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WORK PLAN

DATE:

04-02-2007

1R428-43
Work Plan
April 2, 2007

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Environmental Bureau
Oil Conservation Division

Corrective Action Plan

F-29-1b Junction Site

Section 29, T18S, R 38E

NMOCD Case #: 1-R0428-43

Prepared for:

Rice Operating Company
122 West Taylor
Hobbs, NM 88240

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

April 2, 2007

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

RE: NMOCD Case # 1R0428-43, F-29-1b Junction Boot
Hobbs SWD System Abandonment
Corrective Action Plan

Dear Mr. Price:

On behalf of Rice Operating Company, R.T. Hicks Consultants, Ltd. is pleased to submit the attached Corrective Action Plan for the F-29-1b Boot site. This plan presents characterization activities, evaluations and conclusions as well as a proposal for closure of the site after the selected remedy is implemented.

If you have any questions or concerns, please do not hesitate to contact us.

Sincerely,
R.T. Hicks Consultants, Ltd.

Katie Lee

Katie Lee
Staff Scientist

Copy: Rice Operating Company
Hobbs NMOCD Office

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1.0 EXECUTIVE SUMMARY

The F-29-1b Junction Boot, located west of Hobbs, New Mexico, in section 29, T18S, R38E, was a component in the Hobbs Salt Water Disposal system (SWD) system, which disposed of produced-water from the late 1950s until 2002, when the system was closed. Future impacts from the system are not possible. With the abandonment of the system in 2002, Rice Operating Company (ROC) excavated and removed the F-29-1b Junction Boot and the uppermost 5-10 feet of the vadose zone. At the time of investigation, the excavation was filled with a mixture of sand-clay-caliche. The activities at the followed the NMOCD-approved workplan (August 6, 2004).

This Corrective Action Plan presents:

1) Characterization activities performed by R.T. Hicks Consultants (Hicks Consultants) and Rice Operating Company (ROC) at the F-29-1b Vent site located in the Hobbs SWD system,

2) Evaluations and conclusions drawn from activities performed,

3) A proposal for closure of the site after the selected remedy is implemented.

2.0 WORK ELEMENTS PERFORMED

Detailed descriptions of characterization activities are provided in Appendix A. Appendix B shows the results of field chloride measurements. Plate 1 is an aerial photograph of the site when it was active, taken between 1996 and 1998, showing the locations of the boring and background boring.

Activities included:

1. F-29-1b soil boring characterization.

2. Background soil boring characterization.

3. Field measurements consisted of chloride titration and PID readings for volatiles.

4. Two selected soil samples were submitted for laboratory

analysis in accordance with the workplan.

5. HYDRUS-1D simulation of the site.

6. Development of a corrective action plan.

3.0 CONCLUSIONS

3.1 ACTIVITIES AT THE F-29-1B SITE HAVE NOT CAUSED COCs TO REACH GROUND WATER.

From chloride concentration and PID measurement profiles (confirmed by laboratory analysis), Hicks Consultants concludes that saturated conditions between the surface and ground water never developed, that constituents of concern (COCs) reside in the upper two-thirds of the vadose zone and, therefore, that activities at this site have not caused COCs to reach ground water.

3.2 HYDRUS-1D MODEL SIMULATIONS INDICATE THAT CHLORIDE CONCENTRATIONS WILL NOT EXCEED WQCC GROUND WATER STANDARDS.

Using highly conservative input data, HYDRUS-1D modeling of the vadose zone residual chlorides predicts that resulting ground water chloride concentrations will be less than 40 ppm above background concentrations (100 ppm) in the future and below the 250 ppm Water Quality Control Commission (WQCC) secondary drinking water standard. Chloride concentrations are predicted to fluctuate between 110–136 mg/L for less than 9 years of the time interval from 11 and 27 years from now. The modeling inputs and methodology are discussed in Appendix C.

3.3 THE SITE PRESENTS NO THREAT TO FRESH WATER, PUBLIC HEALTH OR THE ENVIRONMENT.

Vadose zone samples demonstrate no presence of toxic pollutant(s) as defined in 20.6.2.7 NMAC. Further, because residual petroleum hydrocarbons and chloride are not present in sufficient concentration or sufficient mass, Hicks Consultants concluded that the site represents no threat to fresh water, public health, or the environment (see discussion in Appendix A and Appendix C).

