1R - 428-73

WORKPLANS

Date:

5-16-11

Hansen, Edward J., EMNRD

From: Katie Jones [kjones@riceswd.com]
Sent: Thursday, August 04, 2011 9:55 AM
To: Hansen, Edward J., EMNRD
Cc: Hack Conder; Randall Hicks
Subject: ROC - Hobbs G-9 vent (1R428-73) CAP Addendum
Attachments: Hobbs G-9 vent (1R428-73) Proposed Liner.jpg

Mr. Hansen,

This email is an Addendum to the Hobbs G-9 vent site (1R428-73) Corrective Action Plan (CAP), submitted to the NMOCD on May 16, 2011. Page 4, section: Recommendations, paragraph 2: text in blue lettering, below, will be added to the paragraph. Red lettering marked with a strike-through will be deleted and replaced with blue lettering. The new plat showing the additional proposed liner location is attached. If you need any further information, please let me or Hack know.

"Recommendations
The site data that documents the residual mass of chloride and hydrocarbons in the vadose zone permit a conclusion that these constituents in the vadose zone will not with reasonable probability contaminate ground water or surface water in excess of the standards in Subsection B and C of the 19.15.30.9 NMAC through leaching, percolation or other transport mechanisms, or as the water table elevation fluctuates.

Our recommended corrective action for the site is ~~re-vegetation of the ground surface to limit infiltration of precipitation and the subsequent migration of constituents of concern to ground water.~~ the installation of a 36-foot by 31-foot, 20-mil, reinforced poly liner at a depth of approximately 4 foot below ground surface (bgs). The excavation will be backfilled with soil containing a chloride concentration below 500 mg/kg and a PID (field) reading below 100 ppm. Excavated soil will be evaluated for use as backfill, and any soil requiring disposal will be properly disposed of at a NMOCD approved facility. The backfilled site will then be seeded with native vegetation. This proposed remedy will limit infiltration of precipitation and the subsequent migration of constituents of concern to ground water. A synthetic liner installed below the root zone as proposed will inhibit the downward migration of water through the subsurface, slowing movement of chloride or soluble hydrocarbons toward ground water. Plants capture water through their roots, thereby reducing the volume of water infiltrating below the root zone. This natural "infiltration barrier" helps protect ground water as the decreased flux of water through the subsurface slows the transportation rate of residual chloride and soluble hydrocarbons in the subsurface. Upon documentation of installation of the liner and re-seeding with an appropriate mix of native grasses we will submit a Termination Request for this site's regulatory file.

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

Thank you.

Katie Jones
Environmental Project Coordinator
RICE *Operating Company*

Proposed Liner

5 ft west trench

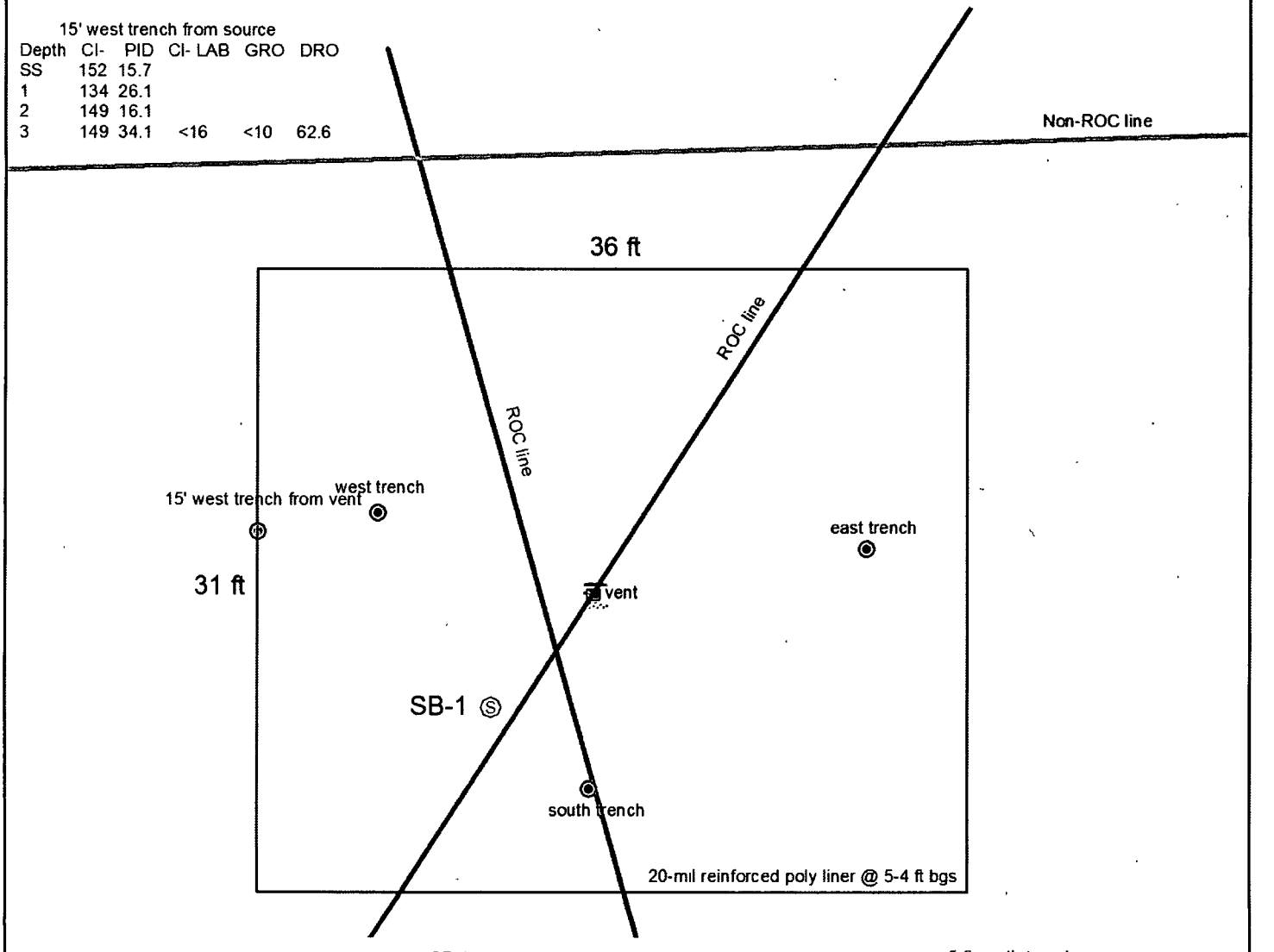
Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
2	142	1738							
4	145	1313							
6	143	1800							
8	146	2554	<16	3730	4360	1.97	2.01	16.7	7.58
10	146	1780							
12	146	1788	32	2980	3440	0.352	1 36	6.24	10.7

5 ft east trench

Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
2	112	1.1							
4	110	18 9							
6	173	53.2							
8	141	1650	<16	940	2690	<0.05	0.284	3.53	4.94
10	149	1396							
12	149	1509	<16	308	441	0.063	0.988	2.73	10.2

15' west trench from source

Depth	Cl-	PID	Cl- LAB	GRO	DRO
SS	152	15.7			
1	134	26.1			
2	149	16.1			
3	149	34.1	<16	<10	62.6



SB-1

Depth	Cl-	PID	LAB Cl-	B	T	E	X
10	242	1681					
15	195	2899	224	1.26	1.01	8 50	11.8
20	245	1283	336	0.082	0 167	1.28	1.39
25	203	69.8	128	<0.05	<0.05	<0.05	<0.3

5 ft south trench

Depth	Cl-	PID	LAB Cl-	GRO	DRO	B	T	E	X
2	143	2 81							
4	143	198							
6	112	2485							
8	112	2640							
10	146	2948	<16	2200	1590	0.219	1.47	14	22.2
12	152	314	.32	618	2050	<0.05	0.411	2.37	2.65

