1R - 426-150

REPORTS

DATE:

7-27-09

Hansen, Edward J., EMNRD

From: L. Peter Galusky, Jr. [lpg@texerra.com]
Sent: Monday, July 27, 2009 11:43 AM
To: Hansen, Edward J., EMNRD
Cc: Jones, Brad A., EMNRD; Katie Jones; Hack Conder
Subject: Rice Operating Company Remediation Termination Request. BD P-35-1. NMOCD Case No. 1R426-150
Attachments: BD P-35-1 ICP Report and Termination Request.pdf

Dear Edward,

Please find attached an updated remediation termination request for the above-referenced project, where we have addressed questions that you and/or Brad Jones raised during our meeting in Santa Fe last month.

We greatly appreciate your consideration of this request.

Sincerly,

Pete G.
Cell: 432-634-9257

L. Peter Galusky, Jr. Ph.D.
Principal
Texerra
Energy Square
505 N. Big Spring, Suite 404
Midland, Texas 79701
E-mail: lpg@texerra.com
Web: www.texerra.com
Office Telephone/Fax: 877-534-9001

Investigation and Characterization Report and Termination Request
Rice Operating Company – BD SWD System
BD P-35-1 Jct
UL P Sec 35 T 21S R 37E[1]
NMOCD Case Number: 1R426-150

July 27th, 2009
(Update from: April 8th, 2009)

Prepared by:

L. Peter Galusky, Jr. Ph.D.
Texerra
505 N. Big Spring, Suite 404
Midland, Texas 79701
Web: www.texerra.com
E-mail: lpg@texerra.com

[1] Please note that the legal description was previously and incorrectly reported as T 22 R 38 E.

Investigation and Characterization Report and Termination Request

BD P-35-1 Jct
UL P Sec 35 T 21S R 37E
NMOCD Case Number: 1R426-150

Executive Summary

This report summarizes the findings of investigative work prescribed in the NMOCD approved Investigation and Characterization Plan for this site. Updates contained in this report from the original of 04-08-09 include the following: 1- The soil area affected by the former junction box was better defined and quantified; 2- The residual soil chloride mass contributed by the former junction box was calculated as the difference between the average soil chloride concentration and an estimated natural background chloride concentration of 100 ppm; 3- The mixing zone depth in the groundwater chloride model was reduced from 15 ft to 10 ft; 4 – The porosity of the aquifer used in the model was reduced from 0.33 to 0.30.

Rice Operating Company removed a wooden junction box at this location, replacing it with a new, water-tight junction box in May of 2006 as part of its facility maintenance and upgrade program. The original wood junction box was removed and the excavated soils were blended and backfilled into the excavation. The disturbed surface was then seeded with a native vegetation mix. Preliminary site investigation associated with the junction box replacement indicated significant residual soil chloride concentrations and measurable but low petroleum hydrocarbon concentrations.

The field investigation was completed on September 10th, 2008. Three soil borings were advanced at and near the location of the former junction box to depths of 40 to 50 ft bgs, and a monitor well was installed in the near-source borehole. Soil chloride concentrations averaged 618 ppm among the three soil borings and throughout the depth of drilling. Soil petroleum hydrocarbons were found to be below detection by both PID field reading and by laboratory analysis.

A simple soil chloride transport and groundwater dilution model was developed to estimate the potential effect of residual soil chloride leaching into groundwater over an elliptical reference plume having maximum dimensions of 250 ft by 100 ft. The model predicted that maximum anticipated elevation of groundwater chlorides caused by the movement of residual soil chlorides is 168 ppm, indicating that residual soil chlorides should not represent a significant hazard to groundwater quality. An initial sample from an at-source monitor well exhibited a chloride concentration of 352 ppm. However, it is to be expected that chloride concentrations at/near the center of the former junction box would be higher than the model-predicted average value over the volume of the reference plume.

This level of chloride concentration, while somewhat above NMOCD's desired standard of 250 ppm, does not appear to warrant remedial actions (or the development of a Corrective Action Plan). Further, given that the monitor well is located within a high oil-field traffic location it may well be advisable to plug and abandon this well altogether, so as to avoid any potential for truck run-over and subsequent direct contamination of the aquifer through the well pipe.

It is therefore requested that NMOCD grant Rice Operating Company a "remediation termination" or similar closure status for this project and authorize the plugging and abandonment of the monitor well that was installed during this investigation.

Investigation and Characterization Report and Termination Request

BD P-35-1 Jct
UL P Sec 35 T 21S R 37E
NMOCD Case Number: 1R426-150

Contents

Background

This report summarizes the findings of investigative work prescribed in the Investigation and Characterization Plan (ICP) for this site, which was approved by NMOCD on July 17th, 2008 (a copy of e-mail approval is given in the Appendix). Updates contained in this report from the original of 04-08-09 include the following: 1- The soil area affected by the former junction box was better defined and quantified; 2- The residual soil chloride mass contributed by the former junction box was calculated as the difference between the average soil chloride concentration and an estimated natural background chloride concentration of 100 ppm; 3- The mixing zone depth in the groundwater chloride model was reduced from 15 ft to 10 ft; 4 – The porosity of the aquifer used in the model was reduced from 0.33 to 0.30.

The site is located approximately one mile east/southeast of Eunice, New Mexico (Figure 1). The topography is gently sloping toward the southeast. Soils on the site are described in the Lea County Soil Survey moderately deep to deep sandy material overlying caliche of varying hardness. NM OSE records indicate that groundwater is likely to be encountered at a depth of 50+/- feet in unconsolidated Tertiary alluvium of the Ogallala Formation.

Rice Operating Company removed a wooden junction box at this location, replacing it with a new, water-tight junction box (located approx. 33 ft southwest of the original location) in May of 2006 as part of its facility maintenance and upgrade program. As the original wood junction box was removed soils were sampled using a backhoe, creating a 30 by 25 by 12 ft deep excavation. The excavated soils were blended and then backfilled into the excavation. The disturbed surface was then seeded with a native vegetation mix.

Low concentrations (30 ppm) of petroleum hydrocarbons (TPH) were encountered in the excavated soil. TPH concentrations were below detection (< 10.0 ppm) in the sidewalls and bottom of the excavation. Petroleum hydrocarbons were therefore ruled out as a potential constituent of concern. In contrast, chloride concentrations increased with depth to 2,185 ppm at 12 ft below ground surface. The surface (ecological) impact of this release was relatively small.

Objective, Scope and Methodology

The objective of the ICP is to: **a**- quantify the magnitude and extent of residual soil chlorides and petroleum hydrocarbons; **b**- determine if these pose a threat to groundwater quality under present conditions and **c**- develop a Corrective Action Plan (CAP) to protect groundwater if this is warranted.

The scope of the ICP encompasses the measured effects of past operations of the facility on soil and groundwater in the affected vicinity.