4.0 RECOMMENDATION

Hicks Consultants recommends that ROC create an infiltration barrier through re-vegetation of the ground surface at the F-29-1b Junction site. This remedy is protective of ground water quality, human health, and the environment. Upon documentation of this action, a closure report/request will be submitted to NMOCD.

Detail of Characterization Activities At the F-29-1b Site

Appendix A

APPENDIX A

1) F-29-1B SOIL BORING CHARACTERIZATION

The boring at the F-29-1b site was drilled in November, 2004, to a depth of 65 feet. Plate 2 illustrates the lithology and distribution of constituents of concern. From 0–36 feet below ground surface (bgs), the split spoon obtained samples at 5-foot intervals.

The dry and unconsolidated nature of the sand-silt from 40–60 feet bgs caused the loss of split-spoon samples during retrieval.

Due to increased soil moisture at 60 feet bgs, the split spoon was able to retain samples. In the interval between 40 feet bgs and 60 feet bgs, samples were collected from cuttings. This is the only material deviation from the NMOCD-approved workplan. Moist soil was observed at 61 feet bgs and depth to water was estimated at approximately 63 feet. The boring was plugged with Bentonite.

2) BACKGROUND SOIL BORING CHARACTERIZATION

Samples taken from a background boring located about 4000 feet northwest of the site show that background chloride concentrations in the area are approximately 80 mg/kg. Appendix B presents the field data from this boring.

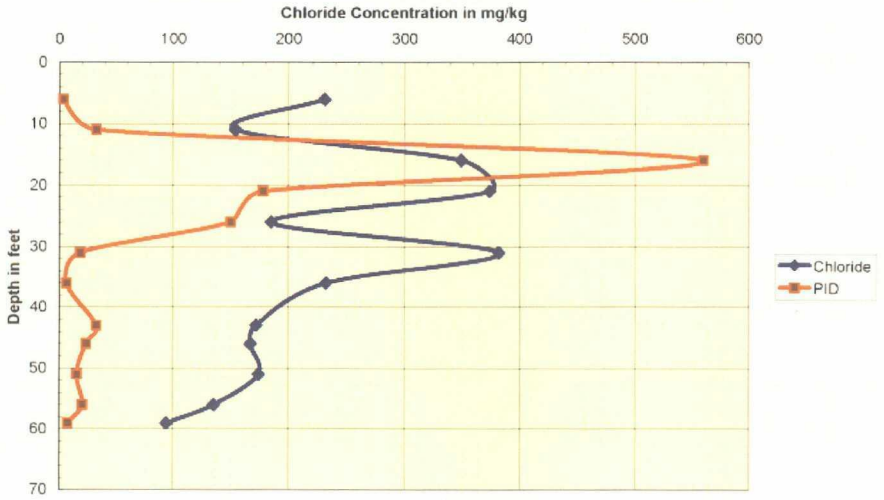
3) FIELD MEASUREMENTS

ROC took field measurements from each 5-foot sampling interval for chloride and volatiles in the field using the heated headspace method to measure total organic vapors by photoionization detector (PID). Samples were submitted to a laboratory from depths showing the highest field chloride and PID measurements (16 feet bgs) and from the capillary fringe (61 feet bgs); see Figure A-1. Plate 2 is a lithologic log of the boring with field chloride concentrations and PID measurements. Appendix B provides additional chemical data for the soil samples.

The maximum chloride concentration in the soil is 382 ppm at 31 feet bgs and chloride declines from that depth, as shown by Figure A-1.

Chloride concentrations reach approximate background levels at a depth of 56 feet bgs. Field evidence demonstrates that the chloride mass resides in the upper two-thirds of the vadose zone.

Figure A-1: Chloride Concentrations and PID Readings From Soil Boring Samples, F-29-1b Vent Site, November 4, 2004



The soil sample obtained at 16 feet bgs contained 560 ppm total organic vapors. PID readings decline from 16 feet bgs, reaching background concentrations below 26 feet bgs.

Laboratory analysis of the soil sample from 16 feet bgs showed benzene, toluene, ethylbenzene and xylene (BTEX) are present in total aggregate concentration below 50 ppm (Table A-1).

