1R - 488

WORKPLANS

DATE:

10-16-09

Vmail
Alumni e-mail for life

L. Peter Galusky Jr. <lpgalusky@alumni.virginia.edu>

NMOCD Case No. 1R488 - ABO F-31 SWD for Vanguard Natural Resources LLC

L Peter Galusky Jr @ Texerra <lpg.texerra@gmail.com> **Fri, Oct 16, 2009 at 2:32 PM**
To: "Edward J. Hansen" <edwardj.hansen@state.nm.us>
Cc: Britt Pence <bpence@vnrllc.com>

Dear Edward,

Please find attached in.pdf format a proposed Corrective Action Plan for the above referenced project. A hard copy will follow via certified U.S. mail w/ return receipt no. 7007 0710 0003 0305 3774.

Please address all correspondence concerning this project to Mr. Britt Spence of Vanguard Natural Resources at the following address:

Vanguard Natural Resources LLC
7700 San Felipe, Suite 485
Houston, TX 77063

Tel: 832-327-2252.
E-mail: bpence@vnrllc.com

Thank you for your consideration.

Sincerely,

Pete G.

L. Peter Galusky, Jr. Ph.D.
Texerra
505 N Big Spring Suite 404
Midland, TX 79707
E-mail: lpg@texerra.com
Cell: 432-634-9257
Web: www.texerra.com

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ABO F-31 ICP report and CAP 10-16-09b lpg.pdf
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Investigation and Characterization Report and Corrective Action Plan

ABO F-31 SWD

UL F Sec 31 T 16S R 37E
NMOCD Case Number: 1R488

October 16th, 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 Corrective Action Plan

ABO F-31 SWD
UL F Sec 31 T 16S R 37E
NMOCD Case Number: 1R488

Executive Summary

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 May 16th, 2008. The objective of the ICP was 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 field investigation was completed during October 2008.

The footprint of past activities and soil investigation encompasses an area of approximately one acre. Soil chloride concentrations averaged less than 500 ppm near the surface and declined to approximately 300 ppm near the water table capillary fringe at 90 ft bgs. Soil petroleum hydrocarbons were found to be insignificant during this investigation. The estimated thickness of the unsaturated zone (the depth to the water table) is 90+/- ft.

The relatively low concentrations of residual chlorides and the large depth to groundwater indicate that groundwater should not be affected down-gradient of the subject site. Nevertheless, the ground surface remains to be restored to original conditions. Therefore, the proposed Corrective Action Plan entails the ecological restoration of the ground surface.

Investigation and Characterization Report and Corrective Action Plan

ABO F-31 SWD
UL F Sec 31 T 16S R 37E
NMOCD Case Number: 1R488

Contents

Background

The ABO F-31 SWD site had been an active terminal facility for the ABO SWD system with tanks, pumps and a well to facilitate produced water disposal. The SWD well at this location operated until 2005, when it was plugged and abandoned. An emergency overflow pit associated with the facility was closed and restored to natural grade in December, 2001[1], and this work was approved by NMOCD on December 3rd, 2004.

The site is located approximately 3.5 miles southeast of Lovington, New Mexico on the east side of NM 18 in Lea County (Figures 1 & 2). The topography is gently sloping toward the southeast. Soils on the site belong to Kimbrough-Lea soil association[2]. These are characterized as nearly level and gently sloping, gravelly and loamy soils that are very shallow to moderately deep to indurated caliche. Groundwater occurs at a depth of approximately 90+ ft, in unconsolidated Tertiary alluvium of the Ogallala Formation[3].

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 May 16th, 2008; (a copy of e-mail approval is given in the Appendix).

Objective, Scope and Methodology

The objective of the ICP was 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 encompassed the measured effects of past operations of the ABO F-31 SWD 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 and **d**- analyzing the data using graphical and statistical methods.

The field investigation was completed over the course of two days, October 20th and 21st, 2008. Harrison and Cooper, Inc. provided drilling services and Rice Operating Company personnel performed field chloride titrations and PID analyses. Confirmatory laboratory analyses were subsequently performed by Cardinal Laboratories. The area of investigation and approximate locations of soil borings is given in Figure 3.

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[1] This work was directed and supervised by Whole Earth Environmental, per their Pit Closure Report of January 24, 2002.

[2] USDA SCS. Soil Survey of Lea County, New Mexico. Issued January, 1974.

[3] New Mexico Bureau of Geology & Mineral Resources. 1982. Circular 175 – Western extent of the Ogallala Formation in New Mexico.

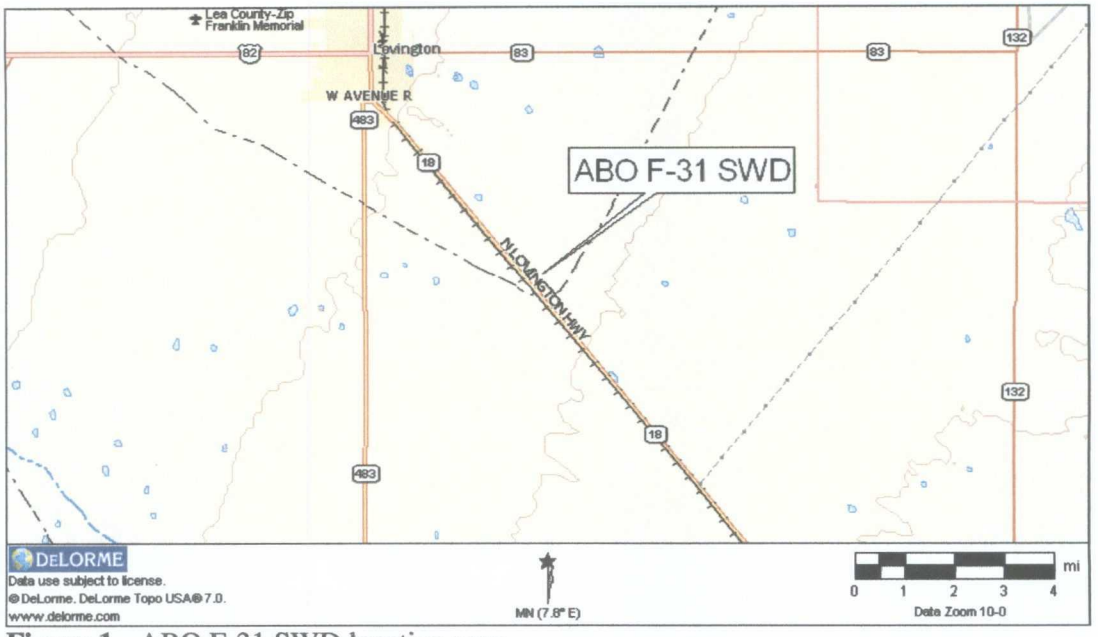


Figure 1 - ABO F-31 SWD location map.