The methodology of the ICP entailed: **a**- drilling to obtain subsurface soil samples; **b**- analyzing these for chlorides using field titration procedures and for petroleum hydrocarbons using a Photo-ionization Detector (PID); **c**- verifying (QA/QC) the field methods against a subset of samples analyzed by a commercial laboratory; **d**- analyzing the data using graphical and statistical methods and **e**- interpreting the data using a simple mass-balance dilution model.

The field investigation was completed on September 10th, 2008. Harrison and Cooper, Inc. provided drilling services and Rice Operating Company personnel performed field chloride titrations and PID analyses. L. Peter Galusky, Jr. of Texerra supervised field activities. Confirmatory laboratory analyses were subsequently performed by Cardinal Laboratories.

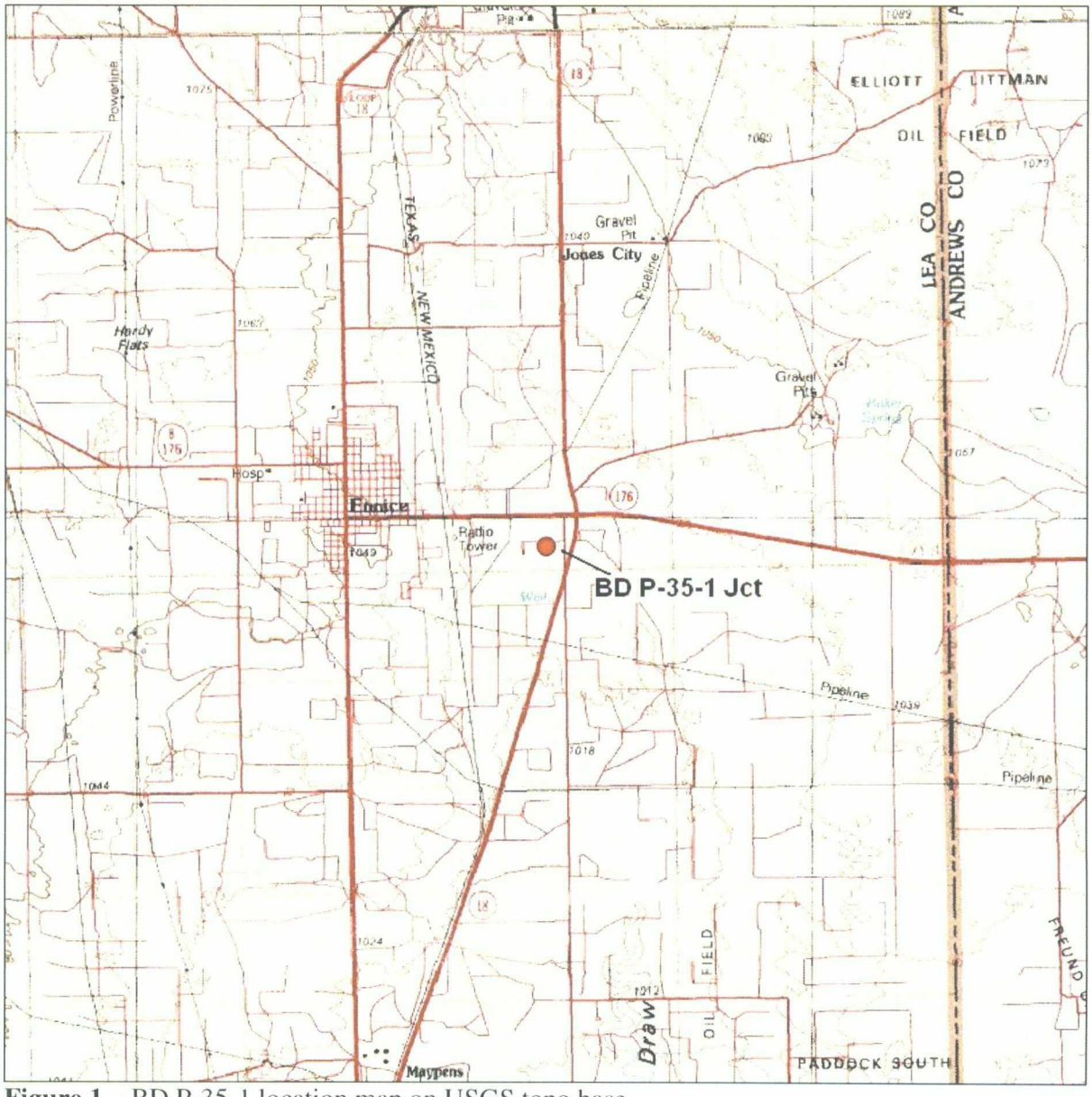

Figure 1 – BD P-35-1 location map on USGS topo base.

Figure 2 – BD P-35-1 Jct location on Google aerial photograph (date unknown).

Results and Discussion

Three soil borings were advanced at and near the location of the former junction box to depths of 40 to 50 ft bgs (Figures 3a, 3b). Depth-averaged Soil chloride concentrations averaged 751 ppm among two soil borings within the affected area. After subtracting the presumed natural background soil chloride concentration of 100 ppm, the net depth averaged soil chloride concentration from the junction box is estimated to be 651 ppm. Soil petroleum hydrocarbons were found to be below detection by both PID field reading and by laboratory analysis (Appendix B2).

The total mass of residual soil chlorides at this location was estimated to be 2,760 lbs (Figure 4). In order to determine if these residual soil chlorides represent a potential hazard to down gradient groundwater quality, a simple soil chloride transport and groundwater dilution model (Figures 5 & 6) was developed to estimate the potential effect of this residual soil chloride leaching into groundwater over time given the following assumptions:

1. The center of mass of residual chlorides moves downward at a rate of 2.0 ft/yr.
2. It is assumed that these chlorides mix uniformly within an elliptical groundwater plume of dimensions 250 ft maximum length by 100 ft maximum width through a depth of 15 ft of the water table aquifer.
3. Natural dilution of the plume occurs at a rate of 10% per year.

The model predicted that maximum anticipated elevation of groundwater chlorides caused by the movement of residual soil chlorides is 168 ppm (Figure 7), indicating that residual soil chlorides should not represent a significant hazard to groundwater quality. An initial sample from an at-source monitor well (MW-1) exhibited a chloride concentration of 352 ppm (Appendix C4). However, it is to be expected that chloride concentrations at/near the center of the former junction box would be higher than the model-predicted average value over the volume of the reference plume.

The observed level of chloride concentration is immediately below the former junction box, and although somewhat above NMOCD's desired standard of 250 ppm it does not appear to warrant remedial actions (or the development of a Corrective Action Plan). Further, given that the monitor well is located within a high oil-field traffic location it may well be advisable to plug and abandon this well altogether, so as to avoid any potential for truck run-over and subsequent direct contamination of the aquifer through the well pipe.