15' west trench conducted 6-24-11
Soil bore conducted 7-9-09
Trenching conducted 5-5-09

DGW = 28 ft

RICE ENVIRONMENTAL RECS CONSULTING & SAFETY, LLC

Hobbs G-9 vent

LEGALS: UL/G sec. 9
T19S R38E

Case #: 1R428-73

N W E S

0 2.5 5 10 Feet

Drawing date: 8-2-11
Drafted by: L. Weinheimer

R. T. HICKS CONSULTANTS, LTD.

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

May 16, 2011

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

RE: **Rice Operating Company, Hobbs SWD System G-9 Vent Site: T-19-S, R-38-E, Section 9, Unit G, Lea County, New Mexico, (NMOCD CASE #1R428-73), Corrective Action Plan**

Mr. Hansen:

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is submitting this Corrective Active Plan for the Hobbs G-9 Vent site. The investigation demonstrates that residual chloride and hydrocarbons in the vadose zone will not with reasonable probability contaminate ground water or surface water, in excess of the standards in Subsections B and C of 19.15.30.9 NMAC through leaching, percolation or other transport mechanisms, or as the water table elevation fluctuates. Revegetation of the site, our recommended corrective action, meets the mandate of NMOCD Rules for protection of surface water and the environment.

Background

The Hobbs G-9 Vent is located southwest of the city of Hobbs, New Mexico at T-19-S, R-38-E, Section 9, in Unit G. An initial 16-foot deep excavation was installed on December 9, 2002, which identified chloride-and hydrocarbon-impacted soil. The NMOCD-approved Investigation Characterization Plan (ICP), dated February 19, 2009 (Attachment A) was prepared to address the further delineation of the site. It includes background information, a site vicinity map, and a regional ground water gradient map for this and five other area sites.

Field Programs

As a part of the approved ICP, ROC installed and sampled three 12-foot deep backhoe trenches on May 5, 2009 in an attempt to delineate the vertical and horizontal extent of hydrocarbons and chloride in the soil.

Hicks Consultants supervised a deep soil sampling program to further delineate the extent and magnitude of media impact. On July 9, 2009, a single 25-foot deep soil boring (SB-1) was drilled just southwest of the original vent location. ROC conducted field analysis of soil samples for chloride and volatile hydrocarbon vapors for the trench and boring program. Plate 1 is a summary map that includes results of the field chloride analyses and hydrocarbon screening data as well as laboratory results for the soil samples used to verify

the ROC field data. Attachment B provides the soil lithology logs for SB-1, which includes the field chloride and hydrocarbon screening data and laboratory results. Attachment C provides the laboratory reports and chain of custody documents for all of the soil verification samples.

Results: Chloride

The ROC trench assessments showed that only the initial source area excavation, conducted in 2002, encountered chloride concentrations above 250 mg/kg. These levels were observed from 12 to 16 feet below the surface (260 and 275 mg/kg respectively). The highest chloride concentration encountered in the 2009 trenches (173 mg/kg) was encountered at six feet below the surface at the trench located five feet east of the original vent.

SB-1 was installed to delineate the depth of chloride-impacted soil. Chloride concentrations similar to the original excavation were encountered at 10 to 12 feet below the surface, decreasing to 128 mg/kg at the total depth of the boring. SB-1 was terminated based on the analysis of chloride by field techniques, which are generally higher in concentration than the analyses performed in the laboratory. The 20-foot sample from SB-1 was anomalous in that the field chloride analysis (245 mg/kg) was lower than the laboratory measurement (336 mg/kg).

The trenching and soil borings show that the extent of the chloride-impacted soil is less than 100 ft^2 (less than 10 x 10 feet) at depths of approximately 12 to 20 feet below the surface. The maximum chloride concentration observed in this area (336 mg/kg) is slightly above the NMOCD guideline target level of 250 mg/kg, however the soil beneath this sample shows chloride levels below 250 mg/kg.

Results: Hydrocarbons

Field screening of hydrocarbon vapors in the soil from the trenches identified concentrations greater than 1,000 ppm in each of the May 2009 excavations (2,948 ppm maximum). Laboratory analysis of BTEX from these samples indicate maximum concentrations of benzene (1.97 mg/kg), toluene (2.01 mg/kg), ethylbenzene (16.7 mg/kg), and total xylenes (22.2 mg/kg) at 2 to 12 feet below the surface. In addition, the samples contained gas and diesel range organics which are essentially non-soluble with respect to leaching.

SB-1 was installed to delineate the vertical extent of hydrocarbon-impacted soil within the source area. Field screening of hydrocarbon vapors were measured from split spoon samples initially but drill cutting samples were used at 20 and 25 feet below the surface because the soil was too hard to recover material with a split spoon sampler. The highest vapor reading was encountered at 15 feet below the surface (2,899 ppm). Laboratory analysis from this sample indicates concentrations of benzene (1.26 mg/kg), toluene (1.01 mg/kg), ethylbenzene (8.50 mg/kg), and total xylenes (11.8 mg/kg). Hydrocarbon concentrations decreased with depth to below the laboratory detection limit at 25 feet below the

surface. A summary of the laboratory results from all of the soil sampling events are provided on Table 1 below.

Table 1
Rice Operating Hobbs G-9 Vent Site
Laboratory Data - Soil Samples

Sample Location	Depth (feet)	Sample Date	PID (ppm)	Chloride (mg/kg)	Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylenes (mg/kg)	BTEX (mg/kg)	GRO (mg/kg)	DRO (mg/kg)
5-Ft East	8	5/5/09	1,650	<16	<0.05	0.284	3.53	**4.94**	8.8	940	2,690
	12	5/5/09	1,509	<16	**0.063**	0.988	2.73	**10.2**	14 0	308	411
5-Ft West	8	5/5/09	2,554	<16	**1.97**	2 01	16.7	**7.6**	28 3	3,730	4,360
	12	5/5/09	1,788	32	**0.352**	1.36	6.24	**10.7**	18.7	2,980	3,440
5-Ft South	10	5/5/09	2,948	<16	**0.219**	1 47	14.0	**22.2**	37 9	2,220	1,590
	12	5/5/09	314	32	<0 05	0.41	2.37	**2.7**	5.5	618	2,050
SB-1	15-17	7/9/09	2,899	224	**1.26**	1.01	8.50	**11.8**	22.6	--	--
	20	7/9/09	1,283	**336**	**0.082**	0.17	1 28	1.4	2 9	--	--
	25	7/9/09	69 8	128	<0.05	<0.05	<0.05	<0.3	0.1	--	--

NMOCD Guideline Remediation Levels	250	10	--	--	--	50	No regulatory standards have been established
2006 NMED Soil Com./Indus. Vapor Exposure Risk		25.8	252	128	82	--	
Screening Guidelines Protect GW (DAF_{20})		0.0201	21.7	20.2	2.06	--	
Site Specific GW Protective Levels (DAF_{127})		0.128	138	128	13.1	--	

The site data that documents the residual mass of chloride in the vadose zone permit a conclusion that it will not contaminate ground water. A conservative estimate of 6,400 ft^2 (80 ft x 80 ft) was used in a simulation modeling evaluation to determine if residual benzene and xylenes concentrations would impact groundwater.

Simulation Modeling

We used the VLEACH vadose zone model to determine if the benzene and xylenes identified during the site assessment would cause the underlying ground water to exceed the regulatory standard. The input to the model employed field data from the site, nearby locations, and conservative default values for parameters that were not measured at or near the site.

