1R – 428 - 67

WORK PLAN

DATE:
01/03/07

January 3, 2007

IR-428-67
Work Plan
1-3-07

Corrective Action Plan for E-33-1 Junction Box Site

Hobbs Salt Water Disposal System

R.T. Hicks Consultants, LTD
901 Rio Grande Blvd., NW, Suite F-142, Albuquerque, NM 87104

R. T. HICKS CONSULTANTS, LTD.

901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

December 31, 2006

RECEIVED

JAN 08 2007

Oil Conservation Division
Environmental Bureau

Wayne Price
Environmental Bureau Chief
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: **E-33-1 Junction Box Site (NMOCD CASE #: 1R0428-67)**

Dear Wayne

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is submitting this Corrective Action Plan (CAP) for the above-referenced site. Rice Operating Company has reviewed this submission and authorized our delivery of this document to NMOCD.

This CAP complies with NMOCD Rule 116 which states:

> D. Corrective Action. The responsible person must complete Division approved corrective action for releases which endanger public health or the environment. Releases will be addressed in accordance with a remediation plan submitted to and approved by the Division or with an abatement plan submitted in accordance with Section 19 of 19.15.1 NMAC.

As stated in the CAP, the proposed remedy is installation of a simple evapotranspiration (ET) infiltration barrier and two additional quarters of ground water monitoring to confirm that ground water will not exceed WQCC Standards as a result of past operations of the site. If you have any questions regarding this submission, please contact Kristin Pope at Rice Operating Company.

Sincerely,
R.T Hicks Consultants, Ltd.

Randall T. Hicks
Principal

Copy:
K. Pope, Rice Operating Company
NMOCD, Hobbs District Office

January 3, 2007

RECEIVED

JAN 08 2007

Oil Conservation Division
Environmental Bureau

Corrective Action Plan for E-33-1 Junction Box Site

Hobbs Salt Water Disposal System

NMOCD CASE #: 1R0428-67

R.T. Hicks Consultants, LTD

901 Rio Grande Blvd. NW, Suite F-142, Albuquerque, NM 87104

Table of Contents

1.0 EXECUTIVE SUMMARY

This Corrective Action Plan presents the results of the characterization activities performed by R.T. Hicks Consultants (Hicks Consultants) and Rice Operating Company (ROC) at the E-33-1 junction box site located in the Hobbs Salt Water Disposal System (SWD), and proposes closure of the site after implementation of the selected remedy and two additional quarterly ground water monitoring events.

The selected remedy is the creation of an infiltration barrier through surface restoration and re-vegetation of the site. This remedy is protective of ground water quality and human health and the environment.

Data Summary

1. R.T. Hicks Consultants supervised field activities at the E-33-1 Junction Box site in May 2006. This involved general reconnaissance as well as supervision of borehole sampling of the vadose zone from ground surface to ground water.

2. Chloride concentration data show that the center of mass of the release from the site resides from 20- to 35-feet below ground surface. The maximum chloride concentration of the borehole is 1381 mg/kg (laboratory) at a depth of 35 feet.

3. Chloride concentrations below the center of mass ranged from 863 mg/kg (field result for 40 feet bgs) to 1054 mg/kg (above the capillary fringe at 45 feet bgs). Above the center of mass, chloride concentrations are less than 1000 mg/kg.

4. Because chloride concentrations in the vadose zone exceeded the delineation limit established by the Investigation Characterization Plan (ICP), a monitoring well was installed within the boring.

5. Neither field PID analyses nor observed characteristics of samples suggest that hydrocarbons are present in the vadose zone. All field PID analyses were 0 ppm.

6. Two quarterly ground water sampling events showed that TDS and chloride were below WQCC Standards.

Conclusions

1. Two sampling events show results demonstrating ground water beneath the site does not exceed WQCC Standards.
2. After re-vegetation of the site and placement of a simple infiltration barrier, the mass of chloride from 20-feet to 40-feet below ground surface is not sufficient to cause ground water to exceed the WQCC standards at the site due to migration of chloride from the vadose zone to ground water. The concentrations of chloride in the remainder of the vadose zone are less than 1000 mg/kg and pose no threat to ground water.
3. An imported silt/loam clean backfill placed over a coarse-grained capillary break plus re- vegetation will effectively eliminate any recharge rate to ground water.
4. Site-specific HYDRUS-1D simulations show that the recharge rate at this site (without re-vegetation) is effectively zero.
5. HYDRUS-1D simulations predict that installation of a simple infiltration barrier will provide ample protection of ground water quality.

Recommendations

1. R.T. Hicks Consultants recommends that ROC restore and re-vegetate the ground surface at the E-33-1 Junction Box Site. Upon documentation of these actions and verification that ground water quality is not impaired relative to WQCC Standards (2 additional quarters of monitoring) ROC will request closure of the regulatory file for the E-33-1 Junction Box site.

2. After site closure, the monitoring well may remain operational, contributing data on an as-needed basis for the closure of remaining sites within the Hobbs SWD system.

2.0 BACKGROUND

The Hobbs Salt Water Disposal System (SWD), which managed produced water from the late 1950s to the present, is now closed. Future releases from the system infrastructure are not possible. Closure of facilities like the E-33-1 Junction Box within Hobbs SWD, followed the August 6, 2004 NMOCD-approved junction box investigation plan. This plan calls for delineation of any impact from these sites during the closure process and states:

> If 12 feet vertical delineation at the source reveals Target Concentrations for TPH or BTEX will not meet NMOCD guidelines or TPH and BTEX will meet guidelines but there is not a significant decline vs. depth in chloride concentration, the site-impact is judged to be outside the scope of this work plan and will become a risk-based corrective action (RBCA) project-site.

The E-33-1 Junction Box site met these criteria. With the abandonment of the system in 2002, Rice Operating Company (ROC) excavated and removed the SWD E-33-1 Junction Box and the upper four feet of the vadose zone. At the time of investigation, the excavation was filled with a mixture of silty loam and some caliche.

2.1 Location

Appendix A includes a regional location map showing the location of the site relative to selected other components of the Hobbs SWD system and public roads. Plate 2 is an aerial photograph of the site when it was active, taken between 1996 and 1998. Plotted on Plate 2 is the location of the boring and nearby roads.

The site is within unit letter E, Section 33, Township 18S Range 38E. To access the site from the intersection of Sanger and Grimes proceed west on Sanger 0.7 miles. Turn left at locked gate and continue south 0.45 mile to the site. The on site monitoring well is situated approximately 60 feet south from the fence around an adjacent gas well.

2.2 Characterization Activities

In May 2006, R. T. Hicks Consultants, ROC, and Atkins Drilling mobilized to conduct a series of exploratory drillings at five sites within the Hobbs SWD System. The investigation and characterization used the same protocols as described in the NMOCD-approved work plan for the site (see Appendix B). In order to permit comparison of the results from this boring with the ambient chloride concentrations in the vadose zone, collection of samples from a background soil boring was a critical element of the ICP. Appendix A shows the location of this background soil boring and Appendix C shows the results of field chloride measurements from the background soil boring.

At the E-33-1 junction box site, one soil boring was advanced immediately over the former junction box on May 2, 2006. In the field, ROC evaluated samples from each depth for chloride and used the heated headspace method to measure total organic vapors by PID. One sample was submitted to the laboratory from the depth showing one of the highest field chloride measurement (24-26 feet bgs). The boring was completed as a monitoring well due to chloride field tests indicating levels above the threshold specified in the ICP (250 mg/kg). The total depth of the boring is 79 feet bgs and the depth to water is about 62 feet bgs.

3.0 CHARACTERISTICS OF THE VADOSE ZONE

The upper 10 feet of the vadose zone at the site is composed of a silty loam and caliche that is underlain by 14 feet of fine sandy caliche. Below these two layers, a 16-ft thick calcareous fine-grained sand was encountered. A fine-grained sand continued to the bottom of the boring and into the saturated zone to a depth of 79 feet bgs. The calcium carbonate content steadily decreases with depth. The lithologic log of the boring/monitoring well is included in Appendix D.

A maximum chloride concentration of 1,381 ppm was measured in the field at the 34-36 ft interval. After field analysis and description there was not sufficient sample material leftover (only 2-inch penetration by split-spoon) for a laboratory submitted duplicate. Laboratory analyses confirm the results of the field tests (1640 mg/kg at 24 feet bgs). Below this center of mass, chloride concentrations declined to 729 mg/kg at 60 feet bgs, which is immediately above or within the capillary fringe. Appendix D shows field chloride concentrations and PID measurements and Appendix E provides additional chemical data for the soil samples. Background chloride concentrations in the area, as determined from the background boring located about 1/2 mile northwest of the former E-33-1 junction box (Appendix C), are approximately 80 mg/kg.

A summary of chloride concentrations, photoionization detector (PID) readings, and general soil type are listed in the Table 1 below.

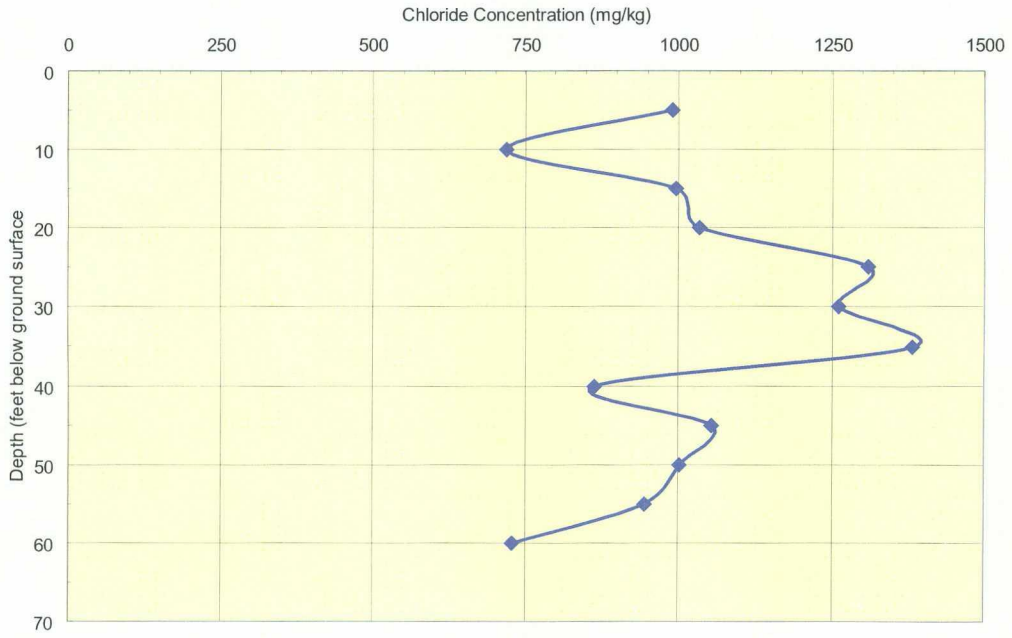
Table 1: Summary of Field Measurements for Boring/Monitoring well

Depth (Feet bgs)	Chloride (mg/kg)	PID (ppm)
4-5	433	0
5-6	990	0
9-11	719	0
14-16	996	0
19-21	1035	0
24-26	1309*	0
27-29	1262	0
34-36	1381	0
39-41	863	0
44-46	1054	0
49-51	1002	0
54-56	946	0
59-61	729	0

* Lab duplicate for the 24-ft sample indicated a chloride concentration of 1,640 mg/kg.

The chloride concentration vs. depth profile is displayed in Figure 1 below.

Figure 1: Chloride Concentration at Depth for E-33-1 Junction Box Site



Neither hydrocarbon odors nor PID measurements above 0 ppm were detected in the boring (Appendix D). Consequently, no laboratory analyses for petroleum hydrocarbons were necessary.

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4.0 CHARACTERISTICS OF THE SATURATED ZONE

At the E-33-1 Junction Box site, moist soil was at 55 feet bgs and depth to water is at 62 feet bgs. Potentiometric surface maps for this area are included in Appendix A.

Ground water sampling showed that chloride, TDS, and BTEX concentrations were below WQCC standards for both sampling events conducted to date. Field and lab data are summarized in the table below.

Table 2: Groundwater Monitoring Results

Date Sampled	Depth to Groundwater (Feet btoc)	Concentrations (mg/L)					
		Chloride	TDS	Benzene	Toluene	Ethylbenzene	Total Xylenes
WQCC Standard		250	1000	0.0	0.75	0.75	0.62
5/17/06	64.44	142	678	<0.001	<0.001	<0.001	<0.001
8/14/06	64.62	138	622	<0.001	<0.001	<0.001	<0.001

5.0 EVALUATION OF VERTICAL CHLORIDE FLUX

Soil boring data shows chloride concentrations above 250 mg/kg throughout the vadose zone. However, the center of chloride mass is between 25 and 35 feet bgs, which is 30 feet above the water table. Chloride concentrations generally decline with depth. These data support a conclusion that a minimal amount of produced water has migrated through the vadose zone to ground water via unsaturated flow.

The fact that the center of chloride mass resides from 25 to 35 feet bgs also demonstrates that the deep percolation rate beneath the finer-grained and more calcareous uppermost vadose zone (0-24 feet bgs) was not sufficient to evenly distribute the chloride load throughout the vadose zone. Where the deep percolation rate is relatively high due to historic releases of produced water, chloride concentrations are generally evenly distributed with concentrations higher than 1000 mg/kg; a distinct center of mass is not observed. This is not the case at the E-33-1 junction box site.

R.T Hicks Consultants believes the following release/transport scenario is consistent with the empirical data. At the E-33-1 junction box site, periodic releases created sufficient soil moisture to allow chloride transport to a depth of 25 to 35 feet bgs, perhaps under saturated or near-saturated flow. After the release, evaporation of soil moisture and drying of the upper vadose zone reduced soil moisture and hydraulic conductivity temporarily "stranding" the chloride mass in the fine-grained, calcareous sand that exists from 25 to 35-feet bgs. Unsaturated flow allowed slow downward chloride transport through the vadose zone.

The fact that ground water does not exceed WQCC Standards also supports a conclusion that chloride transport through the vadose zone cannot and will not naturally migrate to ground water at a flux rate that will cause an exceedance of the WQCC Standards.

6.0 PROPOSED REMEDY

Experience at similar sites and HYDRUS-1D simulations of the conditions observed at this site support re-vegetation and placement of a simple infiltration barrier as an effective corrective action. Technical support for this design is discussed below.

The geometry of the chloride vs. depth profile in Figure 1 permits the conclusion that produced water released from the junction box intercepted ground water in the past. For modeling purposes, this report assumes that background water quality for chloride in the area is about 100 mg/l. However, data show that other wells in the general area can exceed the concentrations observed in the E-33-1 Junction Box site monitoring well (see Appendix A). For the purpose of designing a corrective action using a HYDRUS-1D model, the input data assumes the worst case: that the flux of chloride from the vadose zone at this site *is* sufficient to cause a net increase in ground water chloride concentration of about 40 mg/l. This would result in the 140 mg/l concentrations observed in the monitoring well (assuming a background chloride concentration of 100 mg/l). The model also assumes that leakage from the junction box site created a "wet" vadose zone profile. Appendix F describes the HYDRUS-1D simulation input data and methods.