It is therefore requested that NMOCD grant Rice Operating Company a "remediation termination" or similar closure status for this project and authorize the plugging and abandonment of the monitor well that was installed during this investigation.

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

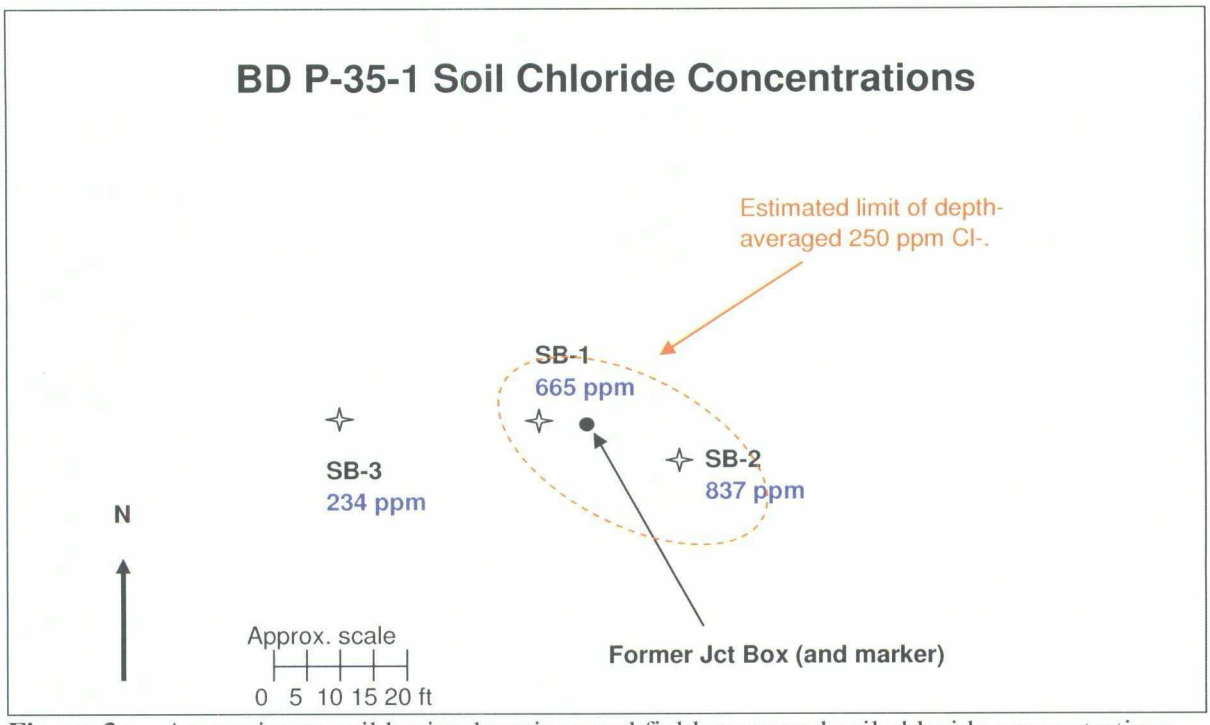

Figure 3a – Approximate soil boring locations and field-measured soil chloride concentrations. The depth-averaged soil chloride concentration within the affected area is 751 ppm. We estimate the natural background soil chloride concentration to be 100 ppm. Therefore, the net depth-averaged soil chloride concentration within the affected area is estimated as 751 ppm – 100 ppm = **651 ppm**.

Soil Boring Log
Rice Operating Company
BD SWD System
BD P-35-1

Identification:	**Avg of SB-1 & SB-2**
Date:	9/10/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	50 ft below ground surface

Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Notes
-5	624		0.0			
-10	685		0.0			
-15	442		0.0	< 25.0	< 25.0	organics from SB-1 only
-20	682	551	0.0			
-25	874		0.0			
-30	647		0.0			
-35	754		0.0			
-40	1,136	831	0.0	< 25.0	< 25.0	organics from SB-1 only
-45	1,143		0.0			
-50	521		0.0			
avg	751		0			

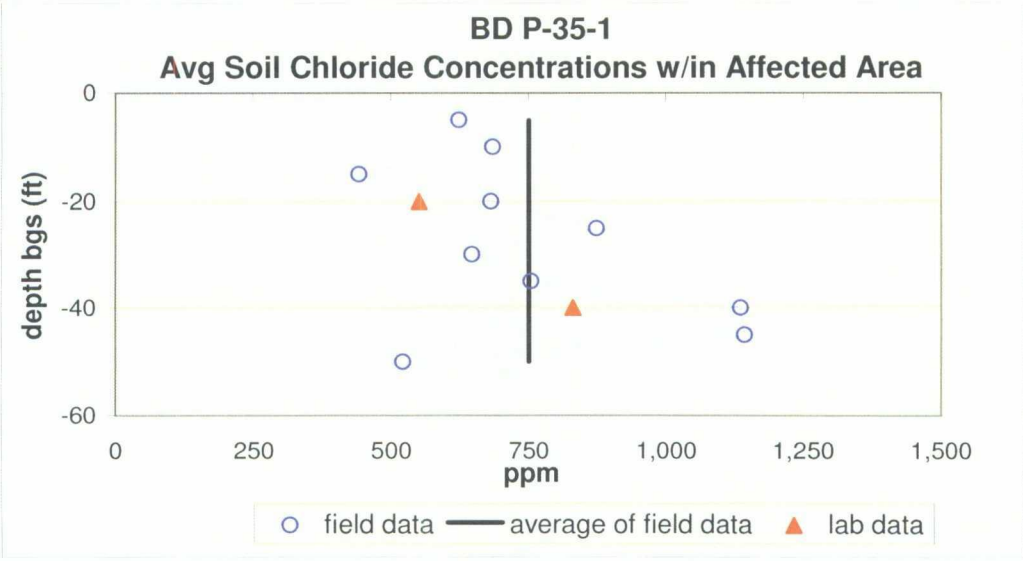

Figure 3b – Average soil chloride and petroleum hydrocarbon concentrations from two soil borings taken within the area affected of the former junction box.

Site:	**BD P-35-1**		
This estimate prepared by:	L. Peter Galusky, Jr.		
Date:	07.23.09		
Inputs in **Blue** Font			Notes
length of affected area (ft)		**45**	
width of affected area (ft)		**22.5**	
affected area (sq ft)		**795**	
affected depth (ft)		**48**	
depth to water table (ft)		**48**	
avg Cl- conc of affected soil (ppm)		**751**	
est. natural background Cl- conc (ppm)		**100**	estimated
unsat zone mass density (lbs/cu yd)		**3,000**	
Cl- conc attributed to source (ppm)		**651**	
volume of affected soil (cu yds)		**1,413**	
total mass of affected soils (lbs)		**4,239,000**	
mass of residual soil chloride (lbs)		**2,760**	

Figure 4 - Estimation of residual soil chloride mass.

