1R - 427-06

REPORTS

DATE:

April 8, 2009

L. Peter Galusky, Jr. Ph.D., P.G.

Texerra

505 N Big Spring, Suite 404 Midland, Texas 79701
Tel: 432-634-9257 E-mail: lpg@texerra.com

April 8th, 2009

Mr. Brad Jones
New Mexico Energy, Minerals, & Natural Resources
Oil Conservation Division, Environmental Bureau
1220 S. St. Francis Drive
Santa Fe, New Mexico 87504

RE: Submittal of **ICP Reports and Termination Requests** for **NMOCD Case Nos. 1R426-117** (BD Oxy Owen A), **1R426-150** (BD P-35-1), **1R427-181** (EME Phillips B EOL) and **1R427-06** (EME O-19 Jct)

Sent via E-mail and Certified Mail/Return Receipt No. 7006 0100 0001 2438 3951

Dear Mr. Jones:

Please find enclosed Investigation and Characterization Reports and Termination Requests for the above-referenced projects.

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

We appreciate your review consideration of these remediation termination requests.

Sincerely,

L. Peter Galusky, Jr. Ph.D.
Principal

Cc: Rice Operating Company, Edward Hansen (NMOCD)

Investigation and Characterization Report and Termination Request
Rice Operating Company – EME SWD System
O-19 Jct
UL O Sec 19 T 20S R 37E
NMOCD Case Number: 1R427-06

April 7th, 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

Investigation and Characterization Report and Termination Request

O-19 Jct
UL O Sec 19 T 20S R 37E
NMOCD Case Number: 1R427-06

Executive Summary

This report summarizes the findings of investigative work prescribed in the NMOCD approved Investigation and Characterization Plan for this site.

Rice Operating Company removed a junction box at this location in March of 2003 as part of its facility maintenance and upgrade program. The wood junction box was removed and soils were sampled using a backhoe, creating a 10 by 10 by 12 ft deep excavation. A one foot thick compacted clay barrier was installed at the bottom of the excavation which was backfilled with the excavated soil to ground level. The disturbed surface was then seeded with a native vegetation mix. Preliminary site investigation associated with the junction box replacement found elevated soil chloride and petroleum hydrocarbon concentrations.

The field investigation was completed on September 9th, 2008. Seven soil borings were advanced near and around the location of the former junction box to depths of 20 ft bgs where the water table capillary fringe was encountered. Soil chloride concentrations averaged 300 ppm throughout the depth of drilling among all soil bores. Soil petroleum hydrocarbons were insignificant. The ground surface surrounding the former junction box has become restored to natural prairie grasses and associated vegetation.

A simple soil chloride transport and groundwater dilution model was developed to estimate the potential effect of residual soil chloride leaching into groundwater. The model predicted that maximum anticipated elevation of groundwater chlorides caused by the movement of residual soil chlorides is less than 200 ppm, indicating that residual soil chlorides should not represent a hazard to groundwater quality.

Given that there are no apparent risks of groundwater contamination from this former junction box and that surface/ecological impacts are negligible, it is therefore requested that NMOCD grant Rice Operating Company a "remediation termination" or similar closure status for this project.

Investigation and Characterization Report and Termination Request

O-19 Jct
UL O Sec 19 T 20S R 37E
NMOCD Case Number: 1R427-06

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).

The site is located approximately five miles south/southwest of Monument, New Mexico (Figures 1&2). The topography is gently sloping toward the southeast. Soils on the site are characterized in the Lea County Soil Survey as deep and sandy. NM OSE records indicate that groundwater is likely to be encountered at a depth of 23+/- feet in unconsolidated Tertiary alluvium of the Ogallala Formation.

Rice Operating Company removed this junction box in March of 2003 as part of its facility maintenance and upgrade program. The wood junction box was removed and soils were sampled using a backhoe, creating a 10 by 10 by 12 ft deep excavation. A one foot thick compacted clay barrier was installed at the bottom of the excavation which was backfilled with the excavated soil to ground level. The disturbed surface was then seeded with a native vegetation mix

Significant concentrations (approx. 2,000 +/- ppm) of diesel range organics (DRO) were encountered in the excavated soil with a lower concentration found (334 ppm) at 12 ft below ground surface (bgs). Chloride concentrations increased with depth to a value of 1,150 ppm at 12 ft bgs. Petroleum hydrocarbons and chlorides thus represent the constituents of concern. 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 9th, 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 – EME O-19 Jct location map on USGS topo base.