The results of the HYDRUS-1D model are presented below in Figure 2. An evapotranspiration (ET) barrier was installed in the model composed of 3 feet of imported silt/loam above one foot of coarse-grained sand (to reduce upward wicking of chloride, see figure 3). The effect of vegetation (increased evapotranspiration) and the placement of imported silt/loam upper vadose zone material (increased storage of infiltrated precipitation) are immediate in the upper vadose zone. Infiltration below the root zone decreases to near zero. However, the wet vadose zone profile continues to drain from year 0 to year 19. After year 19, the vadose zone profile has dried sufficiently through drainage that vadose zone water flux to ground water is reduced by more than an order of magnitude (Figure 4). The resultant chloride flux from the vadose zone to ground water has decreased to the point that ground water quality is statistically indistinguishable from assumed 100 mg/l background at the monitoring well.

Figure 2: Chloride Concentration in the Aquifer With an Installed ET Barrier, E-33-1 Site

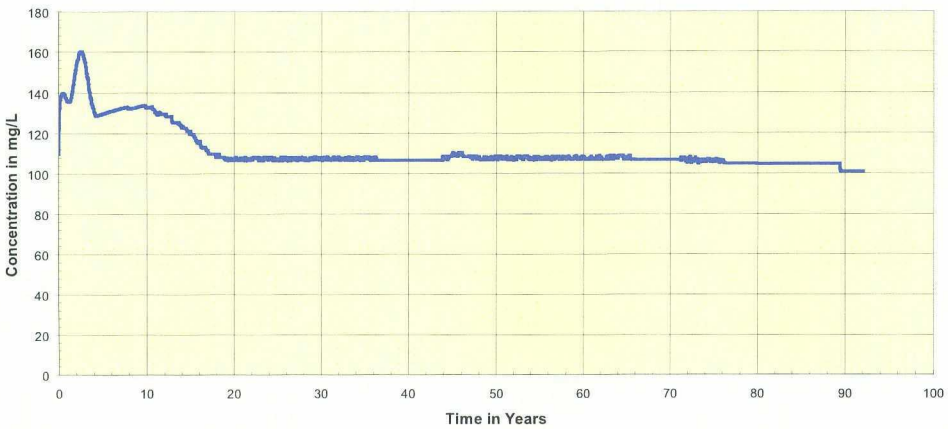


Figure 3

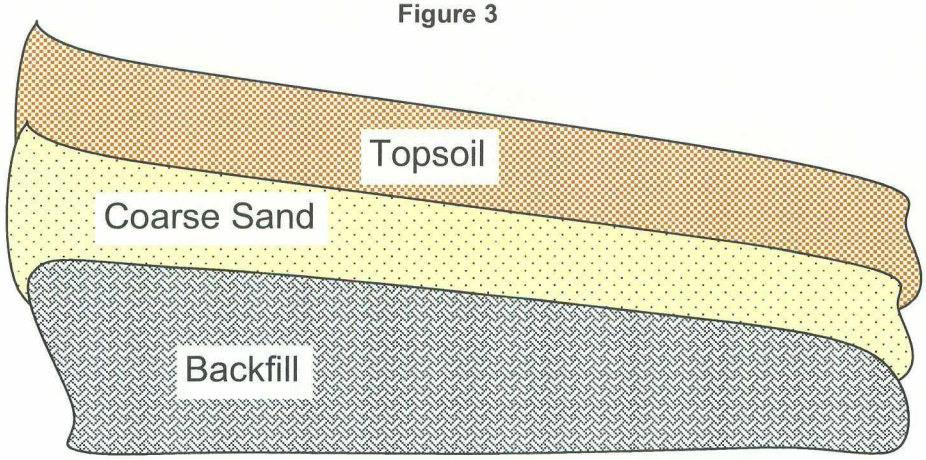
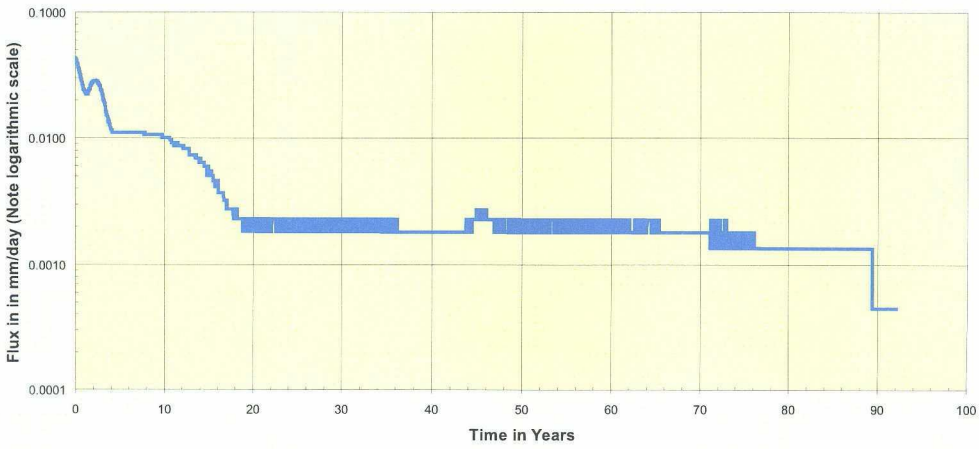


Figure 3: Vadose Zone Water Flux into the Aquifer With an Installed ET Barrier, E-33-1Site

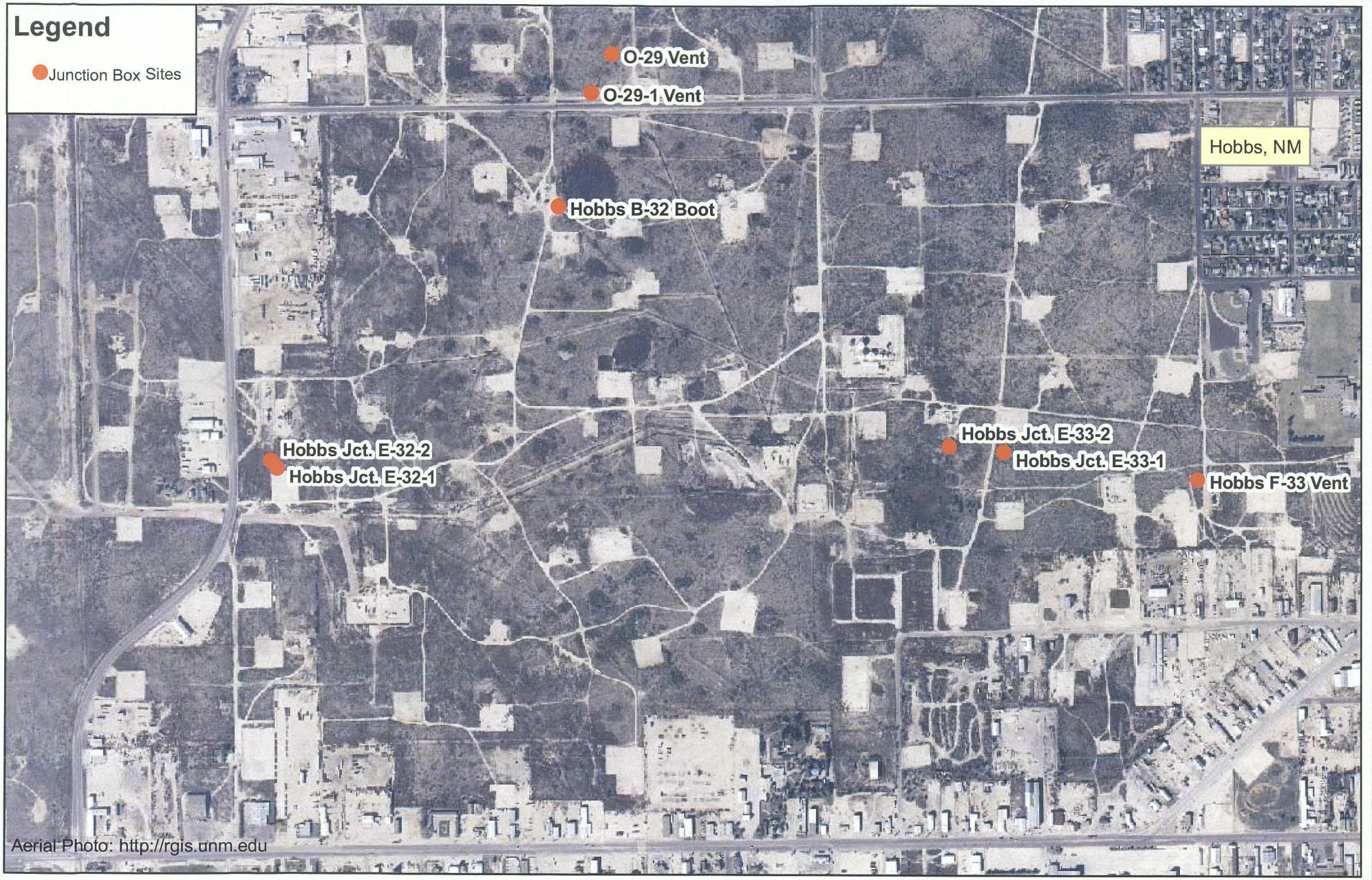


This corrective action plan calls for two years of semi-annual ground water monitoring after establishing vegetation at the site. If chloride concentrations in ground water do not increase over time, ROC will request closure of the regulatory file for this site.

7.0 CRITERIA FOR CLOSURE

Vadose zone samples demonstrate no toxic pollutant(s) as defined in 20.6.2.7 NMAC.

The empirical evidence shows no reasonable probability of exceedance of NMED/WQCC ground water standards in the future due to residual constituents in the vadose zone. After documentation of ground surface restoration and revegetation and two additional ground water sampling events confirm no impact to ground water, Rice will submit a final closure report.



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Junction Box Site Location Map	Plate 1
	Rice Operating Company	December 2006

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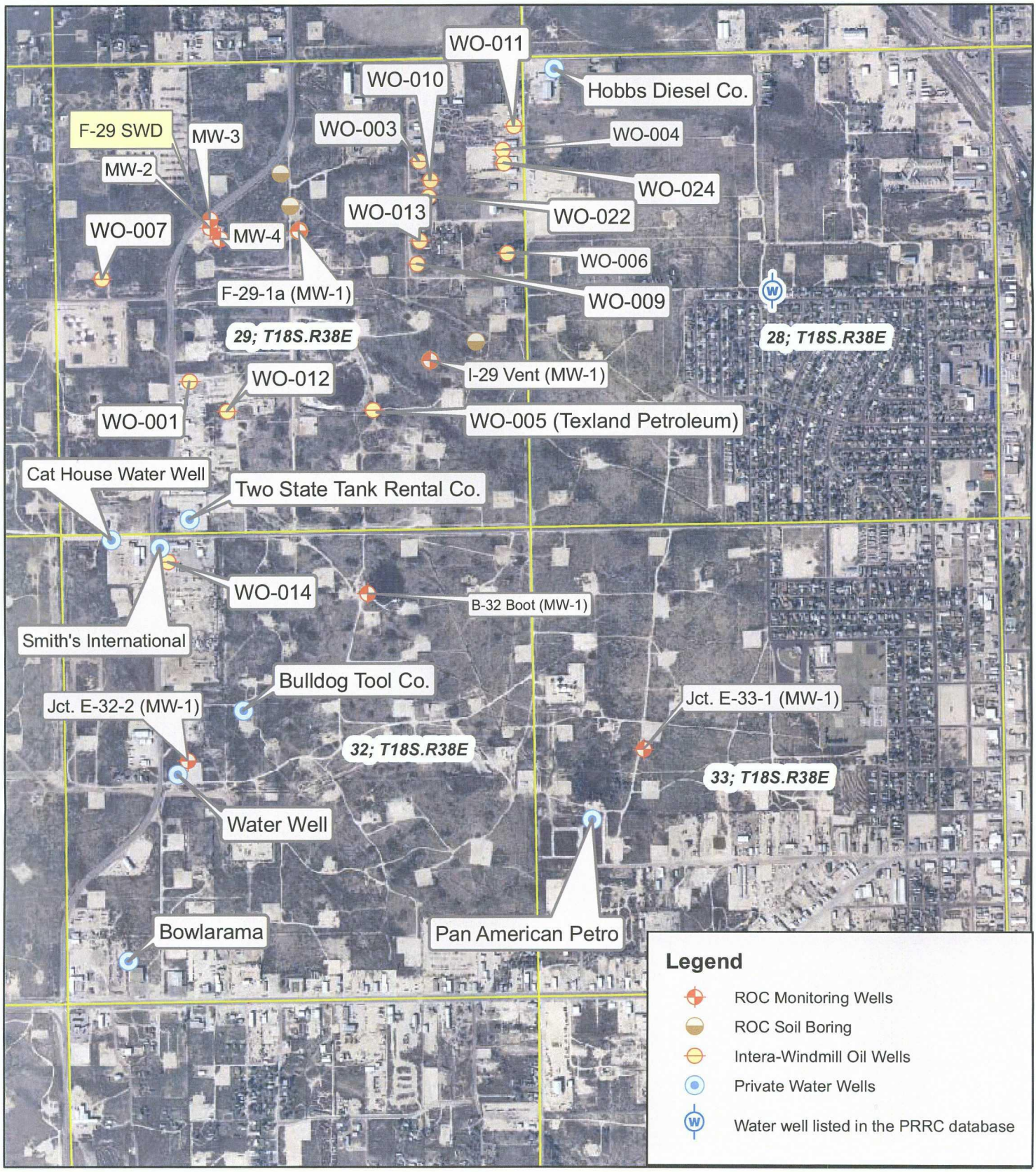
Appendix A Table & Plates

Table A-1 Historic ground water data for the well shown on Plate A-1, November 2006

