1R - 426-169

WORKPLANS

Date:
4-13-11

Hansen, Edward J., EMNRD

From: Katie Jones [kjones@riceswd.com]
Sent: Monday, March 19, 2012 1:04 PM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Laura Pena; Lara Weinheimer
Subject: ROC - BD B-29 leak (1R426-169) CAP Addendum
Attachments: BD B-29 leak (1R426-169) Amended Liner Dimensions.pdf

Mr. Hansen,

This email is an Addendum to the BD B-29 site (1R426-169) Corrective Action Plan (CAP) and CAP Addendum, submitted to the NMOCD on May 9, 2011. Page 4, section: Proposed Remedy, paragraph 2: text in blue lettering, below, will be added to the paragraph. Red lettering marked with a strike-through will be deleted. The new Plate 4 showing the additional proposed liner location is attached. If you need any further information, please let me or Hack know.

"Proposed Remedy

To further delineate groundwater quality, additional monitoring is required of the newly installed MW-3 as well as MW-1 and MW-2.

We propose the following corrective action for the site:

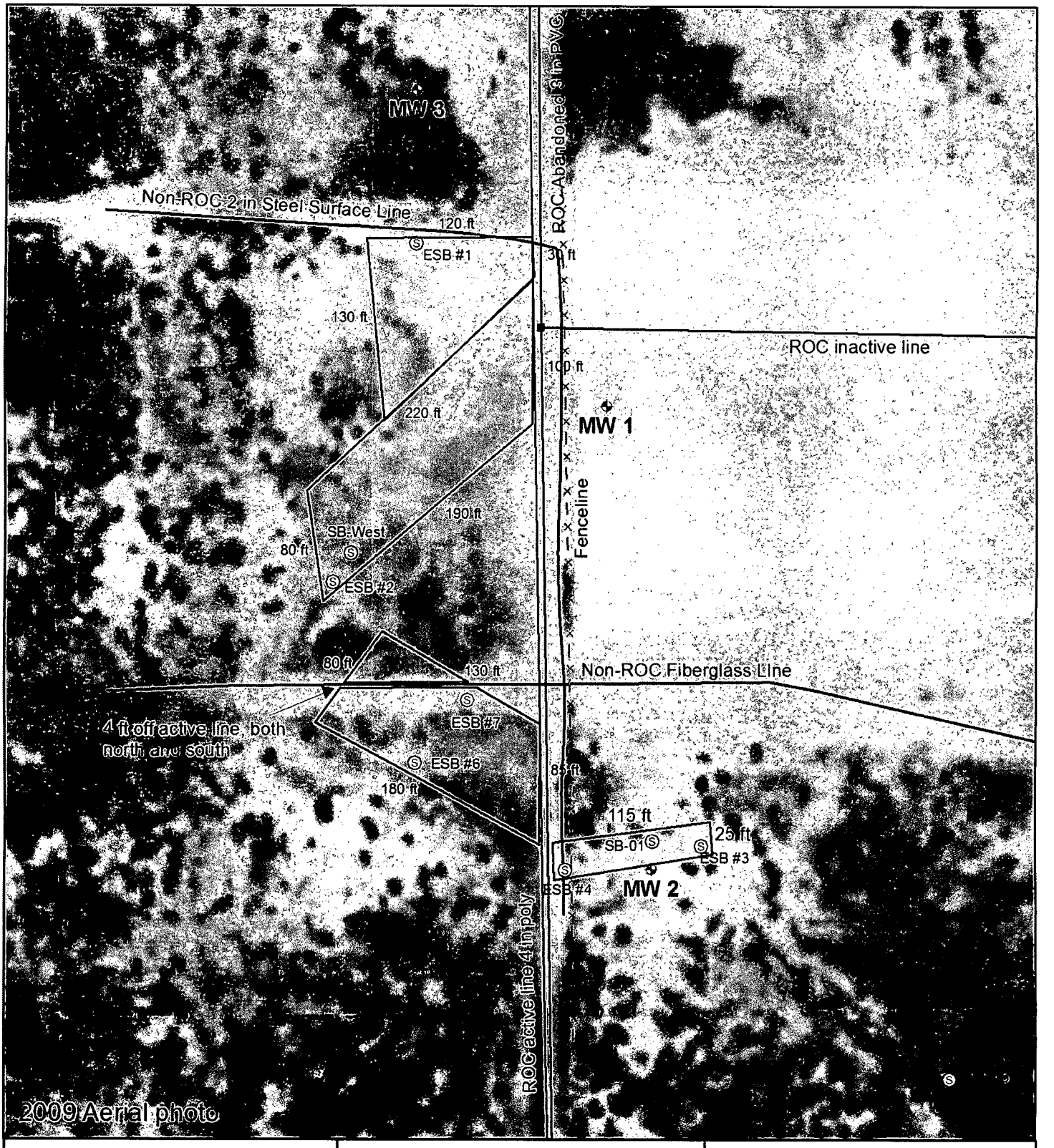
1. Excavate the areas shown on Plate 4 to a depth of 4 to 5-feet.
2. Place a liner at the bottom of the excavation and
3. Place backfill containing a chloride concentration of less than 500 mg/kg and a PID (field) reading of less than 100 ppm on top of the liner. Evaluate excavated soil for use as backfill, any soil requiring disposal will be properly disposed of at an NMOCD approved facility.
4. Import additional material as necessary to blend the site with surrounding topography
5. Seed the lined and unlined portions of the release footprint with an appropriate mix for native vegetation. Appropriate amendments will also be added as necessary to promote the growth of vegetation.

The ~~three~~four liners shown on plate 4 (approximate dimensions of: 120 by 220 feet, 90 by 170 feet, ~~and~~ 30 by 110 feet, and 115 by 25 feet) comprise ~~56%~~67% of the release footprint of about 57,000 feet^2. There is a non-ROC fiberglass line running east to west through the third excavation, as seen on the attached plat. ROC proposes to remain 4 ft north and 4 ft south off this line for safety reasons. The approved liner will then be installed in two segments, split around the line. Installation of the liner stops all infiltration of surface water to the vadose zone beneath the liner. For soil above the water table; hydraulic conductivity (the ability of a soil to transmit water) varies directly with the moisture content of the soil. As the moisture beneath the liner continues to move downwards due to gravity, the soil immediately below the liner becomes drier. As such, the downwards moisture movement rate through the drier soils decreases. This decrease in moisture movement rate first occurs directly under the liner and spreads downwards over time. The last depths affected are those closest to the water table."

Thank you.

Katie Jones
Environmental Project Manger
RICE *Operating Company*

Amended Liner Dimensions



RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

BD B-29 leak

LEGALS: UL/B sec. 29
T21S R37E

NMOCD Case #: 1R426-169

N
W E
S

0 37.5 75 150
Feet

Drawing date: 3-15-12
Drafted by: L Weinheimer

Hansen, Edward J., EMNRD

From: Katie Jones [kjones@riceswd.com]
Sent: Monday, May 09, 2011 2:18 PM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Katie Lee
Subject: BD B-29 (1R426-169) CAP Addendum
Attachments: BD B-29 Proposed Additional Liner - Plate 4.jpg

Mr. Hansen,

This email is an Addendum to the BD B-29 site (1R426-169) Corrective Action Plan (CAP), submitted to the NMOCD on April 13, 2011. Page 4, section: Proposed Remedy, paragraph 2: text in blue lettering, below, will be added to the paragraph. Red lettering marked with a strike-through will be deleted. The new Plate 4 showing the additional proposed liner location is attached. If you need any further information, please let me or Hack know.

"Proposed Remedy

To further delineate groundwater quality, additional monitoring is required of the newly installed MW-3 as well as MW-1 and MW-2.

We propose the following corrective action for the site:

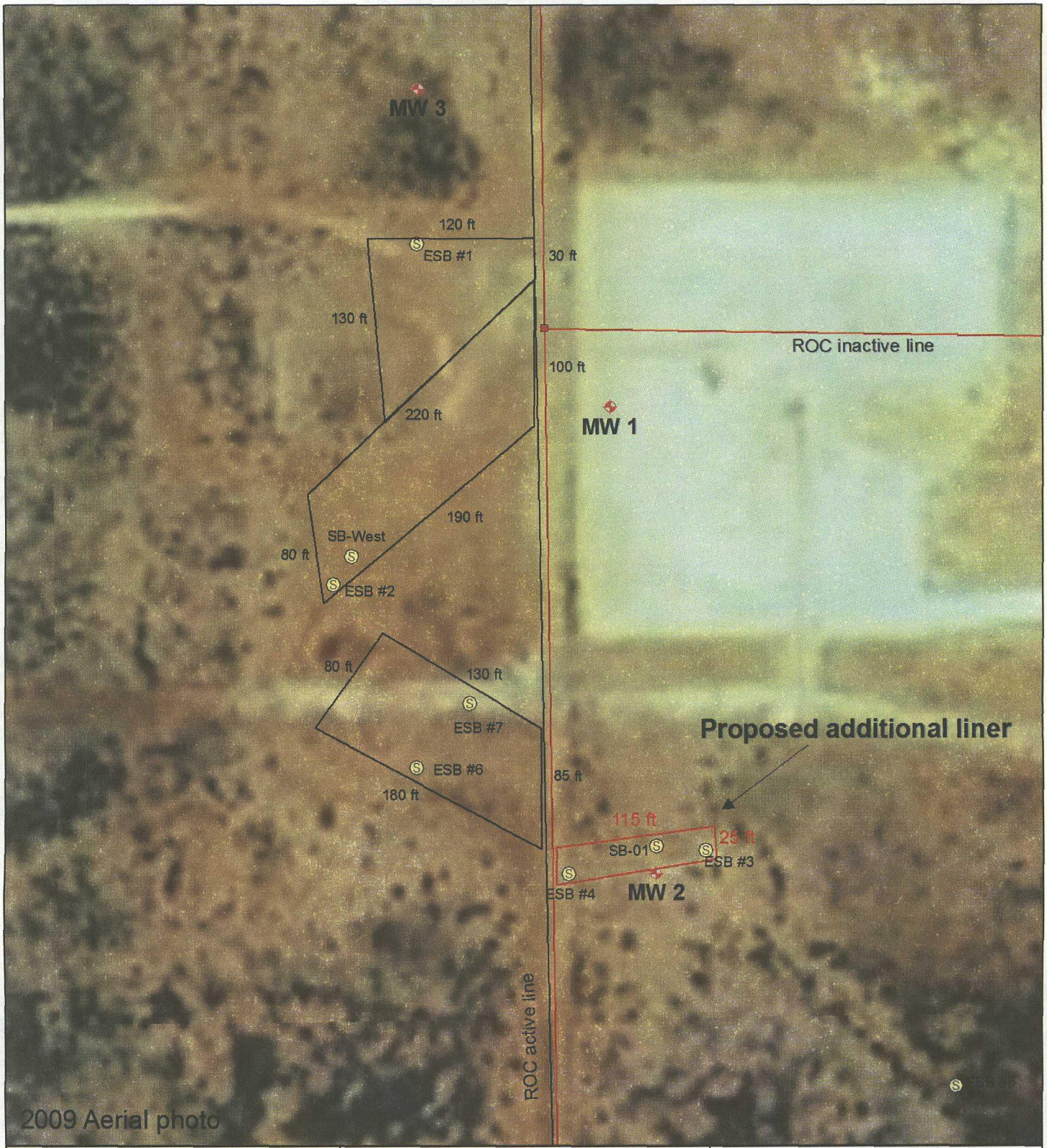
1. Excavate the areas shown on Plate 4 to a depth of 4 to 5-feet.
2. Place a liner at the bottom of the excavation and
3. Place backfill containing a chloride concentration of less than 500 mg/kg and a PID (field) reading of less than 100 ppm on top of the liner. Evaluate excavated soil for use as backfill, any soil requiring disposal will be properly disposed of at an NMOCD approved facility.
4. Import additional material as necessary to blend the site with surrounding topography
5. Seed the lined and unlined portions of the release footprint with an appropriate mix for native vegetation. Appropriate amendments will also be added as necessary to promote the growth of vegetation.