The simulation results indicate, for benzene, 300 years will be required for leaching to move the highest concentrations in the soil to the ground water depth. Conversely, 600 years will be required to move the highest xylenes concentrations in the soil to the ground water depth. During this time neither the benzene nor xylenes mass input to the ground water will be sufficient to cause the water concentrations below the site to exceed the New Mexico water quality standards.

VLEACH is conservative of ground water quality because the model does not take into account the natural biological degradation of the hydrocarbons. Attachment D provides an explanation of the data used and results from the simulation at the Hobbs G-9 Vent site. A detailed description of the model and a free windows-based program download is available from the USEPA at http://www.epa.gov/ada/csmos/models/vleach.html.

Recommendations

The site data that documents the residual mass of chloride and hydrocarbons in the vadose zone permit a conclusion that these constituents in the vadose zone will not with reasonable probability contaminate ground water or surface water in excess of the standards in Subsection B and C of the 19.15.30.9 NMAC through leaching, percolation or other transport mechanisms, or as the water table elevation fluctuates.

Our recommended corrective action for the site is re-vegetation of the ground surface to limit infiltration of precipitation and the subsequent migration of constituents of concern to ground water. Plants capture water through their roots, thereby reducing the volume of water infiltrating below the root zone. This natural "infiltration barrier" helps protect ground water as the decreased flux of water through the subsurface slows the transportation rate of residual chloride and soluble hydrocarbons in the subsurface. Upon documentation of re-seeding with an appropriate mix of native grasses we will submit a Termination Request for this site's regulatory file.

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

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

Sincerely,
R.T Hicks Consultants, Ltd.

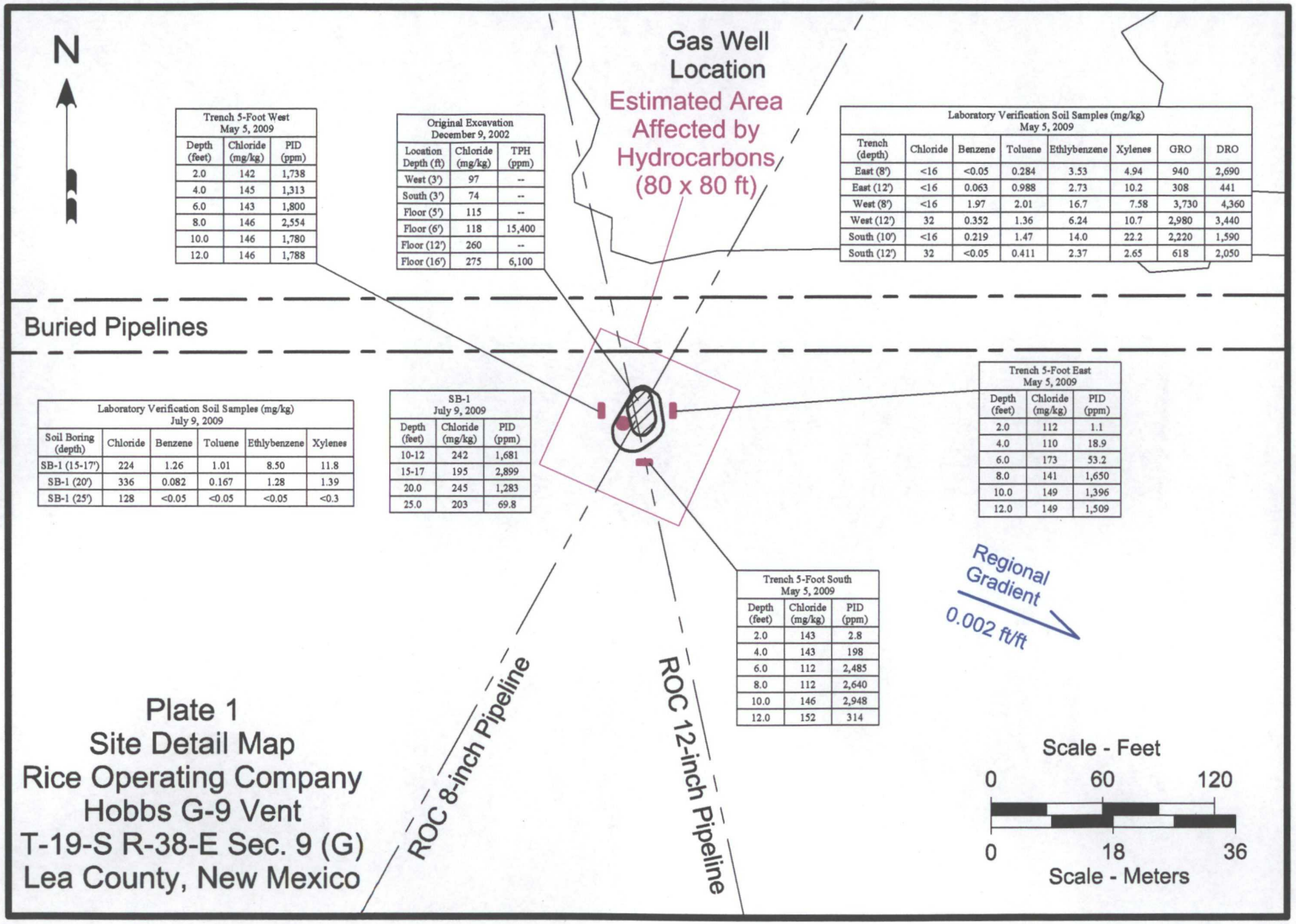
Dale T. Littlejohn

Dale T Littlejohn
Geologist

Copy: Hack Conder, ROC

Plates

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142



Trench 5-Foot West
May 5, 2009

Depth (feet)	Chloride (mg/kg)	PID (ppm)
2.0	142	1,738
4.0	145	1,313
6.0	143	1,800
8.0	146	2,554
10.0	146	1,780
12.0	146	1,788

Original Excavation
December 9, 2002

Location Depth (ft)	Chloride (mg/kg)	TPH (ppm)
West (3')	97	--
South (3')	74	--
Floor (5')	115	--
Floor (6')	118	15,400
Floor (12')	260	--
Floor (16')	275	6,100

Laboratory Verification Soil Samples (mg/kg)
May 5, 2009

Trench (depth)	Chloride	Benzene	Toluene	Ethlybenzene	Xylenes	GRO	DRO
East (8')	<16	<0.05	0.284	3.53	4.94	940	2,690
East (12')	<16	0.063	0.988	2.73	10.2	308	441
West (8')	<16	1.97	2.01	16.7	7.58	3,730	4,360
West (12')	32	0.352	1.36	6.24	10.7	2,980	3,440
South (10')	<16	0.219	1.47	14.0	22.2	2,220	1,590
South (12')	32	<0.05	0.411	2.37	2.65	618	2,050

Laboratory Verification Soil Samples (mg/kg)
July 9, 2009

Soil Boring (depth)	Chloride	Benzene	Toluene	Ethlybenzene	Xylenes
SB-1 (15-17')	224	1.26	1.01	8.50	11.8
SB-1 (20')	336	0.082	0.167	1.28	1.39
SB-1 (25')	128	<0.05	<0.05	<0.05	<0.3

SB-1
July 9, 2009

Depth (feet)	Chloride (mg/kg)	PID (ppm)
10-12	242	1,681
15-17	195	2,899
20.0	245	1,283
25.0	203	69.8

Trench 5-Foot East
May 5, 2009

Depth (feet)	Chloride (mg/kg)	PID (ppm)
2.0	112	1.1
4.0	110	18.9
6.0	173	53.2
8.0	141	1,650
10.0	149	1,396
12.0	149	1,509

Trench 5-Foot South
May 5, 2009

Depth (feet)	Chloride (mg/kg)	PID (ppm)
2.0	143	2.8
4.0	143	198
6.0	112	2,485
8.0	112	2,640
10.0	146	2,948
12.0	152	314

Plate 1
Site Detail Map
Rice Operating Company
Hobbs G-9 Vent
T-19-S R-38-E Sec. 9 (G)
Lea County, New Mexico

Attachment A

Submitted ICP

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142

R. T. HICKS CONSULTANTS, LTD.

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

February 19, 2009

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

RE: Investigation & Characterization Plan
Hobbs Salt Water Disposal System:
Jct. A-6, F-24-3 Vent, F-25 EOL, G-9 Vent, Jct. A-25, Jct. F-24-1
T18S, R37E, Sections 24 & 25, and T19S, R38E Sections 6 & 9

Dear Mr. Jones:

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is pleased to submit this Investigation & Characterization Plan (ICP) for the six (6) junction box and vent sites within the Hobbs Salt Water Disposal System referenced above. Plate 1 is a map showing the sites relative to major roads in the area. Plate 2 shows the sites, nearby USGS monitoring wells, and a regional potentiometric surface map.