In_NO	Site_ID	X_UTM83	Y_UTM83	Loc_ID	System	Location	STATUS	GWelev	Cl_ppm
IN009	18S.38E.20.M.VENT	670996	3622479	M-20 Vent	Hobbs	Sec 20, T18S, R38E	Monitoring Well		
IN010	18S.38E.29.E.VENT	670697	3621643	E-29 Vent	Hobbs	Sec 29, T18S, R38E	Monitoring Well		
IN011	18S.38E.29.F.JCT.1A	671472	3621766	Jct. F-29-1a	Hobbs	Sec 29, T18S, R38E	Monitoring Well		
IN012	18S.38E.29.F.JCT.1A-DEEP	671472	3621766	Jct. F-29-1a-Deep	Hobbs	Sec 29, T18S, R38E	Monitoring Well	3585	332
IN013	18S.38E.29.F.JCT.1A-SHALLOW	671472	3621766	Jct. F-29-1a-Shallow	Hobbs	Sec 29, T18S, R38E	Monitoring Well	3585	626
IN014	18S.38E.29.F.JCT.1B	671440	3621854	Jct. F-29-1b	Hobbs	Sec 29, T18S, R38E	Soil Boring		
IN015	18S.38E.29.H.JCT	671949	3621622	Jct. H-29	Hobbs	Sec 29, T18S, R38E	Monitoring Well		
IN016	18S.38E.29.I.EOL BOOT	672076	3621394	I-29 EOL Boot	Hobbs	Sec 29, T18S, R38E	Soil Boring		
IN017	18S.38E.29.I.VENT	671917	3621330	I-29 Vent	Hobbs	Sec 29, T18S, R38E	Monitoring Well	3583	104
IN018	18S.38E.29.K.EOL BOOT	671314	3621139	K-29 EOL Boot	Hobbs	Sec 29, T18S, R38E	Monitoring Well		
IN019	18S.38E.29.O.EOL	671861	3621031	O-29 EOL	Hobbs	Sec 29, T18S, R38E	Monitoring Well		
IN020	18S.38E.29.O.VENT	671818	3620861	O-29 Vent	Hobbs	Sec 29, T18S, R38E	Soil Boring		
IN021	18S.38E.29.P.VENT	671883	3621009	P-29 Vent	Hobbs	Sec 29, T18S, R38E	Monitoring Well		
IN024	18S.38E.32.B.BOOT	671686	3620535	B-32 Boot	Hobbs	Sec 32, T18S, R38E	Monitoring Well		
IN025	18S.38E.32.E.JCT.1	671077	3619959	Jct. E-32-1	Hobbs	Sec 32, T18S, R38E	Monitoring Well		
IN026	18S.38E.32.E.JCT.2	671075	3619976	Jct. E-32-2	Hobbs	Sec 32, T18S, R38E	Monitoring Well		
IN027	18S.38E.33.E.JCT.1	672671	3620026	Jct. E-33-1	Hobbs	Sec 33, T18S, R38E	Monitoring Well		
IN028	18S.38E.33.F.VENT	673087	3619923	F-33 Vent	Hobbs	Sec 33, T18S, R38E	Monitoring Well		
IN045	INTERA.WO-001	671096	3621258	WO-001	Windmill Oil		OSE Well with Chemistry Data		
IN046	INTERA.WO-003	671878	3622011	WO-003	Windmill Oil		OSE Well with Chemistry Data		478
IN047	INTERA.WO-004	672167	3622050	WO-004	Windmill Oil		OSE Well with Chemistry Data		105
IN048	INTERA.WO-005	671739	3621120	WO-005	Windmill Oil		OSE Well with Chemistry Data		112
IN049	INTERA.WO-006	672183	3621695	WO-006	Windmill Oil		OSE Well with Chemistry Data		119
IN050	INTERA.WO-007	670796	3621523	WO-007	Windmill Oil		OSE Well with Chemistry Data		111
IN051	INTERA.WO-009	671872	3621659	WO-009	Windmill Oil		OSE Well with Chemistry Data		110
IN052	INTERA.WO-010	671917	3621945	WO-010	Windmill Oil		OSE Well with Chemistry Data		84
IN053	INTERA.WO-011	672206	3622132	WO-011	Windmill Oil		OSE Well with Chemistry Data		265
IN054	INTERA.WO-012	671224	3621157	WO-012	Windmill Oil		OSE Well with Chemistry Data		102
IN055	INTERA.WO-013	671881	3621737	WO-013	Windmill Oil		OSE Well with Chemistry Data		378
IN056	INTERA.WO-014	671023	3620640	WO-014	Windmill Oil		OSE Well with Chemistry Data		91
IN057	INTERA.WO-022	671911	3621889	WO-022	Windmill Oil		OSE Well with Chemistry Data		
IN058	INTERA.WO-024	672171	3622003	WO-024	Windmill Oil		OSE Well with Chemistry Data		
IN059	INTERA.WO-044	669954	3622169	WO-044	Windmill Oil		OSE Well with Chemistry Data		402
IN060	OCD.AA Oil Field Services	671456	3622866	AA Oil Field Services			OSE Well with Chemistry Data		60
IN071	OCD.Cat House Water Well	670826	3620715	Cat House Water Well	OSE Well with Chemistry Data		OSE Well with Chemistry Data		92
IN105	ROC.Bowlarama	670888	3619268	Bowlarama	OSE Well with Chemistry Data		OSE Well with Chemistry Data		176
IN106	ROC.Bulldog Tool Co.	670964	3620040	Bulldog Tool Co.	OSE Well with Chemistry Data		OSE Well with Chemistry Data		168
IN112	ROC.F-29-BGB-01	671407	3621969	F-29-BGB-01	Hobbs		Soil Boring		
IN113	ROC.F-29-MW-2	671163	3621786	F-29-MW-2	Hobbs		Monitoring Well		223
IN114	ROC.F-29-MW-3	671164	3621813	F-29-MW-3	Hobbs		Monitoring Well		272
IN115	ROC.F-29-MW-4	671197	3621748	F-29-MW-4	Hobbs		Monitoring Well		336
IN117	ROC.Hobbs Diesel Co.	672343	3622328	Hobbs Diesel Co.	OSE Well with Chemistry Data		OSE Well with Chemistry Data		88
IN127	ROC.Mac Truck Co.	672169	3623794	Mac Truck Co.	OSE Well with Chemistry Data		OSE Well with Chemistry Data		360
IN128	ROC.Oil Field Rental Services	672031	3623935	Oil Field Rental Services	OSE Well with Chemistry Data		OSE Well with Chemistry Data		76
IN133	ROC.Pan American Petro	672478	3619756	Pan American Petro	OSE Well with Chemistry Data		OSE Well with Chemistry Data		124
IN135	ROC.Smith's International	670994	3620689	Smith's International	OSE Well with Chemistry Data		OSE Well with Chemistry Data		92
IN137	ROC.Stoebr Wire Co	672147	3623586	Stoebr Wire Co	OSE Well with Chemistry Data		OSE Well with Chemistry Data		640
IN138	ROC.Texland Petro	671734	3621152	Texland Petro	OSE Well with Chemistry Data		OSE Well with Chemistry Data		140
IN139	ROC.Two State Tank Rental Co.	671070	3621007	Two State Tank Rental Co.	OSE Well with Chemistry Data		OSE Well with Chemistry Data		292
L_06660	MORAN OIL PROD & DRILLING CORP L 06660 (E)	669335	3622615			Sec 19, T18S, R38E	OSE Well		
L_06337	INC. CAPITAN DRILLING COMPANY L 06337	670313	3622837			Sec 19, T18S, R38E	OSE Well		
L_08716	OIL FIELD RENTAL SERVICE CO. L 08716	671608	3623764			Sec 20, T18S, R38E	OSE Well		
L_08851	A.A. OILFIELD L 08851	671514	3623260			Sec 20, T18S, R38E	OSE Well		
L_08867	BIG HORN TANK RENTAL L 08867	672040	3622160			Sec 29, T18S, R38E	OSE Well		
L_07570	SOUTHWESTERN DRILLING MUD L 07570	670753	3620830			Sec 29, T18S, R38E	OSE Well		
L_07005	TWO-STATE TANK RENTAL CO L 07005	670753	3621030			Sec 29, T18S, R38E	OSE Well		
L_11176	TEXLAND PETROLEUM-HOBBS, LLC L 11176	671752	3621246			Sec 29, T18S, R38E	OSE Well		
L_02395	AMERADA PETROLEUM CORPORATION L 02395	669522	3622018			Sec 30, T18S, R38E	OSE Well		
L_05849	AMERADA PETROLEUM CORPORATION L 05849	669729	3621615			Sec 30, T18S, R38E	OSE Well		
L_02964	BAKER OIL TOOLS INC. L 02964	670982	3619217			Sec 32, T18S, R38E	OSE Well		
L_02555	SKELLY OIL COMPANY L 02555	670782	3619217			Sec 32, T18S,R38E	OSE Well		
L_02232	CONTINENTAL TANKE INC. L 02232	672697	3619546			Sec 33, T18S, R38E	OSE Well		



Aerial Souce: http://rgis.unm.edu (2004)
See Table A-1 for historic ground water data

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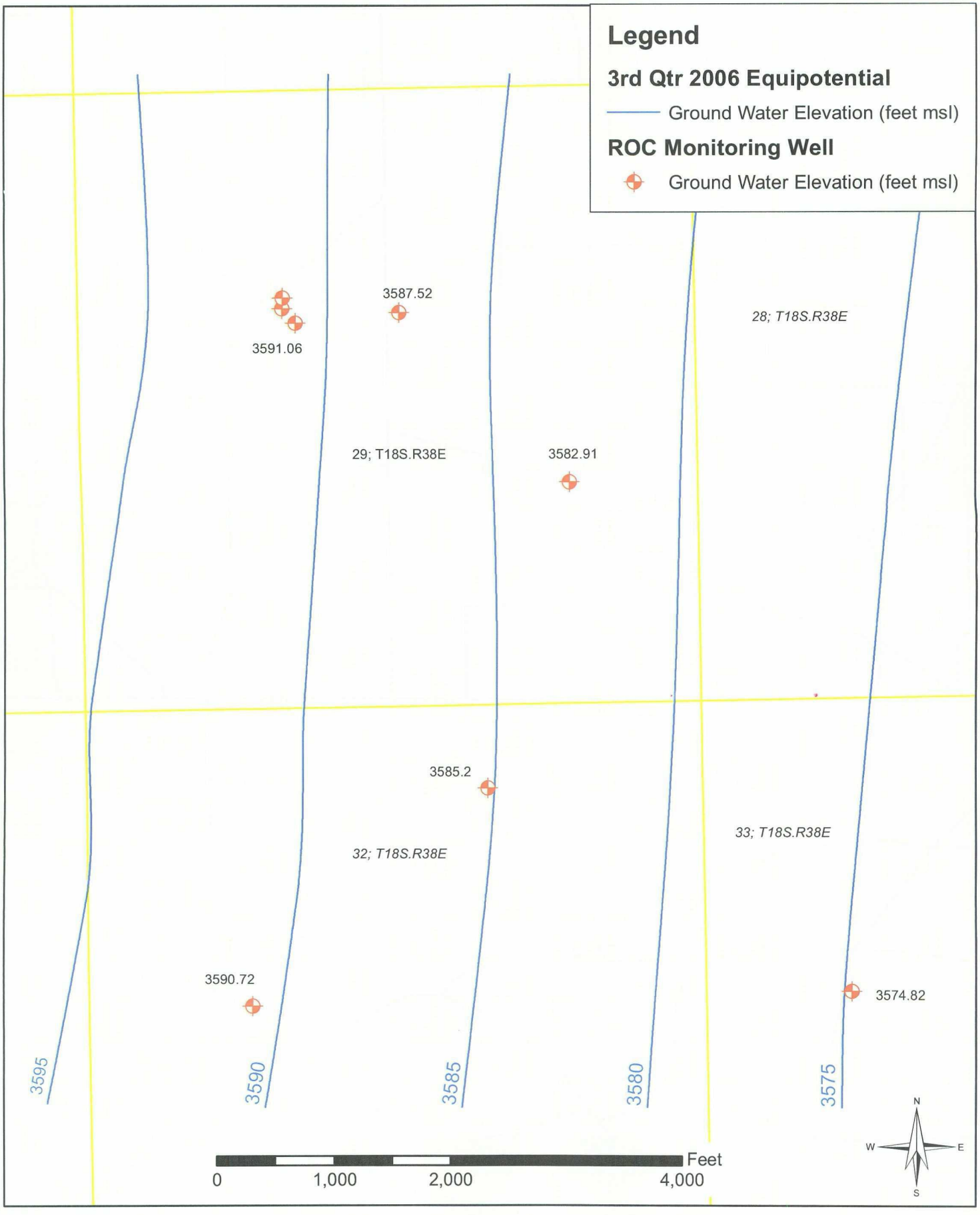
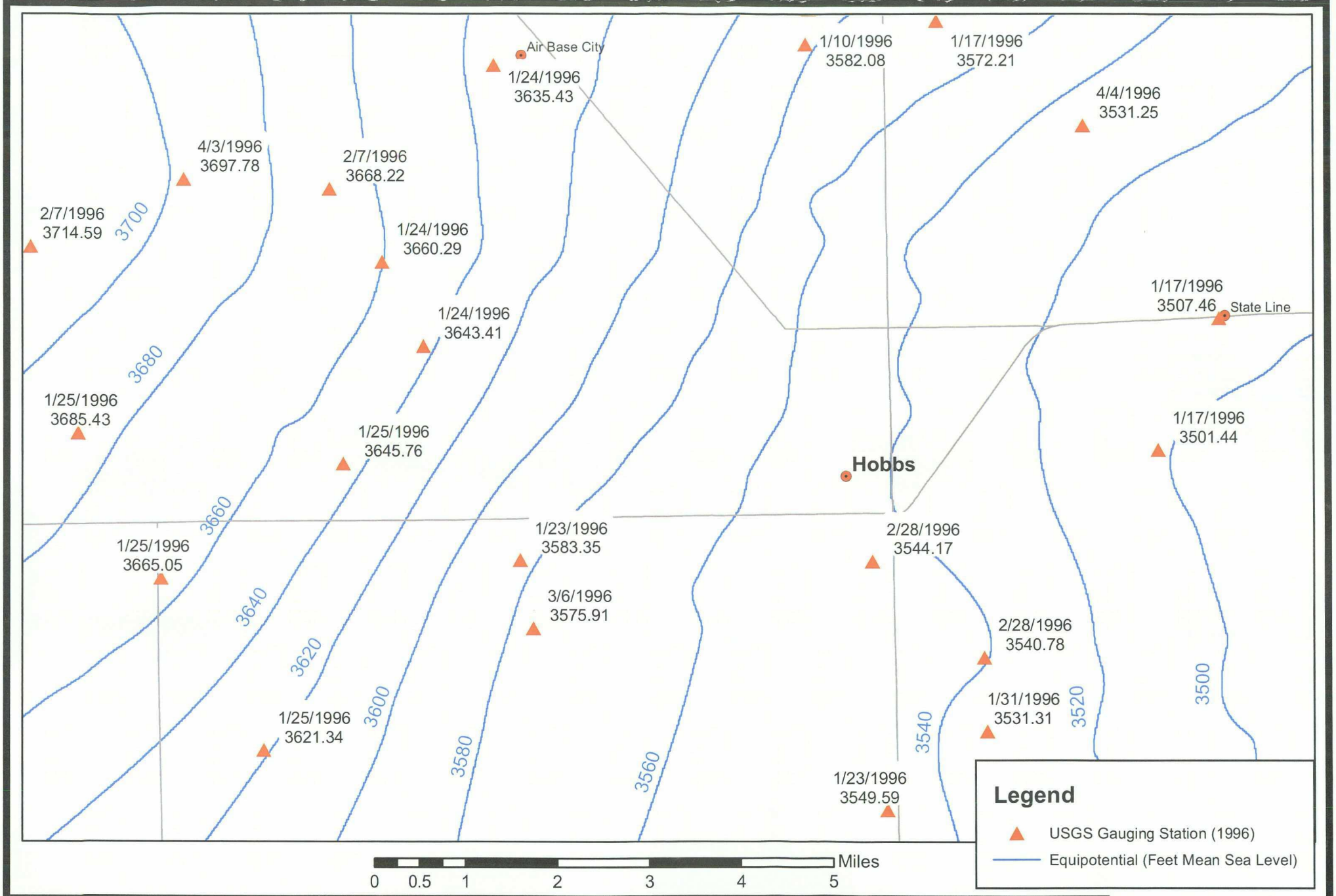
0 0.25 0.5 1 Miles