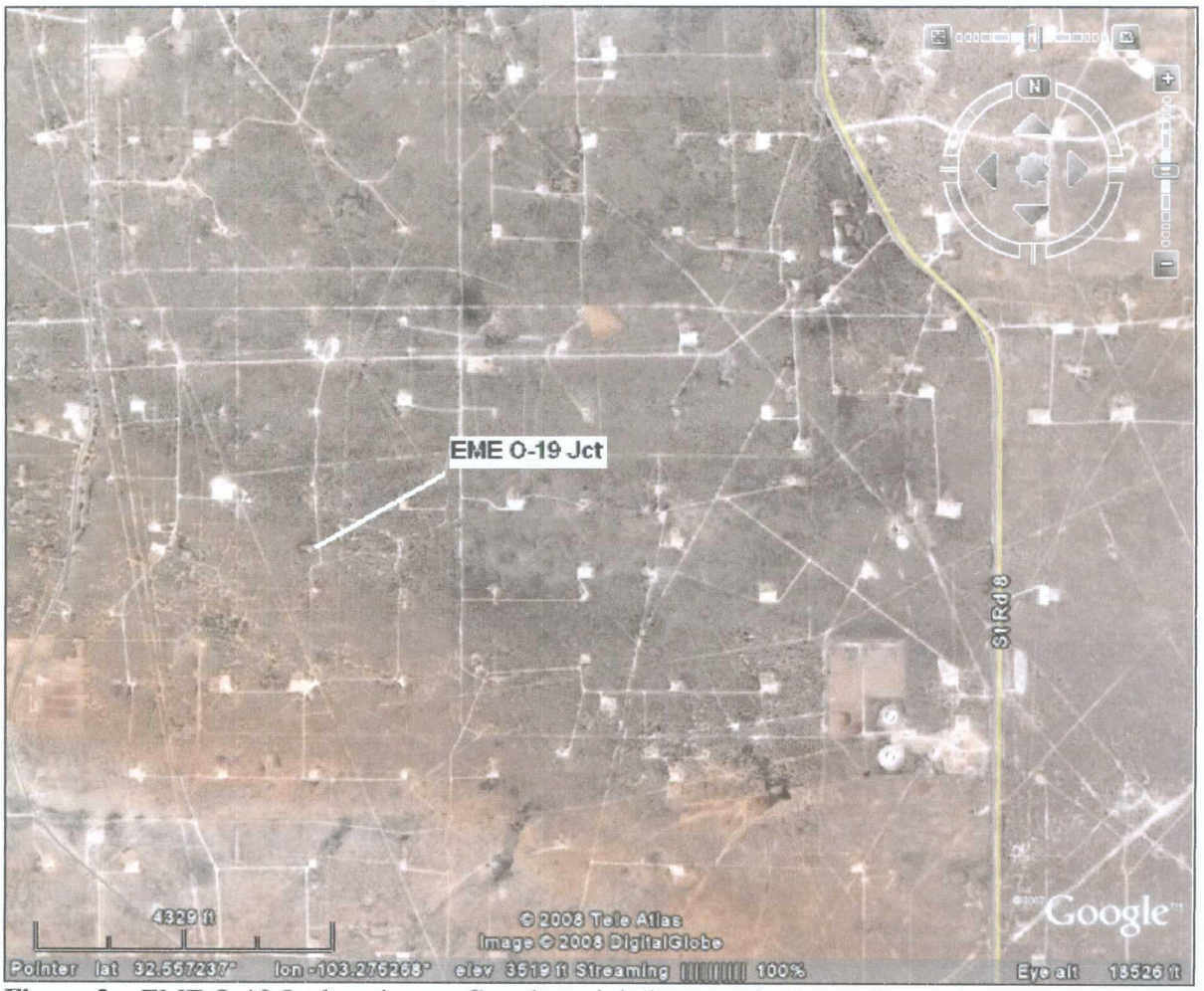


Figure 2 – EME O-19 Jct location on Google aerial photograph (date unknown).

Results and Discussion

Seven soil borings were advanced near and around the location of the former junction box to depths of 20 ft bgs where the water table capillary fringe was encountered (Figure 3). Soil chloride concentrations averaged 300 ppm throughout the depth of drilling among all soil bores (Figures 3 & 4). The total mass of residual soil chlorides at this location was estimated to be 2,667 lbs (Figure 5). Soil petroleum hydrocarbons were insignificant (below 1.0 ppm by PID and below laboratory detection; Appendices B & C).

In order to determine if the residual soil chlorides represent a potential hazard to down gradient groundwater, a simple soil chloride transport and groundwater dilution model (Figures 6 & 7) was developed to estimate the potential effects on groundwater quality 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 under 200 ppm (Figure 8), indicating that residual soil chlorides should not represent a hazard to groundwater quality.

The ground surface surrounding the former junction box has become restored to natural prairie grasses and associated vegetation (See cover photo and Appendix D).

Given that there are no apparent risks of groundwater contamination from this former junction box and that surface/ecological impacts are negligible, it is therefore requested that NMOCD grant Rice Operating Company a "remediation termination" or similar closure status for this project.