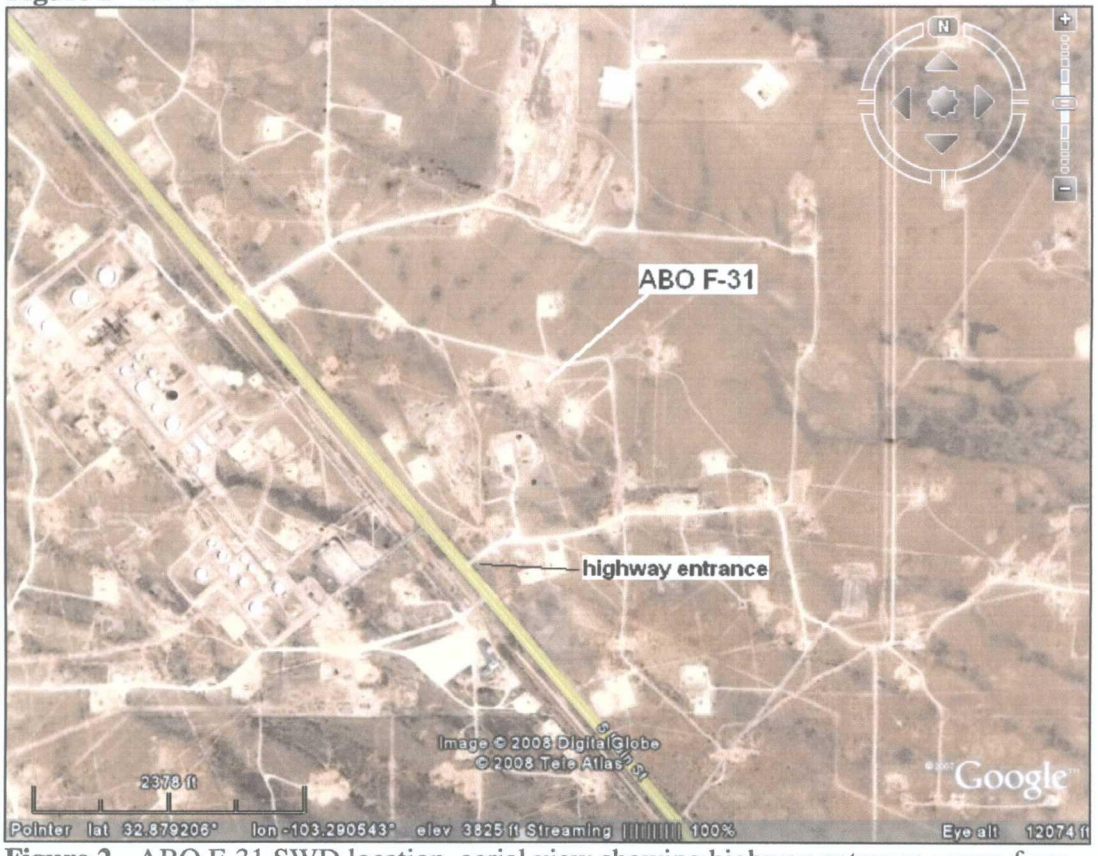


Figure 2 - ABO F-31 SWD location, aerial view showing highway entrance across from southeastern end of refinery.

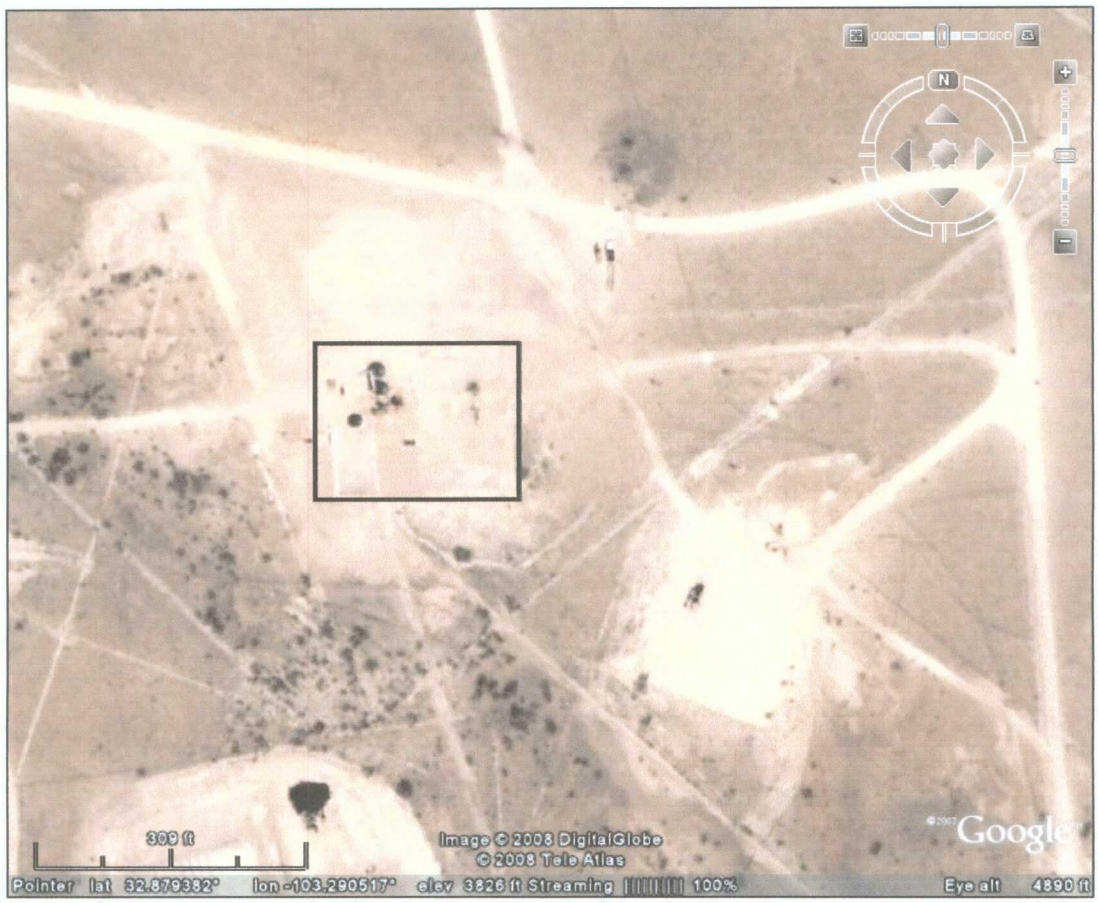


Figure 3 – Area of investigation (outlined in black box). Google aerial photograph, high-level view. Date unknown.