The ~~three~~four liners shown on plate 4 (approximate dimensions of: 120 by 220 feet, 90 by 170 feet, ~~and~~ 30 by 110 feet, and 115 by 25 feet) comprise ~~56%~~67% of the release footprint of about 57,000 feet^2. Installation of the liner stops all infiltration of surface water to the vadose zone beneath the liner. For soil above the water table; hydraulic conductivity (the ability of a soil to transmit water) varies directly with the moisture content of the soil. As the moisture beneath the liner continues to move downwards due to gravity, the soil immediately below the liner becomes drier. As such, the downwards moisture movement rate through the drier soils decreases. This decrease in moisture movement rate first occurs directly under the liner and spreads downwards over time. The last depths affected are those closest to the water table."

Thank you.

Katie Jones
Environmental Project Coordinator
RICE *Operating Company*

Proposed Additional Liner



RICE ENVIRONMENTAL CONSULTING & SAFETY, LLC — RECS

BD B-29 leak

LEGALS: UL/B sec. 29
T21S R37E

NMOCD Case #: 1R426-169

Plate 4

N
W E
S

0 37.5 75 150 Feet

Drawing date: 5-4-11
Drafted by: L Weinheimer

R. T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266.0745

April 13, 2011

Edward J. Hansen
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: BD B-29 Site: Corrective Action Plan
NMOCD CASE #: 1R426-169
Township 21S, Range 37E, Section 29, Unit B

Mr. Hansen:

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is submitting this Corrective Action Plan for the BD B-29 Site file. This letter presents characterization findings including data from the up-gradient well, MW-3, installed in November 2010 and a remedy for the site.

Our recommended corrective action is the installation of a synthetic liner 4-5 feet below ground surface of an area comprising about 56% of the approximately 57,000 foot^2 release footprint. Additional fill will be used as necessary to contour to the surrounding area. Monitoring of ground water quality in the site's three monitoring wells will continue. Depending upon results, additional actions may be proposed. This design meets the mandate of NMOCD Rules for protection of surface water, ground water and the environment. With the remedy in place, residual chloride in the vadose zone will not with reasonable probability contaminate ground water or surface water in excess of the standards in Subsections B and C of 19.15.30.9 NMAC through leaching, percolation or other transport mechanisms, or as the water table elevation fluctuates.

Location and Background

The B-29 site is located about 1.5 miles northwest of the intersection of State Routes 8/176 and Loop 18, near Eunice, New Mexico (see Plate 1). The Amended Investigation Characterization Plan (ICP), dated October 26, 2007 gave background information and the results of borings and proposed two monitoring wells. MW-1 and MW-2 were drilled in late 2007 and have been sampled quarterly since that time. A status report dated May 22, 2008 presented ground water data for the site. MW-3, the up-gradient well was drilled in November 2010.

Site Characterization

Soil Borings

Plate 2 shows the outline of a release that occurred at the site in 2002 as well as the locations of all borings at the site. Plate 3 presents the chloride concentration data from the two drilling events, the SB series, (September 2002) and the ESB series, (December 2006). The boring logs are included in Appendix A. The borings are presented in their relative spatial order from northwest to southeast on the release footprint as shown on Plate 2.

The principal findings of the boring characterization program are:

- Soil chloride concentrations exceed 1,000 mg/kg at total depth in five of the seven ESB borings (50-94 feet below land surface).
- The highest chloride loads (mass/unit area from ground surface to ground water) exist near the junction box, the origin of the 2002 release.
- The lowest chloride loads exist at the greatest distance from the junction box. ESB-5 and SB East have chloride concentrations less than 1,000 mg/kg in the upper15 feet in contrast with all of the other borings. All other borings have chloride concentrations above 2,500 mg/kg in this depth interval.

Ground Water

Based upon the data from these borings, Rice Operating Company installed two four-inch monitoring wells in December 2007 and an additional well, MW-3 in November 2010 (Plate 2).

- The first well (MW-1) is located about 100 feet southeast of the junction box in an area outside of the release footprint on a down gradient edge of the release.

- The second well (MW-2) is located about 5-feet west of SB-1 within the release area and down gradient from borings with highest chloride mass (see Plates 2 and 3).

- MW-3, an up-gradient well, is located about 270 feet northwest of MW-1.

The wells were completed with a 20-foot screen: 5 feet of screen was placed above the water table and 15 feet below. Appendix A includes the drilling logs and completion diagrams of the wells. Both wells were developed and sampled for chloride, TDS, and BTEX. No detection of BTEX has occurred in any sample. Chloride and TDS concentrations are presented in Figures 1 and 2 below.

Figure 1 Chloride Concentrations in Ground Water at B-29, 2007 to Present

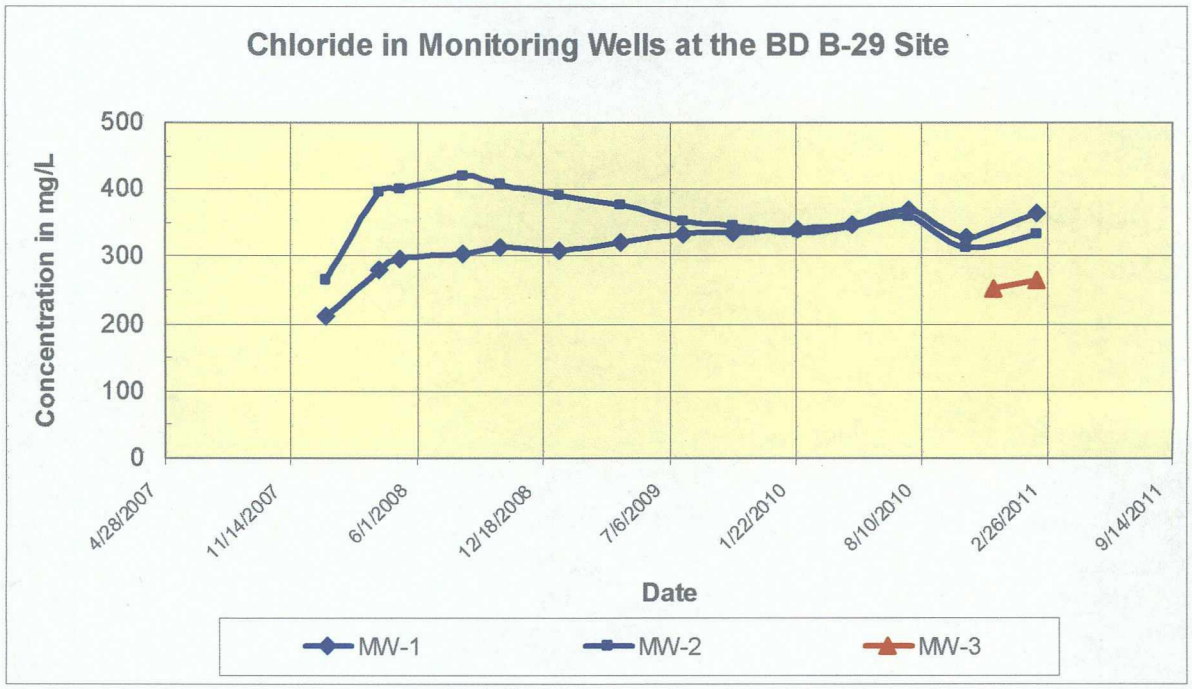
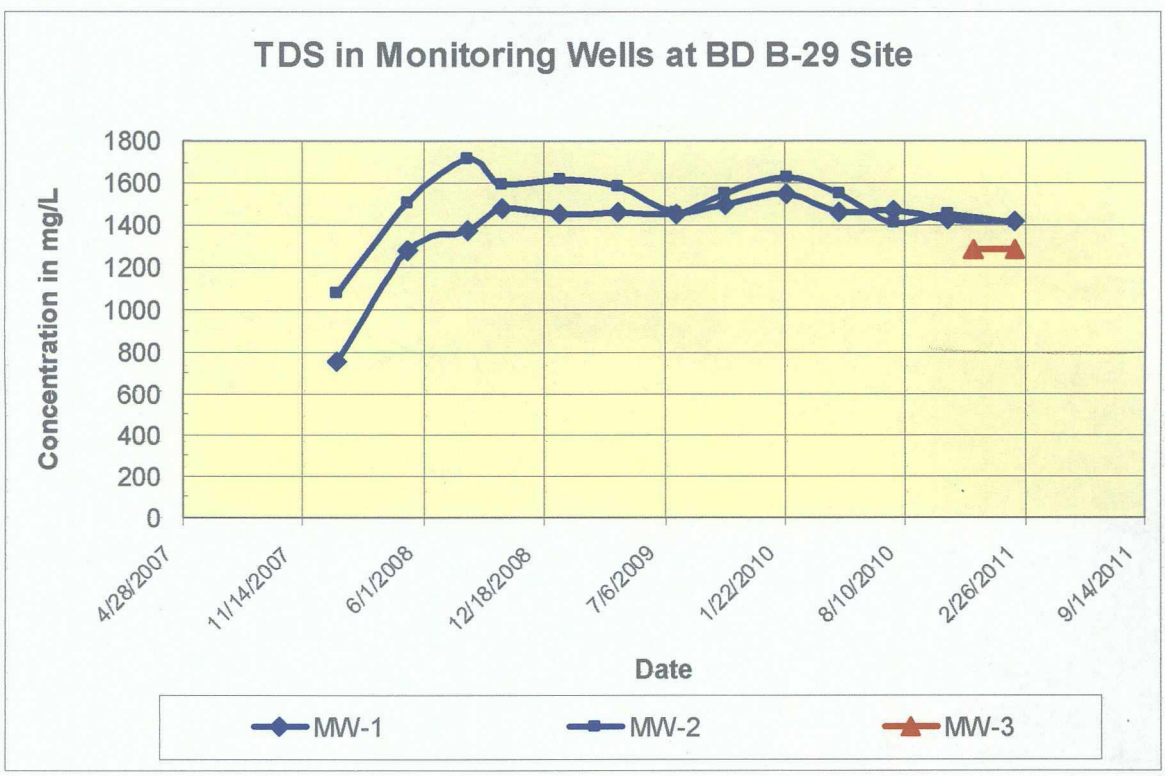