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

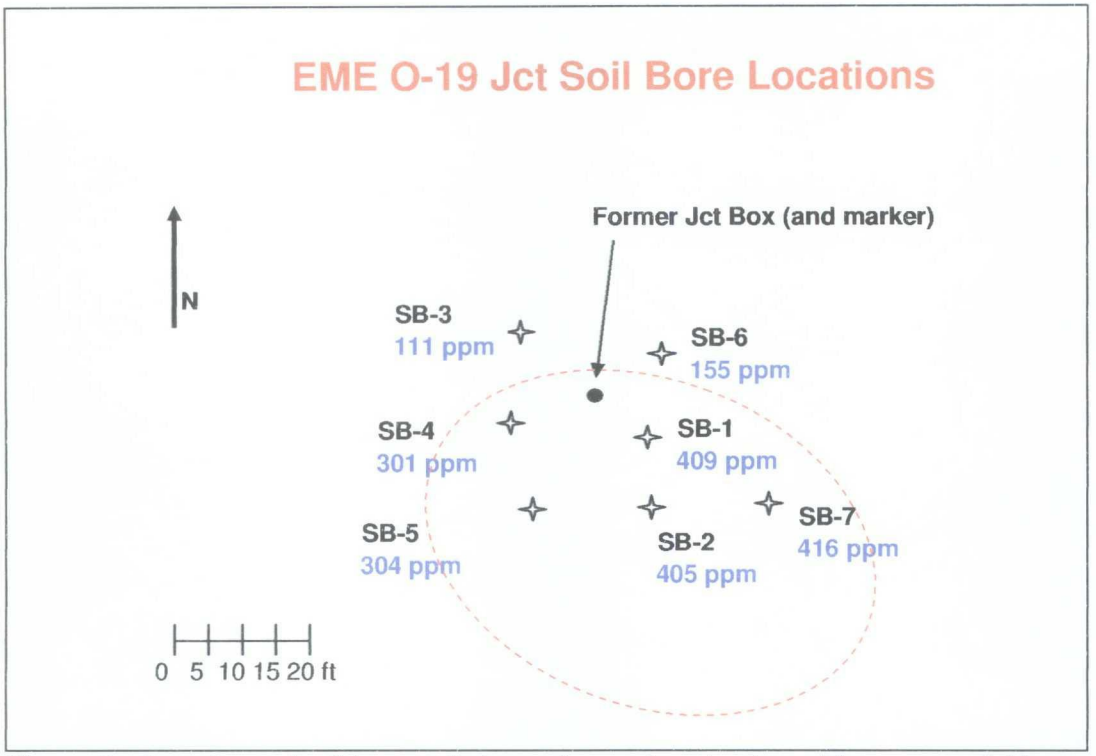


Figure 3 – Locations of soil bores relative to former junction box. The average field-measured, soil chloride concentrations are given for depths 0 to 20 ft bgs. The average soil chloride concentration among all borings and depths was 300 ppm. The dashed, red ellipse approximates the area encompassing average soil chloride concentrations greater than 250 ppm.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**Avg of SB-1 through SB-7**
Location:	
Date:	9/9/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	126		14			pale brown fine sand
-10	151		6			"
-15	514	467	1	< 25.0	< 25.0	light brownish gray silt
-20	409		6			light brownish gray sand, moist
avg	300		7			

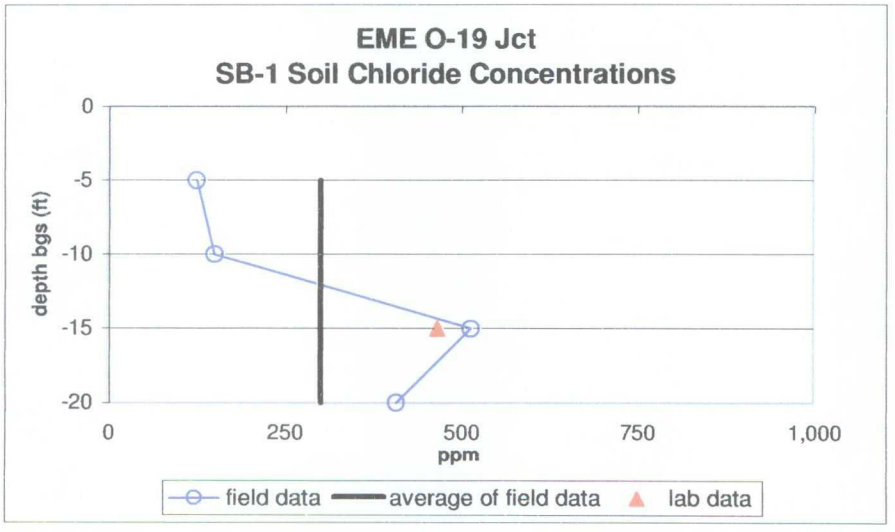


Figure 4 – Average soil chloride and petroleum hydrocarbon concentrations from seven soil borings taken at/near the former junction box location.

Soil Chloride Calculator		
Estimates Mass of Soil Chloride, based upon Soil Chloride Concentration		
Rice Operating Company		
Site:	**EME O-19 Jct**	
This estimate prepared by:	L. Peter Galusky, Jr.	
Date:	4/1/2009	
Inputs in Blue Font		
length of affected area (ft)		50
width of affected area (ft)		80
affected area (sq ft)		4,000
affected depth (ft)		20
depth to water table (ft)		20
avg Cl- conc of affected soil (ppm)		300
unsat zone mass density (lbs/cu yd)		3,000
volume of affected soil (cu yds)		2,963
total mass of affected soils (lbs)		8,888,889
mass of residual soil chloride (lbs)		2,667

Figure 5 - Estimation of residual soil chloride mass.