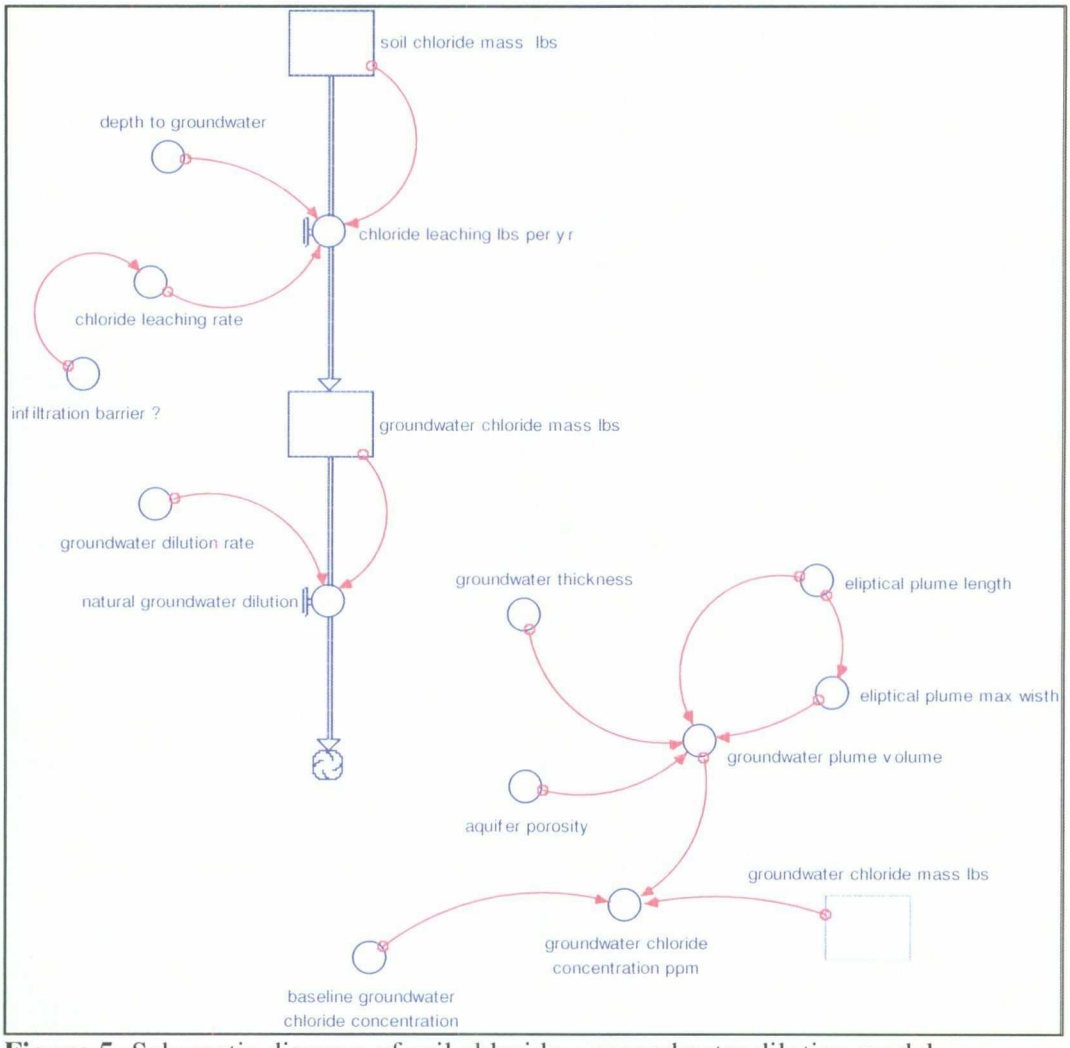

Figure 5- Schematic diagram of soil chloride – groundwater dilution model.

groundwater_chloride_mass_lbs(t) = groundwater_chloride_mass_lbs(t - dt) + (chloride_leaching_lbs_per_yr - natural_groundwater_dilution) * dt
INIT groundwater_chloride_mass_lbs = 0

INFLOWS:
chloride_leaching_lbs_per_yr = (chloride_leaching_rate/depth_to_groundwater)*soil_chloride_mass__lbs
OUTFLOWS:
natural_groundwater_dilution = groundwater_chloride_mass_lbs*groundwater_dilution_rate
soil_chloride_mass__lbs(t) = soil_chloride_mass__lbs(t - dt) + (-chloride_leaching_lbs_per_yr) * dt
INIT soil_chloride_mass__lbs = 2,760

OUTFLOWS:
chloride_leaching_lbs_per_yr = (chloride_leaching_rate/depth_to_groundwater)*soil_chloride_mass__lbs
aquifer_porosity = 0.3
baseline_groundwater_chloride_concentration = 0
chloride_leaching_rate = IF(infiltration_barrier_?=0) THEN 2.0 ELSE 2.0/20
depth_to_groundwater = 48
eliptical_plume_length = 250
eliptical_plume_max_wisth = eliptical_plume_length/2.5
groundwater_chloride_concentration_ppm = 119962*(groundwater_chloride_mass_lbs)/(groundwater_plume_volume*7.5)+baseline_groundwater_chloride_concentration
groundwater_Cl_std = 250
groundwater_dilution_rate = 0.10
groundwater_plume_volume = (3.14*(eliptical_plume_length/2)*(eliptical_plume_max_wisth/2)*groundwater_thickness)*aquifer_porosity
groundwater_thickness = 10
infiltration_barrier_? = 0

Figure 6 – Model equations and parameter values for soil chloride – groundwater dilution model.