Figure 2 TDS Concentrations in Ground Water at B-29, 2007 to Present



Observations
Chloride and TDS concentrations in MW-1 and MW-2 would be expected to be different due to site variation, natural variation in ground water and the well locations. The similarity of water chemistry in the monitoring wells suggests that the results may be primarily due to area wide ground water quality rather than effects to ground water from the site. To determine if this is the case, MW-3 was installed up-gradient of the site. An examination of Figures 1 and 2 show that:

a) Since May of 2008, all samples from MW-1 and MW-2 have exceeded the WQCC standard for chloride, 250 mg/L, and the standard for TDS, 1,000 mg/L.

b) Since the third quarter of 2009, the average difference in chloride concentration between MW-1 and MW-2 is less than 4% of their concentration. In the same time interval, the average difference in TDS concentration between MW-1 and MW-2 is 6% of the concentration.

c) Chloride and TDS concentrations in MW-3 exceed WQCC standards and are about 25% and 8% less than average concentrations in MW-1 and MW-2 respectively.

Proposed Remedy
To further delineate groundwater quality, additional monitoring is required of the newly installed MW-3 as well as MW-1 and MW-2.

We propose the following corrective action for the site:

1. Excavate the areas shown on Plate 4 to a depth of 4 to 5-feet.
2. Place a liner at the bottom of the excavation and
3. Place backfill containing a chloride concentration of less than 500 mg/kg and a PID (field) reading of less than 100 ppm on top of the liner. Evaluate excavated soil for use as backfill, any soil requiring disposal will be properly disposed of at an NMOCD approved facility.
4. Import additional material as necessary to blend the site with surrounding topography
5. Seed the lined and unlined portions of the release footprint with an appropriate mix for native vegetation. Appropriate amendments will also be added as necessary to promote the growth of vegetation.

The three liners shown on plate 4 (approximate dimensions of: 120 by 220 feet, 90 by 170 feet, and 30 by 110 feet) comprise 56% of the release footprint of about 57,000 feet^2.

Installation of the liner stops all infiltration of surface water to the vadose zone beneath the liner. For soil above the water table; hydraulic conductivity (the ability of a soil to transmit water) varies directly with the moisture content of the soil. As the moisture beneath the liner continues to move downwards due to gravity, the soil immediately below the liner becomes drier. As such, the downwards moisture movement rate through the drier soils decreases. This decrease in moisture movement rate first occurs directly under the liner and spreads downwards over time. The last depths affected are those closest to the water table.

As the liner develops tears and chemically degrades (likely decades to centuries after it was installed), downward movement of water and chloride beneath these areas increases to the rates equivalent to a vegetated area without a liner. The chloride beneath the disintegrating parts of a liner moves downwards to ground water before chloride underneath the intact parts of the liner. Due to this process, chloride from the site enters ground water at different times. The resulting chloride concentration in ground water is less than if chloride from the entire site enters ground water over a shorter time interval.

Re-vegetation of the ground surface will limit infiltration of precipitation and the subsequent migration of constituents of concern to ground water. Plants capture water through their roots, thereby reducing the volume of water infiltrating below the root zone. This natural "infiltration barrier" helps protect ground water as the decreased flux of water through the subsurface slows the transportation rate of residual chloride and soluble hydrocarbons in the subsurface.

Upon completion of the remedy, ROC will continue monitoring ground water an additional 3 quarters and re-evaluate site data at the end of 2011. This remedy is protective of ground water quality, human health, and the environment.

ROC is the service provider (agent) for the BD Salt Water Disposal 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.

Please contact Hack Conder of ROC at 575-393-9174 if you have any questions concerning this submission. Thank you for your time and consideration.

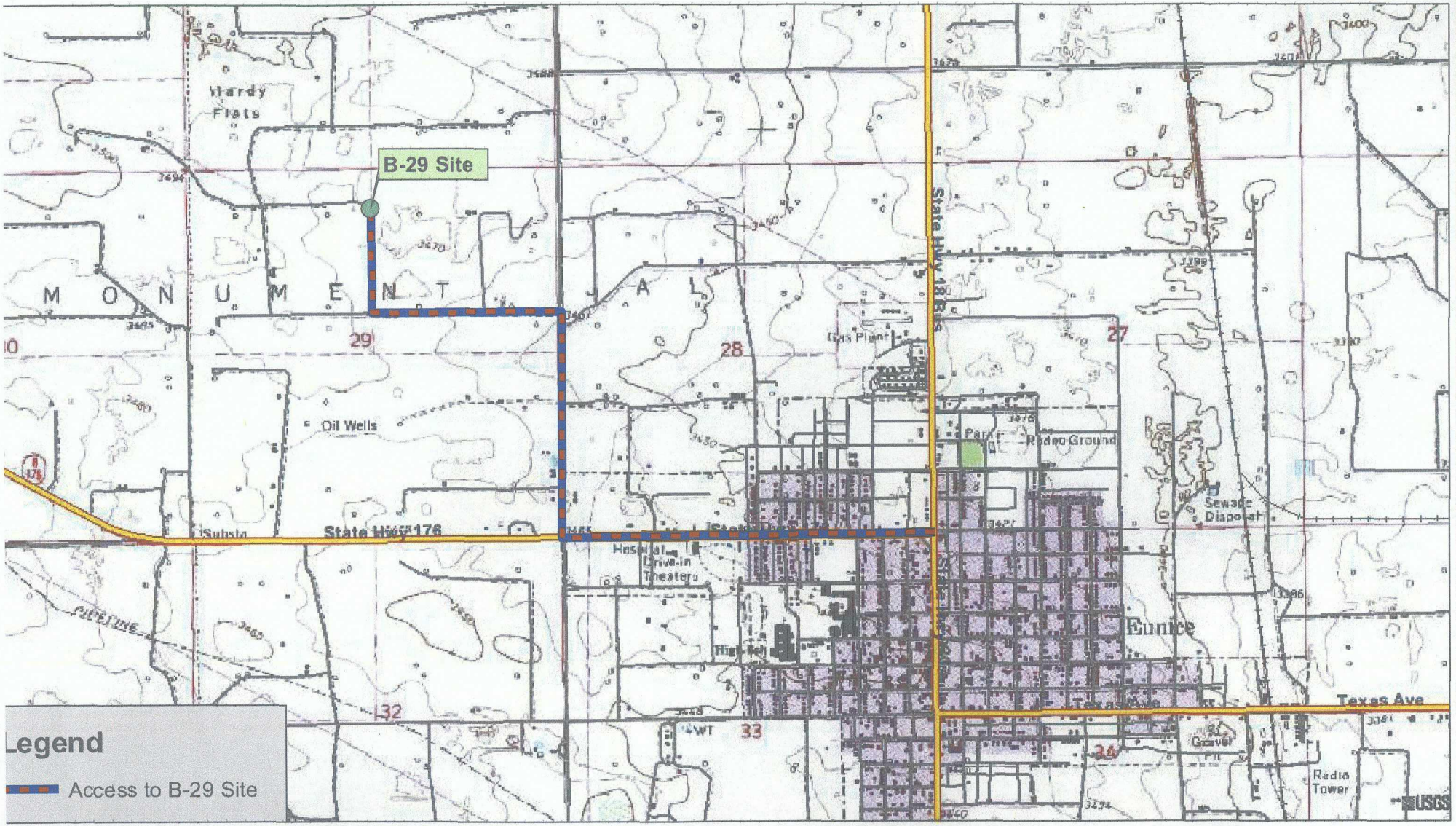
Sincerely,
R.T Hicks Consultants, Ltd.

David J. Hamilton

David Hamilton
Project Hydrologist

Copy: Hack Conder, Rice Operating Company

To access the site, from the intersection of State Highway 176 and 207, Eunice, New Mexico, proceed west on State Highway 176 for 1 mile. Turn north on County Rd 33. Proceed north for 0.6 miles. At 0.6 miles, turn west on an unnamed dirt road. Proceed on the dirt road for 0.2 miles. At 0.2 miles, turn north. Proceed north 0.2 miles to the site.



