111 % 70-130

Surrogate: 1-Chlorooctadecane 119 % 70-130

Sample ID: SB #3 @ 90 FT. (H021370-06)
Chloride, SM4500Cl-B
mg/kg
Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	928	16.0	11/30/2010	ND	448	112	400	11.3	
TPH 8015M	mg/kg								

Analyzed By: AB

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/29/2010	ND	155	77.5	200	0.383	
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53	

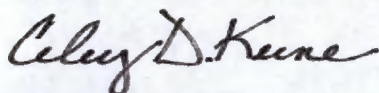
Surrogate: 1-Chlorooctane 114 % 70-130

Surrogate: 1-Chlorooctadecane 118 % 70-130

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 11/22/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/19/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #4 @ 30 FT. (H021370-07)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	2520	16.0	11/30/2010	ND	448	112	400	11.3		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/29/2010	ND	155	77.5	200	0.383		
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53		
Surrogate: 1-Chlorooctane										
	138 %	70-130								
Surrogate: 1-Chlorooctadecane										
	140 %	70-130								

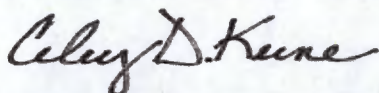
Sample ID: SB #4 @ 90 FT. (H021370-08)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	752	16.0	11/30/2010	ND	448	112	400	11.3		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/29/2010	ND	155	77.5	200	0.383		
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53		
Surrogate: 1-Chlorooctane										
	114 %	70-130								
Surrogate: 1-Chlorooctadecane										
	122 %	70-130								

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Celey D. Keene, Lab Director/Quality Manager

Analytical Results For:

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

Received: 11/22/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/19/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #5 @ 30 FT. (H021370-09)

Chloride, SM4500Cl-B			mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	2720	16.0	11/30/2010	ND	448	112	400	11.3		
TPH 8015M			mg/kg		Analyzed By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/29/2010	ND	155	77.5	200	0.383		
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53		
Surrogate: 1-Chlorooctane	92.8 %	70-130								
Surrogate: 1-Chlorooctadecane	97.0 %	70-130								

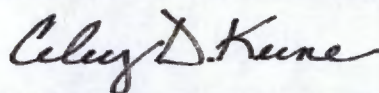
Sample ID: SB #5 @ 90 FT. (H021370-10)

Chloride, SM4500Cl-B			mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1060	16.0	11/30/2010	ND	448	112	400	11.3		
TPH 8015M			mg/kg		Analyzed By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/29/2010	ND	155	77.5	200	0.383		
DRO >C10-C28	<10.0	10.0	11/29/2010	ND	157	78.6	200	3.53		
Surrogate: 1-Chlorooctane	109 %	70-130								
Surrogate: 1-Chlorooctadecane	116 %	70-130								

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Celey D. Keene, Lab Director/Quality Manager

Notes and Definitions

S-04	The surrogate recovery for this sample is outside of established control limits due to a sample matrix effect.
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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Celey D. Keene, Lab Director/Quality Manager

ARDINAL 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

BILL TO										ANALYSIS REQUEST									
Company Name: Rice Operating Company Project Manager: Hack Conder Address: 122 West Taylor City: Hobbs State: NM Zip: 88240 Phone #: 575-393-9174 Fax #: 575-397-1471 Project Owner: Project Name: BD P-30 EOL Project Location: BD P-30 EOL Sampler Name: Jordan Woodfin										P.O. #: Company: Attn: Address: City: State: Zip: Phone #: Fax #:									
Lab I.D. Sample I.D.										PRESERV. MATRIX SAMPLING									
										GROUNDWATER WASTEWATER SOIL OIL SLUDGE OTHER:					ACID/BASE ICE / COOL OTHER:				
# CONTAINERS (G)RAB OR (C)OMP.										TPH 8015 M BTX Complete Cations/Anions TPH 8015 M Extended Thru C40									
1 SB # 1 @ 15ft										✓									
2 SB # 1 @ 90 FT										✓									
3 SB # 2 @ 20FT										✓									
4 SB # 2 @ 70FT										✓									
5 SB # 3 @ 15FT										✓									
6 SB # 3 @ 90FT										✓									
7 SB # 4 @ 30FT										✓									
8 SB # 4 @ 90FT										✓									
9 SB # 5 @ 30FT										✓									
10 SB # 5 @ 90FT										✓									

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Relinquished By: <u>Jordan Woodfin</u> Date: <u>11/22/10</u> Time: <u>7:31</u>		Received By: <u>[Signature]</u> Date: <u>11/23/10</u> Time: <u>13:30</u>	
Relinquished By: <u>[Signature]</u> Date: <u>11/23/10</u> Time: <u>13:30</u>		Received By: <u>[Signature]</u> Date: <u>11/23/10</u> Time: <u>13:30</u>	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		Checked By: (Initials) <u>[Initials]</u>	

Remarks: email results

Phone Result: ☐ Yes ☒ No Add'l Phone #: _____
 Fax Result: ☐ Yes ☒ No Add'l Fax #: _____

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



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

November 30, 2010

Hack Conder

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 EOL

Enclosed are the results of analyses for samples received by the laboratory on 11/23/10 9:26.