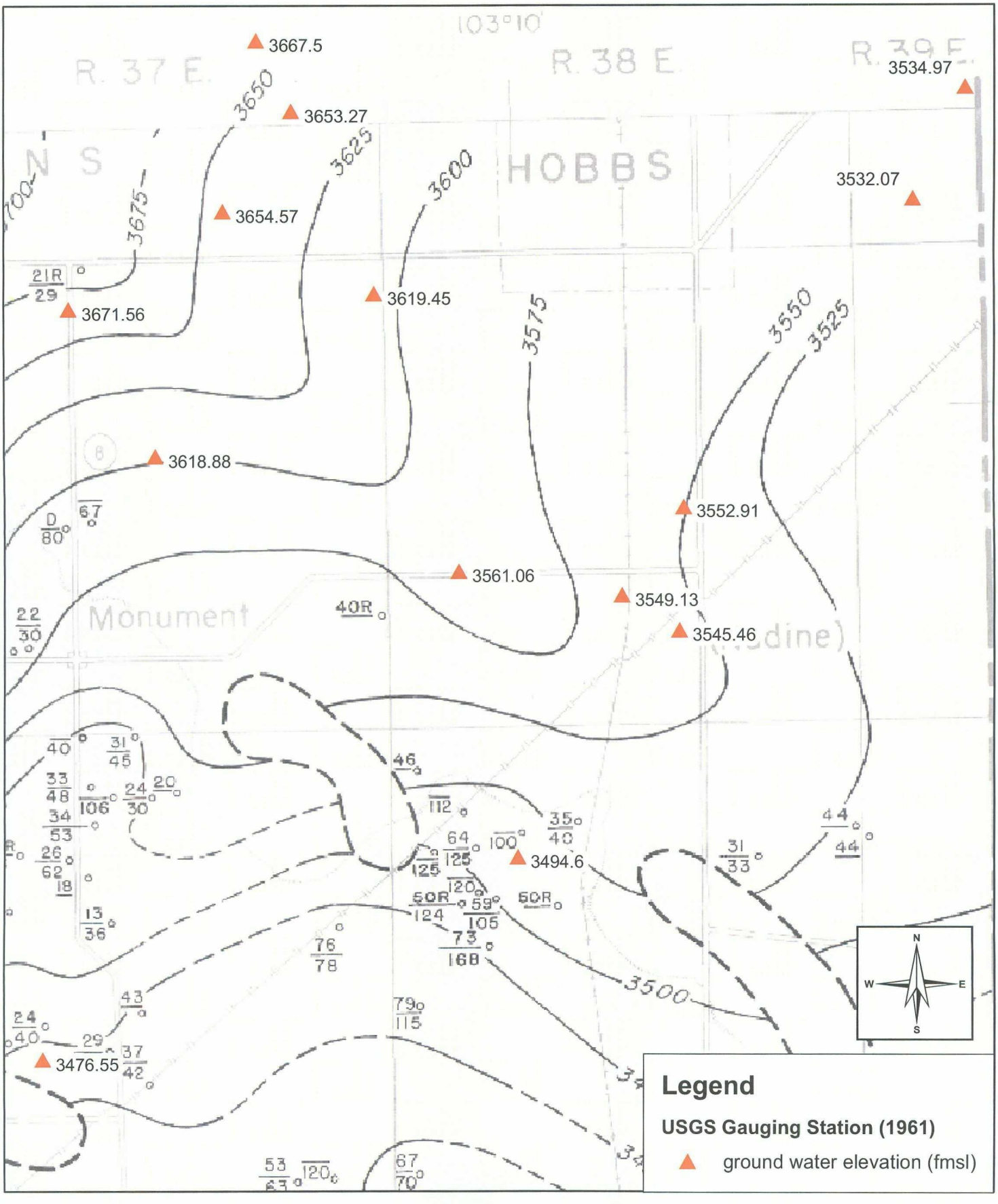
R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Location maps	Plate A-1
	Rice Operating Company: Hobbs SWD System	November 2006



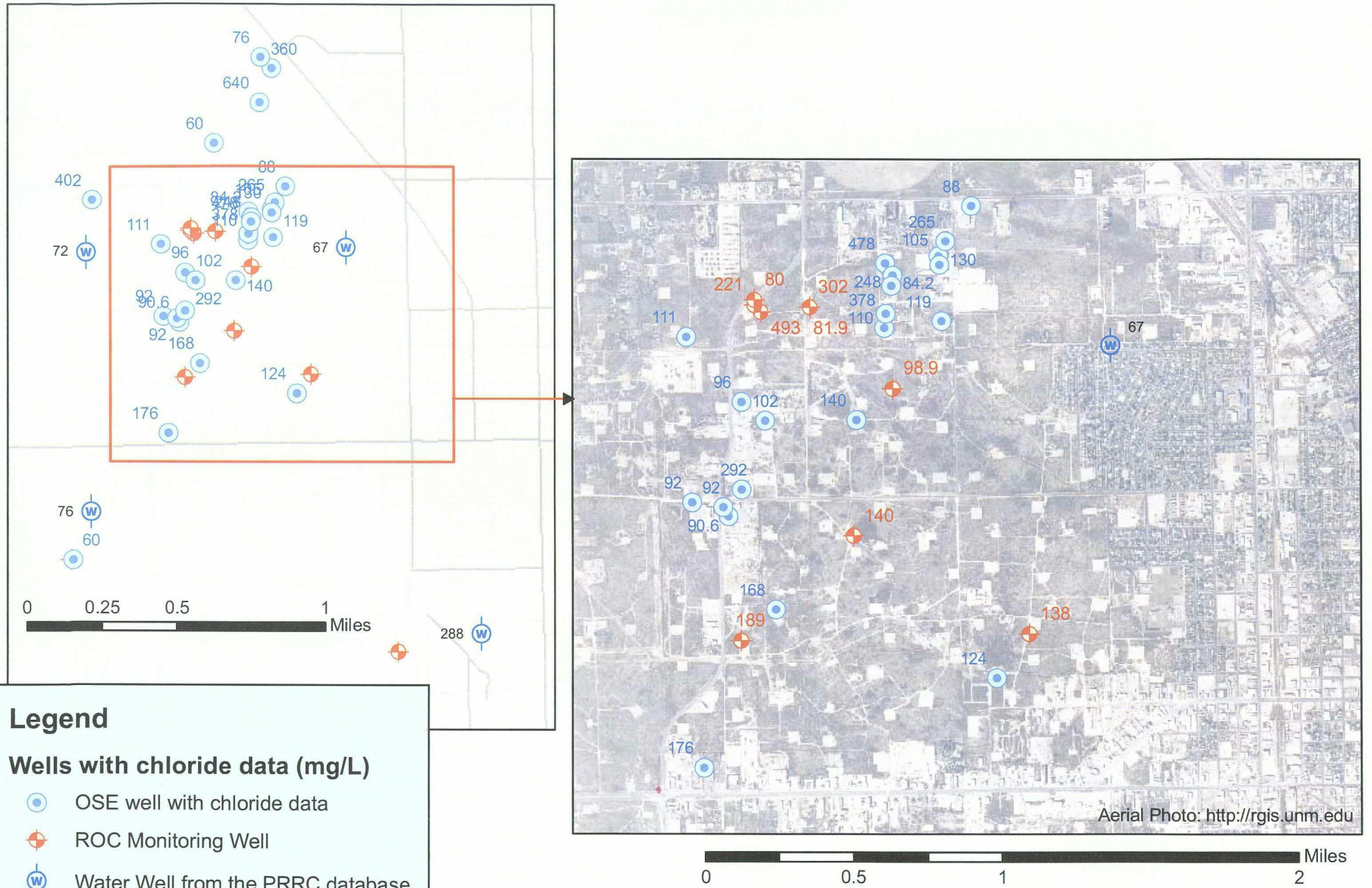
R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	3rd Qtr 2006 Potentiometric Surface	Plate A-5a
	Rice Operating Company: Hobbs SWD System (Sections 29, 32 and 33 of T18S. R38E)	November 2006



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	1996 Regional Potentiometric Surface (USGS)	Plate A-5b
	Rice Operating Company: Hobbs SWD System	November 2006



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Portion of the potentiometric surface map in the Nicholson and Clebsch (1960) report overlayed with 1961 USGS data	Plate A-5c
	Rice Operating Company: Hobbs SWD System	November 2006



Legend

Wells with chloride data (mg/L)

- OSE well with chloride data
- ROC Monitoring Well
- Water Well from the PRRC database

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

Chloride Concentration Map (mg/L)

Rice Operating Company: Hobbs SWD System

Plate A-7

November 2006

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Appendix B Background of the Hobbs SWD System

R. T. HICKS CONSULTANTS, LTD.
1909 Brunson Ave ▲ Midland TX 79701 ▲ 432.638.8740 ▲ Fax: 413.403.9968

CERTIFIED MAIL - RETURN RECIEPT NO. 7099 3400 0017 1737 2367

January 20, 2006

Mr. Wayne Price
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Investigation Characterization Plan: T18S R38E: E-33-1 Junction Box, B-32 Boot, E-32-1 Junction Box, E-32-2 Junction Box, F-33 Vent

Hobbs Salt Water Disposal System

Dear Mr. Price:

On behalf of Rice Operating Company, please accept this submission as our Initial Characterization Plan (ICP) for the five (5) sites referenced above within the Hobbs Salt Water Disposal System (Plate 1).

Rice Operating Company (ROC) is the service provider (operator) for the Hobbs Saltwater Disposal System and has no ownership of any portion of pipeline, well, or facility. A consortium of oil producers who own the Hobbs System (System Partners); provide all operating capital on a percentage ownership/usage basis. Major projects require System Partner authorization for expenditures (AFE) approval and work begins as funds are received. We will implement the work outlined herein after NMOCD approval and subsequent authorization from the System Partners.

For all environmental projects, ROC will choose a path forward that:

1. protects public health,
2. provides the greatest net environmental benefit,
3. complies with NMOCD Rules, and
4. is supported by good science.

The last criteria employed when evaluating any proposed remedy or investigative work is confirming that there is a reasonable relationship between the benefits created by the proposed remedy or assessment and the economic and social costs.

Each site shall have three submissions or a combination of:

1. This Investigation and Characterization Plan (ICP) is a proposal for data gathering and site characterization and assessment.

2. Upon evaluation of the data and results from the ICP, a recommended remedy will be submitted in a Corrective Action Plan (CAP).

3. Finally, after implementing the remedy, a closure report with final documentation will be submitted.

Task 1 Evaluate Chloride and BTEXN Concentrations in Soil at Five Sites, Evaluate Ground Water Quality if Necessary

We will follow the same protocol for characterization of the unsaturated zone at the five new ROC sites listed below.

- E-33-1 Junction Box
- B-32 Boot
- E-32-1 Junction Box
- E-32-2 Junction Box
- F-33 Vent

At each of the above-referenced sites, we will locate the sampling borehole as close as practical to the suspected release source. Earlier, we inspected each of the five sites nominated in this ICP and identified the boring location before the sites were backfilled and re-graded. Due to our recent experience with difficulties encountered in the installation of well clusters in this area, we plan to employ hollow-stem auger drilling techniques for sampling.

We will screen each sample in the field for chlorides and volatile organic compounds using the methods described in QP-03 and QP-07 (attached), respectively. Soil lithology and the presence of any observed staining or odor will be recorded. For any site, if we detect evidence of leakage within 15 feet of the water table (e.g. field chloride greater than 250 ppm in soil samples) we will complete the boring as a monitoring well in accordance with NMOCD Guidance. If three soil samples taken at 5-foot intervals test below 250 ppm chloride and below 100 ppm total volatile organic compounds, we will terminate the boring. However, all borings will penetrate at least 30 feet of the vadose zone.

Task 2 Evaluate Chloride and Hydrocarbon Flux from the Vadose Zone to Ground Water

We anticipate that one or all of the five sites selected for borehole investigation will show evidence of seepage from the source to a depth of more than 15-feet. For these sites, excavation and disposal of released material can cause more environmental damage than it cures. For such sites, we propose to employ HYDRUS-1D and a simple ground water mixing model to evaluate the potential of any residual chloride and hydrocarbon mass in the vadose zone to impair ground water quality above WQCC Standards. We have selected these two constituents for simulation modeling because each of these constituents is typically found in produced water and each is specifically regulated by New Mexico ground water regulations (WQCC). We will also employ vadose zone hydrocarbon migration predictive tools commonly employed by NMED in their PST program.

Task 3 Provide Investigative Results and/or Corrective Action Plan

Because the Hobbs SWD System no longer carries produced water, additional releases of produced water to ground water are highly unlikely. If modeling shows that the residual chloride and hydrocarbon mass in the vadose zone poses a no threat to ground water quality, we will prepare a report that makes this demonstration and request site closure.

If simulation experiments suggest that residual constituents pose a threat to ground water quality or if the field program demonstrates impairment, we will expand upon the HYDRUS-1D model predictions described above to develop a remedy for the vadose zone. If necessary, we will simulate:

1. Excavation, disposal and replacement of clean soil to remove the chloride and hydrocarbon mass,
2. Installation of a low permeability barrier to minimize natural infiltration,
3. Surface grading and seeding to eliminate any ponding of precipitation and promote evapotranspiration, thereby minimizing natural infiltration, and
4. A combination of the above potential remedies.

We will select the vadose zone remedy that offers the greatest environmental benefit while causing the least environmental damage. If data suggest that the site has contributed chloride or hydrocarbons to ground water and caused ground water impairment, we will notify NMOCD and work collaboratively to determine the appropriate path forward.

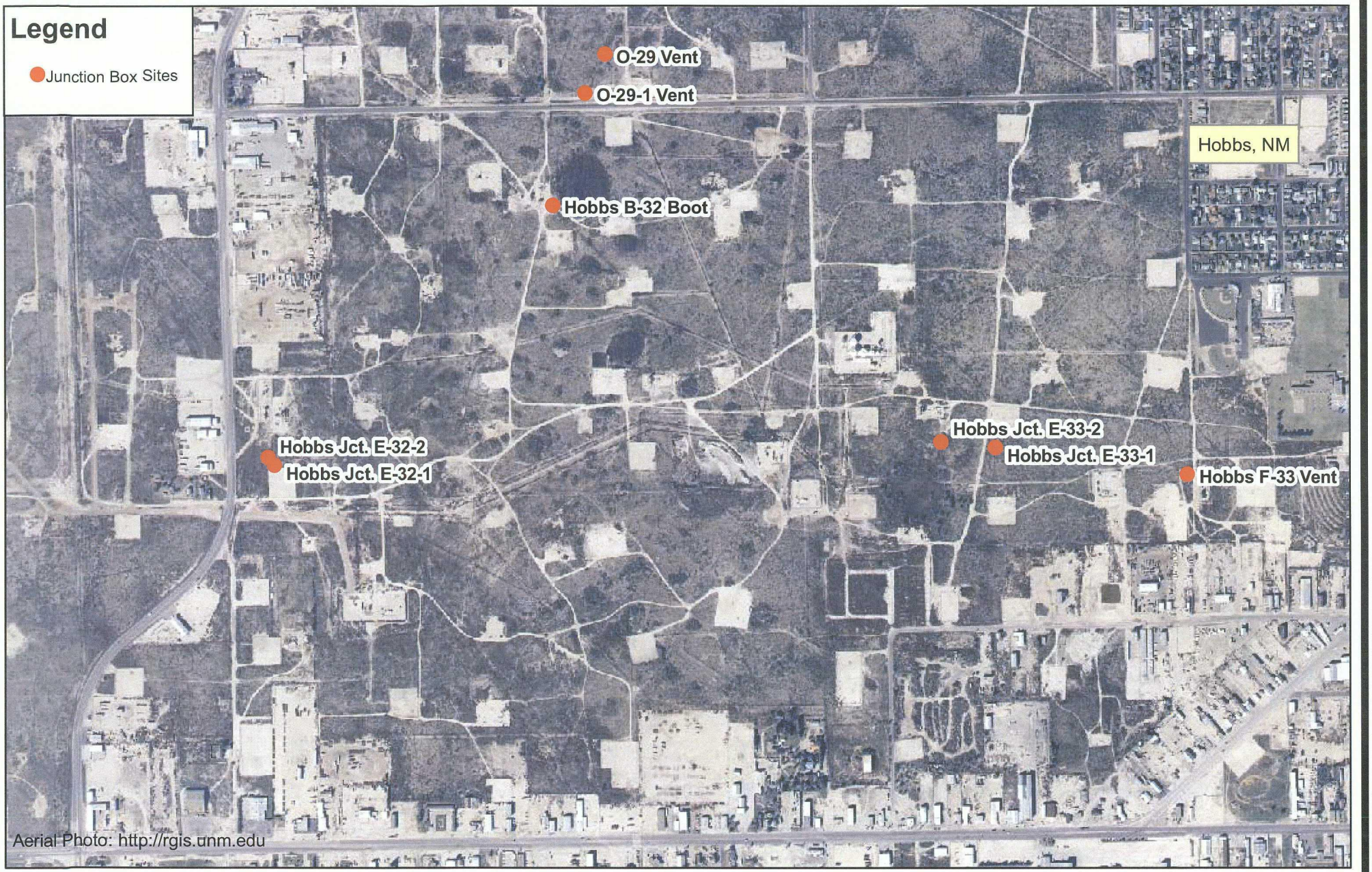
Proposed Schedule

With NMOCD's approval of this work plan, we can perform the field activities at these sites in February or March. In late April or May, we plan to deliver any individual Correction Action Plans to address residual constituents in the vadose zone and any reports requesting site closure. If data suggest ground water impairment we plan to conduct two quarters of ground water monitoring to confirm any initial result then meet with NMOCD to develop an appropriate path forward. Your approval to move forward with this work plan will facilitate approval of expenditures by the System Partners.