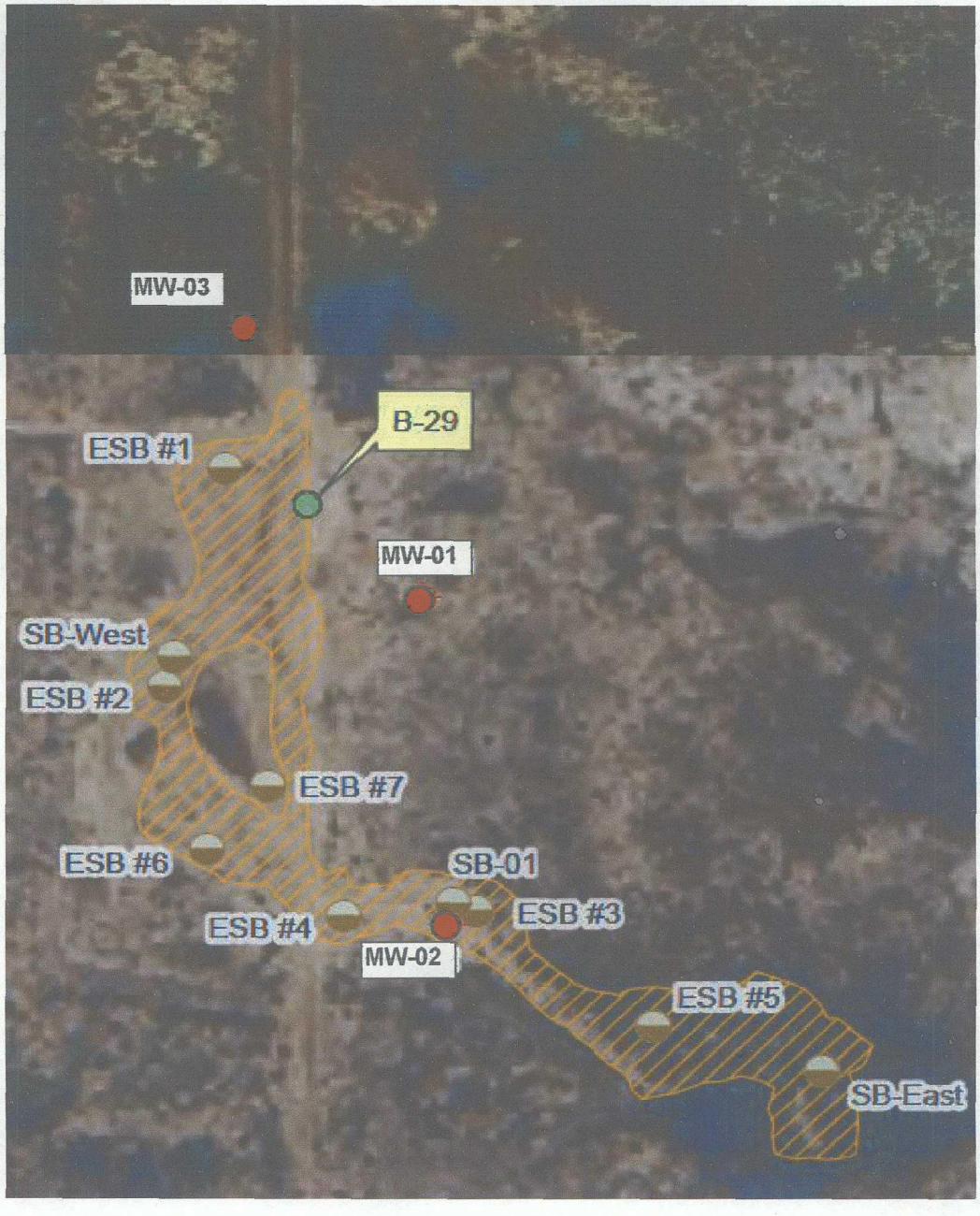
T. Hicks Consultants, Ltd
1 Rio Grande Blvd NW Suite F-142
Albuquerque, NM 87104
Ph: 505.266.5004

7.5 USGS Topo and access to the site

Plate 1

Rice Operating Company: B-29 Site (BD System)

March 2008



Legend

Release Footprint

0 100 200

Scale in feet

North

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Boring and Monitoring Well Locations BD B-29 Site	Plate 2
	Rice Operating Company	April, 2011

R:\BD B29\Spreadsheets\B29AmendedCAP.xls

Chloride Concentrations in Borings. Borings are arranged from North to Southeast.

North

Southeast

Raised Area contained by Release Footprint

Depth (feet)	ESB-1	SB West	ESB-2	ESB-6	ESB-4	SB-1	ESB-3	ESB-5	SB East	ESB-7
5	2510	6483	4265	5143	3821	3639	4393	903	800	1230
10	4543	5807	3809	3462	4145	4626	4887	802	632	594
15	4590	2728	5336	3750	4807	5679	5115	803	745	177
20	4320	1755	5036	2960	4243	4325	4693	1236	603	205
25	4950	899	4094	3826	3586	3185	3396	3492	274	
30	3490	572	4767	4002	3586	2836	3287	3378	152	
35	2981	344	3430	3331	2437	1390	2422	3131	83	
40	2969	236	3269	2809	1671	413	1722	1495	108	
45	2502	160	2649	2452	1499		1648	657	76	
50	2759	152	2583	2237	1348		1539	412		
55	1942	196	1641							
60	1098		1641							
65	1277		1490							
70	1589		1250							
75	1769		2164							
80	1390		2952							
85	1504									
90	1050									
95	1029									

Chloride in [mg/kg]
>6000
6000 - 5000
5000 -4000
3000 -4000
2000 -3000
1000 - 2000
<1000

Borings Shown with Installed Remedy

Depth (feet)	ESB-1	SB West	ESB-2	ESB-6	ESB-4	SB-1	ESB-3	ESB-5	SB East	ESB-7
5	500	500	500	500	3821	3639	4393	903	800	1230
10	4543	5807	3809	3462	4145	4626	4887	802	632	594
15	4590	2728	5336	3750	4807	5679	5115	803	745	177
20	4320	1755	5036	2960	4243	4325	4693	1236	603	205
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30	3490	572	4767	4002	3586	2836	3287	3378	152	
35	2981	344	3430	3331	2437	1390	2422	3131	83	
40	2969	236	3269	2809	1671	413	1722	1495	108	
45	2502	160	2649	2452	1499		1648	657	76	
50	2759	152	2583	2237	1348		1539	412		
55	1942	196	1641							
60	1098		1641							
65	1277		1490							
70	1589		1250							
75	1769		2164							
80	1390		2952							
85	1504									
90	1050									
95	1029									

Added Fill to blend with topography
Material excavated to allow liner placement. Replaced with fill having less than 500 mg/kg chloride. Dark line represents liner.

Chloride in [mg/kg]
>6000
6000 - 5000
5000 -4000
3000 -4000
2000 -3000
1000 - 2000
<1000

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	SB and ESB Boring Series Chloride Concentration Data	Plate 3
	Rice Operating Company, BD B-29 Release Site	April, 2011

Legend

Area with liner installed

Release Footprint

0 100 200

Scale in feet

North

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW, Suite F-142 Albuquerque, NM 87104 505-266-5004	Remedy Plan for the BD B-29 Site	Plate 4
	Rice Operating Company	April, 2011

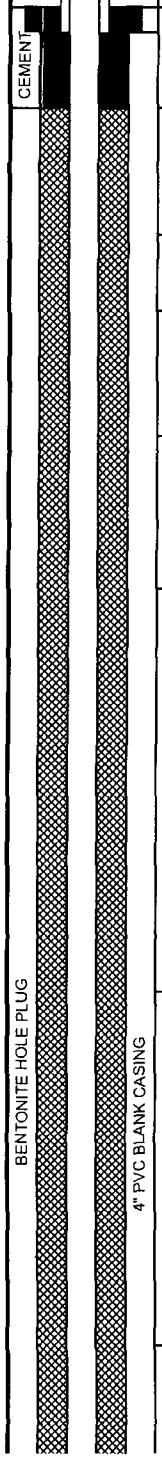
APPENDIX A

LITHOLOGIC LOG (MONITORING WELL)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

MONITOR WELL NO.:	MW-1	TOTAL DEPTH:	110 Ft
SITE ID:	BD System B-29 Line Leak	CLIENT:	Rice Operating Company
SURFACE ELEVATION:	3475 Feet (MSL)	COUNTY:	Lea County
CONTRACTOR:	Harrison & Cooper, Inc.	STATE:	New Mexico
DRILLING METHOD:	Air-Rotary	LOCATION:	T-21-S, R-37-E, Sec. 29 (B)
INSTALLATION DATE:	12/17 to 12/18/07	FIELD REP.:	Dale Littlejohn
WELL PLACEMENT:	68 ft South-southeast of line leak	FILE NAME:	\BD System\B-29\Lithlogs 12-07
COMMENTS:	Lat. 32° 27' 19.2" North, Long. 103° 11' 6.2" West		



Depth	Samples Type	Samples Cl (fld)	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOL., DIST. DEATURES
			SAND AND CLAY Red to reddish brown, medium grain, well sorted, angular sand in red clay matrix.
5	cut	3,273	CALICHE AND SILT Grayish brown, with solid caliche layer from 7 to 9 feet.
10	spoon	1,655	CALICHE AND SILT Grayish brown, Split spoon at 10-12 feet (2,580 mg/kg Cl)
15	cut	3,156	CALICHE Grayish white (hard drilling).
20	cut	2,437	CALICHE AND SILT Gray to light brown with some (5%) very fine grain, sub-angular, poorly sorted sand.
25	cut	2,049	SAND AND SILT Light grayish brown, very fine grain, well sorted, angular.
30	cut	581	
35	cut	350	
40	cut	357	SAND Light brown (with very little silt) very fine grain, well sorted, sub-rounded, with some thin-bedded caliche at 42 feet.
45	cut	377	
50	spoon	274	Split spoon at 50 - 52 feet (6.8 mg/kg Cl).
55			SAND Brown fine grain, well sorted, sub-rounded to rounded.

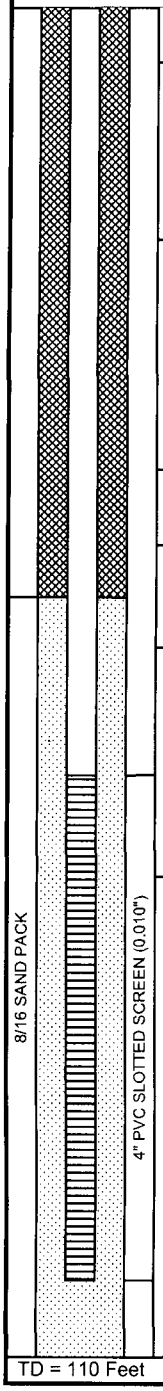
Continued on next page

LITHOLOGIC LOG (MONITORING WELL)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