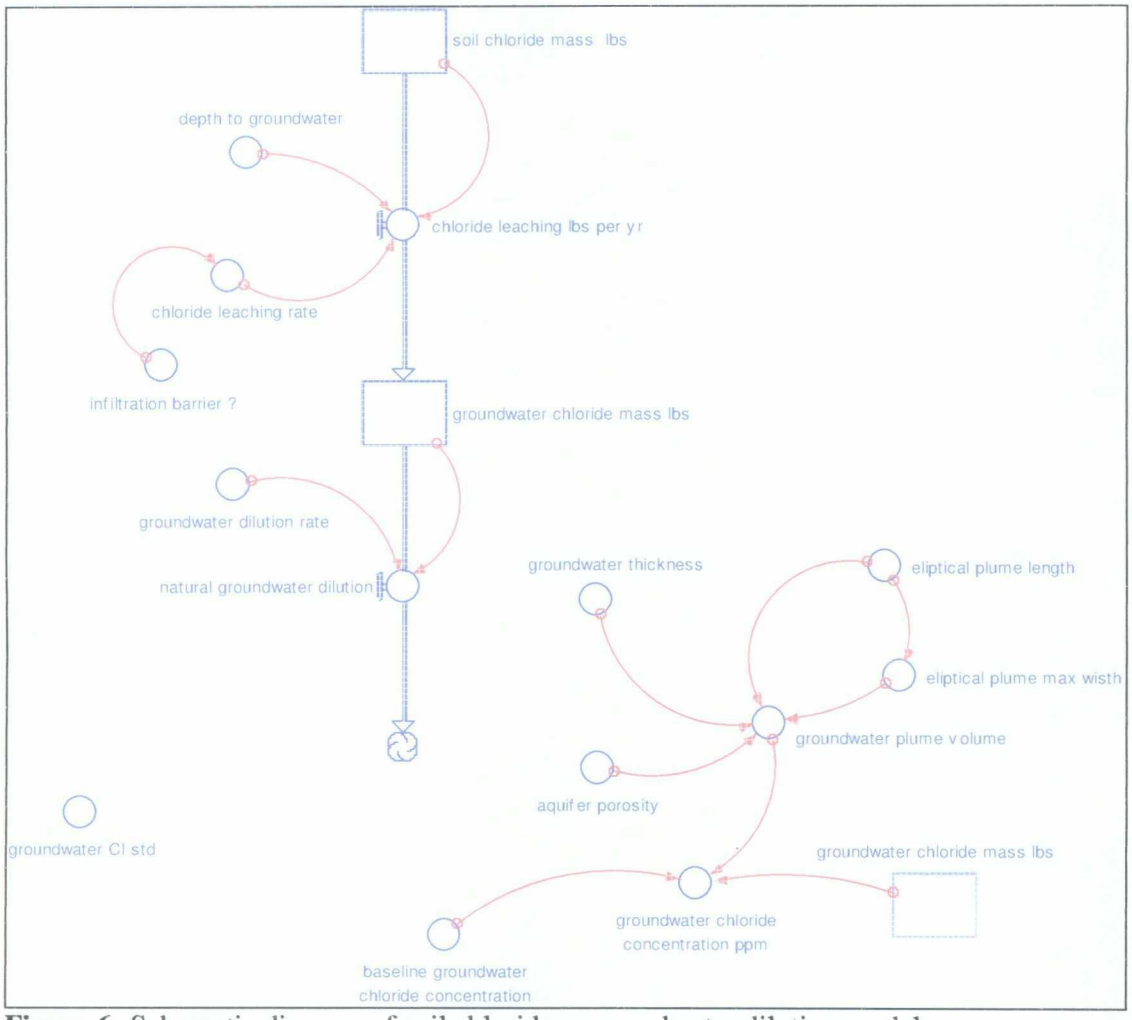


Figure 6- Schematic diagram of soil chloride – groundwater dilution model.

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 = 2667

OUTFLOWS:
chloride_leaching_lbs_per_yr = (chloride_leaching_rate/depth_to_groundwater)*soil_chloride_mass__lbs
aquifer_porosity = 0.33
baseline_groundwater_chloride_concentration = 0
chloride_leaching_rate = IF(infiltration_barrier_?=0) THEN 2.0 ELSE 2.0/20
depth_to_groundwater = 20
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 = 0.1
groundwater_plume_volume = (3.14*(eliptical_plume_length/2)*(eliptical_plume_max_wisth/2)*groundwater_thickness)*aquifer_porosity
groundwater_thickness = 15
infiltration_barrier_? = 0

Figure 7 – Model equations and parameter values for soil chloride – groundwater dilution model.