Sincerely,
R.T. Hicks Consultants, Ltd.

Gilbert Van Deventer
Project Manager

cc: Chris Williams, NMOCD Hobbs District Office
Carolyn Haynes, Rice Operating Company - Hobbs
Kristin Pope, Rice Operating Company – Hobbs
Randy Hicks, R. T. Hicks Consultants, Ltd. - Albuquerque



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Junction Box Site Location Map	Plate 1
	Rice Operating Company	December 2006

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Rice Operating Company

QUALITY PROCEDURE

Sampling and Testing Protocol Chloride Titration Using .282 Normal Silver Nitrate Solution

1.0 Purpose

This procedure is to be used to determine the concentration of chloride in soil.

2.0 Scope

This procedure is to be used as the standard field measurement for soil chloride concentrations.

3.0 Sample Collection and Preparation

3.1 Collect at least 80 grams of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample for soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.2 The soil sample(s) shall be immediately inserted into a one-quart or larger polyethylene freezer bag. Care should be taken to insure that no cross-contamination occurs between the soil sample and the collection tools or sample processing equipment.

3.3 The sealed sample bag should be massaged to break up any clods.

4.0 Sample Preparation

4.1 Tare a clean glass vial having a minimum 40 ml capacity. Add at least 10 grams of the soil sample and record the weight.

4.2 Add at least 10 grams of reverse osmosis water to the soil sample and shake for 20 seconds.

4.3 Allow the sample to set for a period of 5 minutes or until the separation of soil and water.

4.4 Carefully pour the free liquid extract from the sample through a paper filter into a clean plastic cup if necessary.

5.0 Titration Procedure

5.1 Using a graduated pipette, remove 10 ml extract and dispense into a clean plastic cup.

5.2 Add 2-3 drops potassium chromate (K_2CrO_4) to mixture.

5.3 If the sample contains any sulfides (hydrogen or iron sulfides are common to oilfield soil samples) add 2-3 drops of hydrogen peroxide (H_2O_2) to mixture.

5.4 Using a 1 ml pipette, carefully add .282 normal silver nitrate (one drop at a time) to the sample while constantly agitating it. Stop adding silver nitrate when the solution begins to change from yellow to red. Be consistent with endpoint recognition.

5.5 Record the ml of silver nitrate used.

6.0 Calculation

To obtain the chloride concentration, insert measured data into the following formula:

$$\frac{.282 \times 35.450 \times \text{ml } AgNO_3}{\text{ml water extract}} \times \frac{\text{grams of water in mixture}}{\text{grams of soil in mixture}}$$

Using Step 5.0, determine the chloride concentration of the RO water used to mix with the soil sample. Record this concentration and subtract it from the formula results to find the net chloride in the soil sample.

Record all results on the delineation form.

Rice Operating Company

QUALITY PROCEDURE
Sampling and Testing Protocol for VOC in Soil

1.0 Purpose

This procedure is to be used to determine the concentrations of Volatile Organic Compounds in soils.

2.0 Scope

This procedure is to be used as the standard field measurement for soil VOC concentrations. It is not to be used as a substitute for full spectrographic speciation of organic compounds.

3.0 Procedure

3.1 Sample Collection and Preparation

3.1.1 Collect at least 500 g. of soil from the sample collection point. Take care to insure that the sample is representative of the general background to include visible concentrations of hydrocarbons and soil types. If necessary, prepare a composite sample of soils obtained at several points in the sample area. Take care to insure that no loose vegetation, rocks or liquids are included in the sample(s).

3.1.2 The soil sample(s) shall be immediately inserted into a one-quart or larger polyethylene freezer bag and sealed. When sealed, the bag should contain a nearly equal space between the soil sample and trapped air. Record the sample name and the time that the sample was collected on the Field Analytical Report Form.

3.1.3 The sealed samples shall be allowed to set for a minimum of five minutes at a temperature of between 10-15 Celsius, (59-77 ^{0}F). The sample temperatures may be adjusted by cooling the sample in ice, or by heating the sample within a generally controlled environment such as the inside of a vehicle. The samples should not be placed directly on heated surfaces or placed in direct heat sources such as lamps or heater vents.

3.1.4 The sealed sample bag should be massaged to break up any clods, and to provide the soil sample with as much exposed surface area as practically possible.

3.2 Sampling Procedure

3.2.1 The instrument to be used in conducting VOC concentration testing shall be an Environmental Instruments 13471 OVM / Datalogger or a similar PID-type instrument. (Device will be identified on VOC Field Test Report Form.) Prior to use, the instrument shall be zeroed-out in accordance with the appropriate maintenance and calibration procedure outlined in the instrument operation manual. The PID device will be calibrated each day it's used.

3.2.2 Carefully open one end of the collection bag and insert the probe tip into the bag taking care that the probe tip not touch the soil sample or the sidewalls of the bag.

3.2.3 Set the instrument to retain the highest result reading value. Record the reading onto the Field Test Report Form.

3.2.4 If the instrument provides a reading exceeding 100 ppm, proceed to conduct BTEX Speciation in accordance with **QP-02 and QP-06. If the reading is 100 ppm or less, NMOCD BTEX guideline has been met and no further testing for BTEX is necessary. File the Field Test Report Form in the project file.**

4.0 Clean-up

After testing, the soil samples shall be returned to the sampling location, and the bags collected for off-site disposal. **IN NO CASE SHALL THE SAME BAG BE USED TWICE. EACH SAMPLE CONTAINER MUST BE DISCARDED AFTER EACH USE.**

Appendix C Background Boring

LITHOLOGIC LOG

BORING NO.: A-32
SITE ID: Hobbs SWD System
CONTRACTOR: Atkins Engineering
DRILLING METHOD: Hollow Stem Auger
START DATE: 05/03/06
COMPLETION DATE: 05/03/06
COMMENTS: Located in area with no expected impact from oil and gas activities (background conditions).

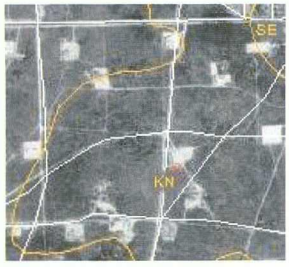
TOTAL DEPTH: 30 Feet
CLIENT: RICE Operating Company
COUNTY: Lea
STATE: New Mexico
LOCATION: T18S-R38E-Sec 32-Unit A
FIELD REP.: G. Van Deventer / M. Franks / J. Hendrickx

USCS	Sample			Blowcounts	Chloride	PID	LITHOLOGIC DESCRIPTION:
	Depth	Time	Type	(blows - in)	(ppm)	(ppm)	LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOLIDATION, DISTINGUISHING FEATURES
SM	1	1421	Split Spoon	50 - 12"	58		Silty loam, pale yellowish brown (10YR 6/2) and caliche (very pale orange (10 YR 8/2), dry.
	2	1426	Split Spoon	100 - 6"	27		
SM/CAL	3	1440	Split Spoon	50 - 12"	58		Fine-grained sandy caliche pale yellowish brown (10YR 6/2), dry.
	4	1443	Split Spoon	50 - 12"	58		Fine-grained sandy caliche pale yellowish brown (10YR 6/2), dry.
	5	1450	Split Spoon	50 - 12"	58		Fine-grained sandy caliche pale yellowish brown (10YR 6/2), dry, very hard, some consolidated sand nodules (cemented)
	6	1500	Split Spoon	30 - 12"	84		
CAL/SM	7	1508	Split Spoon	23 - 12"	179		Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	8	1512	Split Spoon	38 - 12"	151		
	9	1520	Split Spoon	50 - 9"	340		As above.
	10	1524	Split Spoon	50 - 4"	365		As above.
	11						
	12						
	13	1536	Split Spoon	50 - 9"	295		Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	14						
	15	1545	Split Spoon	50 - 4"	228		Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	16						
	17	1555	Split Spoon	50 - 1"	85		Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	18						
	19						Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	20						
	21						
	22	1605	Split Spoon	50 - 2"	57		Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	23	1620	Split Spoon	50 - 2"	89		
	24						
	25						
	26						
	27	1630	Split Spoon	50 - 1"	58		Calcic fine-grained sand (very pale orange (10 YR 8/2), hard, consolidated with calcium carbonate in matrix. Sand grains are subangular, moderately well sorted, dry.
	28						
	29						
	30						
	31						Bottom of boring at 30 feet below ground surface.
	32						
	33						
	34						
	35						
	36						
	37						
	38						
	39						
	40						

Background Boring

Appendix D Monitoring Well

LITHOLOGIC LOG AND MONITORING WELL CONSTRUCTION DIAGRAM



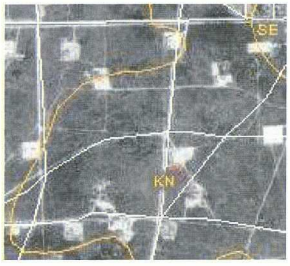
MONITOR WELL NO.:	MW-1	TOTAL DEPTH:	79 Feet
SITE ID:	Hobbs E-33-1 Junction Box	CLIENT:	RICE Operating Company
CONTRACTOR:	Atkins Engineering	COUNTY:	Lea
DRILLING METHOD:	Hollow Stem Auger	STATE:	New Mexico
START DATE:	05/02/06	LOCATION:	T18S-R38E-Sec 33-Unit E
COMPLETION DATE:	05/02/06	FIELD REP.:	G. Van Deventer / M. Franks

COMMENTS: Located immediately adjacent to former junction box location.

USCS	Sample Depth	Sample Time	Sample Type	Blowcounts (blows - in)	Chloride (ppm)	PID (ppm)	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOLIDATION, DISTINGUISHING FEATURES
			Surface				
SM	5	0851	Split Spoon	3 - 6" 50 - 10"	433 990	0	Silty loam and caliche, pale yellowish brown (10YR 6/2), loose backfill, dry.
	10	0906	Split Spoon	50 - 10"	719	0	Fine sandy caliche. Caliche is very pale orange (10YR 8/2) and sand component is pale yellowish brown (10 YR 6/2), moderately hard, dry.
CAL/ SM	15	0917	Split Spoon	50 - 4"	996	0	Fine sandy caliche. Caliche is very pale orange (10YR 8/2) and sand component is pale yellowish brown (10 YR 6/2), moderately hard, dry.
	20	0924	Split Spoon	50 - 2"	1035	0	Fine sandy caliche. Caliche is very pale orange (10YR 8/2) and sand component is pale yellowish brown (10 YR 6/2), moderately hard, dry.
	25	0939	Split Spoon	50 - 4"	1309	0	Calcareous fine sand, grayish orange (10 YR 7/4), moderately hard, dry with hard sandstone streaks, grayish orange pink (5 YR 7/2)
		0953	Cuttings	NA	1262	0	Hard sandstone streaks, grayish orange pink (5 YR 7/2) Calcareous fine sand, grayish orange (10 YR 7/4), moderately hard, dry
SM/ CAL	30						Hard sandstone streak, grayish orange pink (5 YR 7/2)
	35	1018	Split Spoon	50 - 2"	1381	0	Calcareous fine sand, grayish orange (10 YR 7/4), moderately hard, dry with hard sandstone streaks, grayish orange pink (5 YR 7/2)
	40	1031	Split Spoon	50 - 4"	863	0	Calcareous fine sand, very pale orange (10YR 8/2 and grayish orange (10 YR 7/4), moderately hard, dry Calcium carbonate content decreasing and sand content increasing with depth.
SM/ CAL	45	1048	Split Spoon	50 - 4"	1054	0	Fine sand, grayish orange (10 YR 7/4), unconsolidated, moderately well sorted & subangular grains.
SW	50	1100	Split	50 - 4"	1002	0	Fine sand, grayish orange (10 YR 7/4), unconsolidated, moderately well sorted & subangular grains.

Cement
3/8 Bentonite Hole Plug
2" Sched 40 PVC Blank Casing
Cement
3/8 Bentonite Hole Plug

LITHOLOGIC LOG AND MONITORING WELL CONSTRUCTION DIAGRAM



MONITOR WELL NO.:	MW-1	TOTAL DEPTH:	79 Feet
SITE ID:	Hobbs E-33-1 Junction Box	CLIENT:	RICE Operating Company
CONTRACTOR:	Atkins Engineering	COUNTY:	Lea
DRILLING METHOD:	Hollow Stem Auger	STATE:	New Mexico
START DATE:	05/02/06	LOCATION:	T18S-R38E-Sec 33-Unit E
COMPLETION DATE:	05/02/06	FIELD REP.:	G. Van Deventer / M. Franks

COMMENTS: Located immediately adjacent to former junction box location.

USCS	Sample Depth	Sample Time	Sample Type	Blowcounts (blows - in)	Chloride (ppm)	PID (ppm)	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE, SORTING, ROUNDING, CONSOLIDATION, DISTINGUISHING FEATURES
		1100	Spoon				Fine sand, grayish orange (10 YR 7/4), unconsolidated, moderately well sorted & subangular grains.
SW	55	1115	Split Spoon	50 - 6"	946	0	Fine sand, grayish orange (10 YR 7/4), unconsolidated, slightly moist, moderately well sorted & subangular grains.
	60	1132	Split Spoon	36 - 12" 50 - 5"	729	0	Fine sand, light brown (5 YR 6/4), unconsolidated, moist, moderately well sorted & subangular grains.
							Groundwater encountered at approximately 63 ft below ground surface.
	65						Fine sand, light brown (5 YR 6/4), unconsolidated, moist, moderately well sorted & subangular grains.
SW	70	1132					Fine sand, light brown (5 YR 6/4), unconsolidated, moist, moderately well sorted & subangular grains.
	75						Fine sand, light brown (5 YR 6/4), unconsolidated, moist, moderately well sorted & subangular grains.
	80						Bottom of well at 79 ft below ground surface.
	85						
	90						
	95						
	100						

3/8 Bent Hole Plug
2" Sched 40 PVC Blank Casing
3/8 Bent Hole Plug
8/16 Brady Sand Pack
2" Diameter Screen with 0.010" Slots
8/16 Brady Sand Pack
5"

Appendix E Analytical Reports

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope

Rice Operating Co.