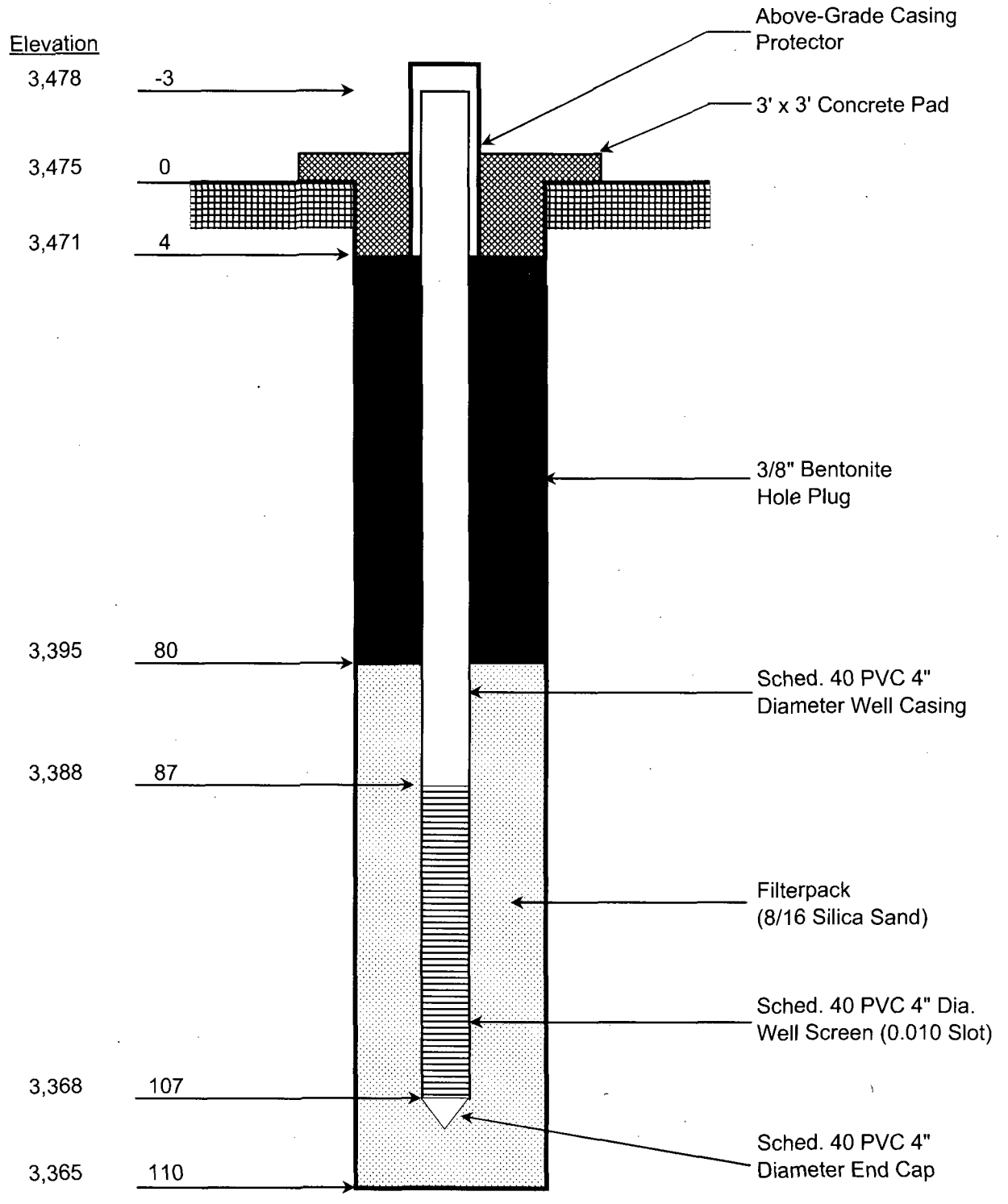
MONITOR WELL NO.:	MW-1	TOTAL DEPTH:	110 Ft
SITE ID:	BD System B-29 Line Leak	CLIENT:	Rice Operating Company
SURFACE ELEVATION:	3475 Feet (MSL)	COUNTY:	Lea County
CONTRACTOR:	Harrison & Cooper, Inc.	STATE:	New Mexico
DRILLING METHOD:	Air-Rotary	LOCATION:	T-21-S, R-37-E, Sec. 29 (B)
INSTALLATION DATE:	12/17 to 12/18/07	FIELD REP.:	Dale Littlejohn
WELL PLACEMENT:	68 ft South-southeast of line leak	FILE NAME:	\BD System\B-29\Lithlogs 12-07
COMMENTS:	Lat. 32° 27' 19.2" North, Long. 103° 11' 6.2" West		



				Continued from previous page
	60	cut	240	SANDSTONE Brown, fine grain, well sorted, subangular, well cemented (not crystalline) and hard to drill.
	65			
	70	cut	225	SAND Brown to reddish brown, fine grain, medium sorted, rounded, subject to caving.
	75			
				QUARTZITE, Reddish brown, fine crystalline, very hard drilling (2-ft/hour).
	80	cut	255	SAND Brown, fine to medium grain, medium sorted, sub-rounded, with interbedded thin sandstone and quartzite.
	85			QUARTZITE, Reddish brown, fine crystalline, very hard drilling (2-ft/hour) with some interbedded hard sandstone.
	90			
very few cuttings to surface	95			SAND (aquifer) Reddish brown, fine grain, moderately sorted, rounded quartz.
	100			Great difficulty encountered during the completion of the well due to caving. Required approx. 15,000 gallons of water with polymer to control caving and clean out well sufficiently to install casing.
	105			
	110			

TD = 110 Feet

MONITORING WELL CONSTRUCTION DIAGRAM



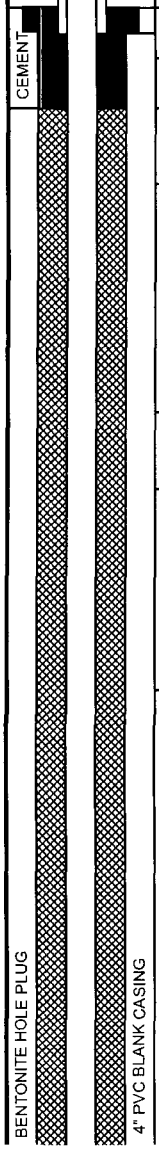
R T Hicks Consultants Ltd	SITE: BD System B-29 Line Leak		**Monitoring Well No. MW-1**
	DATE: ########	REV. NO.: 1	
	AUTHOR: DTL	TECH: DTL	
	DRILLER: H & C, Inc	FILE: Lithlogs	

LITHOLOGIC LOG (MONITORING WELL)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

MONITOR WELL NO.:	MW-2	TOTAL DEPTH:	101 Ft
SITE ID:	BD System B-29 Line Leak	CLIENT:	Rice Operating Company
SURFACE ELEVATION:	3474 Feet (MSL)	COUNTY:	Lea County
CONTRACTOR:	Harrison & Cooper, Inc.	STATE:	New Mexico
DRILLING METHOD:	Air-Rotary	LOCATION:	T-21-S, R-37-E, Sec. 29 (B)
INSTALLATION DATE:	12/18 to 12/19/07	FIELD REP.:	Dale Littlejohn
WELL PLACEMENT:	318 feet South of MW-1	FILE NAME:	\BD System\B-29\Lithlogs 12-07
COMMENTS:	Lat. 32° 27' 16.1" North, Long. 103° 11' 6.0" West		



Depth	Samples Type	Cl (fld)	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOL., DIST. DEATURES
			SILTY CLAY Red to reddish brown.
	cut	2,941	CALICHE Gray with some silt.
5	cut	4,886	SILT Brownish gray
	cut	3,981	SILT Pinkish brown, with some (5%) very fine grain sand and caliche (5%)>
10	cut	3,577	
	cut	3,217	
15	spoon	4,453	Split spoon 15 -17 feet (5,190 mg/kg Cl)
	cut	4,042	SAND Light brown, very fine grain, well sorted, angular.
20	cut	3,807	CALICHE Grayish brown with some silt and very fine grain, well sorted sand
	cut	3,348	
25	spoon	3,736	Split spoon 25 -27 feet (4,100 mg/kg Cl)
	cut	3,045	SAND Light brown with 30% silt) very fine grain, well sorted, rounded sand.
30	cut	3,704	
35	cut	2,664	
40	cut	2,205	
45			

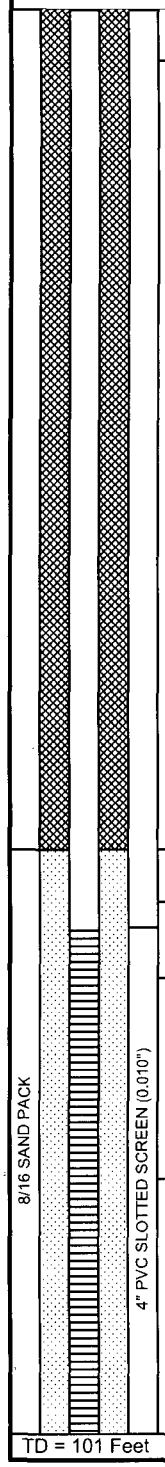
Continued on next page

LITHOLOGIC LOG (MONITORING WELL)

R T Hicks Consultants Ltd

P O Box 7624
Midland, TX 79708
(432) 528-3878

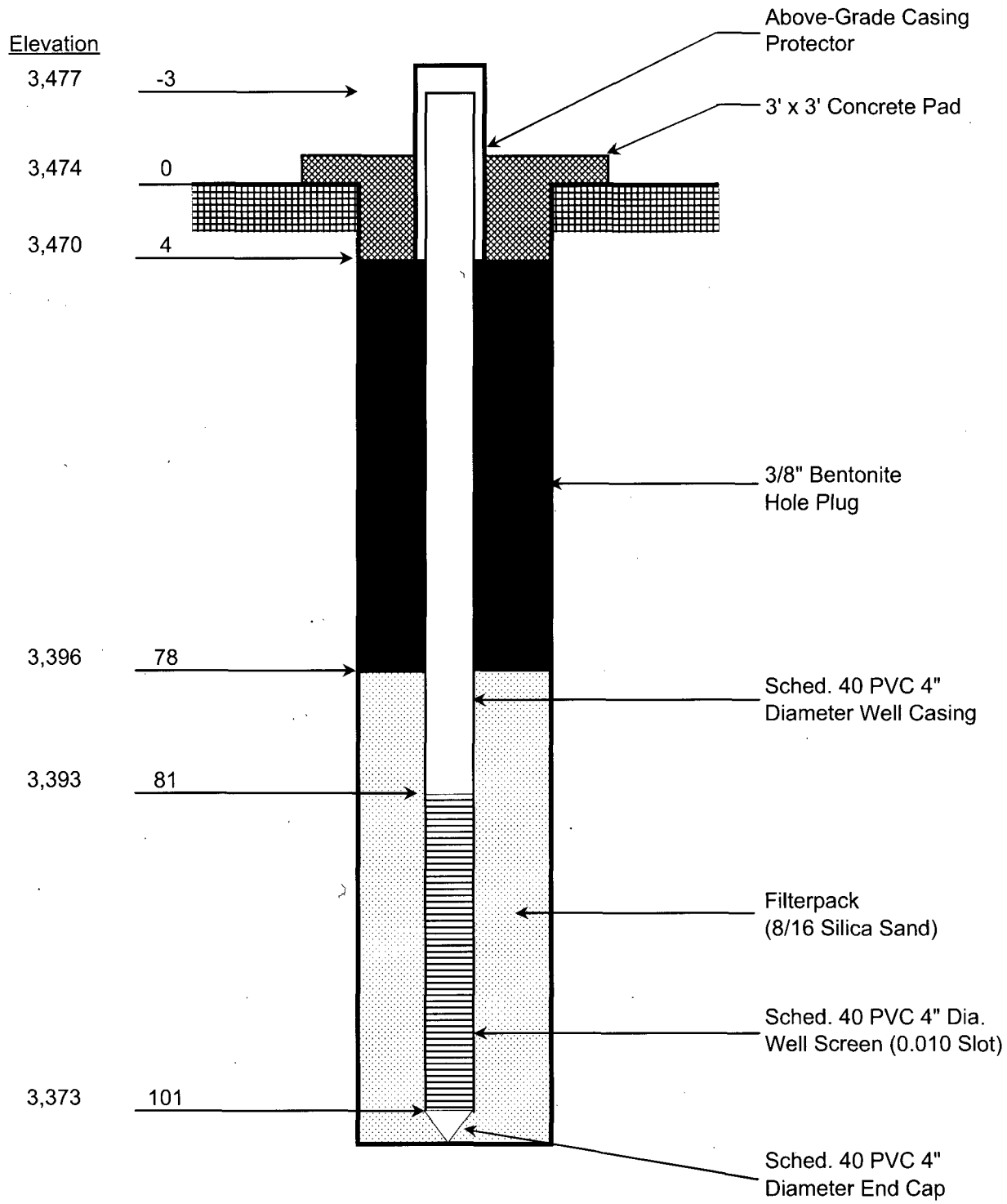
MONITOR WELL NO.:	MW-2	TOTAL DEPTH:	101 Ft
SITE ID:	BD System B-29 Line Leak	CLIENT:	Rice Operating Company
SURFACE ELEVATION:	3474 Feet (MSL)	COUNTY:	Lea County
CONTRACTOR:	Harrison & Cooper, Inc.	STATE:	New Mexico
DRILLING METHOD:	Air-Rotary	LOCATION:	T-21-S, R-37-E, Sec. 29 (B)
INSTALLATION DATE:	12/18 to 12/19/07	FIELD REP.:	Dale Littlejohn
WELL PLACEMENT:	318 feet South of MW-1	FILE NAME:	\BD System\B-29\Lithlogs 12-07
COMMENTS:	Lat. 32° 27' 16.1" North, Long. 103° 11' 6.0" West		