The work elements proposed below will allow us to characterize these sites and develop an appropriate corrective action plan.

1. ROC will identify and document the location of all current and historic equipment and pipelines associated with each site.
2. ROC will use a backhoe with a 12-foot vertical reach to install a series of sampling trenches in order to recover soil samples and delineate the lateral extent (and potentially the vertical extent) of impacted soil.
3. If characterization by the backhoe is insufficient to define the extent and magnitude of past releases, ROC and Hicks Consultants will use a drilling rig to install one soil boring at the center of the source area to delineate the vertical extent of chloride in the soil.
4. Soil samples obtained by the backhoe or drilling rig will be obtained from regular intervals below ground surface.
5. Representative soil samples will be sent to a laboratory to allow for verification of the field chloride and PID results.
6. General soil texture descriptions will be provided for each sample trench or boring.
7. The criteria to delineate the extent of impact during trenching as well as in a soil boring is 5 point chloride decline vs. depth, or:
   a. After thr ee consecutive samples demonstrate <250 ppm chloride using field analyses and <100 ppm total hydrocarbon vapors using the headspace method (see attached ROC Quality Procedure in Appendix A), or
   b. After five consecutive samples show a decreasing trend of chloride and hydrocarbons and the last sample shows chloride < 250 ppm and total hydrocarbon vapors <100 ppm (Appendix A).
   c. Soil boring to capillary fringe should neither (a) or (b) apply

8. If the boring penetrates the capillary fringe, a monitoring well will be completed with a 2 or 4" diameter casing 25 feet down gradient from confirmed impact for use during possible corrective actions. Plate 2 presents a potentiometric surface map for the site area.
9. If field analysis of hydrocarbon vapors and observations of staining show that hydrocarbon impact is unlikely at the site or below 20-feet, collection of samples from cuttings may be substituted for split spoon sampling (chloride only).

The ROC trench characterization will be employed to identify the lateral extent of chloride at each site, if possible. If trenching does not fully characterize the lateral extent of chloride at each site, boreholes will be advanced 20 feet beyond the furthest trenches where the soil data has an average chloride concentration greater than 1,000 mg/kg. The total depth of borings installed to characterize lateral extent shall be 20 feet below ground surface with soil samples for delineation taken at 5 foot intervals.

Rice Operating Company (ROC) is the service provider (agent) 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. The Hobbs SWD system is in abandonment.

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.
4. Is supported by good science.

Following the site characterization described above, a Corrective Action Plan with the data and analysis supportive of a procedure for site file termination, or a termination request will be submitted, depending on characterization findings. Quality Procedures for characterization work are provided in Appendix A.

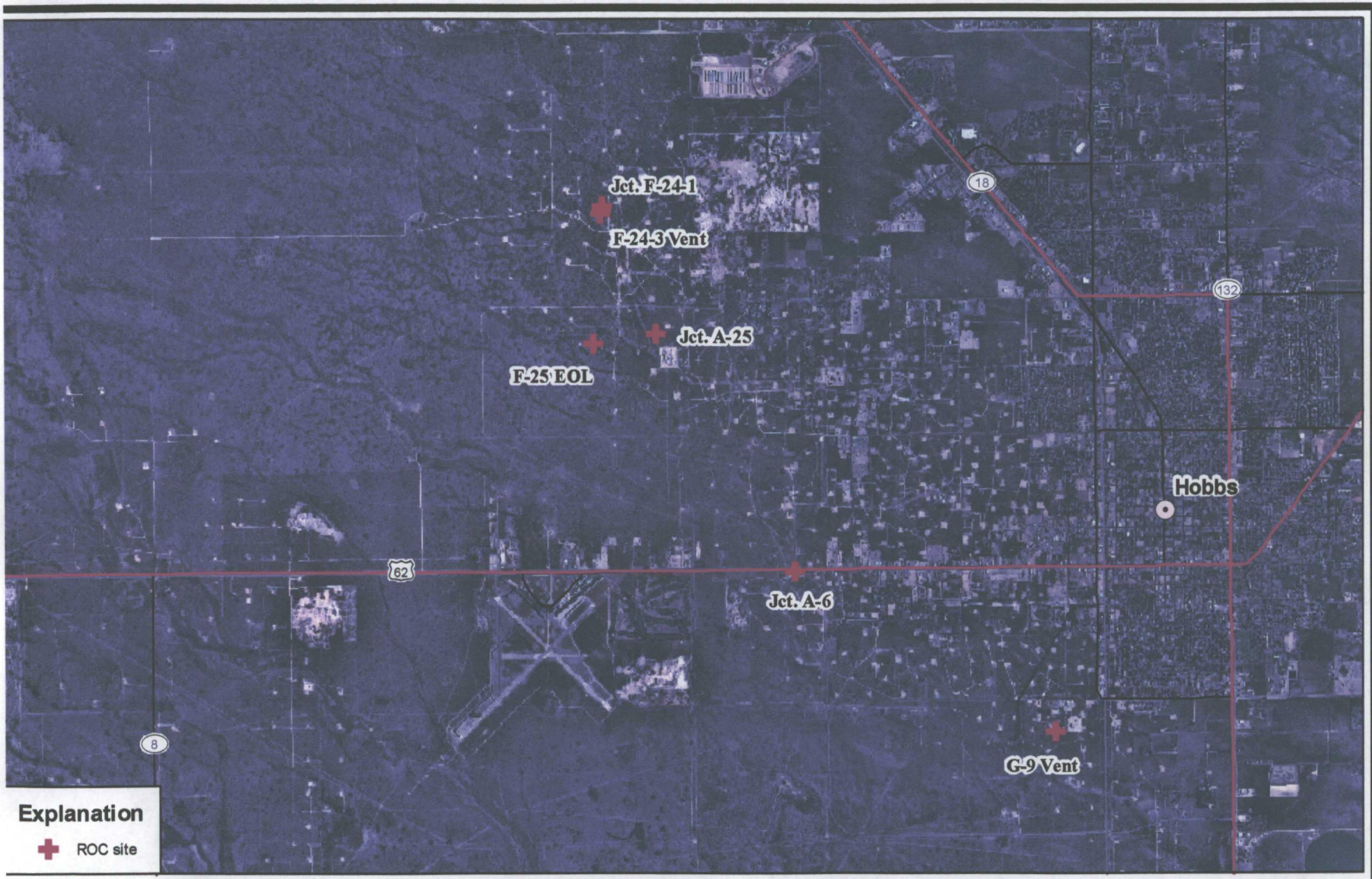
If you have any questions or comments regarding this ICP, please contact me at our Albuquerque office or Hack Conder of Rice Operating Company.

Sincerely,
R.T. Hicks Consultants, Ltd.