Table A-1: Laboratory Analysis Results of Samples From the F-29-1b Boring.

F-29-1b Junction Boot, November, 2004			
Constituent of Concern	16 ft. bgs	61 ft. bgs	Detection Limit
	mg/kg (dry)		
Benzene	ND	ND	0.025
Toluene	0.0691	ND	
Ethyl benzene	0.349	ND	
Xylene (p/m)	1.53	ND	
Xylene (o)	0.379	ND	
	mg/kg (wet)		
Chloride	362	42.5	0.20

BTEX was not detected in field laboratory analysis of the soil sample from the capillary fringe (61 feet bgs).

Field Measurements & Laboratory Results For Soil Samples

Appendix B

Soil Bore

System: [illegible] Location: [illegible] GW: [illegible] Landowner: [illegible]

Soil Bore: [illegible] GPS Coord. System UTM [illegible]

UL [illegible] Sec 29 T 17 R 32 Map Datum Nad83 [illegible]

Depth	CL		PID		Color	Time
6"	231		3.7		Dark brown sand + rocks	
11"	154		32.9		Tan silty loose sand	
16"	2495		560		[illegible]	11:01
21"	174		177		[illegible]	
26"	125		150		[illegible]	
31"	323		175		[illegible]	
36"	232		6.4		[illegible]	
41"	-		-		[illegible]	
46"	172		92.6		[illegible]	
51"	167		337			
56"	174		5.6		[illegible]	
61"	[illegible]		[illegible]		[illegible]	
66"	[illegible]		7.6		[illegible]	12:13

Notes: [illegible]

Signature [illegible] Date 11/9/04

COPY

Blagg Engineering Co.	Project: E-29 TB	Fax (505) 397-1471
122 W. Taylor	Project Number: None Given	Reported:
Hobbs NM, 88240	Project Manager: Kristen Pope	11/12/04 19:02

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB @ 4 ft.	4K10007-01	Soil	11/03/04 00:00	11/10/04 07:50
SB @ 61 ft.	4K10007-02	Soil	11/03/04 00:00	11/10/04 07:50

Rice Operating Co 122 W. Taylor Hobbs NM, 88240	Project: Pipeline Project Number: None Given Project Manager: Kristin Pope	Fax: (505) 397-1471 Reported: 11/12/04 16:02

Organics by GC
Environmental Lab of Texas

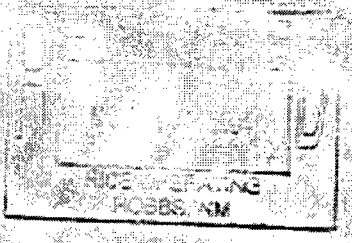
Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB @ 16 ft. (4K10007-01) Soil									
Benzene	ND	0.0250	mg/kg dry	25	4K11203	11/11/04	11/12/04	EPA 8021B	
Toluene	0.0651	0.0250	"	"	"	"	"	"	
Ethylbenzene	0.249	0.0250	"	"	"	"	"	"	
Xylene (p/m)	1.53	0.0250	"	"	"	"	"	"	
Xylene (o)	0.379	0.0250	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*84.1 %*	*80-120*	"	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*124 %*	*80-120*	"	"	"	"	"	*S-01*
Gasoline Range Organics C6-C12	86.5	10.0	mg/kg dry	1	4K09006	11/09/04	11/11/04	EPA 8015M	
Diesel Range Organics >C12-C35	853	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	240	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*99.0 %*	*70-130*	"	"	"	"	"	
Surrogate: o-Terphenyl		*105 %*	*70-130*	"	"	"	"	"	
SB @ 61 ft. (4K10007-02) Soil									
Benzene	ND	0.0250	mg/kg dry	25	4K11203	11/11/04	11/12/04	EPA 8021B	
Toluene	ND	0.0250	"	"	"	"	"	"	
Ethylbenzene	ND	0.0250	"	"	"	"	"	"	
Xylene (p/m)	ND	0.0250	"	"	"	"	"	"	
Xylene (o)	ND	0.0250	"	"	"	"	"	"	
Surrogate: a,a,a-Trifluorotoluene		*87.8 %*	*80-120*	"	"	"	"	"	
Surrogate: 4-Bromofluorobenzene		*97.2 %*	*80-120*	"	"	"	"	"	
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	4K09006	11/09/04	11/11/04	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*107 %*	*70-130*	"	"	"	"	"	
Surrogate: o-Terphenyl		*124 %*	*70-130*	"	"	"	"	"	