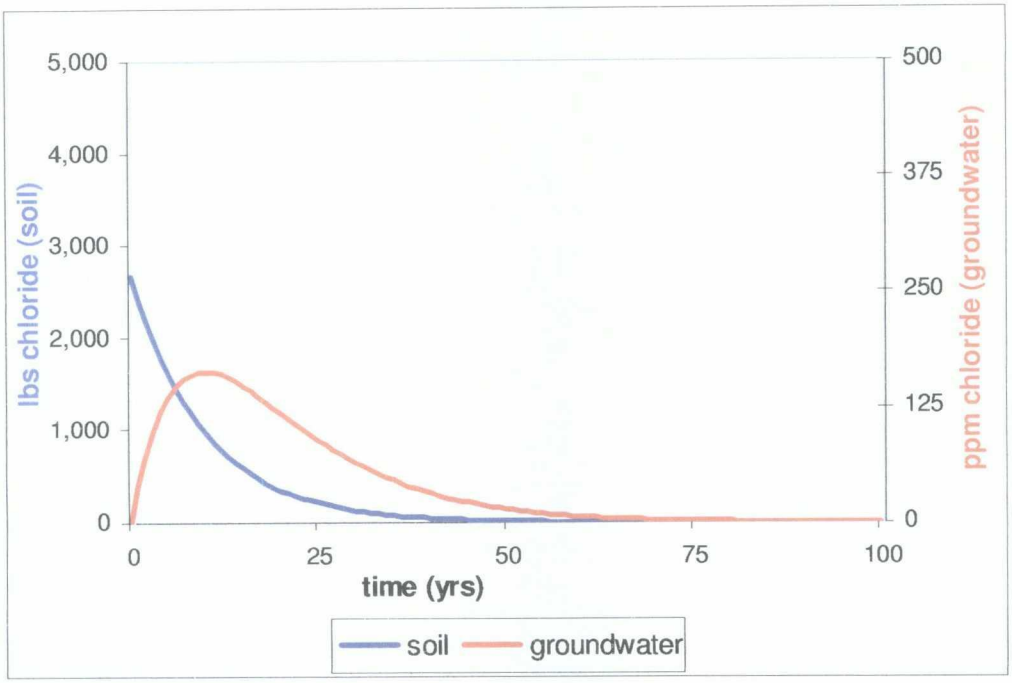


Figure 8 – Estimated change in baseline groundwater chloride concentrations (right axes) over time.

APPENDICES

- Appendix A - NMOCD approval of Investigation and Characterization Plan
- Appendix B – Soil bore descriptions and analytical data
- Appendix C - Laboratory data
- Appendix D – Photographs

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" <edward.j.hansen@state.nm.us>

To: "Jack Conder" <jconder@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.

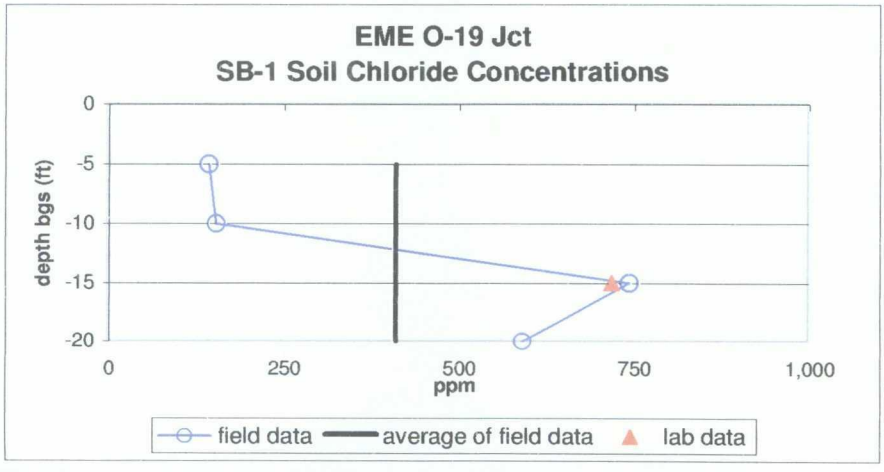
Also, please be advised that NMOCD approval of these plans does not relieve the owner/operator of responsibility should operations pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD approval does not relieve the owner/operator of responsibility for compliance 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
EME SWD System
EME O-19 Jct

Identification:	**SB-1**
Location:	Approx. 9 ft SE of Rice marker
Date:	9/9/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	145		45.2			pale brown fine sand
-10	155		19.8			"
-15	745	720	4.8	< 25.0	< 25.0	light brownish gray silt
-20	592		3.7			light brownish gray sand, moist
avg	409		18			

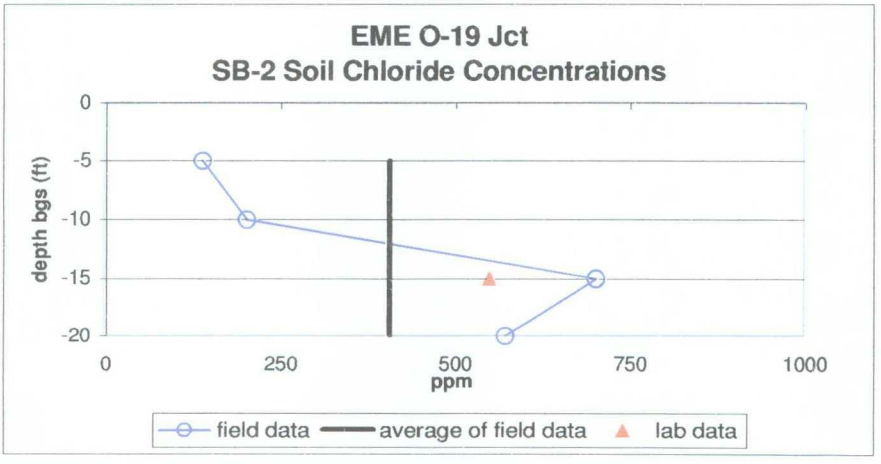


Appendix B1 – Soil boring SB-1 cuttings descriptions and analytical data.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**SB-2**
Location:	Approx. 22 ft SE of Rice marker
Date:	9/9/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	140		3.0			pale brown fine sand
-10	203		0.0			pale brown sand
-15	703	550	0.2	< 25.0	< 25.0	variegated white & very pale prown silt
-20	573		33.3			variegated light gray and brown fine sandy loam, moist
avg	405		9			