Katie Lee

Katie Lee
Project Scientist

Copy: Rice Operating Company
Edward J. Hansen, NMOCD



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Site Map - 2005 Aerial Photo (RGIS) Jct. A-6, Jct. A-25, Jct. F-24-1, Jct. F-24-3 Vent, G-9 Vent	Plate 1
	Rice Operating Company 2009 Hobbs Investigation and Characterization Plan	January 2009

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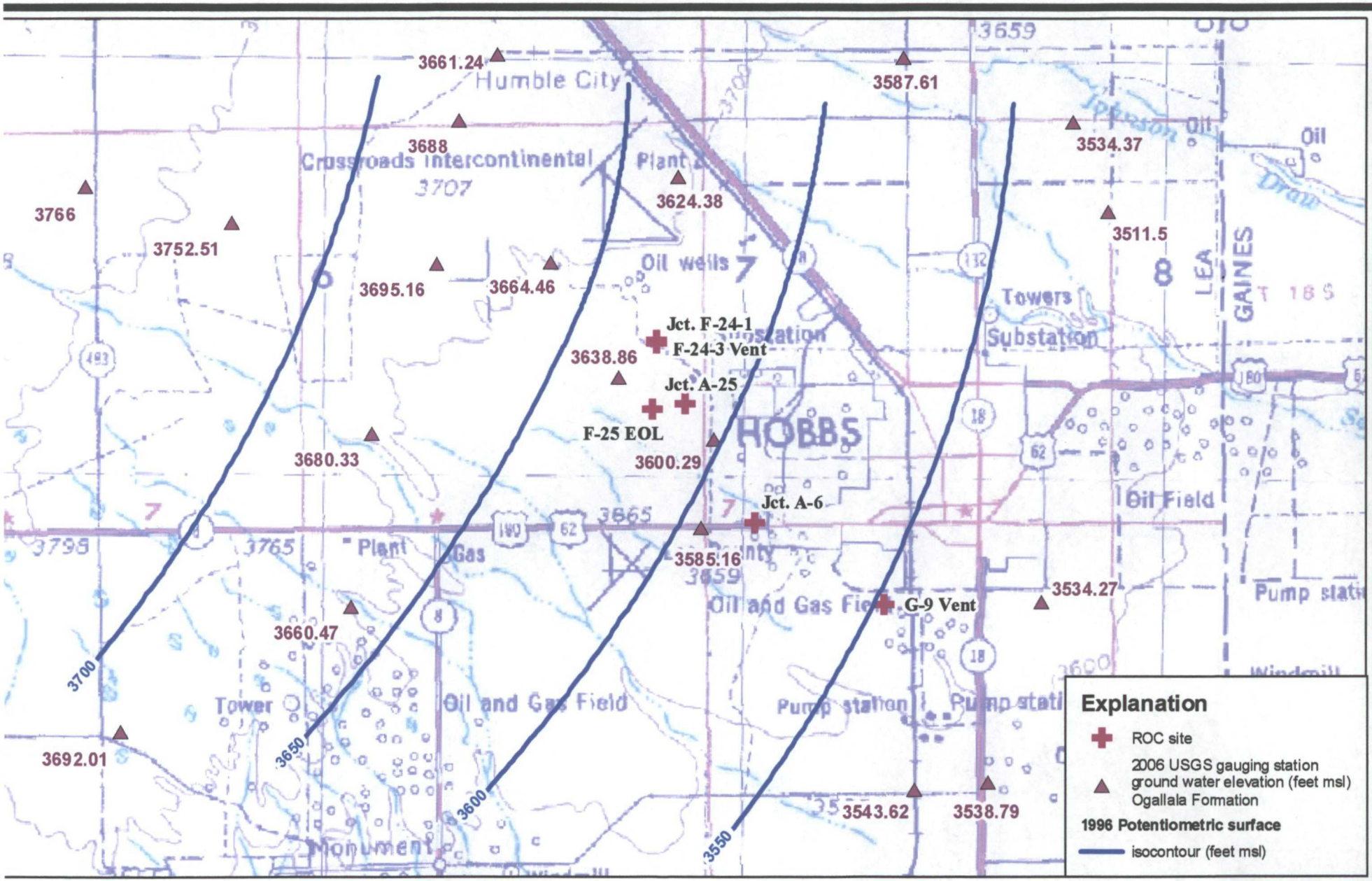

R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	2006 Potentiometric Surface Map Jct. A-6, Jct. A-25, Jct. F-24-1, Jct. F-24-3 Vent, G-9 Vent	Plate 2
	Rice Operating Company 2009 Hobbs Investigation and Characterization Plan	January 2009

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Appendix A

Rice Operating Company

QUALITY PROCEDURE - 03
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 sanlple 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 large 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 10 ml pipette, carefully add 0.282 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:

$$\frac{0.282 \times 35{,}450 \times \text{ml } AgNO_3}{\text{ml water extract}} \times \frac{\text{grams of water in mixture}}{\text{grams of soil in mixture}}$$

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 -07
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° 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 pro-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-O2 and QP-O6. If the reading is 100 ppm or less, NMOCD BTEX guideline has been met and no further testing fur 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.

Attachment B

Soil Boring Log

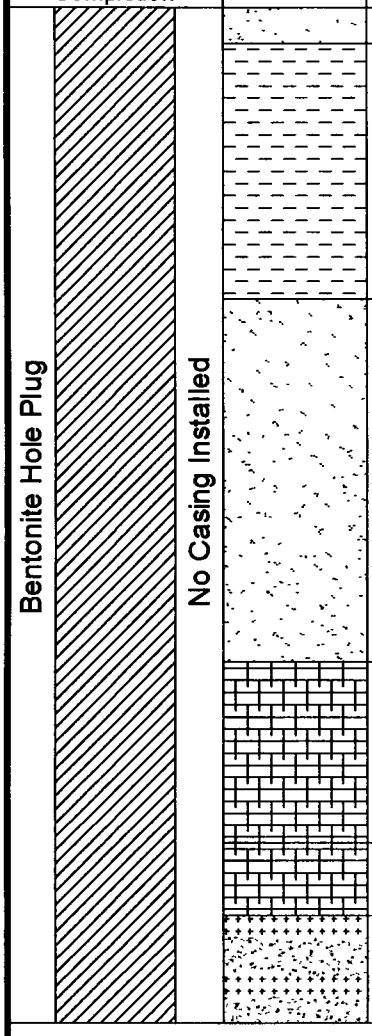
R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142

RT Hicks Consultants Ltd

P O Box 7624
Midland, Texas 79708
(432) 528-3878
(432) 689-4578 (fax)

LITHOLOGIC LOG (Soil Boring)

SOIL BORING NO.: SB-1 | TOTAL DEPTH: 28 Feet
SITE ID: Hobbs SWD G-9 | CLIENT: Rice Operating Co.
SURFACE ELEVATION: 3,607 (USGS) | COUNTY: Lea County
CONTRACTOR: Harrison Cooper | STATE: New Mexico
DRILLING METHOD: Air-Rotary | LOCATION: T-19-S R-38-E 9 (G)
INSTALLATION DATE: July 9, 2009 | FIELD REP: D. Littlejohn
WELL PLACEMENT: 3 ft SW of Orig. Pit | FILE NAME: \Hobbs SWD\G-9
BORING LAT /LONG: Lat. 32° 40' 42.6" North, Long 103° 9' 0.6" West



Sample Data				Depth (feet)	Lithologic Description: LITHOLOGY, Color, grain size, sorting, rounding, special features
Type	% Rec	Cl (mg/kg)	PID (ppm)		
					SILTY SAND Dark brown.
Excav.	–	143	1,738		SILT Grayish brown (discolored), with interbedded caliche, strong hydrocarbon odor
Excav.	–	145	1,313		
				5	
Excav	–	143	2,485		
Excav.	–	146	2,640		
					SILTY SAND Light brown (not discolored), hydrocarbon odor.
Excav.	–	146	2,948	10	
Spoon	100%	242	1,681		
Excav.	–	260	1,788		
				15	
Spoon	15%	195	2,899		
					CALICHE Light grayish brown, hydrocarbon odor.
Cutting	–	245	1,283	20	
					CALICHE Dark gray (discolored), hydrocarbon odor.
Cutting	–	203	69.8	25	QUARTZITE & SANDSTONE Gray to light pinkish brown, very hard drilling, crystalline to cemented sand.
					Saturated Formation (hydrocarbon odor).