12600 West I-20 East - Odessa, Texas 79765 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.	Project: [illegible]	Fax: (505) 397-1471
122 W. Taylor	Project Number: [illegible]	Reported:
Hobbs NM, 88240	Project Manager: Kristin Pope	11/12/04 16:02

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB @ 16 ft (4K11007-01) Soil									
Chloride	362	20.0	mg/kg dry	2	EK41204	11/11/04	11/11/04	SW846/9253	
% Moisture	30.0		%	1	EK41101	11/11/04	11/11/04	% calculation	
SB @ 41 ft (4K11007-02) Soil									
Chloride	42.5	20.0	mg/kg dry	2	EK41204	11/11/04	11/11/04	SW846/9253	
% Moisture	11.0		%	1	EK41101	11/11/04	11/11/04	% calculation	



12600 West I-20 East Odessa, Texas 79765 (432) 563-1800 Fax (432) 563-1713

Soil Bore

System: Hobbs Location: GW: 62 Landowner:

Soil Bore: [illegible] GPS: Coord. System UTM 13 671407 E

UL F Sec. 29 T 19 R 38 Map Datum Nad83 3621969 N

Depth	Cl		PID		Color	Time
5f	127		1.0		Dark Brown	
6'	107		.7		white caliche	
10'	121		3.9		caliche	
16'	24		1.2			
21'	51		4.3			
26'	111		2.8		caliche / sand	
31'	52		5.5		caliche with rock	
37	56		3.3		red fine caliche sandy	
42'	20		4.7		brown sand	
46	126		5.4			
51'	77		2.9			
56	57		4.3			
61'	55		5.2		light brown sand	9:50
					some moisture	

Notes: 4.+ ground water @ 62 Took pictures @ [illegible]

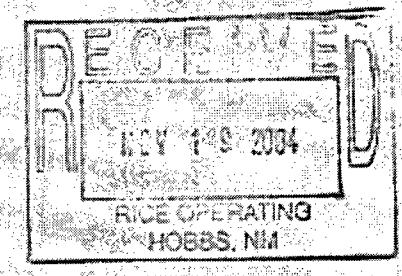
Signature [illegible] Date [illegible]

COPY

Rice Operating Co.	Project: Background Bore	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	Reported:
Hobbs NM, 88240	Project Manager: Kristin Pope	11/12/04 16:02

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
SB @ 61 ft	4K10006-01	Soil	11/03/04 00:00	11/10/04 07:50



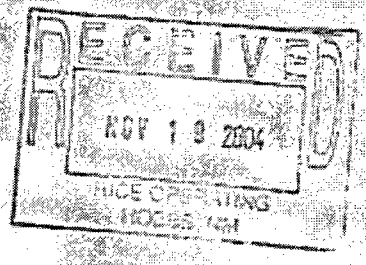
COPY

12600 West I-20 East - Odessa, Texas 79765 - (432) 563-1800 - Fax (432) 563-1713

Rice Operating Co.	Project: Background Bore	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	Reported:
Hobbs NM, 88240	Project Manager: Kristin Pope	11/12/04 16:02

General Chemistry Parameters by EPA / Standard Methods
Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
SB @ 61 ft (4K10006-01) Soil									
Chloride	ND	20.0	mg/kg	Wet	2	EK41209	11/10/04	11/11/04	SW 846 9253



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12600 West I-20 East - Odessa, Texas 79765 - (432) 563-1800 - Fax (432) 563-1713

Modeling Input Parameters & Results

Appendix C

APPENDIX C

To model the effect of the vadose zone remedy's impact on ground water at the F-29-1b site, output from HYDRUS-1D is used as input to a ground water mixing model.