Results and Discussion

The footprint of past activities and soil investigation encompassed an area of approximately one acre (Figure 4). Soil chloride concentrations averaged below 500 ppm near the surface, dropping to approximately 300 ppm near the water table capillary fringe at 90 ft bgs (Figures 4 and 5). Residual soil petroleum hydrocarbons were found at only one sampling location and depth (SB-1 @ 50 ft bgs) but were otherwise not found to be significant during this investigation; (see Figure 4 and the individual soil boring logs in the Appendix).

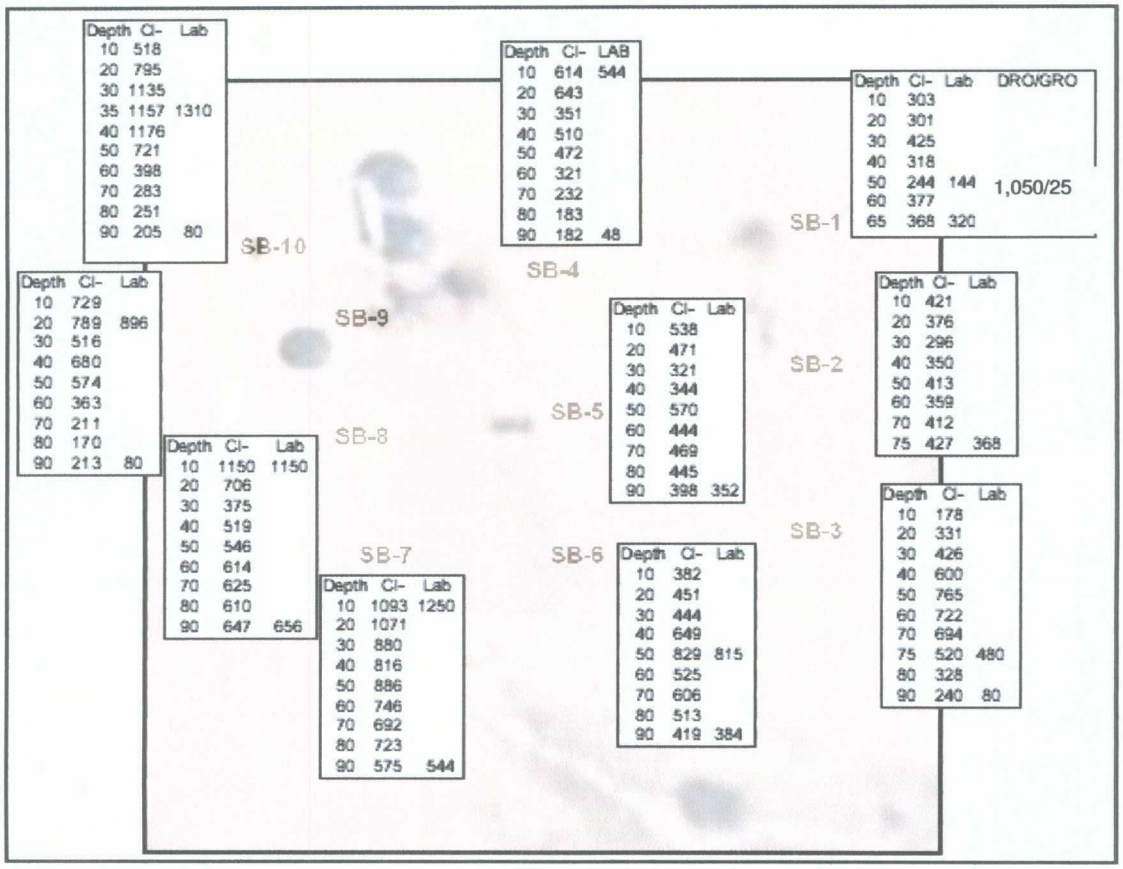


Figure 4 - ABO F-31. ICP field evaluation: approximate locations of soil borings with field measured and laboratory verified soil chloride concentrations... Background aerial photo is a "Goggle map" of unknown date. Tankage and other surface facilities were removed prior to this investigation.

Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**AVG Soil Boring**
Location:	(overall average of 9 soil borings)
Date:	10/20/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

Depth (ft below ground surface)	Field Chloride Test (ppm)	Adjusted Chloride Value (ppm)
-5	520	486
-10	518	484
-15	461	409
-20	503	464
-25	494	452
-30	481	435
-35	505	467
-40	510	474
-45	524	492
-50	456	403
-55	425	362
-60	417	352
-65	402	332
-70	399	329
-75	403	334
-80	386	312
-85	383	307
-90	391	318
avg	454	401

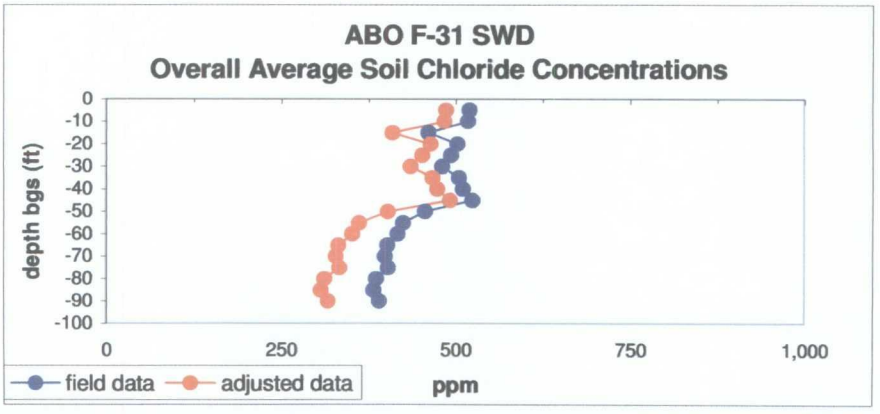


Figure 5 – Average soil chloride concentrations from ten soil borings. Field-measured values were adjusted based on regression analysis comparison against a laboratory measured subset.