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 Hydrocarbons

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

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 (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



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: 11/23/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/22/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #6 @ 10 FT (H021385-01)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	6080	16.0	11/29/2010	ND	448	112	400	0.00	
TPH 8015M		mg/kg		Analyzed By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/27/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/27/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane 109 % 70-130

Surrogate: 1-Chlorooctadecane 115 % 70-130

Sample ID: SB #6 @ 25 FT (H021385-02)

Chloride, SM4500Cl-B		mg/kg		Analyzed By: HM					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	4160	16.0	11/29/2010	ND	448	112	400	0.00	
TPH 8015M		mg/kg		Analyzed By: AB					
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
GRO C6-C10	<10.0	10.0	11/28/2010	ND	162	81.0	200	0.660	
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	194	97.1	200	3.61	

Surrogate: 1-Chlorooctane 84.2 % 70-130

Surrogate: 1-Chlorooctadecane 86.3 % 70-130

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

Page 1015

Analytical Results For:

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

Received: 11/23/2010
Reported: 11/30/2010
Project Name: BD P-30 EOL
Project Number: NONE GIVEN
Project Location: BD P-30 EOL

Sampling Date: 11/22/2010
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: SB #7 @ 10 FT (H021385-03)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	4960	16.0	11/29/2010	ND	448	112	400	0.00		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/28/2010	ND	162	81.0	200	0.660		
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	194	97.1	200	3.61		
Surrogate: 1-Chlorooctane	85.2 %	70-130								
Surrogate: 1-Chlorooctadecane	85.9 %	70-130								

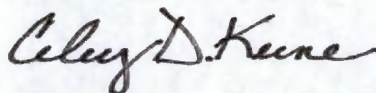
Sample ID: SB #7 @ 25 FT (H021385-04)

Chloride, SM4500Cl-B			mg/kg							Analyzed By: HM
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
Chloride	1680	16.0	11/29/2010	ND	448	112	400	0.00		
TPH 8015M			mg/kg							Analyzed By: AB
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier	
GRO C6-C10	<10.0	10.0	11/28/2010	ND	162	81.0	200	0.660		
DRO >C10-C28	<10.0	10.0	11/28/2010	ND	194	97.1	200	3.61		
Surrogate: 1-Chlorooctane	89.6 %	70-130								
Surrogate: 1-Chlorooctadecane	95.4 %	70-130								

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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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*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

ARDINAL 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

Company Name: Rice Operating Company Project Manager: Hack Conder Address: 122 West Taylor City: Hobbs State: NM Zip: 88240 Phone #: 575-393-9174 Fax #: 575-397-1471 Project #: Project Owner: Project Name: BD P-30 EOL Project Location: BD P-30 EOL Sampler Name: Jordan Woodfin										BILL TO P.O. #: Company: Attn: Address: City: State: Phone #: Fax #:										ANALYSIS REQUEST Chlorides TPH 8015 M BTEX Texas TPH Complete Cations/Anions TPH 8015 M Extended Thru C40									
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															
AR1385-1	SB # 6 @ 10ft	5	1			✓				✓			08:00	✓															
2	SB # 6 @ 25ft	3	1			✓				✓			08:30	✓															
3	SB # 7 @ 10ft	3	1			✓				✓			03:00	✓															
4	SB # 7 @ 25ft	3	1			✓				✓			03:30	✓															

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Relinquished By: Jordan Woodfin Date: 11/23/10 Time: 2:16 PM	Received By: <i>Jodi Benson</i> Date: 11/23/10 Time: 2:16 PM
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	
Sample Condition: Cool ☒ Intact ☒ Yes ☒ No ☒	
Checked By: <i>JWB</i>	
Relinquished By:	
Phone Result: ☐ Yes ☒ No Add'l Phone #: Fax Result: ☐ Yes ☒ No Add'l Fax #:	
REMARKS: email results	
Hcorder@riceswd.com; jwoodfin@riceswd.com; Lweinheimer@riceswd.com kjones@riceswd.com	

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

NEED SAMPLES BACK, PLEASE



Appendix C

Trenching Laboratory Analyses

RICE Environmental Consulting and Safety (RECS)
P.O. Box 2948 Hobbs, NM 88241
Phone 575.393.2967



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

February 08, 2011

Hack Conder
Rice Operating Company
112 W. Taylor
Hobbs, NM 88240

RE: BD P-30 WEST

Enclosed are the results of analyses for samples received by the laboratory on 02/07/11 8:14.

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 Hydrocarbons

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

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 (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



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: 02/07/2011
Reported: 02/08/2011
Project Name: BD P-30 WEST
Project Number: BD P-30 WEST & EOL
Project Location: NOT GIVEN

Sampling Date: 02/04/2011
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: 35' NORTH TRENCH @ 5' (H100233-01)

Chloride, SM4500Cl-B

mg/kg

Analyzed By: HM

Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	144	16.0	02/07/2011	ND	448	112	400	3.64	