TD = 28 Feet

Soil Boring Laboratory Results (mg/kg)
July 9, 2009

Depth	Chloride	Benzene	Toluene	Ethylbenzene	Xylenes
15 Ft	224	1 26	1.01	8.50	11.8
20 Ft	336	0 082	0.167	1.28	1.39
25 Ft	128	<0 05	<0.05	<0 05	<0 3

Attachment C

Laboratory Reports

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142

CARDINAL LABORATORIES

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

July 17, 2009

Hack Conder
Rice Operating Company
122 West Taylor
Hobbs, NM 88240

Re: Hobbs G-9 Vent

Enclosed are the results of analyses for sample number H17790, received by the laboratory on 07/13/09 at 9:10 am.

Cardinal Laboratories is accredited through Texas NELAP for:

Method SW-846 8021	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method SW-846 8260	Benzene, Toluene, Ethyl Benzene, and Total Xylenes
Method TX 1005	Total Petroleum Hydrocarbons

Certificate number T104704398-08-TX. Accreditation applies to solid and chemical materials and non-potable water matrices.

Total Number of Pages of Report: 4 (includes Chain of Custody)

Sincerely,

Celey D. Keene
Laboratory Director

This report conforms with NELAP requirements.

CARDINAL LABORATORIES

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

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

Receiving Date: 07/13/09
Reporting Date: 07/16/09
Project Owner: NOT GIVEN
Project Name: HOBBS G-29 VENT
Project Location: HOBBS G-29 VENT

Sampling Date: 07/09/09
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: ZL

LAB NO.	SAMPLE ID	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS DATE:		07/15/09	07/15/09	07/15/09	07/15/09
H17790-1	SB#1 @ 15'	1.26	1.01	8.50	11.8
H17790-2	SB#1 @ 20'	0.082	0.167	1.28	1.39
H17790-3	SB#1 @ 25'	<0.050	<0.050	<0.050	<0.300
Quality Control		0.048	0.050	0.049	0.154
True Value QC		0.050	0.050	0.050	0.150
% Recovery		96.0	100	98.0	103
Relative Percent Difference		10.7	7.8	7.0	8.2

METHODS: BTEX - SW-846 8021B

TEXAS NELAP ACCREDITATION T104704398-08-TX FOR BENZENE, TOLUENE, ETHYL BENZENE, AND TOTAL XYLENES. Reported on wet weight. Not accredited for Chloride.

Lab Director

07/17/09
Date

H17790 B RICE

CARDINAL LABORATORIES

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

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

Receiving Date: 07/13/09
Reporting Date: 07/13/09
Project Number: NOT GIVEN
Project Name: HOBBS G-9 VENT
Project Location: HOBBS G-9 VENT

Analysis Date: 07/13/09
Sampling Date: 07/09/09
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: HM

LAB NO.	SAMPLE ID	Cl^- (mg/kg)
H17790-1	SB #1 @ 15'	224
H17790-2	SB #1 @ 20'	336
H17790-3	SB #1 @ 25'	128
Quality Control		500
True Value QC		500
% Recovery		100
Relative Percent Difference		2.0

METHOD: Standard Methods	4500-ClB

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

Chemist

Date 07/14/09

H17790 RICE

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

Company Name:	Rice Operating Company	**BILL TO**	
Project Manager:	Hack Conder	**P.O. #:**	
Address:	122 West Taylor	**Company:**	
City:	Hobbs **State:** NM **Zip:** 88240	**Attn:**	
Phone #:	393-9174 **Fax #:** 397-1471	**Address:**	
Project #:	**Project Owner:**	**City:**	
Project Name:	Hobbs G-9 vent	**State:** **Zip:**	
Project Location:	Hobbs G-9 vent	**Phone #:**	
Sampler Name:	Lara Weinheimer	**Fax #:**	

FOR LAB USE ONLY				MATRIX						PRESERV.			SAMPLING		ANALYSIS REQUEST										
Lab I.D.	**Sample I.D.**	(G)RAB OR (C)OMP.	# CONTAINERS	GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	ACID/BASE	ICE / COOL	OTHER :	DATE	TIME	Chlorides	TPH 8015 M	BTEX	Texas TPH								
H17790-1	SB #1 @ 15'		1			✓					✓		7/9/09	03:12	✓		✓								
-2	SB #1 @ 20'		1			✓					✓		7/9/09	03:14	✓		✓								
-3	SB #1 @ 25'		1			✓					✓		7/9/09	03:16	✓		✓								

Relinquished By: L. Weinheimer	**Date:** 7-13-09 **Time:** 9:10	**Received By:**	Phone Result: ☐ Yes ☑ No	Add'l Phone #:	
Relinquished By:	**Date:** **Time:**	**Received By:**	Fax Result: ☐ Yes ☑ No	Add'l Fax #:	
Delivered By: (Circle One) Sampler - UPS - Bus - Other:		**Sample Condition** Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No	**CHECKED BY: (Initials)** MCB	REMARKS: email results	

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

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

NEED SAMPLES BACK, PLEASE

CARDINAL LABORATORIES

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

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

Receiving Date: 05/06/09
Reporting Date: 05/11/09
Project Owner: NOT GIVEN
Project Name: HOBBS G-9 VENT
Project Location: HOBBS G-9 VENT

Sampling Date: 05/05/09
Sample Type: SOIL
Sample Condition. COOL & INTACT
Sample Received By: ML
Analyzed By. AB

LAB NUMBER	SAMPLE ID	GRO (C_6-C_{10}) (mg/kg)	DRO (>C_{10}-C_{28}) (mg/kg)
ANALYSIS DATE		05/08/09	05/08/09
H17370-1	5' WEST TRENCH @ 12'	2,980	3,440
H17370-2	5' EAST TRENCH @ 8'	940	2,690
H17370-3	5' EAST TRENCH @ 12'	308	441
H17370-4	5' SOUTH TRENCH @ 10'	2,220	1,590
H17370-5	5' SOUTH TRENCH @ 12'	618	2,050
H17370-6	5' WEST TRENCH @ 8'	3,730	4,360
Quality Control		540	500
True Value QC		500	500
% Recovery		108	100
Relative Percent Difference		1.9	3.0

METHOD: SW-846 8015 M

Chemist

05/12/09
Date

H17370 T RICE

CARDINAL LABORATORIES

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

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

Receiving Date: 05/06/09
Reporting Date: 05/11/09
Project Owner: NOT GIVEN
Project Name: HOBBS G-9 VENT
Project Location: HOBBS G-9 VENT

Sampling Date: 05/05/09
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: ZL

LAB NO.	SAMPLE ID	BENZENE (mg/kg)	TOLUENE (mg/kg)	ETHYL BENZENE (mg/kg)	TOTAL XYLENES (mg/kg)
ANALYSIS DATE:		05/10/09	05/10/09	05/10/09	05/10/09
H17370-1	5' WEST TRENCH @ 12'	0.352	1.36	6.24	10.7
H17370-2	5' EAST TRENCH @ 8'	<0.050	0.284	3.53	4.94
H17370-3	5' EAST TRENCH @ 12'	0.063	0.988	2.73	10.2
H17370-4	5' SOUTH TRENCH @ 10'	0.219	1.47	14.0	22.2
H17370-5	5' SOUTH TRENCH @ 12'	<0.050	0.411	2.37	2.65
H17370-6	5' WEST TRENCH @ 8'	1.97	2.01	16.7	7.58
Quality Control		0.053	0.053	0.048	0.152
True Value QC		0.050	0.050	0.050	0.150
% Recovery		106	106	96.0	101
Relative Percent Difference		7.5	12.0	11.1	9.2

METHODS: BTEX - SW-846 8021B

TEXAS NELAP ACCREDITATION T104704398-08-TX FOR BENZENE, TOLUENE, ETHYL BENZENE, AND TOTAL XYLENES.