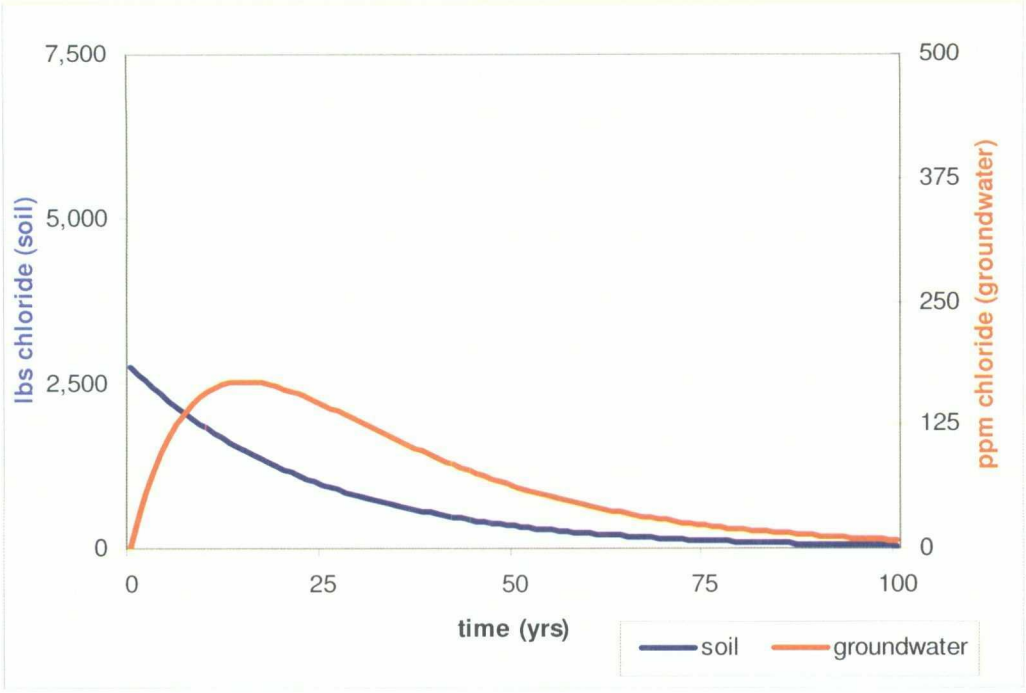

Figure 7 – Estimated change in baseline groundwater chloride concentrations (right axes) over time. The maximum projected elevation in baseline groundwater chloride concentration is 168 ppm.

APPENDICES

- Appendix A - NMOCD approval of Investigation and Characterization Plan
- Appendix B – Soil Boring Logs
- Appendix C - Laboratory data
- Appendix D - Photographs

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Subject: ICP Approvals: #1R427-06; #1R427-181; #1R426-117; #1R426-150

Date: Thu, 17 Jul 2008 17:01:24 -0600

From: "Hansen, Edward J., EMNRD" <edwardj.hansen@state.nm.us>

To: "Hack Conder" <hconder@riceswd.com>

CC: "Price, Wayne, EMNRD" <wayne.price@state.nm.us>, mburrows@valornet.com, lpg@texerra.com

Dear Mr. Conder:

The New Mexico Oil Conservation Division (NMOCD) has reviewed the submitted Investigation Characterization Plans (ICPs), dated May 30, 2008 and June 3, 2008, for the above referenced sites. The NMOCD hereby conditionally approves the following ICPs for the Rice Operating Company sites:

1. EME SWD Jct. O-19 submitted by Texerra on 6/6/2008 #1R427-06
2. EME SWD Phillips 'B' EOL submitted by Texerra on 6/6/2008 #1R427-181
3. BD SWD Oxy Owen 'A' submitted by Texerra on 6/6/2008 #1R426-117
4. BD SWD Jct. P-35-1 submitted by Texerra on 6/6/2008 #1R426-150

In the proposed work elements for all ICPs please include that the delineation of chlorides will be to 250 mg/Kg.

In the proposed work elements for EME SWD Phillips 'B' EOL (#1R427-181) and BD SWD Oxy Owen 'A' (#1R426-117) please include that the delineation of petroleum hydrocarbons will be to 100 ppm using a PID (or equivalent).

Also, for BD SWD Oxy Owen 'A' (#1R426-117) please include re-sampling of the backfill material for petroleum hydrocarbons.

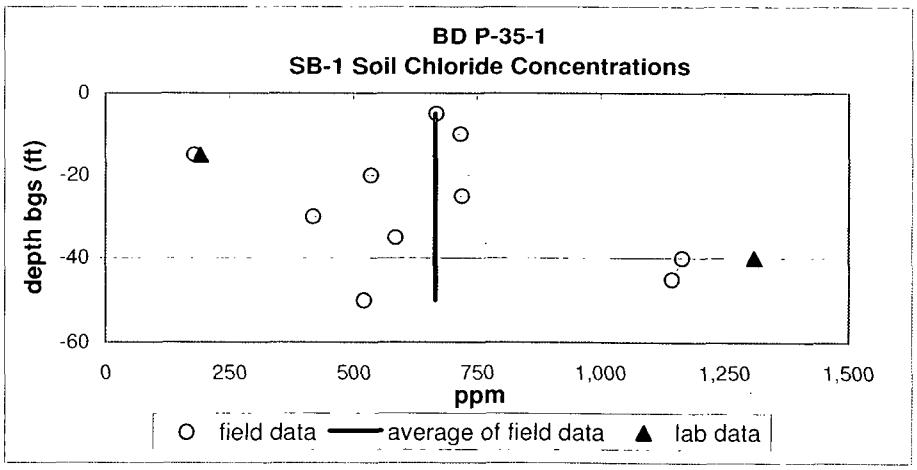
In the proposed work elements for all ICPs please include the analyses for "general chemistry" (including chloride, TDS, and sulfate) and BTEX for potential groundwater sampling.

Also, please be advised that NMOCD approval of these plans does not relieve the owner/operator of responsibility should operations pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD approval does not relieve the owner/operator of responsibility for compliance with any OCD, federal, state, or local laws and/or regulations.

Appendix A – NMOCD approval of Investigation and Characterization Plan.

Soil Boring Log
Rice Operating Company **BD SWD System** **BD P-35-1**
Identification: **SB-1**
Location: Approx. 9 ft W of Rice Date: 9/10/2008
Driller: Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method: Air rotary L. Peter Galusky, Jr., Texerra
Total depth: 50
Screened interval: 40 - 50 ft bg Pipe diameter: 4 inch dia

Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description	Well Schematic
						oil stained sandy	
-5	668		0.0			loam	solid pipe
-10	717		0.0			"	"
-15	180	192	0.0	< 25.0	< 25.0	"	"
						oil stained reddish brown coarse sandy	
-20	535		0.0			loam	"
						light olive loamy sand, common	
-25	719					small gravels	"
-30	418					"	"
						variegated olive brown and grayish white fine gravelly sandy	
-35	585					loam	"
-40	1,165	1,310		< 25.0	< 25.0	"	"
						tan fine gravelly	
-45	1,143					sand	screen
						reddish brown gravelly sand,	
-50	521					moist	"
avg	**665**		**0**				

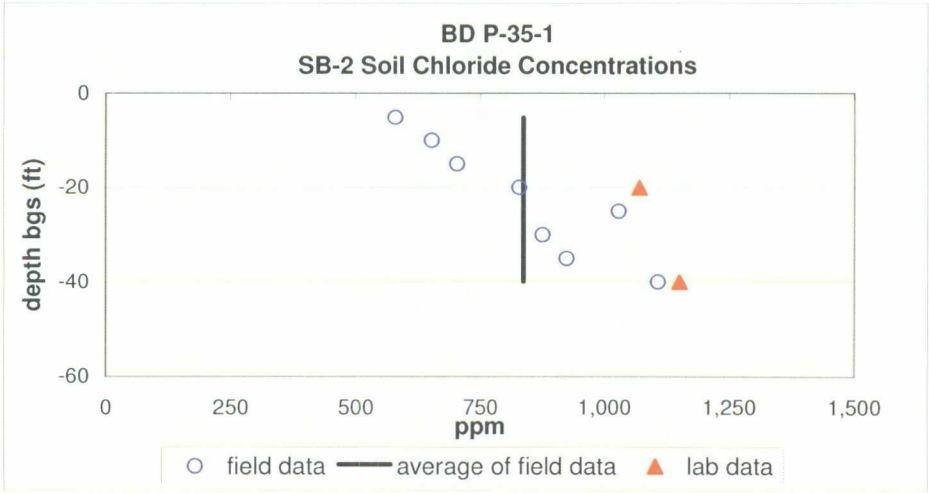


Appendix B1 – SB-1 soil boring log.