The relatively low concentrations of residual chlorides and the large depth to groundwater indicate that groundwater should not be affected down-gradient of the subject site. Nevertheless, the ground surface remains to be restored to original conditions. Therefore, the proposed Corrective Action Plan entails a single work element: the ecological restoration of the ground surface according to the following schematic protocol:

1. The ground surface should be graded and sloped to prevent the accumulation of storm runoff from upslope areas. The existing berms presently around the affected area should be removed and graded into the restored surface.
2. Soils should be plowed, disked and amended with organic materials (i.e. – straw) to facilitate the retention of sufficient soil moisture to facilitate and support the reestablishment of native prairie vegetation.
3. The site will be seeded with a native vegetation seed mixture.
4. Periodic irrigation of the surface should occur during the first growing season of reestablishment should natural rainfall be deficient.

Figure 6 – Desired end-point of surface restoration. This recent (Fall, 2008) photograph is of natural prairie vegetation to the east of the affected area.

The desired end-point of surface restoration should be similar to that shown in Figure 6, which is a photograph of vegetation taken adjacent to the subject site.

NMOCD will be provided with a brief progress report (to include photographs) following site grading, soil preparation and reseeding and approximately one year after showing the extent of re-vegetation.

APPENDIX

- NMOCD approval of Investigation and Characterization Plan
- Soil boring logs
- Laboratory data
- QA/QC comparing field to laboratory chloride analyses
- Photographs

at&t YAHOO! SMALL BUSINESS

RE: ICP Approval for ABO F-31 SWD well site Tuesday, May 6, 2008 6:26 PM

From: "Hansen, Edward J., EMNRD" <edward.hansen@state.nm.us>
To: "Kristin Pope" <kpope@riceswd.com>
Cc: "Price, Wayne, EMNRD" <wayne.price@state.nm.us>, "Pete Galusky" <lpg@texerra.com>

Dear Ms. Pope:

Pursuant to our meeting of April 16th with representatives of the City of Lovington , the NMOCD hereby approves the ICP for the above-referenced site as specified in the original approval of January 17, 2008 (see below).

From: Hansen, Edward J., EMNRD
Sent: Wednesday, January 30, 2008 2:51 PM
To: 'Kristin Pope'
Cc: Price, Wayne, EMNRD ; 'Pete Galusky'
Subject: Rescind ICP Approval for ABO F-31 SWD well site

Dear Ms. Pope:

The approval below is hereby rescinded until further notice.
The NMOCD has recently met with representatives from the City of Lovington . Other issues for the site investigation may be of potential interest. The NMOCD will review the City's information regarding this site and promise to expedite this process.
Thank you for your cooperation in this matter.

Edward J. Hansen
Hydrologist
Environmental Bureau

From: Hansen, Edward J., EMNRD
Sent: Thursday, January 17, 2008 9:55 AM
To: 'Kristin Pope'
Cc: Price, Wayne, EMNRD ; Pete Galusky
Subject: ICP Approval for ABO F-31 SWD well site

Dear Ms. Pope:

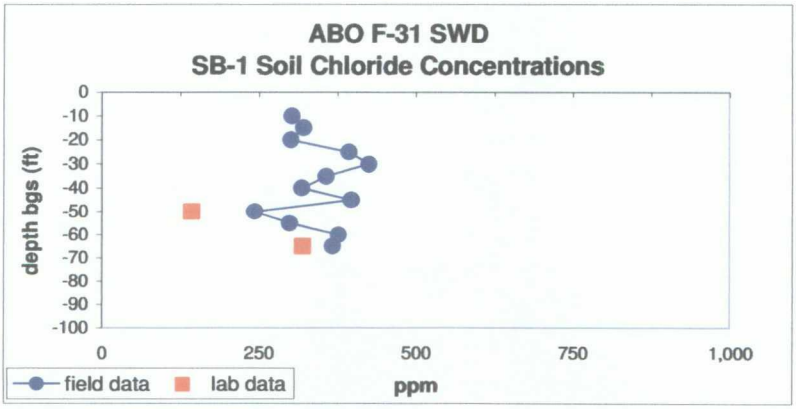
The NMOCD has reviewed the submitted Investigation Characterization Plans (ICPs), dated August 22, 2007, for the above referenced site. The NMOCD hereby conditionally approves the following ICP for the Rice Operating Company site:

1. ABO F-31 SWD well site submitted by Texerra on 8/31/2007 #1R488

Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-1**
Location:	13 ft NNE of former SWD well head
Date:	10/20/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

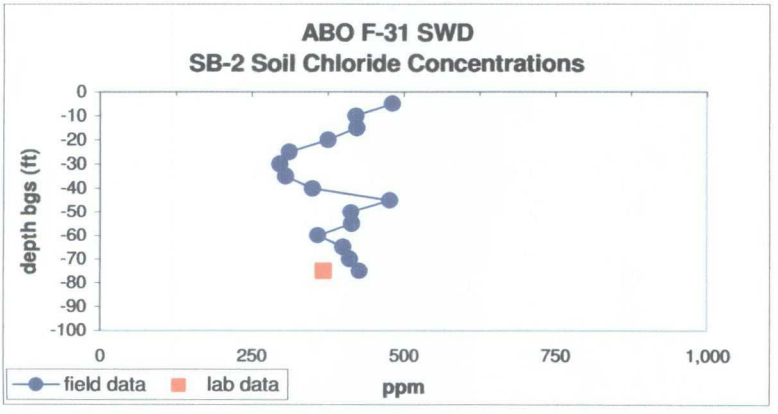
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5						yellow brown loamy sand
-10	303		0.7			"
-15	322		1.1			"
-20	301		4.5			"
-25	394		5.5			light brown loamy sand
-30	425		0.1			reddish brown loamy sand
-35	358		0.0			"
-40	318		0.6			"
-45	398		0.5			light brown loamy sand
-50	244	144	17.6	24.9	1,050.0	reddish brown loamy sand
-55	299		12.0			light brown loamy sand
-60	377		0.5			"
-65	368	320	0.1			light reddish brown loamy sand
-70						
-75						
-80						
-85						
-90						



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-2**
Location:	53 ft SSE of former SWD well head
Date:	10/20/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