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

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

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 Operating Company Project Manager: Hack Conder Address: 122 West Taylor City: Hobbs Phone #: 575-393-9174 State: NM Zip: 88240 Fax #: 575-397-1471 Project #: Project Name: BD P-30 West & EOL Project Location: BD P-30 West & EOL Sampler Name: Jordan Woodfin										BILL TO P.O. #: Company: Attn: Address: City: State: Zip: Phone #: Fax #:										ANALYSIS REQUEST									
FOR LAB USE ONLY Lab I.D. H100233 Sample I.D. 35' North Trench @ 5'										MATRIX		PRESERV		SAMPLING		DATE 2/4/11 TIME 02:45		Chlorides ☒		TPH 8015 M ☒		BTEX ☒		Texas TPH ☒		Complete Cations/Anions ☒		TPH 8015 M Extended Thru C40 ☒	
										(G)RAB OR (C)OMP. 1		# CONTAINERS 1		GROUNDWATER ☒															
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 analysis. 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 services. 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 stipulated remedies or otherwise.																													
Relinquished By: Jordan Woodfin Relinquished By: <i>[Signature]</i> Delivered By: <i>[Signature]</i> Sampler - UPS - Bus - Other:										Received By: <i>[Signature]</i> Received By: <i>[Signature]</i> Checked By: <i>[Signature]</i>																			
Phone Result: ☐ Yes ☒ No Fax Result: ☐ Yes ☒ No REMARKS: email results										Phone Result: ☐ Yes ☒ No Fax Result: ☐ Yes ☒ No REMARKS:																			

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

NEED SAMPLES BACK, PLEASE



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

February 09, 2011

KATY JONES

Rice Operating Company

112 W. Taylor

Hobbs, NM 88240

RE: BD P-30 21.37

Enclosed are the results of analyses for samples received by the laboratory on 02/07/11 17:00.

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 Hydrocarbons

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

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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

Lab Director/Quality Manager

Analytical Results For:

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

Received: 02/07/2011
Reported: 02/09/2011
Project Name: BD P-30 21.37
Project Number: NONE GIVEN
Project Location: NOT GIVEN

Sampling Date: 02/07/2011
Sampling Type: Soil
Sampling Condition: Cool & Intact
Sample Received By: Jodi Henson

Sample ID: W DELINEATION TRENCH @1' (H100240-01)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: LR						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	64.0	16.0	02/08/2011	ND	416	104	400	3.77	

Sample ID: W DELINEATION TRENCH @8' (H100240-02)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: LR						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	1630	16.0	02/08/2011	ND	416	104	400	3.77	

Sample ID: S DELINEATION TRENCH @5' (H100240-03)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: LR						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	848	16.0	02/08/2011	ND	416	104	400	3.77	

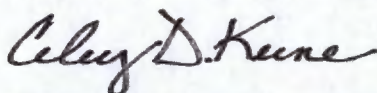
Sample ID: S DELINEATION TRENCH @10' (H100240-04)

Chloride, SM4500Cl-B		mg/kg	Analyzed By: LR						
Analyte	Result	Reporting Limit	Analyzed	Method Blank	BS	% Recovery	True Value QC	RPD	Qualifier
Chloride	2840	16.0	02/08/2011	ND	416	104	400	3.77	

Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager

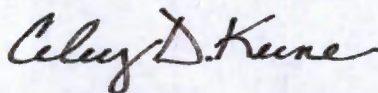
Notes and Definitions

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

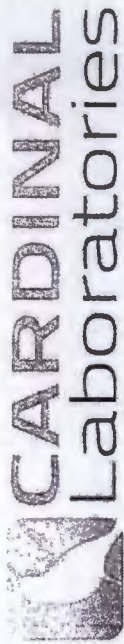
Cardinal Laboratories

*=Accredited Analyte

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Celey D. Keene, Lab Director/Quality Manager



CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240
(575) 393-2326 FAX (575) 393-2476

BILL TO		ANALYSIS REQUEST																		
Company Name:		P.O. #:	Company:																	
Project Manager:		Address:	Attn:																	
City:		State:	Zip:																	
Phone #:		Fax #:	City:																	
Project #:		Project Owner:	State:	Zip:																
Project Name:		130 R30 21.37	Phone #:																	
Project Location:		Sampler Name:	Fax #:																	
Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	MATRIX	OTHER:	ACID/BASE	ICE / COOL	PRESERV.	SAMPLING	DATE	TIME							
H100240-1	W. DELINEATION TRENCH @ 1'	G										2.7.11	10:00							
2	W. DELINEATION TRENCH @ 8"	G										2.7.11	11:25							
3	S. DELINEATION TRENCH @ 5'	G										2.7.11	3:00							
4	S. DELINEATION TRENCH @ 10'	G										2.7.11	3:45							

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 analysis. 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 furnished by Cardinal, regardless of whether such claim is based upon any of the above stated reasons or otherwise.