Lab Director

05/12/09
Date

H17370 BCL RICE

CARDINAL LABORATORIES

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

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

Receiving Date: 05/06/09
Reporting Date: 05/11/09
Project Number: NOT GIVEN
Project Name: HOBBS G-9 VENT
Project Location: HOBBS G-9 VENT

Analysis Date: 05/06/09
Sampling Date: 05/05/09
Sample Type: SOIL
Sample Condition: COOL & INTACT
Sample Received By: ML
Analyzed By: HM

LAB NO.	SAMPLE ID	Cl^- (mg/L)
H17370-1	5' WEST TRENCH @ 12'	32
H17370-2	5' EAST TRENCH @ 8'	<16
H17370-3	5' EAST TRENCH @ 12'	<16
H17370-4	5' SOUTH TRENCH @ 10'	<16
H17370-5	5' SOUTH TRENCH @ 12'	32
H17370-6	5' WEST TRENCH @ 8'	<16
Quality Control		490
True Value QC		500
% Recovery		98.0
Relative Percent Difference		2.0

METHOD: Standard Methods	4500-Cl B

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

Chemist

05/12/09
Date

H17370 RICE

CARDINAL LABORATORIES

CHAIN-OF-CUSTODY AND ANALYSIS REQUEST

101 East Marland, Hobbs, NM 88240 2111 Beechwood, Abilene, TX 79603
(505) 393-2326 FAX (505) 393-2476 (325) 673-7001 FAX (325)673-7020

Company Name: Rice Operating Company	**BILL TO**
Project Manager: Hack Conder	**P.O. #:**
Address: 122 West Taylor	**Company:**
City: Hobbs **State:** NM **Zip:** 88240	**Attn:**
Phone #: 393-9174 **Fax #:** 397-1471	**Address:**
Project #: **Project Owner:**	**City:**
Project Name: Hobbs G-9 vent	**State:** **Zip:**
Project Location: Hobbs G-9 vent	**Phone #:**
Sampler Name: Lara Weinheimer	**Fax #:**

FOR LAB USE ONLY Lab I.D.	Sample I.D.	(G)RAB OR (C)OMP.	# CONTAINERS	MATRIX: GROUNDWATER	WASTEWATER	SOIL	OIL	SLUDGE	OTHER :	PRESERV.: ACID/BASE:	ICE / COOL	OTHER :	SAMPLING: DATE	TIME	ANALYSIS REQUEST: Chlorides	TPH 8015 M	BTEX	Texas TPH
H17370-1	5' west trench @ 12'	G	1			✓					✓		5/5/09	11:29	✓	✓	✓	
-2	5' east trench @ 8'	G	1			✓					✓		5/5/09	9:50	✓	✓	✓	
-3	5' east trench @ 12'	G	1			✓					✓		5/5/09	9:40	✓	✓	✓	
-4	5' south trench @ 10'	G	1			✓					✓		5/5/09	8:50	✓	✓	✓	
-5	5' south trench @ 12'	G	1			✓					✓		5/5/09	8:42	✓	✓	✓	
-6	5' west trench @ 8'	G	1			✓					✓		5/5/09	11:35	✓	✓	✓	

Please print TPH on own page

Relinquished By: L. Weinheimer	**Date:** 5-6-09 **Time:** 8:08	**Received By:** Misty LeBert	
Relinquished By:	**Date:** **Time:**	**Received By:**	

Delivered By: (Circle One) Sampler - UPS - Bus - Other:

Sample Condition Cool: ☑ Yes ☐ No Intact: ☑ Yes ☐ No

CHECKED BY: (Initials) MCBB

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

email results

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

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

NEED SAMPLES BACK, PLEASE

Attachment D

VLEACH Model Results

R.T. Hicks Consultants, Ltd.
901 Rio Grande Blvd. NW, Suite F-142

R. T. HICKS CONSULTANTS, LTD.
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266.0745

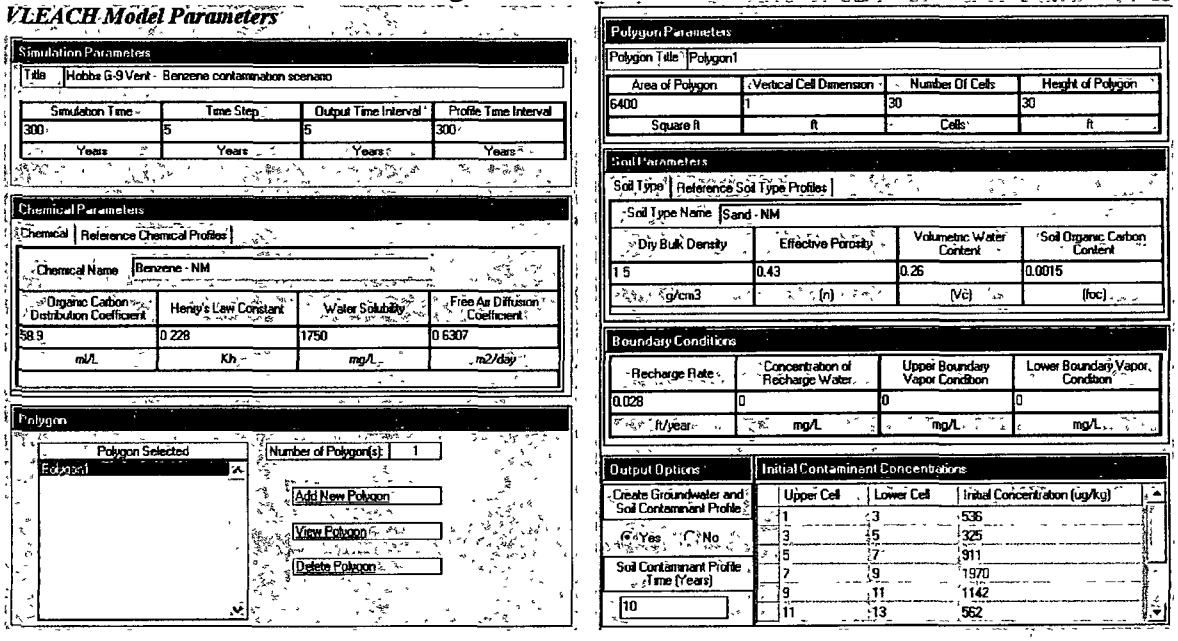
Input and Results of the VLEACH Simulation Performed at the Rice Operating Co. Hobbs G-9 Vent Site

The specific parameters used in the simulation and diffusion to ground water equation at the site are presented in the table and figures below.