122 W. Taylor

Hobbs, NM 88240

Project: Jct. E-33-1 (UNO 146)

Project Number: Hobbs Abandonment

Location: T18S, R38E, Sec. 33, Unit Letter E

Lab Order Number: 6E11004

Report Date: 05/16/06

Rice Operating Co.	Project: Jct. E-33-1 (UNO 146)	Fax: (505) 397-1471
122 W. Taylor	Project Number: Hobbs Abandonment	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/16/06 16:10

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
B-1 (24')	6E11004-01	Soil	05/02/06 09:39	05/10/06 17:50

12600 West I-20 East - Odessa, Texas 79705 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.	Project: Jct. E-33-1 (UNO 146)	Fax: (505) 397-1471
122 W. Taylor	Project Number: Hobbs Abandonment	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/16/06 16:10

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
B-1 (24') (6E11004-01) Soil									
Chloride	**1640**	25.0	mg/kg	50	EE61225	05/12/06	05/12/06	EPA 300.0	

12600 West I-20 East - Odessa, Texas 79705 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.	Project: Jct. E-33-1 (UNO 146)	Fax: (505) 397-1471
122 W. Taylor	Project Number: Hobbs Abandonment	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/16/06 16:10

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE61225 - Water Extraction										
Blank (EE61225-BLK1)				Prepared & Analyzed: 05/12/06						
Chloride	ND	0.500	mg/kg							
LCS (EE61225-BS1)				Prepared & Analyzed: 05/12/06						
Chloride	9.96	0.500	mg/kg	10.0		99.6	80-120			
Calibration Check (EE61225-CCV1)				Prepared & Analyzed: 05/12/06						
Chloride	10.9		mg/kg	10.0		109	80-120			
Duplicate (EE61225-DUP1)		**Source: 6E05006-03**		Prepared & Analyzed: 05/12/06						
Chloride	2920	50.0	mg/kg		2870			1.73	20	
Duplicate (EE61225-DUP2)		**Source: 6E11006-02**		Prepared & Analyzed: 05/12/06						
Chloride	284	12.5	mg/kg		284			0.00	20	
Matrix Spike (EE61225-MS1)		**Source: 6E05006-04**		Prepared & Analyzed: 05/12/06						
Chloride	3160	50.0	mg/kg	1000	2100	106	75-125			
Matrix Spike (EE61225-MS2)		**Source: 6E11019-01**		Prepared & Analyzed: 05/12/06						
Chloride	984	10.0	mg/kg	200	699	142	75-125			S-07

12600 West I-20 East - Odessa, Texas 79705 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.	Project: Jct. E-33-1 (UNO 146)	Fax: (505) 397-1471
122 W. Taylor	Project Number: Hobbs Abandonment	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/16/06 16:10

Notes and Definitions

S-07	Recovery outside Laboratory historical or method prescribed limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 5/16/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765
Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Pope
Company Name: Rice Operating Company
Company Address: 122 West Taylor
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: 505-393-9174
Fax No: 505-397-1471
Email results to: gil@rthicksconsult.com, mfranks@riceswd.com, kpope@riceswd.com, & andrew@rthicksconsult.com
Sampler Signature: Gil Hicks

Project Name: Jct. E-33-1 (UN0146)
Project #: Hobbs Abandonment
Project Location: T18S, R38E, Sec 33, Unit Letter E
ROC Billing Code

Analyze For:

LAB # (lab use only)	GIS CODE	FIELD CODE	Sample Depth (soils only) Begin (ft)	Sample Depth (soils only) End (ft)	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	Preservative: HNO_3	Preservative: HCl	Preservative: NaOH	Preservative: H_2SO_4	Preservative: None	Preservative: Other (Specify)	Matrix: Water	Matrix: Sludge	Matrix: Soil	Matrix: Other (specify)	TCLP: TPH: 418.1 8015M 1005 1006	TCLP: Cations (Ca, Mg, Na, K)	TCLP: Anions (Cl, SO4, CO3, HCO3)	TCLP: SAR / ESP / CEC	TOTAL: Metals: As Ag Ba Cd Cr Pb Hg Se	TOTAL: Volatiles	TOTAL: Semivolatiles	TOTAL: BTEX 8021B/5030 or BTEX 8260	RCI	N O R M	Total Dissolved Solids	Chlorides	RUSH TAT (Pre-Schedule)	Standard TAT
11004																															
-01	UN0410	B-1 (24')	24	24	5-2-06	0939	1	✓									✓													✓	✓

Special Instruction:

Sample Containers Intact? Y N
Temperature Upon Receipt: Labels w/ Seals
Laboratory Comments:
Rec 0.0°

Relinquished by:	Date	Time	Received by:	Date	Time
Gil Hicks	5/10/06	17:58			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Kalandra Tate	5-10-06	1750

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Dp.

Date/Time: 5/10/06 17:50

Order #: 6E11004

Initials: CK

Sample Receipt Checklist

Temperature of container/cooler?	Yes	No	0.5 C
Shipping container/cooler in good condition?	Yes	No	
Custody Seals intact on shipping container/cooler?	Yes	No	Not present
Custody Seals intact on sample bottles?	Yes	No	Not present
Chain of custody present?	Yes	No	
Sample Instructions complete on Chain of Custody?	Yes	No	
Chain of Custody signed when relinquished and received?	Yes	No	
Chain of custody agrees with sample label(s)	Yes	No	
Container labels legible and intact?	Yes	No	
Sample Matrix and properties same as on chain of custody?	Yes	No	
Samples in proper container/bottle?	Yes	No	
Samples properly preserved?	Yes	No	
Sample bottles intact?	Yes	No	
Preservations documented on Chain of Custody?	Yes	No	
Containers documented on Chain of Custody?	Yes	No	
Sufficient sample amount for indicated test?	Yes	No	
All samples received within sufficient hold time?	Yes	No	
VOC samples have zero headspace?	Yes	No	Not Applicable

Other observations:

Variance Documentation:

Contact Person: _____ Date/Time: _____ Contacted by: _____

Regarding:

Corrective Action Taken:

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope

Rice Operating Co.

122 W. Taylor

Hobbs, NM 88240

Project: Hobbs Jct. E-33-1

Project Number: None Given

Location: Lea County

Lab Order Number: 6H18009

Report Date: 08/28/06

Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6H18009-01	Water	08/14/06 10:40	08-18-2006 10:20

12600 West I-20 East - Odessa, Texas 79705 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6H18009-01) Water									
Benzene	ND	0.00100	mg/L	1	EH62121	08/21/06	08/21/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*88.5 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*82.2 %*	*80-120*		"	"	"	"	

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6H18009-01) Water									
Total Alkalinity	**216**	2.00	mg/L	1	EH62128	08/21/06	08/21/06	EPA 310.1M	
Chloride	**138**	5.00	"	10	EH62101	08/21/06	08/21/06	EPA 300.0	
Total Dissolved Solids	**622**	10.0	"	1	EH62303	08/18/06	08/22/06	EPA 160.1	
Sulfate	**90.9**	5.00	"	10	EH62101	08/21/06	08/21/06	EPA 300.0	

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6H18009-01) Water									
Calcium	**86.8**	0.810	mg/L	10	EH62313	08/23/06	08/23/06	EPA 6010B	
Magnesium	**18.6**	0.360	"	"	"	"	"	"	
Potassium	**5.14**	0.600	"	"	"	"	"	"	
Sodium	**81.5**	0.430	"	"	"	"	"	"	

12600 West I-20 East - Odessa, Texas 79705 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: Hobbs Jct. E-33-1
Project Number: None Given
Project Manager: Kristin Farris-Pope

Fax: (505) 397-1471

Organics by GC - Quality Control
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62121 - EPA 5030C (GC)										
Blank (EH62121-BLK1)				Prepared: 08/21/06		Analyzed: 08/22/06				
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*40.3*		*ug/l*	*40.0*		*101*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*36.7*		*"*	*40.0*		*91.8*	*80-120*			
LCS (EH62121-BS1)				Prepared & Analyzed: 08/21/06						
Benzene	0.0460	0.00100	mg/L	0.0500		92.0	80-120			
Toluene	0.0503	0.00100	"	0.0500		101	80-120			
Ethylbenzene	0.0463	0.00100	"	0.0500		92.6	80-120			
Xylene (p/m)	0.113	0.00100	"	0.100		113	80-120			
Xylene (o)	0.0565	0.00100	"	0.0500		113	80-120			
Surrogate: a,a,a-Trifluorotoluene	*39.7*		*ug/l*	*40.0*		*99.2*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*45.0*		*"*	*40.0*		*112*	*80-120*			
Calibration Check (EH62121-CCV1)				Prepared: 08/21/06		Analyzed: 08/22/06				
Benzene	48.7		ug/l	50.0		97.4	80-120			
Toluene	52.3		"	50.0		105	80-120			
Ethylbenzene	57.3		"	50.0		115	80-120			
Xylene (p/m)	114		"	100		114	80-120			
Xylene (o)	57.6		"	50.0		115	80-120			
Surrogate: a,a,a-Trifluorotoluene	*44.7*		*"*	*40.0*		*112*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*38.3*		*"*	*40.0*		*95.8*	*80-120*			
Matrix Spike (EH62121-MS1)	**Source: 6H18007-01**			Prepared: 08/21/06		Analyzed: 08/22/06				
Benzene	0.0464	0.00100	mg/L	0.0500	ND	92.8	80-120			
Toluene	0.0550	0.00100	"	0.0500	ND	110	80-120			
Ethylbenzene	0.0554	0.00100	"	0.0500	ND	111	80-120			
Xylene (p/m)	0.117	0.00100	"	0.100	ND	117	80-120			
Xylene (o)	0.0575	0.00100	"	0.0500	ND	115	80-120			
Surrogate: a,a,a-Trifluorotoluene	*41.8*		*ug/l*	*40.0*		*104*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*46.5*		*"*	*40.0*		*116*	*80-120*			

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Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62121 - EPA 5030C (GC)										
Matrix Spike Dup (EH62121-MSD1)	**Source: 6H18007-01**			Prepared: 08/21/06		Analyzed: 08/22/06				
Benzene	0.0473	0.00100	mg/L	0.0500	ND	94.6	80-120	1.92	20	
Toluene	0.0535	0.00100	"	0.0500	ND	107	80-120	2.76	20	
Ethylbenzene	0.0549	0.00100	"	0.0500	ND	110	80-120	0.905	20	
Xylene (p/m)	0.120	0.00100	"	0.100	ND	120	80-120	2.53	20	
Xylene (o)	0.0583	0.00100	"	0.0500	ND	117	80-120	1.72	20	
Surrogate: a,a,a-Trifluorotoluene	*42.9*		*ug/l*	*40.0*		*107*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*46.4*		*"*	*40.0*		*116*	*80-120*			

12600 West I-20 East - Odessa, Texas 79705 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.
122 W. Taylor
Hobbs NM, 88240

Project: Hobbs Jct. E-33-1
Project Number: None Given
Project Manager: Kristin Farris-Pope

Fax: (505) 397-1471

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62101 - General Preparation (WetChem)										
Blank (EH62101-BLK1)				Prepared & Analyzed: 08/21/06						
Sulfate	ND	0.500	mg/L							
Chloride	ND	0.500	"							
LCS (EH62101-BS1)				Prepared & Analyzed: 08/21/06						
Sulfate	8.51	0.500	mg/L	10.0		85.1	80-120			
Chloride	10.0	0.500	"	10.0		100	80-120			
Calibration Check (EH62101-CCV1)				Prepared & Analyzed: 08/21/06						
Sulfate	8.34		mg/L	10.0		83.4	80-120			
Chloride	10.2		"	10.0		102	80-120			
Duplicate (EH62101-DUP1)	**Source: 6H18007-01**			Prepared & Analyzed: 08/21/06						
Sulfate	76.3	5.00	mg/L		65.9			14.6	20	
Chloride	105	5.00	"		98.9			5.98	20	
Duplicate (EH62101-DUP2)	**Source: 6H18013-04**			Prepared & Analyzed: 08/21/06						
Sulfate	331	5.00	mg/L		336			1.50	20	
Chloride	138	5.00	"		136			1.46	20	
Matrix Spike (EH62101-MS1)	**Source: 6H18007-01**			Prepared & Analyzed: 08/21/06						
Sulfate	172	5.00	mg/L	100	65.9	106	80-120			
Chloride	210	5.00	"	100	98.9	111	80-120			
Matrix Spike (EH62101-MS2)	**Source: 6H18013-04**			Prepared & Analyzed: 08/21/06						
Sulfate	422	5.00	mg/L	100	336	86.0	80-120			
Chloride	224	5.00	"	100	136	88.0	80-120			

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62128 - General Preparation (WetChem)										
Blank (EH62128-BLK1)				Prepared & Analyzed: 08/21/06						
Total Alkalinity	ND	2.00	mg/L							
LCS (EH62128-BS1)				Prepared & Analyzed: 08/21/06						
Total Alkalinity	178		mg/L	200		89.0	85-115			
Duplicate (EH62128-DUP1)	**Source: 6H18007-01**			Prepared & Analyzed: 08/21/06						
Total Alkalinity	186	2.00	mg/L		186			0.00	20	
Reference (EH62128-SRM1)				Prepared & Analyzed: 08/21/06						
Total Alkalinity	248		mg/L	250		99.2	90-110			
Batch EH62303 - Filtration Preparation										
Blank (EH62303-BLK1)				Prepared: 08/18/06 Analyzed: 08/22/06						
Total Dissolved Solids	ND	10.0	mg/L							
Duplicate (EH62303-DUP1)	**Source: 6H18007-01**			Prepared: 08/18/06 Analyzed: 08/22/06						
Total Dissolved Solids	556	10.0	mg/L		526			5.55	5	R5
Duplicate (EH62303-DUP2)	**Source: 6H18013-04**			Prepared & Analyzed: 08/18/06						
Total Dissolved Solids	808	10.0	mg/L		930			14.0	5	

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	

Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EH62313 - 6010B/No Digestion										
Blank (EH62313-BLK1)				Prepared & Analyzed: 08/23/06						
Calcium	ND	0.0810	mg/L							
Magnesium	ND	0.0360	"							
Potassium	ND	0.0600	"							
Sodium	ND	0.0430	"							
Calibration Check (EH62313-CCV1)				Prepared & Analyzed: 08/23/06						
Calcium	1.96		mg/L	2.00		98.0	85-115			
Magnesium	2.01		"	2.00		100	85-115			
Potassium	1.76		"	2.00		88.0	85-115			
Sodium	1.96		"	2.00		98.0	85-115			
Duplicate (EH62313-DUP1)	**Source: 6H15005-04**			Prepared & Analyzed: 08/23/06						
Calcium	44.4	0.810	mg/L		45.9			3.32	20	
Magnesium	48.1	0.360	"		49.3			2.46	20	
Potassium	42.9	0.600	"		42.6			0.702	20	
Sodium	44.4	0.430	"		43.5			2.05	20	