Relinquished By: <i>[Signature]</i>	Date: 2.7.11	Received By: <i>[Signature]</i>	Phone Result: ☐ Yes ☐ No	Add'l Phone #: _____
Relinquished By: _____	Time: 5:00	Received By: _____	Fax Result: ☐ Yes ☐ No	Add'l Fax #: _____
REMARKS: <i>EMATEL</i>				
Delivered By: (Circle One) Sampler - UPS - Bus - Other:				
Sample Condition: Cool ☐ Intact ☐ (Initials) <i>[Signature]</i>				

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

#26



Appendix D

Background Characterization Report

RICE Environmental Consulting and Safety (RECS)
P.O. Box 2948 Hobbs, NM 88241
Phone 575.393.2967



CERTIFIED MAIL
RETURN RECEIPT NO. 7010 0290 0003 1264 9000

October 11, 2010

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: **Background Characterization Report**
BD Jct. P-30 (1R0426-124)
T21S-R37E-Section 30, Unit Letter P, Lea County, New Mexico

Mr. Hansen:

As agent for Rice Operating Company (ROC), and in response to your email request on August 18, 2010, Trident Environmental is submitting this *Background Characterization Report* for the above-referenced site. Based on the characterization of background concentrations for chlorides and total dissolved solids (TDS), as described in more detail below, we have determined that groundwater at the site is representative of background conditions and therefore has not been impacted by the former junction box. However, ROC will develop a *Corrective Action Plan* to address the vadose zone and mitigate the potential for migration of chlorides and TDS from the vadose zone to groundwater. The CAP will include plans to excavate the affected area, install a liner, and re-establish vegetation.

Chloride and TDS Background Characterization

The most recent data (1990 – 1995) from the New Mexico Water and Infrastructure Data System (NMWAIDS) were used to determine the range of chloride concentrations within an approximate 5 mile radius of the site. Only chloride data is available; therefore, TDS concentrations were directly correlated to chloride levels using a conservative factor of 3. This data set resulted in 29 wells within all of T21S-R36E, T21S-R37E, T22S-R36E, and T22S-R37E. The mean (μ) and standard deviation (σ) were calculated from the data set from which an upper limit for background chloride concentration was conservatively estimated by adding two standard deviations to the mean ($\mu + 2\sigma$). Table 1 below summarizes the available data set and calculation results.

Table 1
Summary of Background Chloride Concentrations

Data obtained from NMWAIDS (Years: 1990-1995; Chlorides: 0 mg/L – 1,000 mg/L)

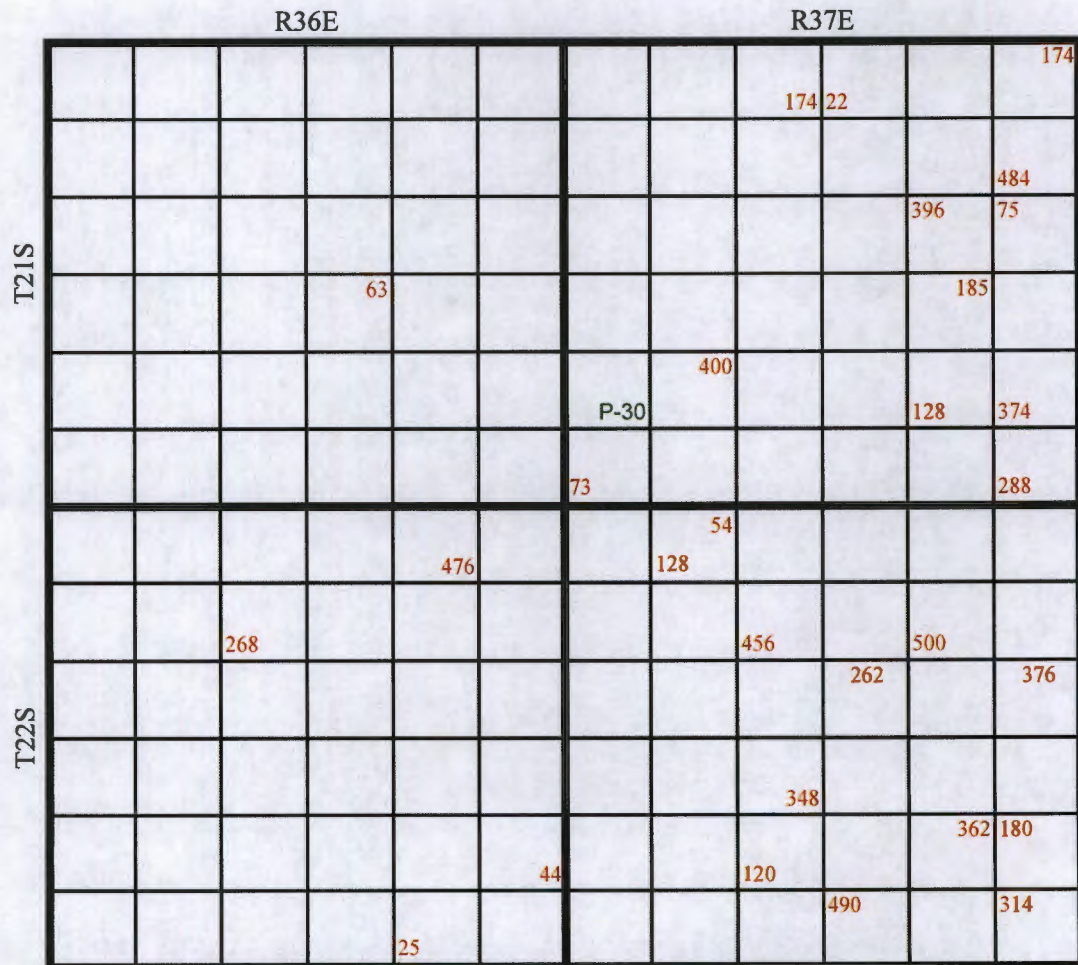
S	T	R	Formation	Date	Chlorides	
					(mg/L)	Location (qtr/qtr)
23	21S	36E	OGALLALA	10/05/95	63	21S.36E.23.232311
1	21S	37E	OAL	10/04/95	174	21S.37E.01.242422
3	21S	37E	OAL	11/15/95	22	21S.37E.03.31221
4	21S	37E	OAL	10/03/95	174	21S.37E.04.412442
12	21S	37E	OAL	10/04/95	484	21S.37E.12.34341
13	21S	37E	OAL	06/21/90	75	21S.37E.13.13434
14	21S	37E	OAL	10/04/95	396	21S.37E.14.12410
26	21S	37E	OAL	11/15/95	128	21S.37E.26.32322
31	21S	37E	OAL	10/05/95	73	21S.37E.31.13311
36	21S	37E	OAL	10/04/95	288	21S.37E.36.34432
2	22S	36E	OGALLALA	10/06/95	476	22S.36E.02.442441
9	22S	36E	OGALLALA	10/17/95	268	22S.36E.09.341221
25	22S	36E	OGALLALA	10/11/95	44	22S.36E.25.43433A
35	22S	36E	OGALLALA	10/06/95	25	22S.36E.35.313224
5	22S	37E	OAL	10/05/95	54	22S.37E.05.21213
5	22S	37E	OGALLALA	10/04/95	128	22S.37E.05.341434
9	22S	37E	OGALLALA	10/05/95	456	22S.37E.09.313331
11	22S	37E	OAL	10/03/95	500	22S.37E.11.322414
13	22S	37E	null	10/03/95	376	22S.37E.13.22111
15	22S	37E	OGALLALA	10/05/95	262	22S.37E.15.333343
21	22S	37E	OAL	10/11/95	348	22S.37E.21.44223
25	22S	37E	OAL	10/04/95	180	22S.37E.25.123332
26	22S	37E	OAL	10/03/95	362	22S.37E.26.21231
28	22S	37E	OAL	10/04/95	120	22S.37E.28.31243
34	22S	37E	OAL	10/04/95	490	22S.37E.34.121344
36	22S	37E	null	10/04/95	314	22S.37E.36.14311