Soil Boring Log
Rice Operating Company
BD SWD System
BD P-35-1

Identification:	**SB-2**
Location:	Approx. 15 ft SSE of Rice marker
Date:	9/10/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	40 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	580					pale yellowish brown loamy sand
-10	653					pale olive brown loamy sand
-15	703					fine gravelly, pale olive brown loamy sand
-20	829	1,070				yellowish brown gravelly loamy sand
-25	1,028					"
-30	875					variegated white & reddish brown gravelly loamy sand
-35	924					"
-40	1,107	1,150				
avg	837					

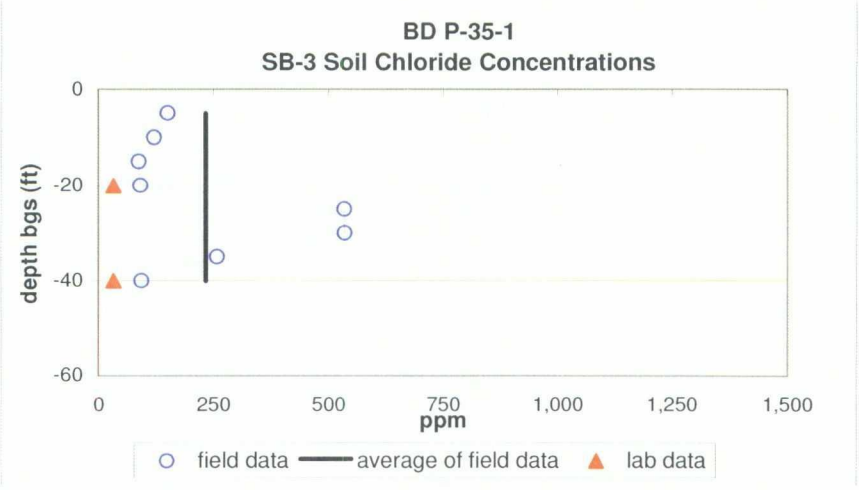


Appendix B2 – SB-2 soil boring log.

Soil Boring Log
Rice Operating Company
BD SWD System
BD P-35-1

Identification:	**SB-3**
Location:	Approx. 31 ft W of Rice marker
Date:	9/10/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	40 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	151					reddish brown loamy sand
-10	121					pale brown loamy sand
-15	88					light reddish brown, fine gravelly loamy sand
-20	91	32				gravelly reddish brown loamy sand
-25	534					pale brown, gravelly loamy sand
-30	535					"
-35	258					"
-40	94	32				"
avg	**234**					



Appendix B3 – SB-3 soil boring log.

CARDINAL LABORATORIES

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

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: JORDAN WOODFIN
122 W. TAYLOR
HOBBS, NM 88240

Receiving Date: 09/12/08
Reporting Date: 09/16/08
Project Number: NOT GIVEN
Project Name: BD JCT P-35-1
Project Location: BD JCT P-35-1

Sampling Date: 09/10/08
Sample Type: SOIl
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: AB

LAB NUMBER	SAMPLE ID	GRO (C_6-C_{10}) (mg/kg)	DRO (>C_{10}-C_{28}) (mg/kg)
ANALYSIS DATE		09/15/08	09/15/08
H15921-1	SB#1 @ 15FT	<25.0	<25.0
H15921-2	SB#1 @ 40FT	<25.0	<25.0
Quality Control		570	527
True Value QC		500	500
% Recovery		114	105
Relative Percent Difference		4.8	4.3

METHODS: TPH GRO & DRO EPA SW-846 8015 M

Chemist

09/16/08
Date

H15921 T RICE

Appendix C1 – Cardinal Laboratories soil petroleum hydrocarbon data

CARDINAL LABORATORIES

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

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: JORDAN WOODFIN
122 W. TAYLOR
HOBBS, NM 88240

Receiving Date: 09/12/08
Reporting Date: 09/16/08
Project Number: NOT GIVEN
Project Name: BD JCT P-35-1
Project Location: BD JCT P-35-1

Sampling Date: 09/10/08
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: HM

LAB NUMBER	SAMPLE ID	Cl* (mg/kg)
ANALYSIS DATE		09/15/08
H15921-1	SB#1 @ 15FT	192
H15921-2	SB#1 @ 40FT	1,310
H15921-3	SB#2 @ 20FT	1,680
H15921-4	SB#2 @ 40FT	1,150
H15921-5	SB#3 @ 20FT	32
H15921-6	SB#3 @ 40FT	32
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		2.0

METHODS: Cl: SM Methods 4500-ClB
*Analyses performed on 1:4 w:v aqueous extracts.