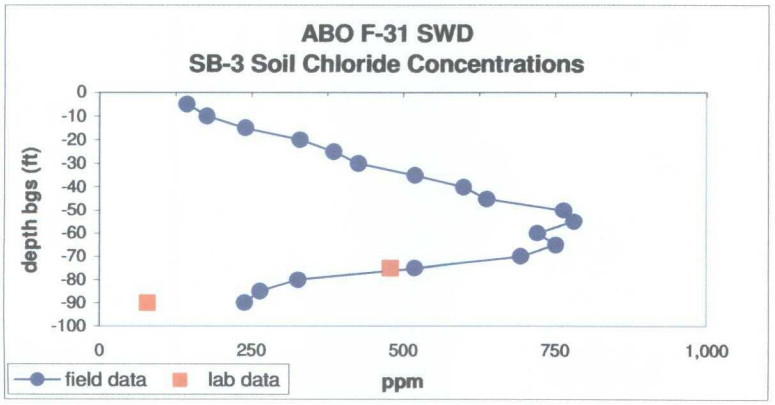
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	481		0.0			light tan loamy sand
-10	421		0.0			"
-15	423		0.0			"
-20	376		0.0			light reddish brown loamy sand
-25	312		0.0			"
-30	296		0.0			"
-35	306		0.0			"
-40	350		0.0			"
-45	477		0.0			"
-50	413		0.0			"
-55	414		0.0			"
-60	359		0.0			"
-65	400		0.0			light brown sand
-70	412		0.0			"
-75	427	368	0.0			"
-80						
-85						
-90						



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-3**
Location:	96 ft south of former SWD well head
Date:	10/20/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

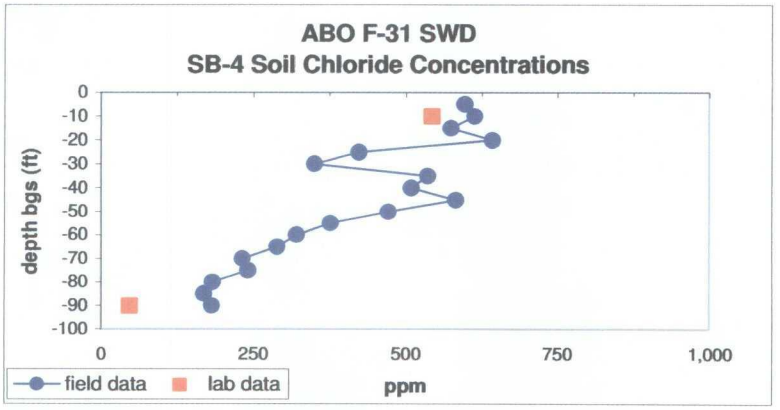
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	145		0.0			light tan loamy sand
-10	178		0.0			light reddish brown loamy sand
-15	241		0.0			"
-20	331		0.0			light tan loamy sand
-25	386		0.0			light reddish brown loamy sand
-30	426		0.0			"
-35	520		0.0			"
-40	600		0.0			"
-45	639		0.0			"
-50	765		0.0			"
-55	782		0.0			"
-60	722		0.0			"
-65	752		0.0			"
-70	694		0.0			"
-75	520	480	0.0			"
-80	328		0.0			"
-85	265		0.0			"
-90	240	80	0.0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-4**
Location:	96 ft south of former SWD well head
Date:	10/20/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

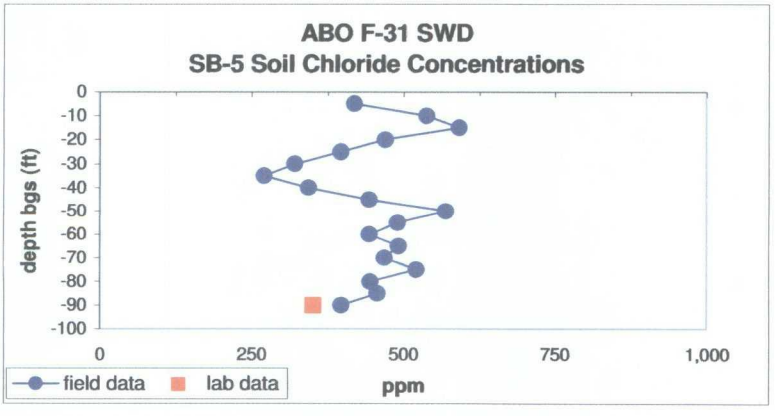
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	598		0.0			gravelly brown loamy sand
-10	614	544	0.0			light reddish brown loamy sand
-15	575		0.0			"
-20	643		0.0			"
-25	424		0.0			"
-30	351		0.1			"
-35	536		0.0			brown loamy sand
-40	510		0.0			"
-45	583		0.1			light brown loamy sand
-50	472		0.0			"
-55	377		0.0			"
-60	321		0.0			"
-65	290		0.0			"
-70	232		0.0			"
-75	241		0.0			"
-80	183		0.0			"
-85	170		0.0			"
-90	182	48	0.0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-5**
Location:	77 ft SW of former SWD well head
Date:	10/20/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

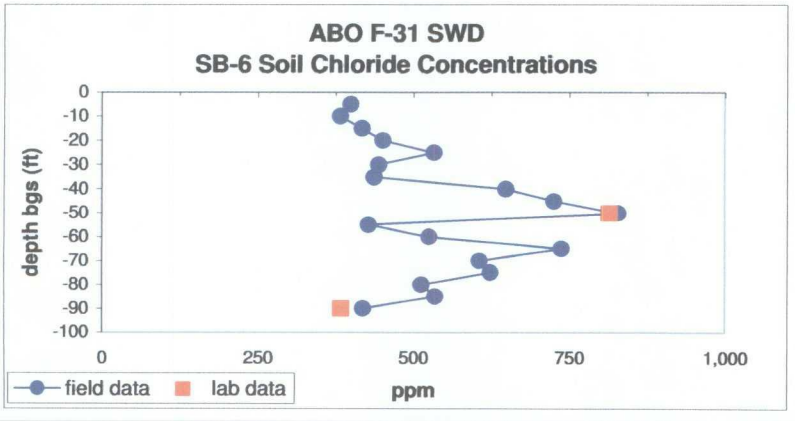
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	419		0.0			light brown loamy sand
-10	538		0.0			"
-15	592		0.0			"
-20	471		0.0			reddish brown loamy sand
-25	397		0.0			"
-30	321		0.0			"
-35	271		0.0			"
-40	344		0.0			"
-45	444		0.0			"
-50	570		0.0			"
-55	491		0.0			"
-60	444		0.0			"
-65	492		0.0			"
-70	469		0.0			light brown loamy sand
-75	521		0.0			"
-80	445		0.0			"
-85	457		0.0			"
-90	398	352	0.0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-6**
Location:	117 ft SSW of former SWD well head
Date:	10/21/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