Mean (μ) = 249.6 mg/L
Standard Deviation (σ) = 160.3 mg/L
Mean + 2 SD = $\mu + 2\sigma$ = 570.2 mg/L

The chloride concentrations in Table 1 are also depicted in Figure 2. Based on the regional chloride concentration data in Table 1 above, a conservative upper limit for background chloride concentration is 570 mg/L. Since TDS data is not available an upper limit for background TDS was conservatively estimated at three times the chloride level ($3 \times 570.2 = 1,711$ mg/L).

BD Jct. P-30 Site (1R0426-124)
Background Characterization Report

Figure 2
Regional Distribution of Chloride Concentrations
Data obtained from NMWAIDS (Years: 1990-1995; Chlorides: 0 mg/L – 1,000 mg/L)



Values in red type indicate chloride concentrations in (mg/L)

BD Jct. P-30 Site (1R0426-124)
Background Characterization Report

As shown in Table 2 below, five quarters of groundwater data at the site monitoring well (MW-1) indicate chloride and TDS levels well below the upper limit of background concentrations for the regional area. In addition, the average chloride and TDS concentrations in MW-1 are only marginally above the WQCC standard of 250 mg/L and 1,000 mg/L, respectively. Therefore, it has been concluded that chloride and TDS concentrations at the site are representative of background conditions, and the site has not been impacted by the former junction box.

Table 2
Summary of Site Chloride and TDS Concentrations

Monitoring Well	Sample Date	Depth to Groundwater (feet BTOC)	Chloride (mg/L)	TDS (mg/L)
MW-1	07/27/09	97.89	392	1,180
	10/16/09	97.86	364	1,130
	01/25/10	97.82	324	957
	04/22/10	97.77	280	811
	07/22/10	97.76	370	1,030
Mean (μ) =			346	1,022

Chloride and TDS Background Characterization

The United States Geological Survey National Water Information System (USGS NWIS), New Mexico Water Rights Reporting System (NM WRRS), and NM WAIDS, databases were reviewed to identify water wells within a mile of the site with historical chloride concentration data as summarized in Table 3 below. A site location map with these wells identified is shown in Figure 1.

Table 3
Summary of Chloride Concentrations within One-Mile Radius

Water Well or Sample ID	Distance from BD Jct P-30	S	T	R	Sample Date	TD (ft bgs)	Chloride (mg/L)
MW-1	0 ft	30	21S	37E	07/22/10	113	370
10155	2,500 ft NW	30	21S	37E	10/18/84	125	106
8849	3,800 ft SSW	31	21S	37E	07/09/90	115	95
9387	4,200 ft NE	29	21S	37E	07/09/90	130	400
12349	5,000 ft SE	32	21S	37E	10/26/65	115	140

Chloride concentrations in each well identified in Table 3 above and in Figure 1 are representative of background conditions. The nearest water well is located approximately 2,500 ft northwest of the site and is not a concern due to its upgradient location. The closest downgradient well from the site is located almost a mile (5,000 ft) southeast and is not a concern due to its long distance from the site. The remaining wells can not be affected by any activity at the site due to their distant cross-gradient locations and the prevailing southeast trending groundwater gradient direction.