HYDRUS-1D modeling simulates water and chloride fluxes through the vadose zone. The HYDRUS-1D output becomes the input to a simple ground water mixing model to predict chloride concentration in a simulated monitoring well immediately down-gradient of the site. Section 3.0 of "Modeling Study of Produced Water Release Scenarios" (Hendrickx, et al., 2005) provides a general description of this modeling approach (see Appendix D for references).

The observed vadose zone chloride profile was installed in the model. The present chloride load within the soil profile is the result of all previous activities at the site and is based upon field observation and analysis producing the most accurate modeling approach.

HYDRUS-1D INPUTS:

A synopsis of modeling inputs for the F-29-1b site is presented in Table C-1.

Table C-1: HYDRUS-1D and Mixing Model Input Parameters

Input Parameter	Source
Vadose zone thickness - 60 feet	F-29-1b field data and professional judgement
Vadose zone texture (Plate 3)	F-29-1b field data
Dispersion length: <6% of model length	Professional judgement
Climate	2004 Hobbs, NM, data and Pearl Weather Station data
Soil moisture	HYDRUS-1D initial condition simulation
Initial soil chloride concentration profile	From ROC field measurements
Length of release parallel to ground water flow: 15 feet	Field estimate
Background chloride in ground water: 100 ppm	Chemical analysis
Ground water flux: 8.6 cm/day	Calculated from published data
Aquifer thickness: 10 feet	Conservative choice

SOIL PROFILE

The F-29-1b model has a vadose zone soil profile constructed from the lithologic logs of the F-29-1b boring and five other borings in Section 29. The model's soil profile is representative of a soil profile excavated to a depth of 19 feet bgs (See Plate 3). Although the F-29-1b site was not excavated to this great a depth, this choice is conservative of ground water quality in that the upper 19 feet of the model's soil profile have been replaced with materials featuring equal or greater hydraulic conductivities than the materials at the F-29-1b site.

Vadose zone thickness is 63 feet at the F-29-1b site. The model uses a thickness of 60 feet. The effect of this difference is to reduce time of transit of infiltrated water through the vadose zone.

DISPERSION LENGTHS

Because of Hicks Consultants' recent experience with similar soils, conservative dispersion lengths were employed. Standard practice calls for employing a dispersion length that is 10% of the model length. For each lithologic unit identified in Plate 3, a dispersion length less than 6% of the model thickness was installed (Table C-2 presents the dispersion lengths for each lithology).

Table C-2: Dispersion Lengths

F-29-1b Hydrus-1D Soil Profile Properties				
Material	Description	Length (cm)	Dispersion (cm)	% of Profile Length
1	Sandy loam	30	50	2.778
2	Caliche-sand	60	30	1.667
3	Caliche	90	10	0.556
4	Sand-silt	1070	100	5.556
5	Loamy sand	550	100	5.556

CLIMATE

Weather data used in the predictive modeling include Hobbs data from November, 2003, to December, 2004, plus an additional 45 years from the Pearl Weather Station, approximately 11 miles west of the Hobbs Airport. The Pearl Weather Station is the

closest station to the F-29-1b site with sufficiently complete weather data for the HYDRUS-1D input files.

SOIL MOISTURE

An initial soil moisture condition was obtained running a HYDRUS-1D simulation for 45 years using the weather data from the Pearl Weather Station. 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. Vegetation was not allowed in order to create a "wetter" initial condition. This choice is conservative of ground water quality in that "wetter" soils have greater hydraulic conductivities.

The calculation of soil moisture content begins with an initial soil moisture input estimated by professional judgment. Then, sufficient years of weather data are run 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, a 45-year simulation was considered acceptable to establish the initial moisture condition. Soil profiles hydrated in this manner were used in all simulations of chloride movement.

INITIAL CHLORIDE PROFILE

From the observed field data generated by ROC personnel, linearly interpolated chloride concentrations were assigned to the model's more finely spaced nodes of the hydrated soil profile.

MIXING MODEL INPUTS:

INFLUENCE DISTANCE

As the Boot was oriented vertically, the affected surface area is small. Significant lateral impacts were not observed. The affected diameter of the site parallel to ground water flow was taken as 15 feet.

BACKGROUND CHLORIDE CONCENTRATION

From nearby well data, a value of 100 mg/L chloride for ground water was used for the predictive modeling.