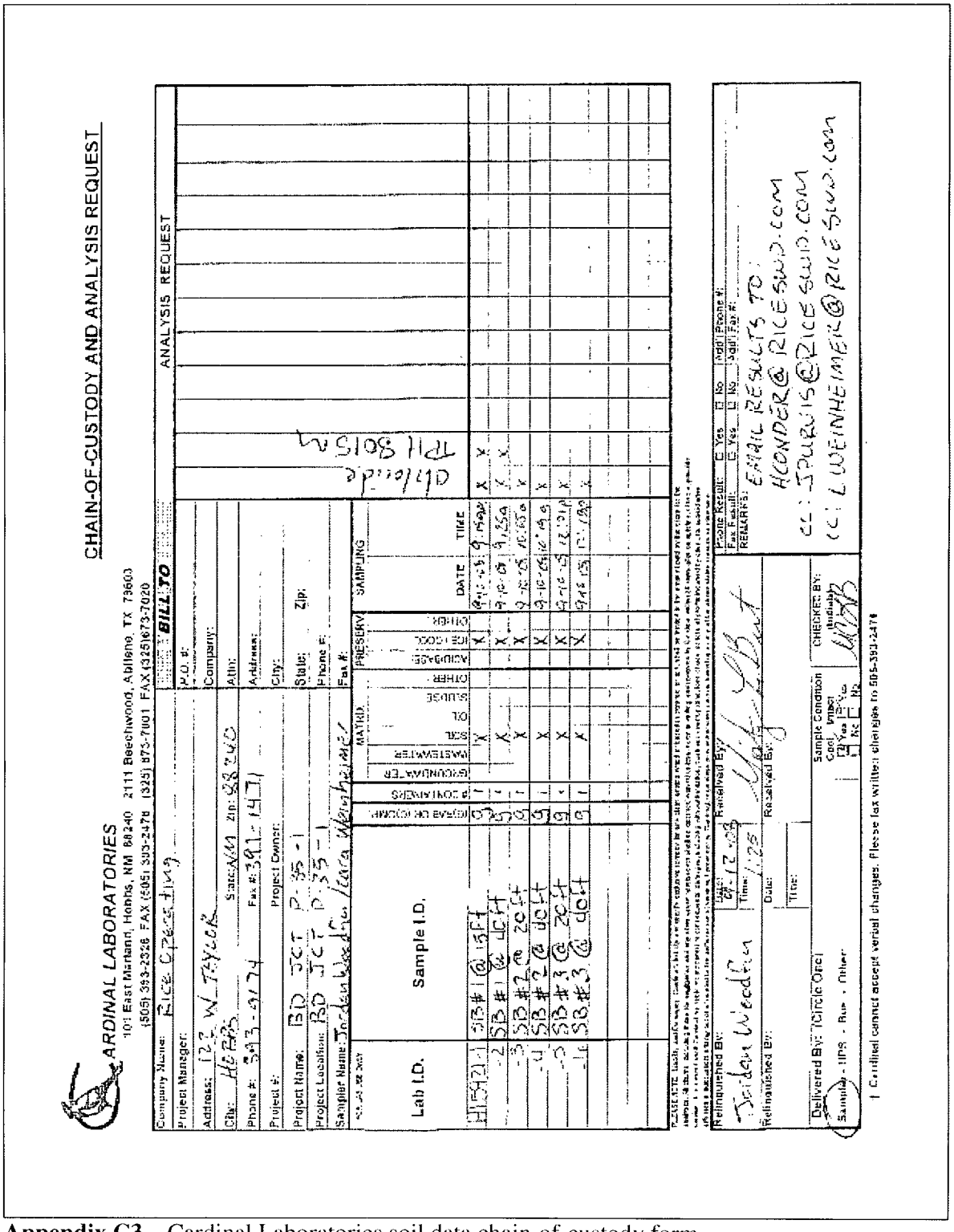
Chemist

09/16/08
Date

H15921 TCL RICE

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates, or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.

Appendix C2 – Cardinal Laboratories soil chloride data.



Appendix C3 – Cardinal Laboratories soil data chain-of-custody form.

CARDINAL LABORATORIES

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

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: HACK CONDER
122 W. TAYLOR STREET
HOBBS, NM 88240
FAX TO: (575) 397-1471

Receiving Date: 10/09/08
Reporting Date: 10/14/08
Project Number: NOT GIVEN
Project Name: BD JUNCTION P-35-1
Project Location: T25S-R37E-SEC35 P ~ LEA CO., NM

Sampling Date: 10/08/08
Sample Type: WATER
Sample Condition: COOL & INTACT
Sample Received By: Mt
Analyzed By: HM/TR

LAB NUMBE SAMPLE ID	Na (mg/L)	Ca (mg/L)	Mg (mg/L)	K (mg/L)	Conductivity (u S/cm)	T-Alkalinity ($mgCaCO_3$/L)
ANALYSIS DATE:	10/13/08	10/13/08	10/13/08	10/13/08	10/10/08	10/10/08
H16082-1 MONITOR WELL #1	242	94.6	68.0	7.4	1,900	288
Quality Control	NR	48.1	48.6	2.92	1,416	NR
True Value QC	NR	50.0	50.0	3.00	1,413	NR
% Recovery	NR	96.2	97.2	97.3	100	NR
Relative Percent Difference	NR	<0.1	4.8	3.0	0.2	NR
METHODS:		SM3500-Ca-D	3500-Mg E	8049	120.1	310.1

	Cl (mg/L)	SO_4 (mg/L)	CO_3 (mg/L)	HCO_3 (mg/L)	pH (s.u.)	TDS (mg/L)
ANALYSIS DATE:	10/10/08	10/13/08	10/10/08	10/10/08	10/10/08	10/10/08
H16082-1 MONITOR WELL #1	352	257	0	351	7.04	1,610
Quality Control	490	44.4	NR	986	7.09	NR
True Value QC	500	40.0	NR	1000	7.00	NR
% Recovery	98.0	111	NR	98.6	101	NR
Relative Percent Difference	2.0	1.1	NR	<0.1	1.3	NR
METHODS:	SM4500-Cl-B	375.4	310.1	310.1	150.1	160.1

Chemist

10-16-08
Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages, including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.

Appendix C4 – Cardinal Laboratories monitor well data – inorganics.

CARDINAL LABORATORIES

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

ANALYTICAL RESULTS FOR
RICE OPERATING COMPANY
ATTN: HACK CONDER
122 W. TAYLOR
HOBBS, NM 88240
FAX TO: (575) 397-1471

Receiving Date: 10/09/08
Reporting Date: 10/13/08
Project Number: NOT GIVEN
Project Name: BD JUNCTION P-35-1
Project Location: T25S-R37E-SEC35 P ~ LEA CO., NM

Sampling Date: 10/08/08
Sample Type: WATER
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: ZL

LAB NUMBER	SAMPLE ID	BENZENE (mg/L)	TOLUENE (mg/L)	ETHYL BENZENE (mg/L)	TOTAL XYLENES (mg/L)
ANALYSIS DATE		10/10/08	10/10/08	10/10/08	10/10/08
H16082-1	MONITOR WELL #1	<0.001	<0.001	<0.001	<0.003
Quality Control		0.051	0.053	0.050	0.158
True Value QC		0.050	0.050	0.050	0.150
% Recovery		102	106	100	105
Relative Percent Difference		0.8	0.4	1.6	1.3