0 1000 2000
Approximate Scale (Feet)

BD Jct. P-30 Site
T21S - R37E - Section 30, Unit P
RICE *operating company*

FIGURE 1
SITE LOCATION MAP

BD Jct. P-30 Site (1R0426-124)
Background Characterization Report

Conclusions and Recommendations

Based on the regional characterization of background concentrations for chlorides and TDS, we have determined that groundwater at the site is representative of background conditions and therefore has not been impacted by the former junction box. However, ROC will develop a *Corrective Action Plan* to address the vadose zone and mitigate the potential for migration of chlorides from the vadose zone to groundwater. The CAP will include plans to excavate the affected area, install a liner, and re-establish vegetation.

ROC is the service provider (agent) for the Blinbry Drinkard (BD) Salt Water Disposal System and has no ownership of any portion of the pipelines, wells, or facilities. The BD System is owned by a consortium of oil producers, System Parties, who provide all operating capital on a percentage ownership/usage basis. Environmental remediation projects of this magnitude require System Parties AFE approval and work begins as funds are received.

If you have any questions please call Hack Conder at 575-393-9174.

Sincerely,

Gilbert J. Van Deventer, REM, PG
Trident Environmental - Project Manager

cc: Hack Conder (Rice Operating Co., Hobbs NM)



Appendix E

Multimed Report

RICE Environmental Consulting and Safety (RECS)
P.O. Box 2948 Hobbs, NM 88241
Phone 575.393.2967

MULTIMED V1.01 DATE OF CALCULATIONS: 19-JUN-2013 TIME: 12:25:24 BD Jct. P-30 west and P-30 EOL_final draft 6.18.13

U. S. E N V I R O N M E N T A L P R O T E C T I O N A G E N C Y
E X P O S U R E A S S E S S M E N T
M U L T I M E D I A M O D E L
MULTIMED (Version 1.50, 2005)

1 Run options
--- -----

BD Jct. P-30 west and BD P-30 EOL

Chemical simulated is Chloride

Option Chosen Saturated and unsaturated zone models
Run was DETERMIN
Infiltration Specified By User: 7.620E-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 2.00 1

DATA FOR MATERIAL 1

VADOSE ZONE MATERIAL VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	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	2.00	0.000	0.000	0.000

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	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 MEAN	STD DEV	MIN	LIMITS MAX
Thickness of layer	m	CONSTANT	2.00	-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	1.99	-999.	-999.	-999.

CHEMICAL SPECIFIC VARIABLES

VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS 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	cm ² /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 MEAN	STD DEV	MIN	MAX
Infiltration rate	m/yr	CONSTANT	0.762E-02	-999.	-999.	-999.
Area of waste disposal unit	m ²	DERIVED	892.	-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	0.118E+04	-999.	-999.	-999.
Length scale of facility	m	CONSTANT	36.6	-999.	-999.	-999.
Width scale of facility	m	CONSTANT	24.4	-999.	-999.	-999.
Near field dilution		DERIVED	1.00	0.000	0.000	1.00

AQUIFER SPECIFIC VARIABLES

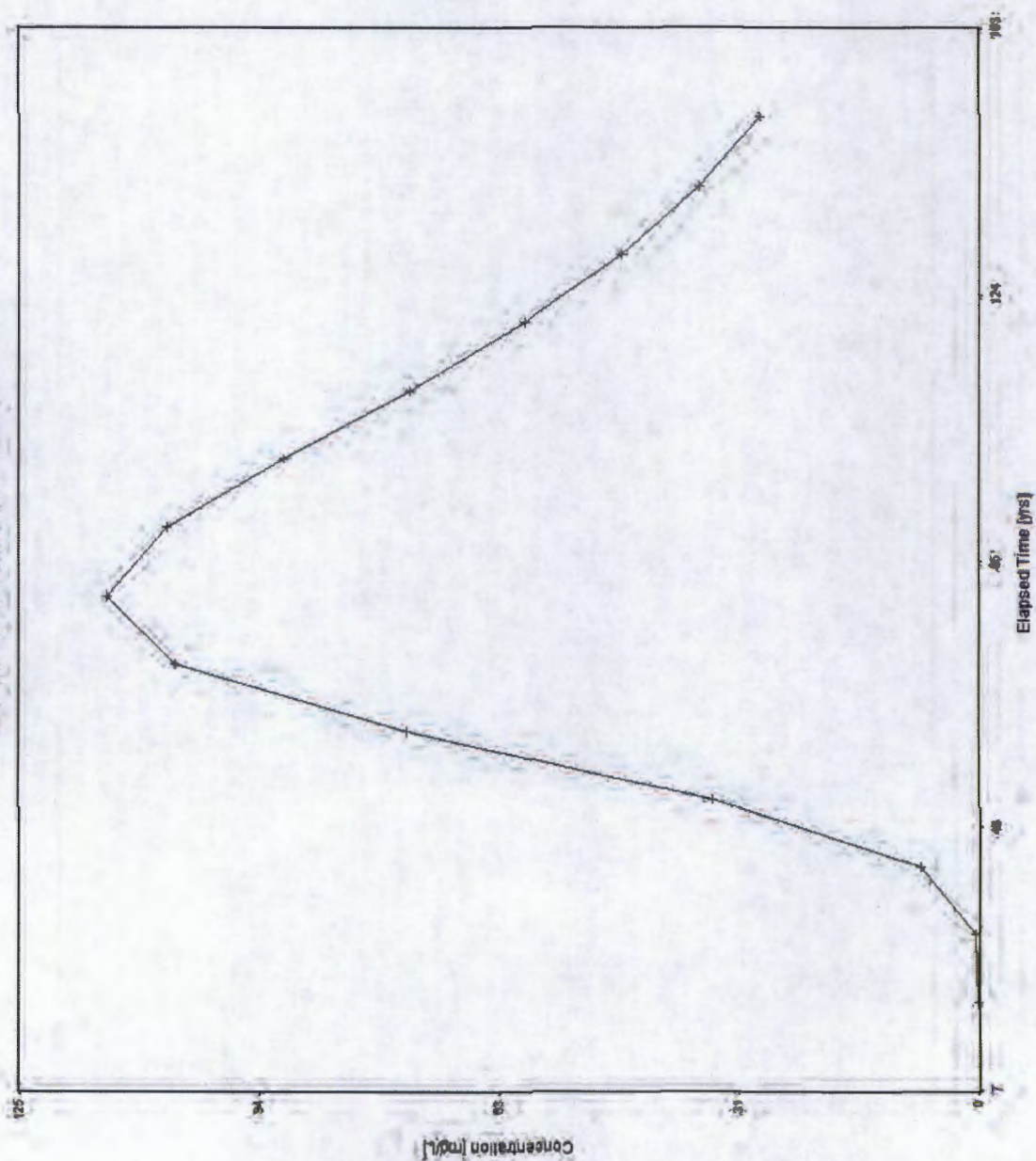
VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS MEAN	STD DEV	MIN	MAX
Particle diameter	cm	CONSTANT	-999.	-999.	-999.	-999.
Aquifer porosity	--	CONSTANT	0.300	-999.	-999.	-999.
Bulk density	g/cc	CONSTANT	1.86	-999.	-999.	-999.
Aquifer thickness	m	CONSTANT	6.10	-999.	-999.	-999.
Source thickness (mixing zone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