		cut	2,044	*Continued from previous page*
No trackable cuttings below 50 Ft Descrip. based on MW-1 and drilling rate	50	spoon	1,478	SAND Brown (no silt) fine to medium grain, moderately sorted, sub-rounded. *Split spoon at 50 - 52 feet* (1,280 mg/kg Cl). Shut down drilling to add water and polymer (less than 2,500 gallons).
	55			
	60			
	65			
	70			
	75			
	80			QUARTZITE, Reddish brown, fine crystalline, very hard drilling (2-ft/hour).
				SAND Brown, fine to medium grain, medium sorted, sub-rounded, with interbedded thin sandstone and quartzite.
	85			QUARTZITE, Reddish brown, fine crystalline, very hard drilling (2-ft/hour).
	90			
	95			SAND (aquifer) Reddish brown, fine grain, moderately sorted, rounded quartz.
	100			

TD = 101 Feet

MONITORING WELL CONSTRUCTION DIAGRAM



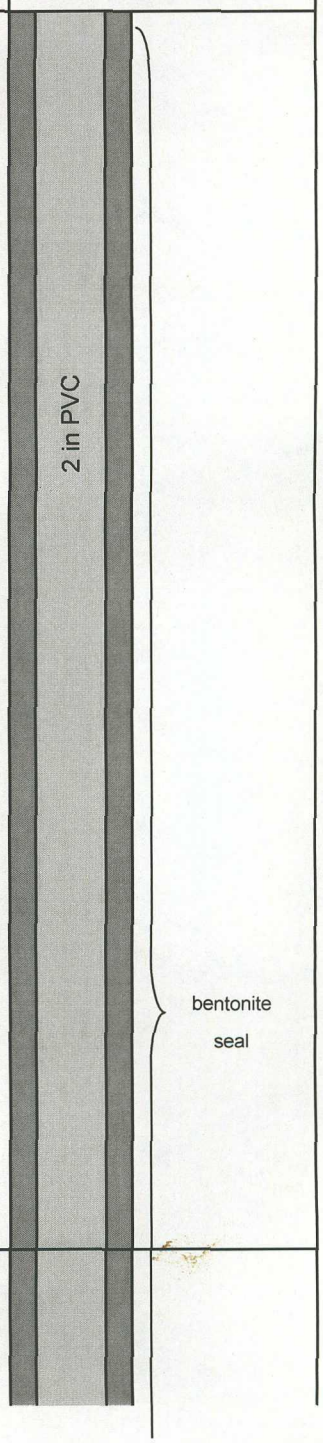
R T Hicks Consultants Ltd	SITE: BD System B-29 Line Leak		**Monitoring Well No. MW-2**
	DATE: ########	REV. NO.: 1	
	AUTHOR: DTL	TECH: DTL	
	DRILLER: H & C, Inc	FILE: Lithlogs	

Logger:	Tony Grieco	MW 3	RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.	MW 1	
Drilling Method:	Air rotary		**Project Name:** BD B-29 leak **Well ID:** MW-3
Start Date:	11/18/2010	MW 2	
End Date:	11/18/2010		**Project Consultant:** R.T. Hicks

Comments: Located 266 ft north west of MW-1. All samples were from cuttings.
DRAFTED BY: L. Weinheimer
TD = 106 ft GW = 90 ft

Location: UL/C sec. 29 T21S R37E
Lat: 32°27'21.485"N **Long:** 103°11'7.736"W
County: LEA **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description
6 in	216		0.7	Red very fine sand, slightly clayey, dry
5 ft	141		1	Tan silt, very slightly clayey, very slightly damp
10 ft	81		0.8	
15 ft	54		0.5	
20 ft	80		0.6	
25 ft	79		0.9	
30 ft	103		0.7	
35 ft	131		0.8	
40ft	82		0.4	
45 ft				
50 ft				
55 ft				NO SAMPLES TAKEN



Logger:	Tony Grieco	MW 3	RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC
Driller:	Harrison & Cooper, Inc.	MW 1	
Drilling Method:	Air rotary		**Project Name:** BD B-29 leak **Well ID:** MW-3
Start Date:	11/18/2010	MW 2	
End Date:	11/18/2010		**Project Consultant:** R.T. Hicks

Comments: Located 266 ft north west of MW-1. All samples were from cuttings.

DRAFTED BY: L. Weinheimer

TD = 106 ft GW = 90 ft

Location: UL/C sec. 29 T21S R37E

Lat: 32°27'21.485"N **County**: LEA

Long: 103°11'7.736"W **State**: NM

Depth (feet)	chloride field tests	LAB	PID	Description	Lithology	Well Construction
60 ft						
65 ft						
70 ft						
75 ft						
80 ft						
85 ft						
90 ft						
95 ft						sand pack
100 ft						
105 ft						
106 ft						

DRILLING LOG	Site Name/Location	BORING/WELL INFORMATION			Logged by: Eades
RICE *Operarting Company*	**B-29**	Well No.SB-West	Date Drilled: 9/9/02	Driller: Eades	Completion:
122 West Taylor	**29-T21S-R37E**	Well Depth:	Boring Depth: 60'	Well Material:	Plugged
Hobbs, New Mexico 88240	**BD SWD System**	Casing Length	Boring Diameter: 4.75"	Casing Size:	with bentonite
(505) 393-9174	**Lea County, NM**	Screen Length:	Drilling Method: Air Rotary	Slot Size:	& cuttings.

DEPTH	SUBSURFACE LITHOLOGY	SAMPLE TYPE	Test Results (ppm) Cl⁻	TPH	REMARKS	Boring
0	Ground surface		Titrate	EPA 418.1		
	Topsoil					
5		Grab	6483			
10	Caliche	Grab	5807		cuttings	
15		Grab	2728			
20		Grab	1755			
25		Grab	899			
30		Grab	572			
35		Grab	344			
40		Grab	236			
45		Grab	160			
					bentonite	
50		Grab	152			
55		Grab	196			
60	Sand and Sandstone Stringers	Grab				
65						

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	Soil Borings, SB-West	**November, 2007**

DRILLING LOG	Site Name/Location	BORING/WELL INFORMATION			Logged by: Eades
RICE *Operarting Company*	**B-29**	Well No. MD SB 1	Date Drilled: 06-25-02	Driller: Eades	Completion:
122 West Taylor	**29-T21S-R37E**	Well Depth:	Boring Depth: 40'	Well Material:	Plugged
Hobbs, New Mexico 88240	**BD SWD System**	Casing Length	Boring Diameter: 4.75"	Casing Size:	with bentonite
(505) 393-9174	**Lea County, NM**	Screen Length:	Drilling Method: Air Rotary	Slot Size:	& cuttings.

DEPTH	SUBSURFACE LITHOLOGY	SAMPLE TYPE	Test Results (ppm) Cl^-	TPH	REMARKS	Boring
0	Ground surface		Titrate	EPA 418.1		
1	Topsoil					
2						
3						
4					cuttings	
5		Grab	3599			
6						
7						
8	Sandy Brown Clay					
9						
10		Grab	4279			
11						
12						
13						
14	Caliche and Light Tan Sand					
15		Grab	5758			
16						
17						
18						
19						
20		Grab	4439			
21						
22						
23						
24						
25		Grab	3279			
26						
27					bentonite	
28						
29						
30		Grab	2959			
31						
32						
33						
34						
35		Grab	1440			
36						
37						
38	Caliche					
39						
40	Sand	Grab	592			

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	Soil Borings, SB-1	**November, 2007**

DRILLING LOG	Site Name/Location	BORING/WELL INFORMATION			Logged by: Eades
RICE *Operarting Company*	**B-29**	Well No. SB-East	Date Drilled: 9/9/02	Driller: Eades	Completion:
122 West Taylor	**29-T21S-R37E**	Well Depth:	Boring Depth: 45'	Well Material:	Plugged
Hobbs, New Mexico 88240	**BD SWD System**	Casing Length	Boring Diameter: 4.75"	Casing Size:	with bentonite
(505) 393-9174	**Lea County, NM**	Screen Length:	Drilling Method: Air Rotary	Slot Size:	& cuttings.