HYDRAULIC CONDUCTIVITY

Hicks Consultants believes that the hydraulic conductivity of the saturated zone at the F-29-1b 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. According to Freeze and Cherry (1979), these values correspond to clean sand, which agrees with nearby lithologic descriptions of the saturated zone. A value of 45 feet/day was assumed for hydraulic conductivity of the uppermost saturated zone to be conservative of ground water quality.

GROUNDWATER GRADIENT

A hydraulic gradient of 0.0063 was calculated for this site (Intera Report and USGS Topographic Map). Using a hydraulic conductivity of 45 ft/day, ground water flux is calculated as 8.6 cm/day.

AQUIFER THICKNESS

Field data within Section 29 demonstrate that the aquifer is greater than 40 feet thick. A restricted aquifer thickness of 10 feet was employed in the mixing model in accordance with NMOCD request. This choice is conservative of ground water quality as it results in higher predicted chloride concentrations in a simulated monitoring well.

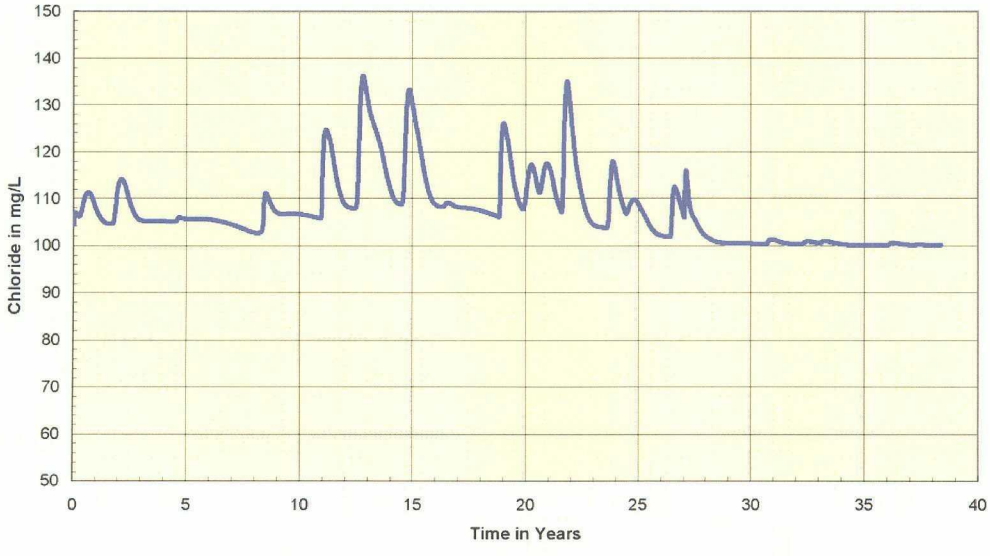
MODELING RESULTS:

Using the input data described above, HYDRUS-1D and the ground water mixing model predict no exceedance of WQCC ground water standards at the F-29-1b site (Figure C-1). For this simulation, it was assumed that no vegetation is present at the site.

As field chloride data demonstrate, impacts at this site are marginally greater than background; thus, an insignificant

impact to ground water quality would be expected. As shown in Figure C-1, chloride concentration in the aquifer attains a maximum of 136 ppm approximately 13 years from now. The effect of the chloride load is no longer distinguishable 28 years from now.

Figure C-1: Predicted Chloride Concentration in the Aquifer for the F-29-1b Site with No Vegetation



Chloride concentration in ground water varies in response to natural causes. At a nearby background monitoring well, over four years of data show that chloride concentration ranges from 111 mg/L to 301 mg/L with an average concentration of 159 mg/L and a standard deviation of 59 mg/L. Therefore, the predicted chloride concentration increase at the F-29-1b site (36 mg/L) could not be differentiated from natural variation.

Works Consulted

Appendix D

APPENDIX D

Ash, S.R., 1963, Ground water conditions in northern Lea County, U.S. Geological Survey Hydrologic Investigations Atlas HA-62

Hendrickx, J., Rodriguez, G., Hicks, R. T., and Simunek, January 2005, Modeling Study of Produced Water Release Scenarios, API Publication Number 4734, 11 pp.