METHOD: EPA SW-846 8021B

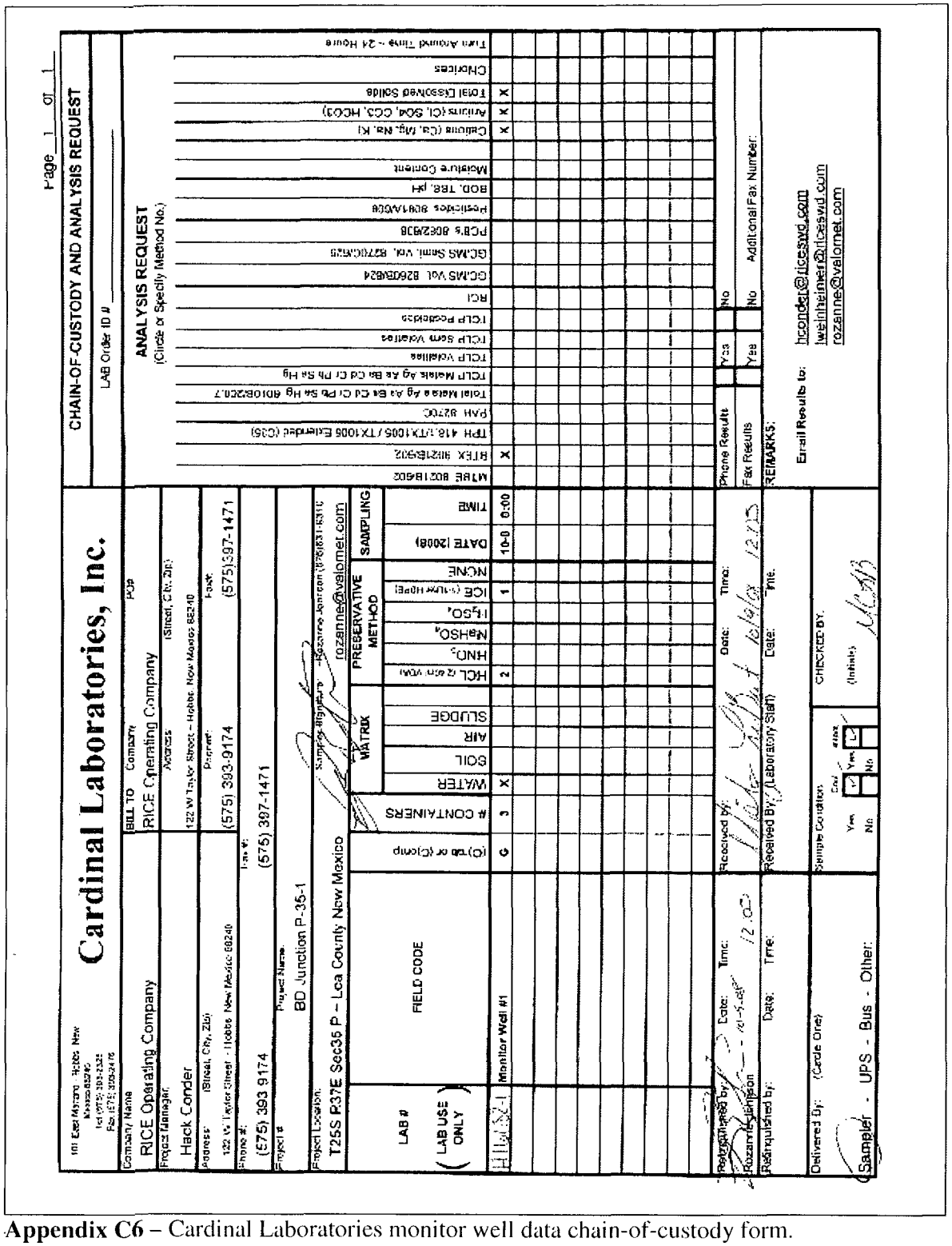
TEXAS NELAP CERTIFICATION T104704398-08-TX FOR BENZENE, TOLUENE, ETHYL BENZENE, AND TOTAL XYLENES.

Chemist

10/13/08
Date

PLEASE NOTE: Liability and Damages. Cardinal's liability and client's exclusive remedy for any claim arising, whether based in contract or tort, shall be limited to the amount paid by client for analyses. All claims, including those for negligence and any other cause whatsoever shall be deemed waived unless made in writing and received by Cardinal within thirty (30) days after completion of the applicable service. In no event shall Cardinal be liable for incidental or consequential damages including, without limitation, business interruptions, loss of use, or loss of profits incurred by client, its subsidiaries, affiliates or successors arising out of or related to the performance of services hereunder by Cardinal, regardless of whether such claim is based upon any of the above-stated reasons or otherwise. Results relate only to the samples identified above. This report shall not be reproduced except in full with written approval of Cardinal Laboratories.

Appendix C5 – Cardinal Laboratories monitor well data – petroleum hydrocarbons.



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Cardinal Laboratories, Inc.

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

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

LAB Order ID #

Company Name: RICE Operating Company
Project Manager: Hack Conder
Address: 122 W Taylor Street - Hobbs, New Mexico 88240
Phone #: (575) 393-9174
Fax #: (575) 397-1471
Project #:
Project Name: BD Junction P-35-1
Project Location: T25S R37E Sec35 P – Lea County New Mexico
Sampler Signature:

BILL TO: Company: RICE Operating Company; P.O.#:
Address: 122 W Taylor Street – Hobbs, New Mexico 88240
Phone: (575) 393-9174
Fax #: (575) 397-1471
Reserve Jennifer (575)631-6310 rozanne@valornet.com

ANALYSIS REQUEST (Circle or Specify Method No.)

LAB # (LAB USE ONLY)	FIELD CODE	(G)rab or (C)omp	# CONTAINERS	MATRIX: WATER	SOIL	AIR	SLUDGE	PRESERVATIVE METHOD: HCL (Conc. VOA)	HNO3	NaHSO4	H2SO4	ICE (Custody Seal)	NONE	SAMPLING: DATE (2008)	TIME	MTBE 8021B/8260	BTEX 8021B/8260	TPH 418.1/TX1005 / TX1005 Extended (C35)	PAH 8270C	Total Metals Ag As Ba Cd Cr Pb Se Hg 6010B/200.7	TCLP Metals Ag As Ba Cd Cr Pb Se Hg	TCLP Volatiles	TCLP Semi Volatiles	TCLP Pesticides	RCI	GC/MS Vol. 8260B/624	GC/MS Semi. Vol. 8270C/625	PCB's 8082/608	Pesticides 8081A/608	BOD, TSS, pH	Moisture Content	Chlorides (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	Total Dissolved Solids	Chlorides	Turn Around Time - 24 Hours
H18432-1	Monitor Well #1	G	3	X				2				1		10-0	6:00																	X	X	X	

Relinquished by: Date: Time: Received by: Date: Time:
Rozanne Jennison 12.03
Relinquished by: Date: Time: Received by: (Laboratory Staff) Date: Time:

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

Sample Condition: Cool: Yes / No; Intact: Yes / No
CHECKED BY: (Initials)

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

REMARKS:

Email Results to: hconder@riceswd.com; lweinheimer@riceswd.com; rozanne@valornet.com

Appendix C6 – Cardinal Laboratories monitor well data chain-of-custody form.

Appendix D – Harrison and Cooper completing MW-1.