DEPTH	SUBSURFACE LITHOLOGY	SAMPLE TYPE	Test Results (ppm) Cl⁻	TPH	REMARKS	Boring
0	Ground surface		Titrate	EPA 418.1		
	Topsoil					
5		Grab	800			
10		Grab	632		cuttings	
15	Caliche	Grab	745			
20		Grab	603			
25		Grab	274			
30		Grab	152			
35		Grab	83		bentonite	
40		Grab	108			
45	Sand and Sandstone Stringers	Grab	76			
50						
55						
60						
65						

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B-29 Site

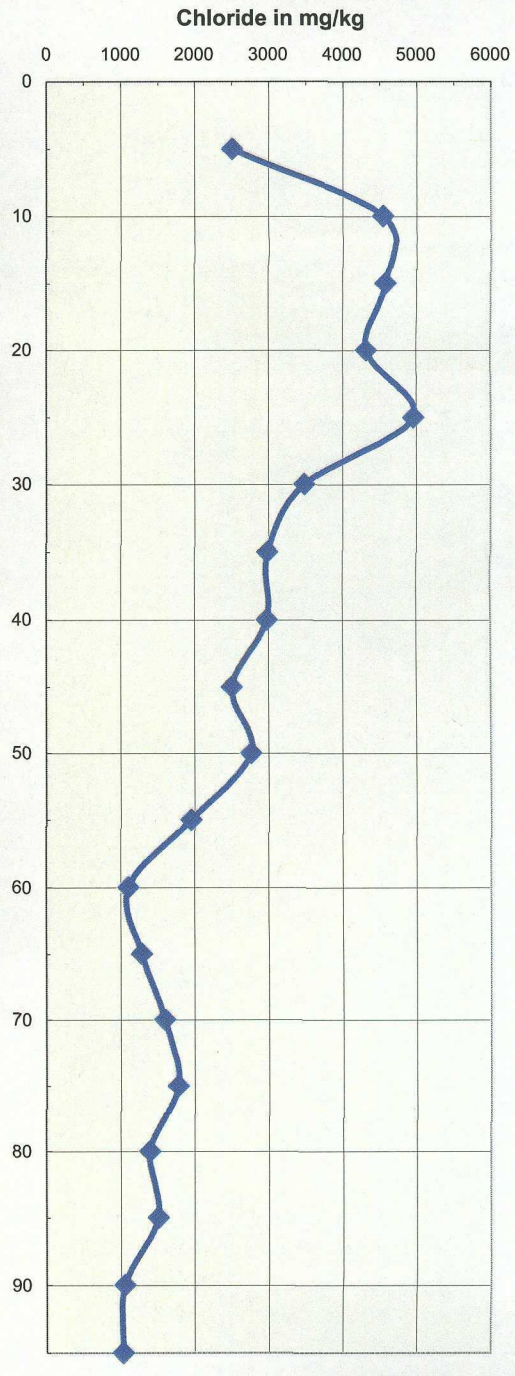
Soil Borings, SB-East

Plate B-3

November, 2007

Driller:	Harrison Cooper Drilling	**Client:**	**Boring ID:**
Logger:	David Hamilton	Rice Operating Company	**ESB-1**
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	**Location:**	
Latitude:	32 27.330	T21S R37E	
Longitude:	103 11.097	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 3 feet	
2.0	Very fine grained sand, silt, caliche, 3-16 feet	
4.0		
6.0		
8.0		
10.0		
12.0		
14.0		
16.0	Fine grained sand, silt, some caliche, 16-24 feet	
18.0		
20.0		
22.0		
24.0	Vf sand, silt, hard caliche, 24-26 fee	
26.0	Very fine gained sand, silt, 26 -30 feet	
28.0		
30.0	Caliche, vf sand, siltt, 30-31 fee	
32.0	Vf sand, silt, 31-36 feet	
34.0		
36.0	Caliche, sand, silt, 36-37 fee	
38.0	Very fine sand, silt, 37-52 feet	
40.0		
42.0		
44.0		
46.0		
48.0		
50.0		
52.0	Vf grained sand, silt, some clay, some caliche, 52 58 feet	
54.0		
56.0		
58.0	Vf grained sand, silt, some clay, 58-66 feet	
60.0		
62.0		
64.0		
66.0	Silt, vf grained sand, some clay, some caliche, 66 72 feet	
68.0		
70.0		
72.0	Vf grained sand, silt, occasional thin caliche, 72 77 feet	
74.0		
76.0	Fine grained sand, some silt, occasional thin caliche, 77-95 feet	
78.0		
80.0		
82.0		
84.0		
86.0		
88.0		
90.0		
92.0		
94.0		
96.0		



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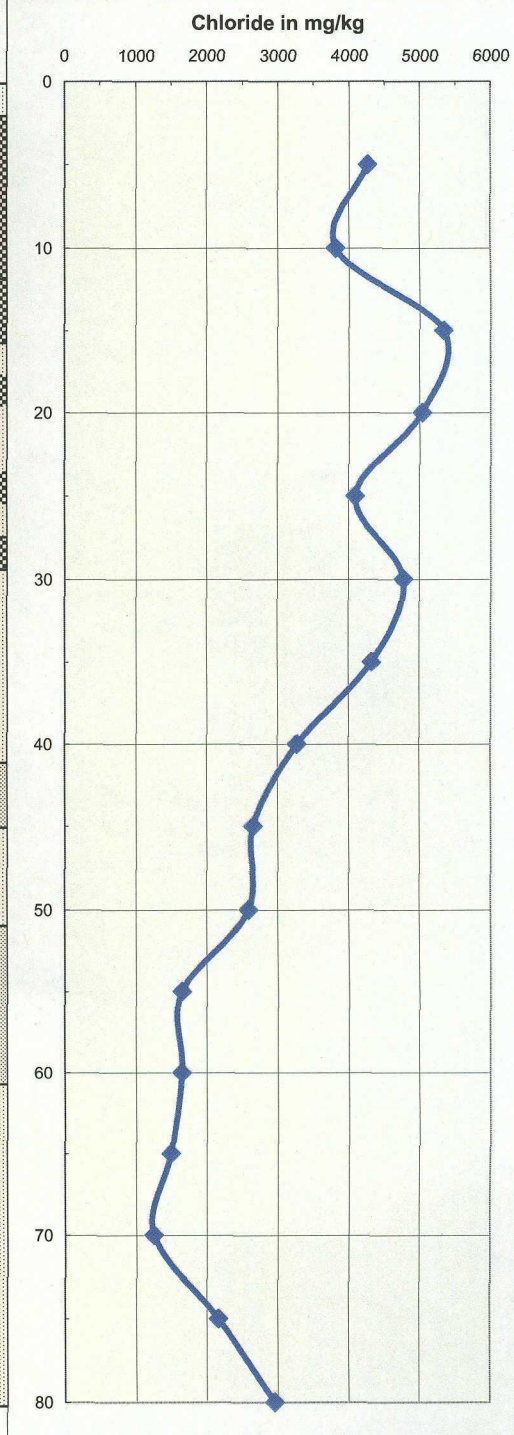
B-29 Site	**Plate B-4**
Exploratory Soil Boring	**November, 2007**

Driller:	Harrison Cooper Drilling	**Client:**	**Boring ID:**
Logger:	David Hamilton	Rice Operating Company	**ESB-2**
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	**Location:**	
Latitude:	32 27.295	T21S R37E	
Longitude:	103 11.108	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 2 feet	
2.0	Very fine grained sand, silt, some clay, some caliche, 2-13 feet, tan-red	
4.0		
6.0		
8.0		
10.0		
12.0	Vf grained sand, silt, caliche, 13-17 feet	
14.0		
16.0	Very fine grained sand, silt, some caliche, 17-28 feet	
18.0		
20.0		
22.0		
24.0		
26.0		
28.0	Very fine grained sand, silt, caliche, 28 -31 feet	
30.0	Very fine grained sand, silt, 31-42 feet	
32.0		
34.0		
36.0		
38.0		
40.0		
42.0	Silt, very fine grained sand, 42-47 feet	
44.0		
46.0	Very fine grained sand, silt, 47-52 feet	
48.0		
50.0		
52.0	Silt, very fine grained sand, 52-63 feet	
54.0		
56.0		
58.0		
60.0		
62.0	Very fine grained sand, silt, 62-80 feet	
64.0		
66.0		
68.0		
70.0		
72.0		
74.0		
76.0		
78.0		
80.0		



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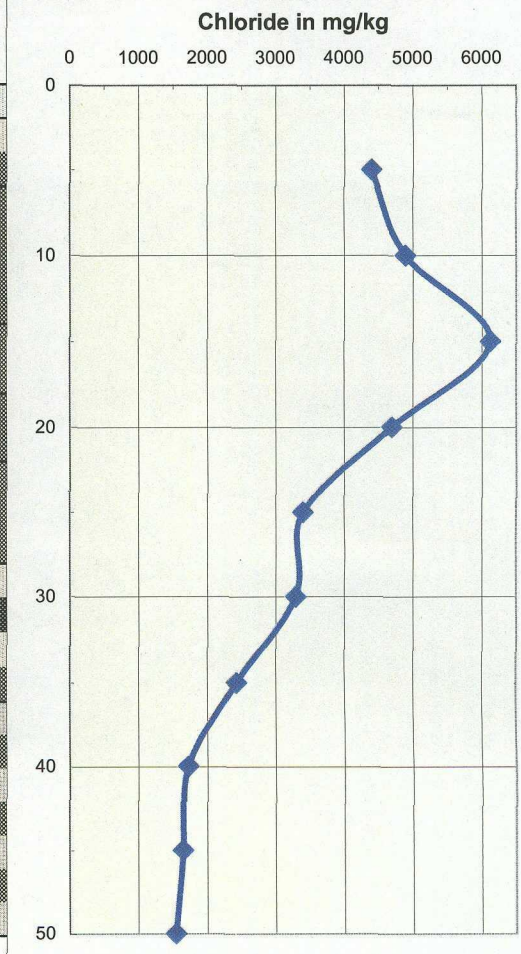
	Exploratory Soil Boring	**November, 2007**

Driller:	Harrison Cooper Drilling	Client:	Boring ID:
Logger:	David Hamilton	Rice Operating Company	ESB-3
Drilling Method:	Air Rotary	Project Name:	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	Location:	
Latitude:	32 27.235	T21S R37E	
Longitude:	103 11.055	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 1 feet	
2.0	Fine grained sand, some silt, some caliche, 1-7 feet	
4.0		
6.0	Vf grained sand, silt,caliche, 7-14 feet	
8.0		
10.0		
12.0		
14.0	Silt, very fine grained sand, some caliche,14-18 feet	
16.0		
18.0	Very fine grained sand, silt, caliche, 18-23 feet	
20.0		
22.0	Silt, very fine grained sand, some caliche, 23-28 feet	
24.0		
26.0		
28.0	Fine grained sand, silt, some caliche layers, 28-37 feet	
30.0		
32.0		
34.0		
36.0	Silt, very fine sand, some thin caliche layers, 37-50 feet	
38.0		
40.0		
42.0		
44.0		
46.0		
48.0		
50.0		