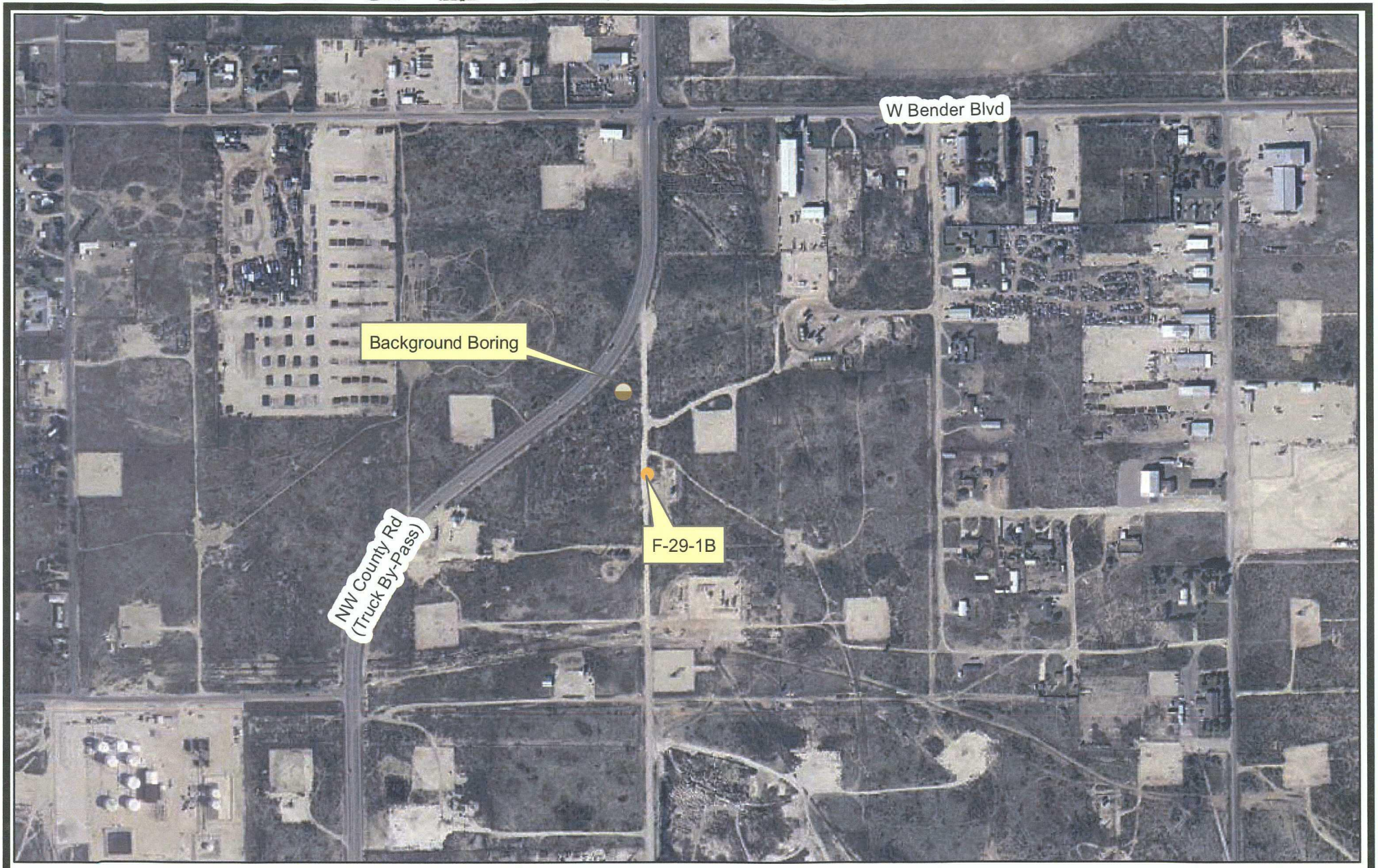
Intera Incorporated, July 8, 2003, Windmill Oil Site Ground Water Sampling Results, prepared for the New Mexico Oil Conservation Division, 3 pp.

McAda, D.P., 1985, Projected water-level declines in the Ogallala aquifer in Lea County, New Mexico, US Geological Survey Water-Resources Investigations Report 84-4062, 84 pp.