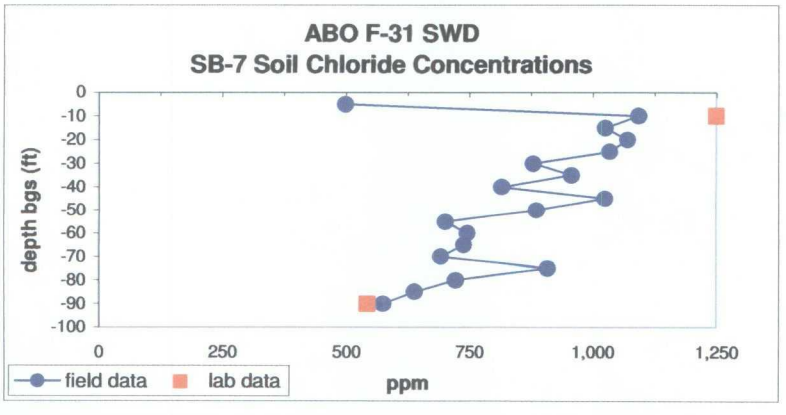
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	399		2.2			pale brown loamy sand
-10	382		0.0			"
-15	417		0.0			light reddish brown loamy sand
-20	451		0.0			pale brown loamy sand
-25	533		0.5			"
-30	444		0.0			light reddish brown loamy sand
-35	437		0.0			"
-40	649		0.0			"
-45	726		0.0			"
-50	829	815	0.0			"
-55	427		0.0			"
-60	525		0.0			"
-65	738		0.0			"
-70	606		0.0			light brown loamy sand
-75	624		0.0			"
-80	513		0.0			light reddish brown loamy sand
-85	535		0.0			"
-90	419	384	0.0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-7**
Location:	141 ft SW of former SWD well head
Date:	10/21/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

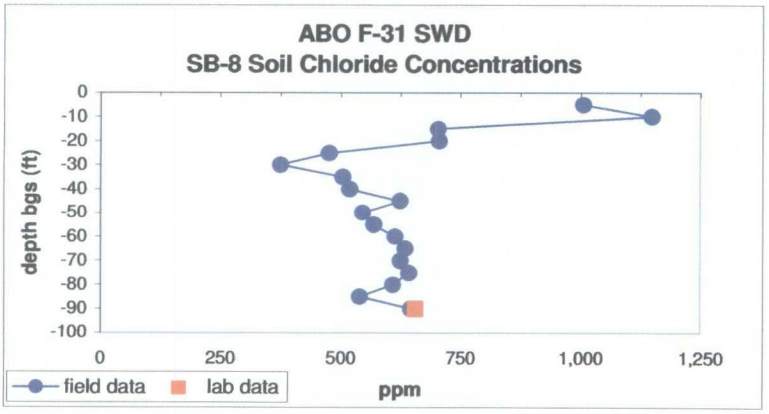
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	499		3.4			light gray silty sand
-10	1,093	1,250	0.0			reddish brown loamy sand
-15	1,025		0.0			"
-20	1,071		0.0			light reddish brown loamy sand
-25	1,034		0.0			"
-30	880		0.0			"
-35	957		0.0			reddish brown loamy sand
-40	816		0.0			"
-45	1,025		0.0			"
-50	886		0.0			"
-55	701		0.0			"
-60	746		0			"
-65	739		0			"
-70	692		0			yellow brown loamy sand
-75	908		0			"
-80	723		0			"
-85	639		0			"
-90	575	544	0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-8**
Location:	109 ft SW of former SWD well head
Date:	10/21/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

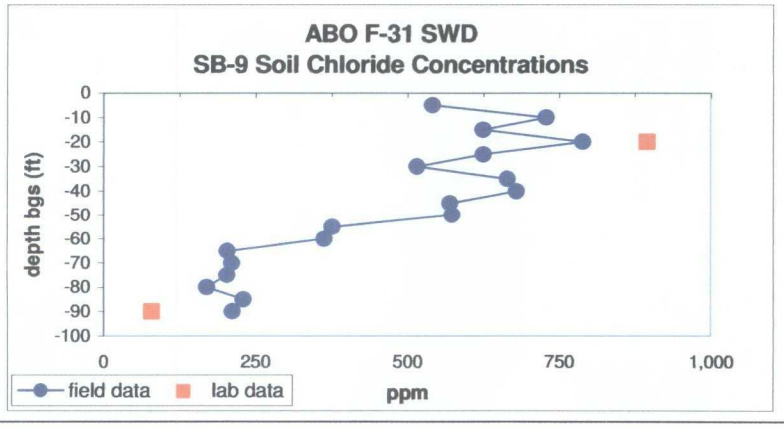
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	1,006		3.9			light gray silty sand
-10	1,150	1,330	0.0			reddish brown loamy sand
-15	704		0.0			"
-20	706		0.0			"
-25	477		0.0			"
-30	375		0.0			"
-35	505		0.0			"
-40	519		0.0			"
-45	625		0.0			"
-50	546		0.0			"
-55	570		0.0			"
-60	614		0.2			"
-65	635		0.0			"
-70	625		0.0			light reddish brown loamy sand
-75	643		0.0			"
-80	610		0.0			"
-85	540		0.0			pale brown loamy sand
-90	647	656	0.0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-9**
Location:	87 ft west of former SWD well head
Date:	10/21/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 ft below ground surface
Screened interval:	n/a (no well installed)
Pipe diameter:	"