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Notes and Definitions

R5	RPD is outside of historic values
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 8/28/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765
Phone: 432-563-1800
Fax: 432-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpope@riceswd.com
Project Name: Hobbs Junction E-33-1
Company Name: RICE Operating Company
Project #:
Company Address: 122 W. Taylor Street
Project Loc: Lea County
City/State/Zip: Hobbs, New Mexico 88240
PO #:
Telephone No: (505) 393-9174
Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505) 631-9310
Email: rozanne@valornet.com

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	Preservative: HNO_3	Preservative: HCl (2) 40 ml glass vials	Preservative: NaOH	Preservative: H_2SO_4	Preservative: None (1) 1 Liter HDPE	Preservative: Other (Specify)	Matrix: Water	Matrix: Sludge	Matrix: Soil	Matrix: Other (specify)	Analyze For: TCLP: TPH: 418.1 8015M 1005 1006	TOTAL: TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids	RUSH TAT (Pre-Schedule)	Standard TAT
01	Monitor Well #1	8/14/2006	10:40	3	X		2			1		X					X	X	X					X			X		X

Special Instructions:

PLEASE Email RESULTS TO: kpope@riceswd.com; mfranks@riceswd.com
rozanne@valornet.com

Sample Containers Intact? Y N
Labels on container? Y N
Custody Seals: Containers / Cooler
Temperature Upon Receipt:

Laboratory Comments: 4.0

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	8/18/06	5:30	James Johnson	8-18-06	5:31
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	8/18/06	11:20		8/18/06	10:20

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice DP

Date/ Time: 8/18/06 10:20

Lab ID # : 6H18009

Initials: CK

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	Yes	No	4.0 °C	
#2	Shipping container in good condition?	Yes	No		
#3	Custody Seals intact on shipping container/ cooler?	Yes	No	Not Present	
#4	Custody Seals intact on sample bottles/ container?	Yes	No	Not Present	
#5	Chain of Custody present?	Yes	No		
#6	Sample instructions complete of Chain of Custody?	Yes	No		
#7	Chain of Custody signed when relinquished/ received?	Yes	No		
#8	Chain of Custody agrees with sample label(s)?	Yes	No	ID written on Cont./ Lid	
#9	Container label(s) legible and intact?	Yes	No	Not Applicable	
#10	Sample matrix/ properties agree with Chain of Custody?	Yes	No		
#11	Containers supplied by ELOT?	Yes	No		
#12	Samples in proper container/ bottle?	Yes	No	See Below	
#13	Samples properly preserved?	Yes	No	See Below	
#14	Sample bottles intact?	Yes	No		
#15	Preservations documented on Chain of Custody?	Yes	No		
#16	Containers documented on Chain of Custody?	Yes	No		
#17	Sufficient sample amount for indicated test(s)?	Yes	No	See Below	
#18	All samples received within sufficient hold time?	Yes	No	See Below	
#19	VOC samples have zero headspace?	Yes	No	Not Applicable	

Variance Documentation

Contact: _____ Contacted by: _____ Date/ Time: _____

Regarding: _____

Corrective Action Taken: _____

Check all that Apply:

- ☐ See attached e-mail/ fax
- ☐ Client understands and would like to proceed with analysis
- ☐ Cooling process had begun shortly after sampling event

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Kristin Farris-Pope

Rice Operating Co.

122 W. Taylor

Hobbs, NM 88240

Project: Hobbs Jct. E-33-1

Project Number: None Given

Location: Lea County

Lab Order Number: 6E18019

Report Date: 05/25/06

Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/25/06 16:11

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Monitor Well #1	6E18019-01	Water	05/17/06 14:05	05/18/06 12:00

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/25/06 16:11

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6E18019-01) Water									
Benzene	ND	0.00100	mg/L	1	EE62101	05/21/06	05/22/06	EPA 8021B	
Toluene	ND	0.00100	"	"	"	"	"	"	
Ethylbenzene	ND	0.00100	"	"	"	"	"	"	
Xylene (p/m)	ND	0.00100	"	"	"	"	"	"	
Xylene (o)	ND	0.00100	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*116 %*	*80-120*		"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*87.2 %*	*80-120*		"	"	"	"	

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/25/06 16:11

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6E18019-01) Water									
Total Alkalinity	**200**	2.00	mg/L	1	EE62220	05/22/06	05/22/06	EPA 310.1M	
Chloride	**142**	5.00	"	10	EE62205	05/22/06	05/22/06	EPA 300.0	
Total Dissolved Solids	**678**	5.00	"	1	EE61919	05/18/06	05/18/06	EPA 160.1	
Sulfate	**93.4**	5.00	"	10	EE62205	05/22/06	05/22/06	EPA 300.0	

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Rice Operating Co.	Project: Hobbs Jct. E-33-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Kristin Farris-Pope	05/25/06 16:11

Total Metals by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Monitor Well #1 (6E18019-01) Water									
Calcium	**98.1**	0.0100	mg/L	1	EE61926	05/19/06	05/19/06	EPA 6010B	
Magnesium	**20.5**	0.0100	"	10	"	"	"	"	
Potassium	**6.24**	2.50	"	50	"	"	"	"	
Sodium	**75.9**	0.500	"	"	"	"	"	"	

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Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE62101 - EPA 5030C (GC)										
Blank (EE62101-BLK1)				Prepared & Analyzed: 05/21/06						
Benzene	ND	0.00100	mg/L							
Toluene	ND	0.00100	"							
Ethylbenzene	ND	0.00100	"							
Xylene (p/m)	ND	0.00100	"							
Xylene (o)	ND	0.00100	"							
Surrogate: a,a,a-Trifluorotoluene	*42.9*		*ug/l*	*40.0*		*107*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*32.2*		*"*	*40.0*		*80.5*	*80-120*			
LCS (EE62101-BS1)				Prepared & Analyzed: 05/21/06						
Benzene	0.0415	0.00100	mg/L	0.0500		83.0	80-120			
Toluene	0.0421	0.00100	"	0.0500		84.2	80-120			
Ethylbenzene	0.0463	0.00100	"	0.0500		92.6	80-120			
Xylene (p/m)	0.102	0.00100	"	0.100		102	80-120			
Xylene (o)	0.0504	0.00100	"	0.0500		101	80-120			
Surrogate: a,a,a-Trifluorotoluene	*42.7*		*ug/l*	*40.0*		*107*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*36.2*		*"*	*40.0*		*90.5*	*80-120*			
Calibration Check (EE62101-CCV1)				Prepared & Analyzed: 05/21/06						
Benzene	44.3		ug/l	50.0		88.6	80-120			
Toluene	44.3		"	50.0		88.6	80-120			
Ethylbenzene	55.3		"	50.0		111	80-120			
Xylene (p/m)	99.1		"	100		99.1	80-120			
Xylene (o)	49.1		"	50.0		98.2	80-120			
Surrogate: a,a,a-Trifluorotoluene	*44.6*		*"*	*40.0*		*112*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*34.8*		*"*	*40.0*		*87.0*	*80-120*			
Matrix Spike (EE62101-MS1)	**Source: 6E17005-01**			Prepared: 05/21/06		Analyzed: 05/22/06				
Benzene	0.0444	0.00100	mg/L	0.0500	ND	88.8	80-120			
Toluene	0.0454	0.00100	"	0.0500	ND	90.8	80-120			
Ethylbenzene	0.0488	0.00100	"	0.0500	ND	97.6	80-120			
Xylene (p/m)	0.108	0.00100	"	0.100	ND	108	80-120			
Xylene (o)	0.0531	0.00100	"	0.0500	ND	106	80-120			
Surrogate: a,a,a-Trifluorotoluene	*45.5*		*ug/l*	*40.0*		*114*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*36.9*		*"*	*40.0*		*92.2*	*80-120*			

Organics by GC - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE62101 - EPA 5030C (GC)										
Matrix Spike Dup (EE62101-MSD1)	**Source: 6E17005-01**			Prepared: 05/21/06		Analyzed: 05/22/06				
Benzene	0.0439	0.00100	mg/L	0.0500	ND	87.8	80-120	1.13	20	
Toluene	0.0447	0.00100	"	0.0500	ND	89.4	80-120	1.55	20	
Ethylbenzene	0.0481	0.00100	"	0.0500	ND	96.2	80-120	1.44	20	
Xylene (p/m)	0.107	0.00100	"	0.100	ND	107	80-120	0.930	20	
Xylene (o)	0.0521	0.00100	"	0.0500	ND	104	80-120	1.90	20	
Surrogate: a,a,a-Trifluorotoluene	*46.4*		*ug/l*	*40.0*		*116*	*80-120*			
Surrogate: 4-Bromofluorobenzene	*33.4*		*"*	*40.0*		*83.5*	*80-120*			

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General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE61919 - Filtration Preparation										
Blank (EE61919-BLK1)				Prepared & Analyzed: 05/18/06						
Total Dissolved Solids	ND	5.00	mg/L							
Duplicate (EE61919-DUP1)	**Source: 6E18012-01**			Prepared & Analyzed: 05/18/06						
Total Dissolved Solids	1420	5.00	mg/L		1470			3.46	5	
Batch EE62205 - General Preparation (WetChem)										
Blank (EE62205-BLK1)				Prepared & Analyzed: 05/22/06						
Sulfate	ND	0.500	mg/L							
Chloride	ND	0.500	"							
LCS (EE62205-BS1)				Prepared & Analyzed: 05/22/06						
Sulfate	8.20		mg/L	10.0		82.0	80-120			
Chloride	10.1		"	10.0		101	80-120			
Calibration Check (EE62205-CCV1)				Prepared & Analyzed: 05/22/06						
Chloride	10.1		mg/L	10.0		101	80-120			
Sulfate	9.63		"	10.0		96.3	80-120			
Duplicate (EE62205-DUP1)	**Source: 6E18012-01**			Prepared & Analyzed: 05/22/06						
Sulfate	307	10.0	mg/L		304			0.982	20	
Chloride	343	10.0	"		344			0.291	20	
Duplicate (EE62205-DUP2)	**Source: 6E18015-01**			Prepared & Analyzed: 05/22/06						
Chloride	415	10.0	mg/L		412			0.726	20	
Sulfate	50.3	10.0	"		50.6			0.595	20	

General Chemistry Parameters by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE62205 - General Preparation (WetChem)										
Matrix Spike (EE62205-MS1)	**Source: 6E18012-01**			Prepared & Analyzed: 05/22/06						
Chloride	565	10.0	mg/L	200	344	110	80-120			
Sulfate	465	10.0	"	200	304	80.5	80-120			
Matrix Spike (EE62205-MS2)	**Source: 6E18015-01**			Prepared & Analyzed: 05/22/06						
Chloride	654	10.0	mg/L	200	412	121	80-120			S-07
Sulfate	200	10.0	"	200	50.6	74.7	80-120			S-07
Batch EE62220 - General Preparation (WetChem)										
Blank (EE62220-BLK1)				Prepared & Analyzed: 05/22/06						
Total Alkalinity	ND	2.00	mg/L							
LCS (EE62220-BS1)				Prepared & Analyzed: 05/22/06						
Bicarbonate Alkalinity	214	2.00	mg/L	200		107	85-115			
Duplicate (EE62220-DUP1)	**Source: 6E18012-01**			Prepared & Analyzed: 05/22/06						
Total Alkalinity	279	2.00	mg/L		280			0.358	20	
Reference (EE62220-SRM1)				Prepared & Analyzed: 05/22/06						
Total Alkalinity	96.0		mg/L	100		96.0	90-110			

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Total Metals by EPA / Standard Methods - Quality Control

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Spike Level	Source Result	%REC	%REC Limits	RPD	RPD Limit	Notes
Batch EE61926 - 6010B/No Digestion										
Blank (EE61926-BLK1)				Prepared & Analyzed: 05/19/06						
Calcium	ND	0.0100	mg/L							
Magnesium	ND	0.00100	"							
Potassium	ND	0.0500	"							
Sodium	ND	0.0100	"							
Calibration Check (EE61926-CCV1)				Prepared & Analyzed: 05/19/06						
Calcium	2.30		mg/L	2.00		115	85-115			
Magnesium	2.21		"	2.00		110	85-115			
Potassium	1.80		"	2.00		90.0	85-115			
Sodium	1.81		"	2.00		90.5	85-115			
Duplicate (EE61926-DUP1)	**Source: 6E18012-01**			Prepared & Analyzed: 05/19/06						
Calcium	111	0.500	mg/L		111			0.00	20	
Magnesium	58.3	0.0100	"		56.5			3.14	20	
Potassium	12.2	0.500	"		12.9			5.58	20	
Sodium	266	0.500	"		271			1.86	20	

Notes and Definitions

S-07	Recovery outside Laboratory historical or method prescribed limits.
DET	Analyte DETECTED
ND	Analyte NOT DETECTED at or above the reporting limit
NR	Not Reported
dry	Sample results reported on a dry weight basis
RPD	Relative Percent Difference
LCS	Laboratory Control Spike
MS	Matrix Spike
Dup	Duplicate

Report Approved By: Raland K Tuttle Date: 5/25/2006

Raland K. Tuttle, Lab Manager
Celey D. Keene, Lab Director, Org. Tech Director
Peggy Allen, QA Officer
Jeanne Mc Murrey, Inorg. Tech Director
LaTasha Cornish, Chemist
Sandra Sanchez, Lab Tech.

Environmental Lab of Texas

12600 West I-20 East
Odessa, Texas 79765
Phone: 432-563-1800
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CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Kristin Farris Pope kpope@riceswd.com
Company Name: RICE Operating Company
Company Address: 122 W. Taylor Street
City/State/Zip: Hobbs, New Mexico 88240
Telephone No: (505) 393-9174 Fax No: (505) 397-1471
Sampler Signature: Rozanne Johnson (505) 631-9310
Email: rozanne@valornet.com

Project Name: Hobbs Jct. E-33-1
Project #:
Project Loc: Lea County
PO #:

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO_3	HCl (2) 40 ml glass vials	NaOH	H_2SO_4	None (1) 1 Liter HDPE	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify):	Analyze For: TPH: 418.1 8015M 1005 1006	Cations (Ca, Mg, Na, K)	Anions (Cl, SO4, CO3, HCO3)	SAR / ESP / CEC	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	RCI	N.O.R.M.	Total Dissolved Solids				RUSH TAT (Pre-Schedule)	Standard TAT
6E18019																TCLP:															
																TOTAL:							X								
-01	Monitor Well #1	5/17/2006	14:05	3	X		2			1		X					X	X					X			X					X

Special Instructions:
PLEASE Email RESULTS TO: kpope@riceswd.com & mfranks@riceswd.com

Sample Containers Intact? Y N
Labels on container? Y N
Custody Seals: Containers / Cooler
Temperature Upon Receipt: 1.0 °C - not frozen

Relinquished by:	Date	Time	Received by:	Date	Time
Rozanne Johnson	5/18/06	6:02	James Johnson	5/18/06	6:03
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
James Johnson	5/18/06	12:06	Kalandra Fox	5-18-06	1200

Laboratory Comments:

Environmental Lab of Texas
Variance / Corrective Action Report – Sample Log-In

Client: Rice Operating Co.