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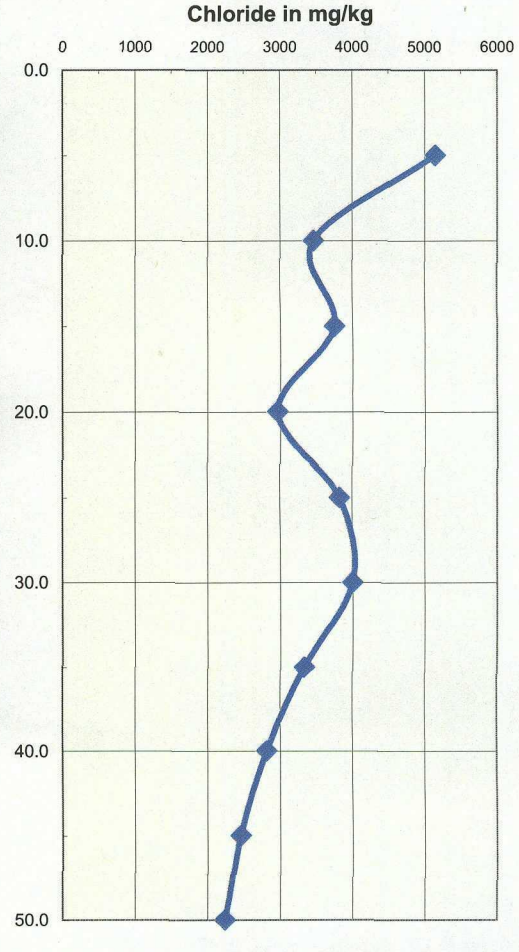
505-266-5004

B-29 Site	Plate B-6
Exploratory Soil Boring	November, 2007

Driller:	Harrison Cooper Drilling	**Client:**	**Boring ID:**
Logger:	David Hamilton	Rice Operating Company	**ESB-4**
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	**Location:**	
Latitude:	32 27.258	T21S R37E	
Longitude:	103 11.077	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 2 feet	
2.0	Very fine grained sand, silt, 2-3.5 feet	
4.0	Vf grained sand, silt, hard caliche, 3.5-7 feet	
6.0	Very fine grained sand, silt, some caliche, 7-20 feet	
8.0		
10.0		
12.0		
14.0		
16.0		
18.0		
20.0	Hard caliche, 20 -22 feet	
22.0	Very fine grained sand, silt, some caliche layers, 22-30 feet	
24.0		
26.0		
28.0	Silt, very fine grained sand, some caliche layers, 30-50 feet	
30.0		
32.0		
34.0		
36.0		
38.0		
40.0		
42.0		
44.0		
46.0		
48.0		
50.0		



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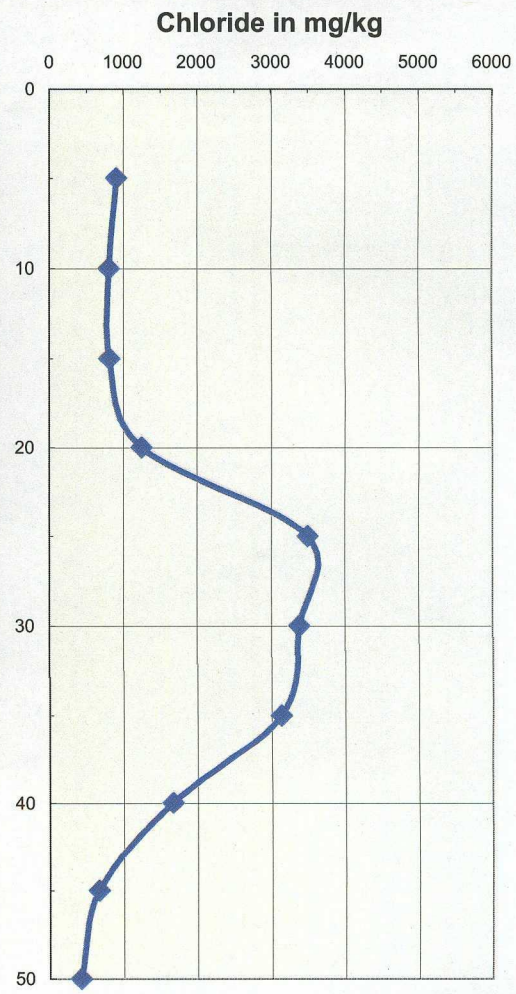
B-29 Site	**Plate B-7**
Exploratory Soil Boring	**November, 2007**

Driller:	Harrison Cooper Drilling	**Client:**	**Boring ID:**
Logger:	David Hamilton	Rice Operating Company	**ESB-5**
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	**Location:**	
Latitude:	32 27.233	T21S R37E	
Longitude:	103 11.017	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 1.5 feet	
2.0	Silt, very fine grained sand, some clay, some caliche, 1.5-6 feet	
4.0		
6.0		
8.0	Vf grained sand, silt, some clay, 8-11 feet	
10.0	Sand, silt, some clay, some caliche, 11-18 feet	
12.0		
14.0		
16.0		
18.0	Sand, silt, caliche, 18 -22 feet	
20.0		
22.0	Caliche, sand, silt, 22-24 feet	
24.0	Vf grained sand, silt, 24-27 feet, tan	
26.0	Very fined grained sand, silt, caliche layers 27-30 feet	
28.0		
30.0	Vf grained sand, silt, caliche, 30-33 feet	
32.0	Fine grained sand, silt, 33 - 42 feet	
34.0		
36.0		
38.0		
40.0		
42.0	Fine grained sand, silt, thin caliche layers, 42-50 feet	
44.0		
46.0		
48.0		
50.0		



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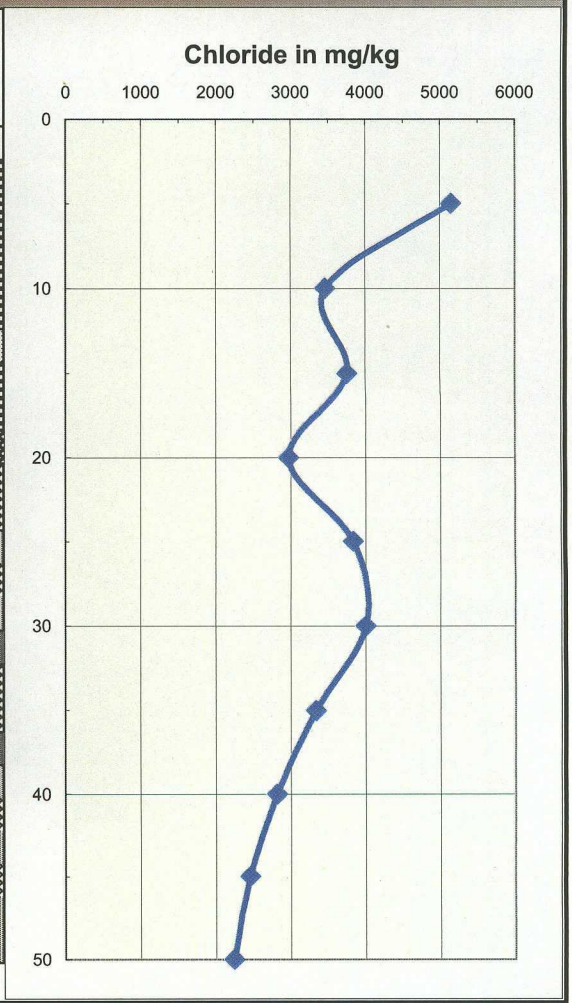
B-29 Site	**Plate B-8**
Exploratory Soil Boring	**November, 2007**

Driller:	Harrison Cooper Drilling	**Client:**	**Boring ID:**
Logger:	David Hamilton	Rice Operating Company	**ESB-6**
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	**Location:**	
Latitude:	32 27.269	T21S R37E	
Longitude:	103 11.101	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 2 feet	
2.0	Very fine grained sand, silt, some caliche, 2-12 feet, light tan	
4.0		
6.0		
8.0		
10.0		
12.0	Vf grained sand, silt, 12-14 feet, light tan	
14.0	Very fine grained sand, silt, some caliche, 14-18 feet, light tan	
16.0		
18.0	Vf grained sand, silt, hard caliche, 18 -20 feet	
20.0	Silt, very fine grained sand, some caliche, 20-23 feet, light tan	
22.0		
24.0	Silt, very fine grained sand, some caliche, 23-30 feet, tan	
26.0		
28.0		
30.0	Silt, vf grained sand, hard caliche, 30-32 feet	
32.0	Silt, vf grained sand, caliche layers, 32-36 feet, ta	
34.0		
36.0	Silt, vf grained sand, hard caliche, 36-37 feet	
38.0	Silt, very fine grained sand, some caliche, 37 - 50 feet	
40.0		
42.0		
44.0		
46.0		
48.0		
50.0		



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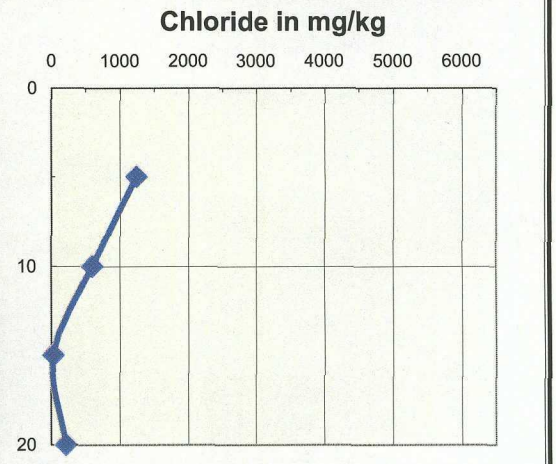
505-266-5004

B-29 Site	**Plate B-9**
Exploratory Soil Boring	**November, 2007**

Driller:	Harrison Cooper Drilling	**Client:**	**Boring ID:**
Logger:	David Hamilton	Rice Operating Company	**ESB-7**
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	12/14/2006	B-29 Site	
End Date:	12/14/2006	**Location:**	
Latitude:	32 27.279	T21S R37E	
Longitude:	103 11.090	Section 29	

Depth (feet)	Description	Lithology
0.0	Surface, 0 - 1.5 feet	
2.0	Very fine grained sand, silt, some caliche, 1.5-12 feet	
4.0		
6.0		
8.0		
10.0		
12.0	Vf grained sand, silt, caliche, 12-20 feet	
14.0		
16.0		
18.0		
20.0		



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B-29 Site	**Plate B-10**
Exploratory Soil Boring	**November, 2007**