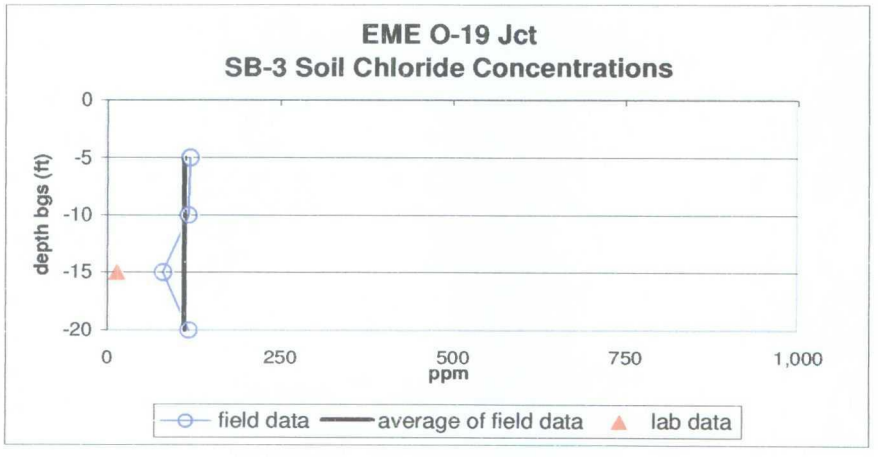


Appendix B2 – Soil boring SB-2 cuttings descriptions and analytical data.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**SB-3**
Location:	Approx. 16 ft NW of Rice marker
Date:	9/9/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	122		3.9			pale olive brown fine sand
-10	120		0.0			"
-15	83	16	0.0	< 25.0	< 25.0	variegated white & very pale brown silt
-20	120		0.0			variegated light gray and brown fine sandy loam, moist
avg	111		1			

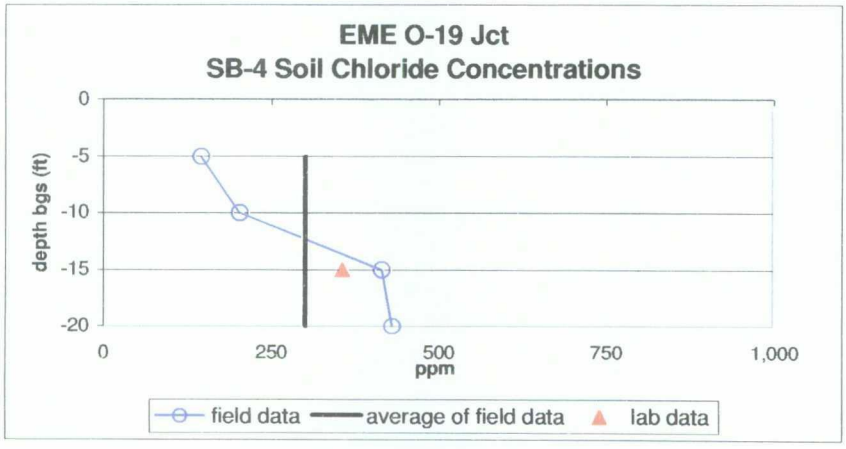


Appendix B3 – Soil boring SB-3 cuttings descriptions and analytical data.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**SB-4**
Location:	Approx. 14 ft WSW of Rice marker
Date:	9/9/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	148		0.0			pale brownish gray fine sand
-10	205		0.7			pale brownish gray fine sandy loam
-15	417	358	0.0	< 25.0	< 25.0	pale brownish gray fine sand
-20	433		0.0			light olive gray sandy loam
avg	301		0			