BD Jct. P-30 west and P-30 EOL_final draft 6.18.13

TIME	CONCENTRATION
0.200E+02	0.15357E-02
0.300E+02	0.43476E+00
0.400E+02	0.75995E+01
0.500E+02	0.34663E+02
0.600E+02	0.74681E+02
0.700E+02	0.10491E+03
0.800E+02	0.11372E+03
0.900E+02	0.10590E+03
0.100E+03	0.90746E+02
0.110E+03	0.74248E+02
0.120E+03	0.59212E+02
0.130E+03	0.46703E+02
0.140E+03	0.36542E+02
0.150E+03	0.28665E+02

Chloride Concentration At The Receptor Well
 BD Jct. P-30 west and BD P-30 EQ1



-- Chloride

[illegible]

30' W 20' N

Cl- PID
1' 87 1.5
2' 167 2
3' 477 167.7
4' 501 141.9
5' 686 1802
6' 765 7.1
7' 1102 4.5
8' 1001 1.4

Cl- PID
1' 720 0
2' 178 0
3' 457 0
4' 312 0
5' 1212 0
6' 1214 0
7' 1547 0
8' 1858 0
9' 1823 0
10' 2262 0

Cl-	PID
1181	0.9
4717	0.3
3010	0.7
3220	0.9
2106	0.9

Cl-	PID
295	0
4955	0
4729	0
3689	0
3861	0

Cl-	PID
1023	0
2034	0
1905	0
1730	0
1829	0
2148	0
1413	0
1618	0
1010	0
1554	0
1464	0.1
1728	0.1
1010	0.1
818	0.1
1022	0.5
885	0.7
1013	0.7
915	0.6

Cl-	PID
572	0.2
608	0.2
947	0.1
1023	0.1
1238	0
1878	0
1677	0
1399	0
1295	0
1373	0
1461	0
1291	0.1
1196	0.1
1215	0.1
1100	0.1
801	0.1
606	0.1
710	0.1

1099	0
1191	0
2689	0
1752	0
1782	0.1
1484	0.1
940	0.1
348	0.2
326	0
420	0
293	0
321	0
376	0
425	0
602	0
626	0
777	0
840	0.2

1224	0.7
1208	0.5
3512	0.6
3535	0.5
2444	0.2
1258	0.1
418	0.5
334	0.5
283	0.7
258	0.4
227	0.4
195	0.4
197	0.2
174	0.2

3446	0.3
2295	0.2
1688	0.1
2089	0.1
2007	0.1
1964	0.1
1614	0.1
1580	0.2
1298	0.1
1565	0.1
1243	0.1
880	0.1
660	0.2
607	0.3
768	0.1
790	0.1

10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90

1,184 mg/kg
7 ft

Average Chloride concentration
Deepest sample collected (90 ft) subtracted
from depth to GW (97 ft)

MULTIMED V1.01 DATE OF CALCULATIONS: 1-JUL-2013 TIME: 16: 7:22

U. S. E N V I R O N M E N T A L P R O T E C T I O N A G E N C Y

E X P O S U R E A S S E S S M E N T

M U L T I M E D I A M O D E L

MULTIMED (Version 1.50, 2005)