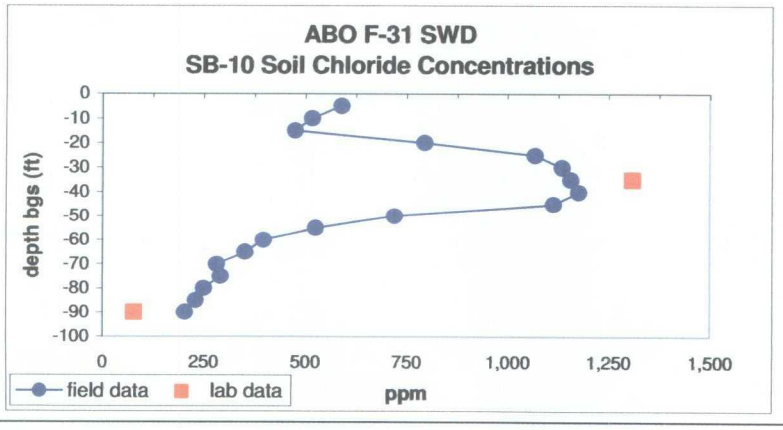
Depth (ft below ground surface)	Field Chloride Test (ppm)	Lab Chloride Test (ppm)	Field PID test (ppm)	Lab GRO test (ppm)	Lab DRO test (ppm)	Cutting Description
-5	542		0.0			very pale brown loamy sand
-10	729		0.0			"
-15	625		0.0			pale brown loamy sand
-20	789	896	0.0			very pale brown loamy sand
-25	626		0.0			light reddish brown loamy sand
-30	516		0.0			"
-35	665		0.0			reddish brown loamy sand
-40	680		0.0			"
-45	570		0.0			very pale brown loamy sand
-50	574		0.0			"
-55	376		0.0			"
-60	363		0.0			"
-65	204		0.0			"
-70	211		0.0			"
-75	203		0.0			"
-80	170		0.0			"
-85	230		0.0			"
-90	213	80	0.0			"



Soil Boring Log
Rice Operating Company
ABO SWD System **ABO F-31 SWD**

Identification:	**SB-10**
Location:	5 ft ESE of the SE corner of the current junction box
Date:	10/21/2008
Driller:	Harrison & Cooper, Inc. (Ken Cooper supervising)
Drill method:	Air rotary
Logged by:	L. Peter Galusky, Jr., Texerra
Total depth:	90 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	590		0.0			very pale brown loamy sand
-10	518		0.0			"
-15	475		0.0			light reddish brown loamy sand
-20	795		0.0			very light reddish brown loamy sand
-25	1,069		0.0			"
-30	1,135		0.0			light reddish brown loamy sand
-35	1,157	1,310	0.0			reddish brown loamy sand
-40	1,176		0.0			"
-45	1,114		0.0			pale brown loamy sand
-50	721		0.0			"
-55	526		0.0			"
-60	398		0.0			very light reddish brown loamy sand
-65	352		0.0			"
-70	283		0.0			"
-75	292		0.0			"
-80	251		0.0			"
-85	231		0.0			"
-90	205	80	0.0			"



CARDINAL LABORATORIES

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

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

Receiving Date: 10/27/08
Reporting Date: 10/29/08
Project Number: NOT GIVEN
Project Name: ABO F-31 SWD
Project Location: ABO F-31 SWD

Analysis Date: 10/29/08
Sampling Date: 10/20/08 & 10/21/08
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: AB

LAB NUMBER	SAMPLE ID	Cl^- (mg/kg)
H16200-1	SB #1 @ 65'	320
H16200-2	SB #1 @ 50'	144
H16200-3	SB #3 @ 75'	480
H16200-4	SB #3 @ 90'	80
H16200-5	SB #2 @ 75'	368
H16200-6	SB #4 @ 10'	544
H16200-7	SB #4 @ 90'	48
H16200-8	SB #5 @ 90'	352
H16200-9	SB #6 @ 50'	816
H16200-10	SB #6 @ 90'	384
H16200-11	SB #7 @ 10'	1,250
H16200-12	SB #7 @ 90'	544
H16200-13	SB #8 @ 10'	1,330
H16200-14	SB #8 @ 90'	656
H16200-15	SB #9 @ 20'	896
H16200-16	SB #9 @ 90'	80
H16200-17	SB #10 @ 35'	1,310
H16200-18	SB #10 @ 90'	80
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		2.0
METHOD: Std. Methods		4500-ClB

NOTE: Analyses performed on 1:4 w:v aqueous extracts.

Chemist

10/29/08
Date

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

Receiving Date: 10/27/08
Reporting Date: 10/29/08
Project Number: NOT GIVEN
Project Name: ABO F-31 SWD
Project Location: ABO F-31 SWD

Sampling Date: 10/20/08
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		10/28/08	10/28/08
H16200-2	SB #1 @ 50'	24.9	1,050
Quality Control		554	499
True Value QC		500	500
% Recovery		111	99.8
Relative Percent Difference		0.9	8.2

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

Chemist

10/29/08
Date

H16200 T RICE

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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

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name:	Rice Operating Company	BILL TO	
Project Manager:	Hack Conder	P.O. #:	
Address:	122 West Taylor	Company:	
City: Hobbs	State: NM Zip: 88240	Attn:	
Phone #: 393-9174	Fax #: 397-1471	Address:	
Project #:	Project Owner:	City:	
Project Name: Abo F-31 SWD		State: Zip:	
Project Location: Abo F-31 SWD		Phone #:	
Sampler Name: Lane Weinheimer		Fax #:	

ANALYSIS REQUEST

Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER:	PRESERV: ACID/BASE	ICE / COOL	OTHER:	SAMPLING: DATE	TIME	Chlorides	TPH 8015 M	BTEX
H12601	SB #1 @ 65'												10-27-08	9:11	✓	✓	
-2	SB #1 @ 50'												10-27-08	8:58	✓		
-3	SB #3 @ 75'												10-27-08	11:40	✓		
-4	SB #3 @ 90'												10-27-08	11:59	✓		
-5	SB #3 @ 75'												10-27-08	12:50	✓		
-6	SB #4 @ 10'												10-27-08	1:37	✓		
-7	SB #4 @ 90'												10-27-08	1:56	✓		
-8	SB #5 @ 90'												10-27-08	2:24	✓		

Relinquished By: L. Weinheimer	Date: 10-27-08 Time: 2:30	Received By:	Phone Result: ☐ Yes ☐ No	Add'l Phone #:	
Relinquished By:	Date: Time:	Received By:	Fax Result: ☐ Yes ☐ No	Add'l Fax #:	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool - Intact ☐ Yes ☐ No ☐ Yes ☐ No	CHECKED BY: (Initials)	REMARKS: email results to Hconder@riceswd.com; jpurvis@riceswd.com; Lweinheimer@riceswd.com		

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

NEED SAMPLES BACK. PLEASE

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(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

Company Name: Rice Operating Company	BILL TO
Project Manager: Hack Conder	P.O. #:
Address: 122 West Taylor	Company:
City: Hobbs State: NM Zip: 88240	Attn:
Phone #: 393-9174 Fax #: 397-1471	Address:
Project #: Project Owner:	City:
Project Name: Abo F-31 SWD	State: Zip:
Project Location: Abo F-31 SWD	Phone #:
Sampler Name: Lara Weinheimer	Fax #:

FOR LAB USE ONLY Lab I.D.	Sample I.D.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER	ACID/BASE	ICE / COOL	OTHER	DATE	TIME	Chlorides	TPH 8015 M	BTEX
H11288-9	SB #6 @ 50'											10-31-08	9:45	✓		
-10	SB #6 @ 40'											10-31-08	9:58	✓		
-11	SB #7 @ 10'											10-31-08	1:51	✓		
-12	SB #7 @ 90'											10-31-08	1:16	✓		
-13	SB #8 @ 10'											10-31-08	1:17	✓		
-14	SB #8 @ 90'											10-31-08	1:58	✓		
-15	SB #9 @ 2m'											10-31-08	1:51	✓		
-16	SB #9 @ 90'											10-31-08	2:10	✓		
-17	SB #10 @ 35'											10-31-08	2:13	✓		
-18	SB #10 @ 90'											10-31-08	2:28	✓		

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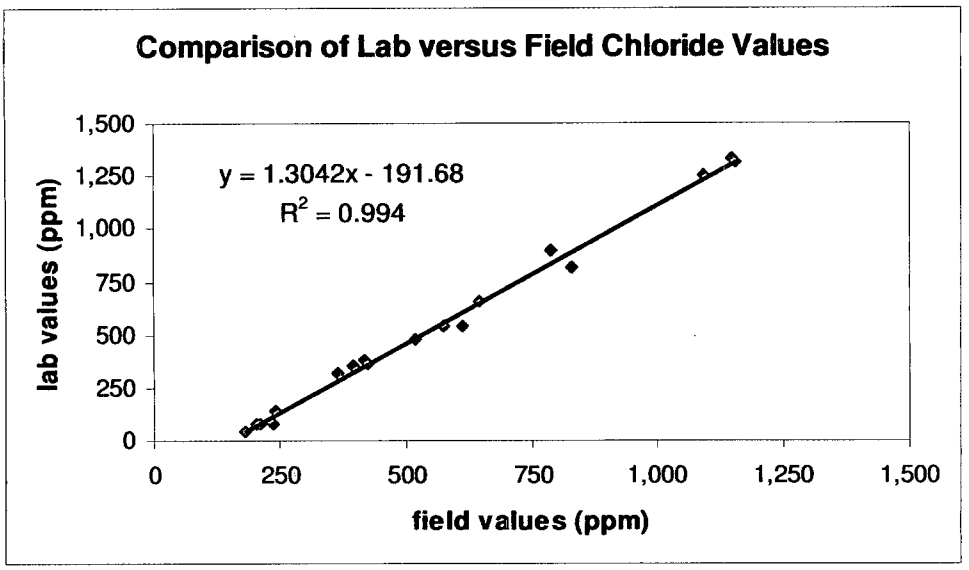
Relinquished By: L. Weinheimer	Date: 10-31-08 Time: 4:30	Received By:	
Relinquished By:	Date: Time:	Received By:	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:	Sample Condition Cool / Intact ☑ Yes ☐ Yes ☐ No ☐ No	CHECKED BY: (Initials)	

Phone Result: ☐ Yes ☑ No Add'l Phone #:
Fax Result: ☐ Yes ☑ No Add'l Fax #:
REMARKS:
email results

Hconder@riceswd.com; jpurvis@riceswd.com; Lweinheimer@riceswd.com

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

NEED SAMPLES BACK, PLEASE



Note: The laboratory (and presumed actual) soil chloride values were very close to the field measured values. Nevertheless, the resulting statistical regression equation was used to adjust the field measured values in the computation of the overall site-averaged soil chloride concentrations (Figure 5).

Photo 1 – View NE drilling SB-1.

Photo 2 – View W drilling SB-4.

Photo 3 – View S drilling SB-7.

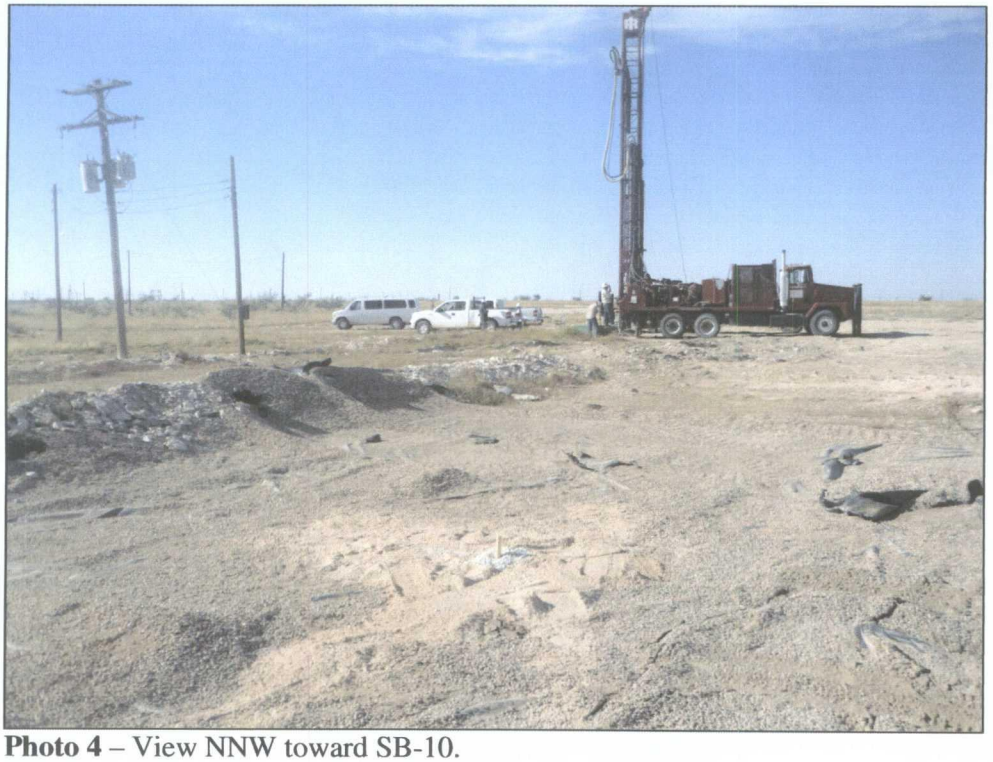


Photo 4 – View NNW toward SB-10.