Musharrafieh, G. and Chudnoff, M., January 1999, Numerical Simulation of Groundwater Flow for Water Rights Administration in the Lea County Underground Water Basin New Mexico, New Mexico Office of the State Engineer Technical Report 99-1, 6 pp.

Nicholson Jr., A. and Clebsch, A., 1961, Geology and Ground Water Conditions of Southern Lea County, New Mexico, Ground Water Report 6, US Geological Survey, New Mexico Bureau of Mines and Mineral Resources

Plates



Aerial Photo: http://rgis.unm.edu

0 500 1,000 2,000 3,000 4,000 Feet

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

2004 Aerial Photograph showing the F-29-1B Site

Plate 1

Rice Operating Company : F-29-1B Site
(NMOCD#: 1R0428-45)

February 2007

N W E S

Logger:	David Hamilton	**Client:**	**Boring ID:**
Driller:	Eades Drilling	Rice Operating Company	
Drilling Method:	Air Rotary	**Project Name:**	
Start Date:	11/3/2004	Hobbs F-29-1b Site	**F-29-1b B-1 (65 feet)**
End Date:	11/3/2004	**Location:**	
		T18S R38E	
		Section 29, Unit F	

Depth (feet)	Description	Lithology	Comments	Field data		
				Depth	Chloride mg/kg	PID ppm
0.0	Surface, 0 - 1 feet					
2.0	Sand, caliche, clay, dark brown, 1-10 feet					
4.0				6.0	231	3.7
6.0						
8.0			Strong odor, some discoloration			
10.0	Sand, caliche, tan, 10-17 feet			11.0	154	32.4
12.0						
14.0			Strong Odor			
16.0	Caliche, well indurated, 17-18 feet			16.0	349	560.0
18.0	Sand, caliche, tan, 18-20 feet					
20.0	Caliche, well indurated, 20-21 feet		Some discoloration and odor	21.0	374	178.0
22.0	Very fine grained sand, silt, tan, 21-27 feet					
24.0						
26.0	Caliche,well indurated, tan, 27-29 feet			26.0	185	150.0
28.0	Sand, silt, reddish tan, 29-30 feet					
30.0	Caliche, well indurated, 30-31 feet			31.0	382	18.5
32.0	Very fine grained sand, silt, reddish tan, 31-44 feet, Caliche , 36-36.5 feet					
34.0						
36.0				36.0	232	6.4
38.0						
40.0						
42.0				43.0	172	32.6
44.0	Caliche, sandstone, 44-45 feet					
46.0	Very fine grained sand silt, reddish tan, 45-65 feet			46.0	167	23.7
48.0						
50.0				51.0	174	15.6
52.0						
54.0				56.0	135	20.6
56.0						
58.0				59.0	94	7.6
60.0			Drilled to 65 feet, after 20 minutes, water level was 63 feet. Hole filled with bentonite.			
62.0						
64.0						
66.0						

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 505-266-5004	**Hobbs F-29-1b Site**	**Plate 2**
	Exploratory Boring	**February, 2007**

HYDRUS-1D Vadose Zone Soil Profile	Client: Rice Operating Company Project Name: F-29-1b Junction Boot	Location: T18S R38E Section 29

Depth (feet)	Description	Model Profile	Depth (feet)
0.0	Sandy loam 0-1 feet		0.0
2.0	Loamy sand, 1-19 feet		2.0
4.0			4.0
6.0			6.0
8.0			8.0
10.0			10.0
12.0			12.0
14.0			14.0
16.0			16.0
18.0	Sand, silt 19-20feet		18.0
20.0	Caliche, 20-22 feet		20.0
22.0	Sand, silt 22-34 feet		22.0
24.0			24.0
26.0			26.0
28.0			28.0
30.0			30.0
32.0			32.0
34.0	Caliche, 34-35 feet		34.0
36.0	Sand, silt, 35-45 feet		36.0
38.0			38.0
40.0			40.0
42.0			42.0
44.0	Sand , caliche, 45-47 feet		44.0
46.0	Sand, silt, 47-60 feet		46.0
48.0			48.0
50.0			50.0
52.0			52.0
54.0			54.0
56.0			56.0
58.0			58.0
60.0			60.0

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