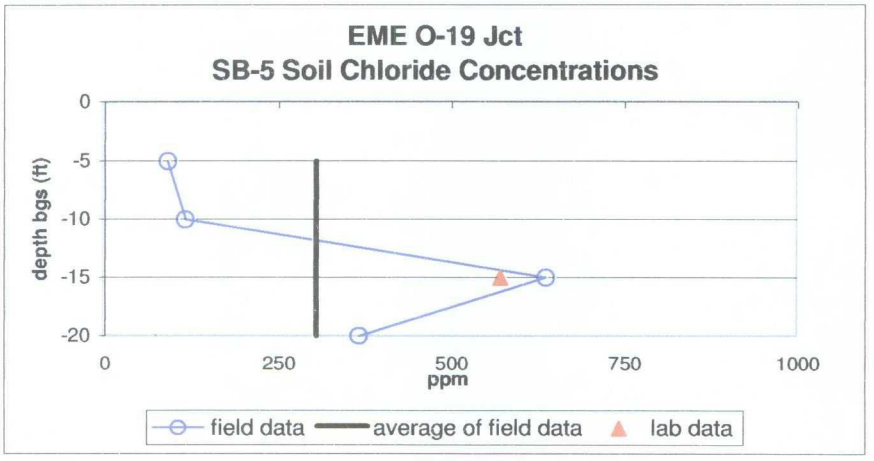


Appendix B4 – Soil boring SB-4 cuttings descriptions and analytical data.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**SB-5**
Location:	Approx. 26 ft SW Rice marker
Date:	9/8/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	92		0.0			pale brown fine sand
-10	118		0.0			very pale brown fine sand
-15	638	572	0.0	< 25.0	< 25.0	"
-20	368		0.0			light olive brown fine gravelly fine sandy loam
avg	304		0			

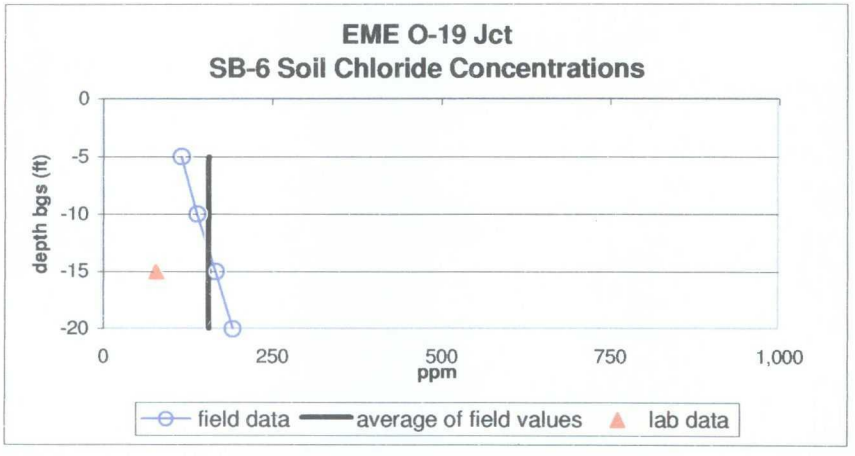


Appendix B5 – Soil boring SB-5 cuttings descriptions and analytical data.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**SB-6**
Location:	Approx. 11 ft ENE of Rice marker
Date:	9/8/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	118		0.0			pale brown fine sand
-10	141		0.0			"
-15	168	80	0.0	< 25.0	< 25.0	light olive brown fine loamy sand
-20	193		0.0			light olive brown fine sandy loam w/ iron concretions
avg	155		0			

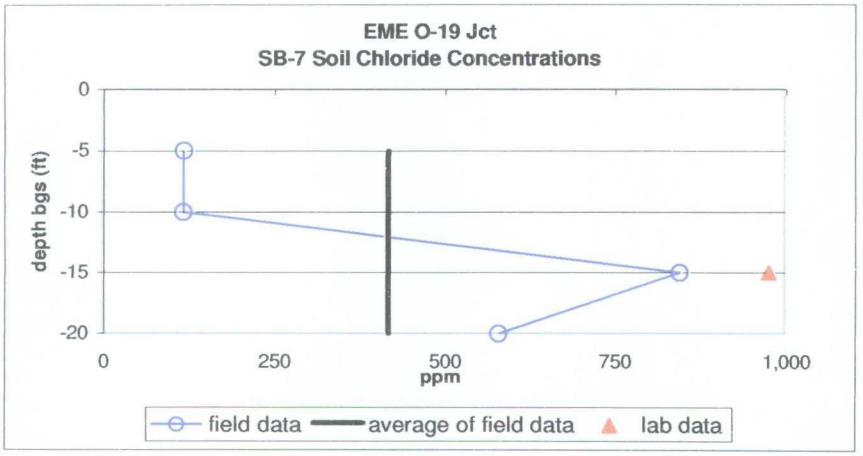


Appendix B6 – Soil boring SB-6 cuttings descriptions and analytical data.

Soil Boring Log
Rice Operating Company
EME SWD System
EME O-19 Jct

Identification:	**SB-7**
Location:	Approx. 24 ft ESE of Rice marker
Date:	9/8/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	20 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
0						
-5	120		45.2			pale brown fine sand
-10	118		19.8			very pale brown fine sand
-15	846	976	4.8	< 25.0	< 25.0	light olive brown fine sandy loam w/ iron concretions
-20	581		3.7			"
avg	416		18			



Appendix B7 – Soil boring SB-7 cuttings descriptions and analytical data.