1 Run options
 --- -----

BD Jct. P-30 west and BD P-30 EOL

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: Find Maximum Concentration
 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	
LIMITS				MEAN	STD DEV
MIN	MAX				

-999.	Saturated hydraulic conductivity	cm/hr	CONSTANT	3.60	-999.
-999.	-999.				
-999.	Unsaturated zone porosity	--	CONSTANT	0.250	-999.
-999.	-999.				
-999.	Air entry pressure head	m	CONSTANT	0.700	-999.
-999.	-999.				
0.000	Depth of the unsaturated zone	m	CONSTANT	3.00	0.000
0.000	0.000				

DATA FOR MATERIAL 1

VADOSE ZONE FUNCTION VARIABLES

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

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

LIMITS	VARIABLE NAME		UNITS	DISTRIBUTION	PARAMETERS	
	MIN	MAX			MEAN	STD DEV

-999.	Solid phase decay coefficient		1/yr	DERIVED	-999.	-999.
-999.	Dissolved phase decay coefficient		1/yr	DERIVED	-999.	-999.
-999.	Overall chemical decay coefficient		1/yr	DERIVED	-999.	-999.
-999.	Acid catalyzed hydrolysis rate		1/M-yr	CONSTANT	0.000	-999.
-999.	Neutral hydrolysis rate constant		1/yr	CONSTANT	0.000	-999.
-999.	Base catalyzed hydrolysis rate		1/M-yr	CONSTANT	0.000	-999.
-999.	Reference temperature		C	CONSTANT	25.0	-999.
-999.	Normalized distribution coefficient		ml/g	CONSTANT	0.000	-999.
-999.	Distribution coefficient		--	DERIVED	-999.	-999.
-999.	Biodegradation coefficient (sat. zone)		1/yr	CONSTANT	0.000	-999.
-999.	Air diffusion coefficient		cm2/s	CONSTANT	-999.	-999.
-999.	Reference temperature for air diffusion		C	CONSTANT	-999.	-999.
-999.	Molecular weight		g/M	CONSTANT	-999.	-999.
-999.	Mole fraction of solute		--	CONSTANT	-999.	-999.
-999.	Vapor pressure of solute		mm Hg	CONSTANT	-999.	-999.

-999.	Henry`s law constant	atm-m ³ /M	CONSTANT	-999.	-999.
0.000	-999.				
0.000	Overall 1st order decay sat. zone	1/yr	DERIVED	0.000	0.000
	1.00				
	Not currently used		CONSTANT	0.000	0.000
	0.000				
	Not currently used		CONSTANT	0.000	0.000
	0.000				

SOURCE SPECIFIC VARIABLES

LIMITS		VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS	
MIN	MAX				MEAN	STD DEV
-999.		Infiltration rate	m/yr	CONSTANT	0.152E-01	-999.
-999.		Area of waste disposal unit	m^2	DERIVED	892.	-999.
-999.		Duration of pulse	yr	DERIVED	50.0	-999.
-999.		Spread of contaminant source	m	DERIVED	-999.	-999.
-999.		Recharge rate	m/yr	CONSTANT	0.000	-999.
0.000		Source decay constant	1/yr	CONSTANT	0.250E-01	0.000
-999.		Initial concentration at landfill	mg/l	CONSTANT	806.	-999.
-999.		Length scale of facility	m	CONSTANT	36.6	-999.
-999.		Width scale of facility	m	CONSTANT	24.4	-999.

0.000	Near field dilution	DERIVED	1.00	0.000
1	1.00			

AQUIFER SPECIFIC VARIABLES

LIMITS		VARIABLE NAME	UNITS	DISTRIBUTION	PARAMETERS	
MIN	MAX				MEAN	STD DEV

-999.		Particle diameter	cm	CONSTANT	-999.	-999.
-999.		Aquifer porosity	--	CONSTANT	0.300	-999.
-999.		Bulk density	g/cc	CONSTANT	1.86	-999.
-999.		Aquifer thickness	m	CONSTANT	6.10	-999.
-999.		Source thickness (mixing zone depth)	m	CONSTANT	3.18	-999.
-999.		Conductivity (hydraulic)	m/yr	CONSTANT	315.	-999.
-999.		Gradient (hydraulic)		CONSTANT	0.300E-02	-999.
-999.		Groundwater seepage velocity	m/yr	DERIVED	-999.	-999.
-999.		Retardation coefficient	--	DERIVED	-999.	-999.
-999.		Longitudinal dispersivity	m	FUNCTION OF X	-999.	-999.
-999.		Transverse dispersivity	m	FUNCTION OF X	-999.	-999.
-999.		Vertical dispersivity	m	FUNCTION OF X	-999.	-999.

-999.	Temperature of aquifer	C	CONSTANT	20.0	-999.
-999.	pH	--	CONSTANT	7.00	-999.
-999.	Organic carbon content (fraction)		CONSTANT	0.000	-999.
-999.	Well distance from site	m	CONSTANT	1.00	-999.
-999.	Angle off center	degree	CONSTANT	0.000	-999.
-999.	Well vertical distance	m	CONSTANT	0.000	-999.

MAXIMUM WELL CONCENTRATION IS 211.4 AT 0.628E+02 YEARS