Date/Time: 05-18-06 @ 1200

Order #: 6E18019

Initials: JMM

Sample Receipt Checklist

Temperature of container/cooler?	(Yes)	No	1.0	C
Shipping container/cooler in good condition?	(Yes)	No		
Custody Seals intact on shipping container/cooler?	(Yes)	No	Not present	
Custody Seals intact on sample bottles?	(Yes)	No	Not present	
Chain of custody present?	(Yes)	No		
Sample Instructions complete on Chain of Custody?	(Yes)	No		
Chain of Custody signed when relinquished and received?	(Yes)	No		
Chain of custody agrees with sample label(s)	(Yes)	No		
Container labels legible and intact?	(Yes)	No		
Sample Matrix and properties same as on chain of custody?	(Yes)	No		
Samples in proper container/bottle?	(Yes)	No		
Samples properly preserved?	(Yes)	No		
Sample bottles intact?	(Yes)	No		
Preservations documented on Chain of Custody?	(Yes)	No		
Containers documented on Chain of Custody?	(Yes)	No		
Sufficient sample amount for indicated test?	(Yes)	No		
All samples received within sufficient hold time?	(Yes)	No		
VOC samples have zero headspace?	(Yes)	No	Not Applicable	

Other observations:

Variance Documentation:

Contact Person: _____ Date/Time: _____ Contacted by: _____

Regarding:

Corrective Action Taken:

Appendix F Hydrus 1-D

To model the effect of the vadose zone remedy's impact on ground water at the E-33-1 junction box site, output from HYDRUS-1D is used as input to a ground water mixing model.

HYDRUS-1D numerically solves the Richard's equation for water flow and the Fickian-based advection-dispersion equation for heat and solute transportation. The HYDRUS-1D flow equation includes a sink term (a term used to specify water leaving the system) to account for transpiration by plants. The solute transport equation considers advective, dispersive transport in the liquid phase, diffusion in the gaseous phase, nonlinear and non-equilibrium sorption, linear equilibrium reactions between the liquid and gaseous phases, zero-order production, and first-order degradation.

The ground water mixing model uses the chloride flux from the vadose zone to ground water provided by HYDRUS-1D and instantaneously mixes this chloride and water with the ground water flux of chloride plus water that enters the mixing cell beneath the subject site. We refer the reader to API Publication 4734, Modeling Study of Produced Water Release Scenarios (Hendrickx and others, 2005) for a general description of the techniques employed for this simulation experiment.

A description of the model input parameters are listed below.

HYDRUS 1-D INPUTS:

Soil Profile - Information for the soil profile (or vadose zone thickness and texture) uses information obtained from installation of the monitoring well at the E-33-1 junction box site. Depth to water measurements from the monitoring well demonstrate a vadose zone thickness of 64 feet at the site. To be conservative of ground water quality, a vadose zone thickness of 62 feet was used. The boring log of the monitoring well at the site demonstrates that the vadose zone is composed of sandy caliches and fine-grained sands. For modeling purposes, the vadose zone was modeled using a sand. This choice is conservative of ground water quality in that this material has higher hydraulic conductivities than the finer grained materials (caliche) it replaced in the soil profile.

Dispersion lengths - Conservative dispersion lengths were employed. Standard practice calls for employing a dispersion length that is 10% of the model length. Based upon experience with similar soils in this area, dispersion lengths of 6% of the model length were used. This choice is conservative of ground water quality.

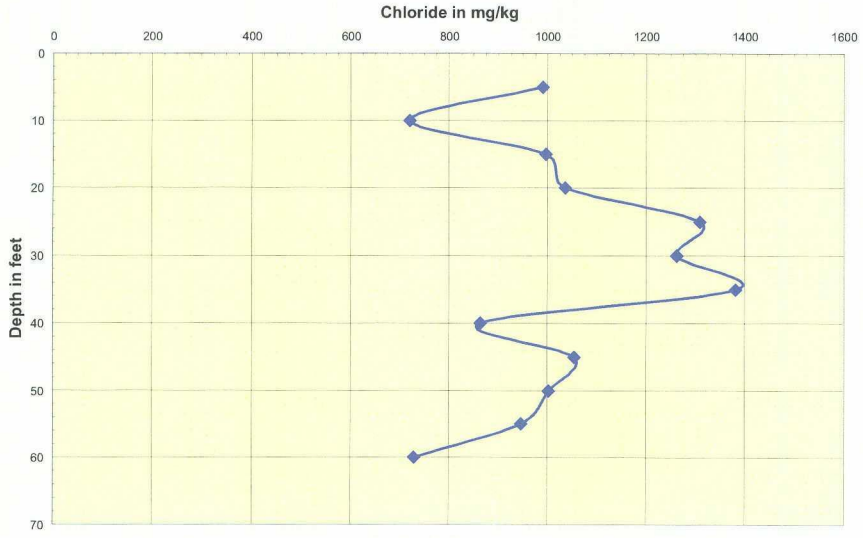
Climate - Weather data used in the predictive modeling was from the Pearl Weather Station (46 years of data), approximately 12 miles southwest of the E-33-1 site.

HYDRUS-1D can also employ a uniform yearly infiltration rate that will obviously smooth the temporal variations. Because the atmospheric data are of high quality and nearby to the site, we have elected to allow HYDRUS-1D to predict the deep percolation rate and the resultant variable flux to ground water. This choice results in higher peak chloride concentrations in ground water due to temporally variable high fluxes from the vadose zone. As such, this choice is conservative and will not under-predict impairment to ground water quality.

Soil Moisture - Because soils are relatively dry in this climate and vadose zone hydraulic conductivity varies with moisture content, it is important that simulation experiments of different remedial strategies begin with an initial "steady state" soil moisture content. The calculation of soil moisture content begins with using professional judgment as an initial input and then running sufficient years of weather data through the model to establish a "steady state" moisture content. Because only minimal changes in the HYDRUS-1D soil moisture content profile occurred after year 30 of the initial condition calculation, 46 years was considered more than sufficient to establish the initial moisture condition. All simulations of chloride movement used soil profiles hydrated in this manner.

Initial Chloride Profile – Field chloride soil concentrations (mg/kg) at depth were obtained from the samples collected from the monitoring well boring (Figure 1).

Figure 1: Chloride Concentration at Depth for E-33-1 Junction Box Site



Integration of the chloride contained within the profile yielded a chloride load of 30.5 kg/m^2. The averaged soil concentration values (mg/kg) were linearly interpolated to correspond to the HYDRUS 1-D soil profile nodes. Using the volumetric moisture content from the HYDRUS 1-D initial condition and a default dry bulk soil density of 1390 kg/m^3, soil water moisture concentrations (mg/L) were calculated for the HYDRUS 1-D soil profile nodes. These chloride concentrations were installed in the HYDRUS-1D model.

As described in API Publication 4734, the ground water mixing model takes the background chloride concentration in ground water multiplied by the ground water flux to calculate the total mass of ground water chloride entering the ground water mixing cell, which lies below the area of interest. The chloride and water flux from HYDRUS-1D is added to the ground water chloride mass and flux to create a final chloride concentration in ground water at an imaginary monitoring well located at the down gradient edge of the mixing cell (the edge of the release site).

MIXING MODEL INPUTS:

Influence Distance - The influence distance is defined as the maximal length of the release area parallel to groundwater flow direction. A maximum diameter of 20 feet for the site was used.

Background Chloride Concentration – From nearby well data from the site, a value of 100 mg/L chloride for ground water was used at this location. Chloride concentration data from the E-33-1 monitoring well was used in calibration of the model.

Hydraulic Conductivity - R.T. Hicks Consultants believes that the hydraulic conductivity of the saturated zone at the release site is similar to that observed for the Ogallala Aquifer throughout the general area. McAda (1984) simulated water level declines using a two-dimensional digital model and employed hydraulic conductivity values of 51-75 feet/day (1.9 E-4 to 2.8 E-4 m/s) in the area. More recently, Musharrafieh and Chudnoff (1999) employed values for hydraulic conductivity within this area of interest between 81 and 100 ft/day, for their simulation. According to Freeze and Cherry (1979), these values correspond to clean sand, which agrees with nearby lithologic descriptions of the saturated zone. For the E-32-1 site, the saturated hydraulic conductivity of the uppermost saturated zone is assumed as 75 feet/day.

Groundwater Gradient - From USGS well data (1996), ground water flows southeast in the area under a hydraulic gradient of approximately 0.0036 ft/ft. The resulting ground water flux is 8.2 cm/day.

Aquifer Thickness - A restricted aquifer thickness of 10 feet was employed in the mixing model as a conservative measure although aquifer thickness penetrated by the monitoring well is approximately 15 feet.

For all variables for which field data did not exist, assumptions conservative of ground water quality were made. A summary of the input parameters and a description of the source information used in the HYDRUS-1D model for this application are provided in Table 1 below.

Table 1: Modeling Inputs for the E-33-1 junction box site

Input Parameter	Source
Vadose Zone Thickness - 62 feet	From Monitoring Well on the Site
Vadose Zone Texture	Boring Log and professional judgment
Dispersion Length - 6% of model length	Professional judgment
Climate	Pearl, N.M. Weather Station Data
Soil Moisture	HYDRUS-1D initial condition simulation
Initial soil chloride concentration profile	From E-33-1 monitoring well boring samples
Length of release parallel to ground water flow - 20 feet	Maximum Dimension of Site
Background Chloride in Ground Water -100 ppm	Regional and Site Data
Ground Water Flux - 8.2 cm/day	From regional data
Aquifer Thickness - 10-feet	Conservative value

Vegetation was allowed at the site within the upper 3.0 feet of silt loam.

Model of the E-33-1 junction box site with Revegetation of the Site

The proposed remedy of the E-33-1 junction box site was modeled with a site specific HYDRUS-1D model. The model was begun with a 62-foot thick soil profile constructed and hydrated as discussed above. The initial chloride profile was also installed as described above.

The remedy modeled featured vegetation acting as an evapotranspiration (ET) barrier in 3.0 feet of silt loam above eight inches of coarse-grained material to reduce upwards wicking of chloride. The assumed installation of the ET barrier is at the present. To calibrate the model, the chloride concentration output from the HYDRUS-1D model was multiplied by a concentration factor to match early peak chloride concentration with observed chloride concentrations in the E-33-1 monitoring well (140 mg/L in May and August, 2006). There is a time delay as the model numerically reaches an "equilibrium" between ground water chloride concentration and vadose zone water chloride concentration (from time 0.0 to about time 0.75 years). This calibration was made in order to be most representative of installation of the remedy at the current time.

With vegetation established, vadose zone flux to ground water declines. The resultant chloride concentration in ground water peaks at 160 mg/L about two years after installation of the ET barrier and declines there after (see Figure 2).

Figure 2: Chloride Concentration in the Aquifer With an Installed ET Barrier, E-33-1 Site

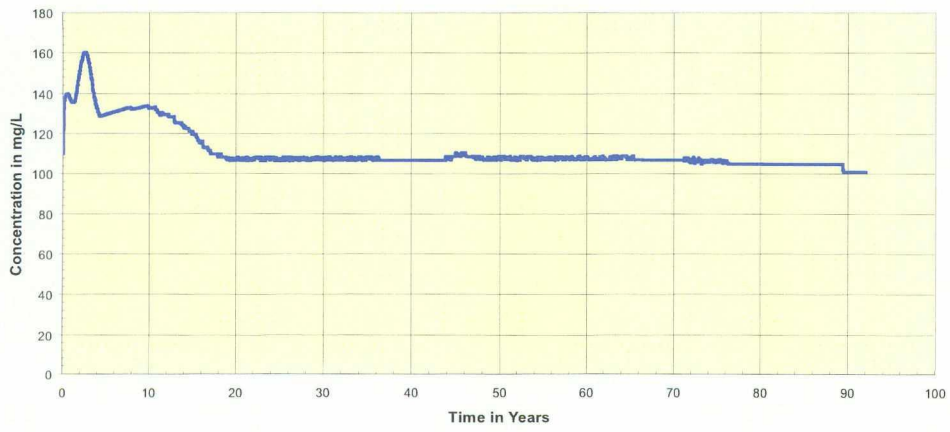


Figure 3 is a graph of vadose zone flux to the aquifer with an installed ET barrier. Predicted vadose zone flux to the aquifer is reduced by over one order of magnitude within a time period of 20 years after installation of the remedy.

Figure 3: Vadose Zone Water Flux into the Aquifer With an Installed ET Barrier, E-33-1Site

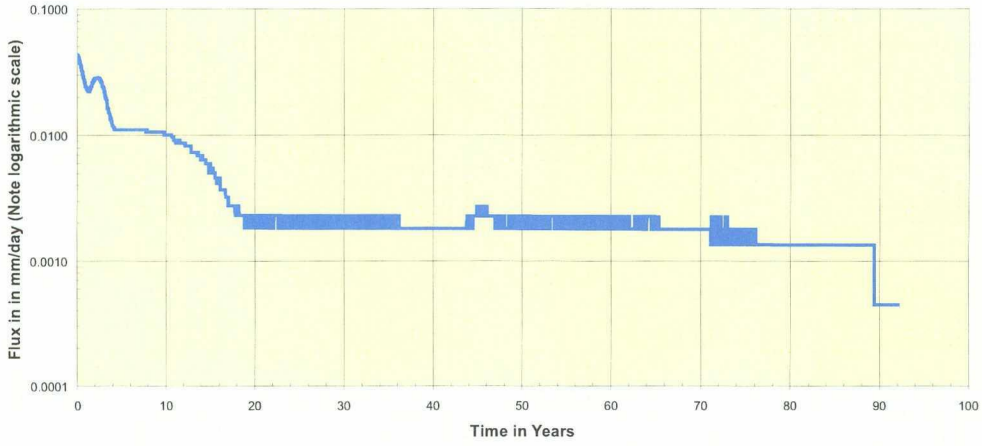


Figure 2 is a graph of predicted soil water chloride concentration profiles at times in the future with the remedy installed. Between year 0 and year 92, peak chloride concentration moves about 1.0 foot downwards, a migration rate of 0.011 feet per year. This rate implies that peak chloride concentration will enter ground water about 2700 years from now.

Rather than run the model for the large time necessary for the peak chloride concentration to enter ground water, an upper bound was calculated for chloride concentration in the aquifer through time.

This bound is calculated by identifying maximum chloride concentration in the vadose zone and a maximum vadose zone water flux in time. These values are entered as constants through time in the limit calculation and represent a maximum chloride flux from the vadose zone. This flux is used in the calculation as a steady state condition. Then, the limit calculation of the chloride concentration in ground water as time approaches infinity is a simple algebraic evaluation.

The maximum chloride concentration value is42,300 mg/L in the vadose zone at 10.5 feet bgs (Time = 92 Years, Figure 2). Examination of the HYDRUS 1-d output files reveals no vadose zone water flux to ground water exceeding 0.00166 mm/day after year 42. Neither of these values will be equaled or exceeded in the future. Due to dispersion, peak vadose zone chloride concentration will decrease. As can be seen in Figure 3, with vegetation at the site, predicted vadose zone water flux will be less than or equal to this maximum value after year 50.

The calculation demonstrates that although peak chloride concentration has not yet migrated to the ground water interface, predicted chloride concentration in the aquifer is bounded by 166 mg/L through all time after year 92.