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

Receiving Date: 09/12/08
Reporting Date: 09/16/08
Project Number: NOT GIVEN
Project Name: EME JCT. O-19
Project Location: EME JCT O-19

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

LAB NUMBER	SAMPLE ID	GRO (C_6-C_{10}) (mg/kg)	DRO (>C_{10}-C_{28}) (mg/kg)	Cl* (mg/kg)
ANALYSIS DATE		09/16/08	09/16/08	09/15/08
H15922-1	SB#1 @ 15'	<25.0	<25.0	704
H15922-2	SB#2 @ 15'	<25.0	<25.0	832
H15922-3	SB#3 @ 15'	<25.0	<25.0	16
H15922-4	SB#4 @ 15'	<25.0	<25.0	352
H15922-5	SB#5 @ 15'	<25.0	<25.0	624
H15922-6	SB#3 @ 15'	<25.0	<25.0	80
H15922-7	SB#7 @ 15'	<25.0	<25.0	976
Quality Control		570	527	500
True Value QC		500	500	500
% Recovery		114	105	100
Relative Percent Difference		4.8	4.3	2.0

METHODS: TPH GRO & DRO: EPA SW-846 8015 M; Cl: Std. Methods 4500-Cl B
*Analyses performed on 1:4 w:v aqueous extracts

Chemist

09/16/08
Date

H15922 TCL RICE

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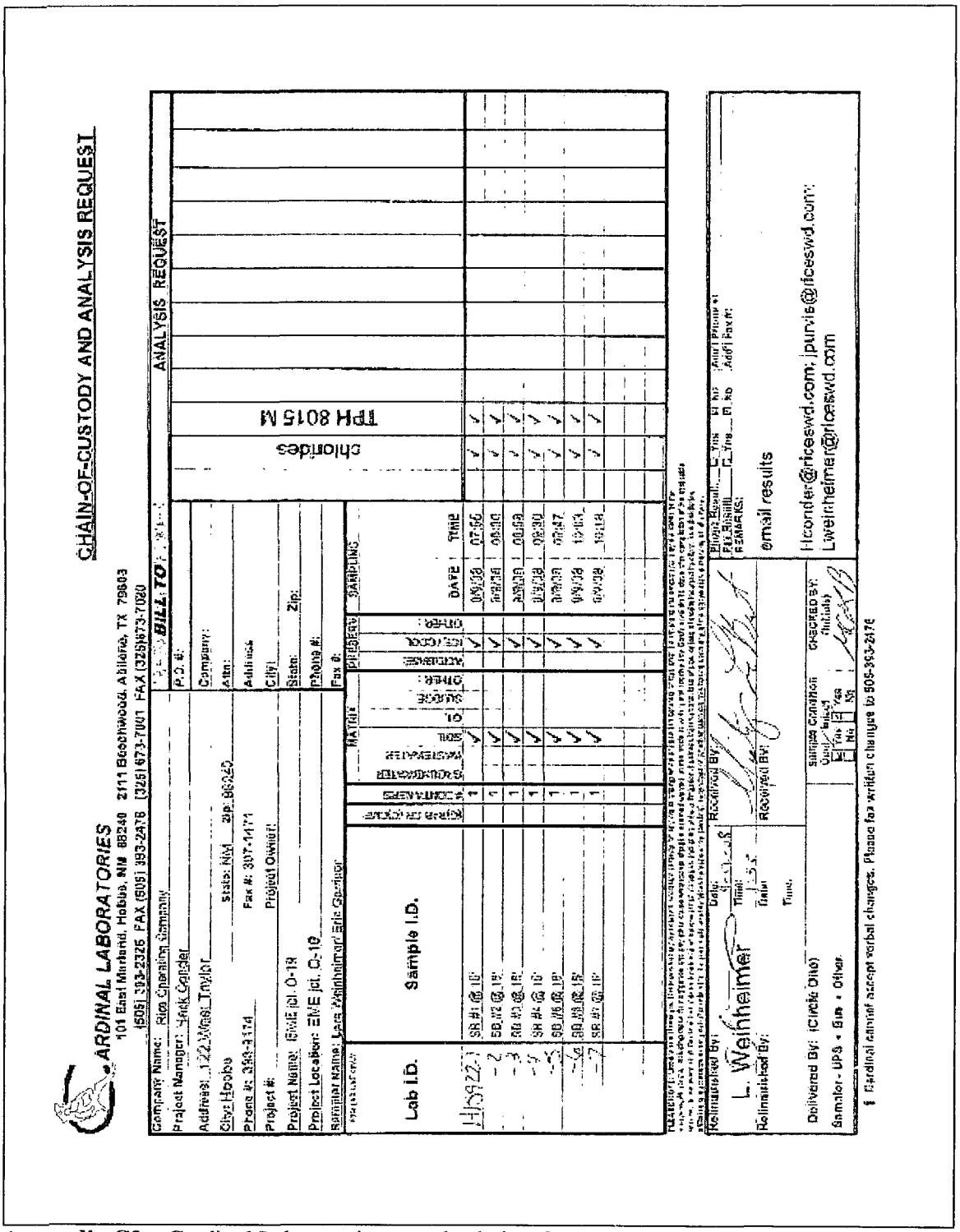
Appendix C1 – Cardinal Laboratories soil analysis data



Appendix C2 – Cardinal Laboratories sample chain-of-custody form.

Appendix D1 – View toward NW drilling SB-1.

Appendix D2 – View looking SE toward SB-2 (staked).

Appendix D3 – View looking SW toward SB-5 (staked).