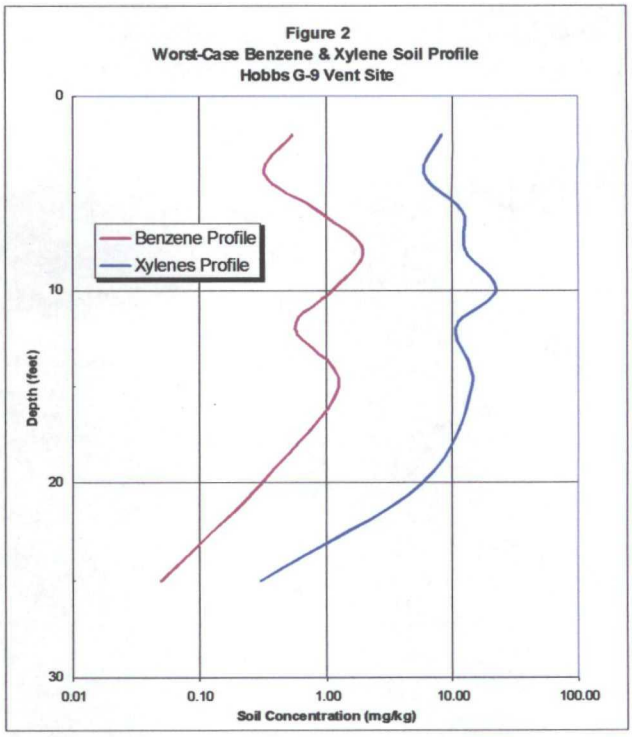
Table 1 – Common Parameters Employed in the VLEACH model for the Hobbs G-9 Vent Site

Model Parameter	Value	Source of Value
Benzene & Xylene Chemical Parameters	Chemical Specific	NMED June 2006 Soil Screening Levels Document
Spill Area (ft^2)	6,400	Site Measurement (Estimate)
Groundwater Table Depth (ft)	30	Hobbs M-4 and E-4 Sites
Vadose Zone Soil Bulk Density (g/cm^3)	1.5	NMED June 2006 Document
Vadose Zone Porosity (unitless)	0.43	NMED June 2006 Document
Volumetric Water Content (%)	0.26	NMED June 2006 Document
Vadose Zone Soil Organic Content (f_{oc})	0.0015	NMED June 2006 Document
Recharge Rate (ft/year)	0.028	Musharrafieh 1999
Benzene & Xylene Concentrations (ug/kg)	Chemical Specific	Worst-Case Hydrocarbon Profile (Excavations & SB-1)
Slope of Water Table	0.002	Regional Map (Attachment A)
Hydraulic Conductivity (ft/d)	81	Musharrafieh 1999
Max width perpendicular to direction of GW flow (ft)	80	Site Measurement
Aquifer Porosity (unitless)	0.25	Prof. Judgment Conservative Assumption
Mixing zone depth in aquifer (ft)	6.6	Prof. Judgment Conservative Assumption

Figure 1 - Actual Input Screens from the VLEACH Model Program for the Benzene Run



As a conservative measure a "worst-case" hydrocarbon soil profile was constructed by taking the highest benzene and xylenes concentration from each sampled depth as shown in Figure 2. Sampling depths for which laboratory results were not available were estimated from the field screening data. The benzene and xylenes values from this profile were conservatively assumed to be present across the entire 6,400 ft² area.



The results from the VLEACH modeling relative to this assessment are provided as a graph that presents the subsurface impact as Mass Flux to Ground Water in grams/year (g/yr) as a function of future time as shown in Figure 3.

Simulation Time, Time Step, Output Time Interval, and Profile Time Interval were adjusted to provide the clearest presentation of the results based on the time required to identify the maximum impact to groundwater. The model results show the highest mass flux to ground water occurs at the present time. At a time of 250 years from now, the flux from the soil profile to ground water will be 1/10 or less of the present values.

Figure 3 - Results of VLEACH Vadose Model for Benzene (Present – 300 years from now)

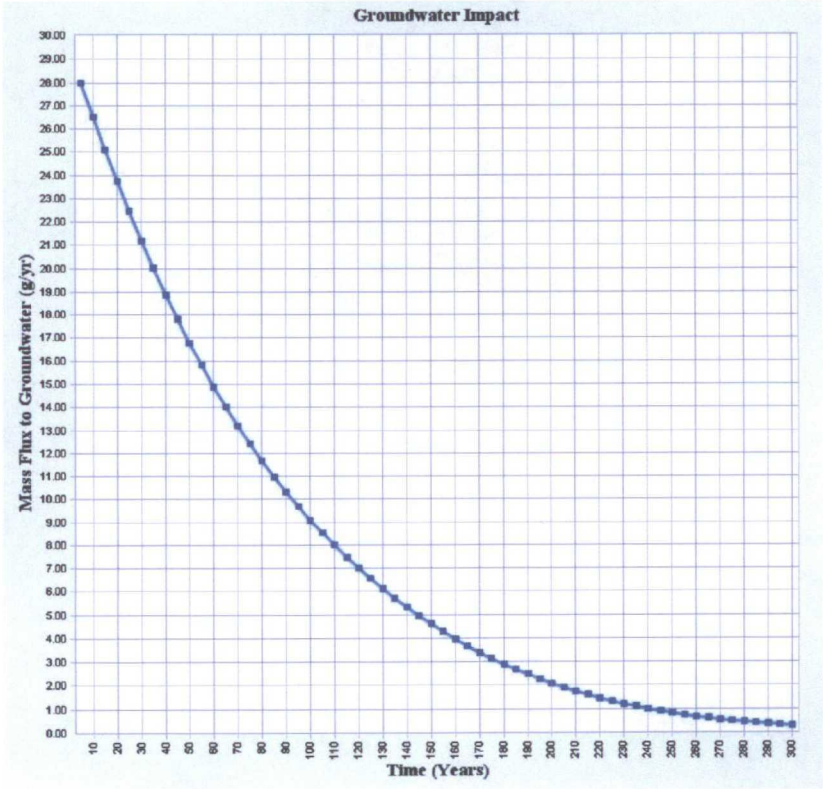
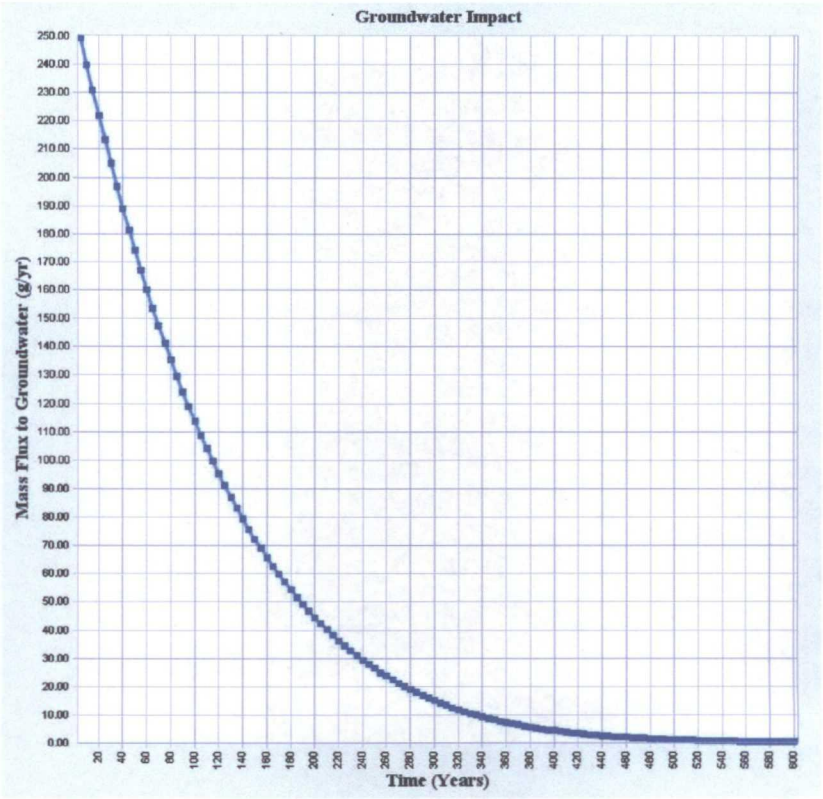


Figure 4 - Results of VLEACH Vadose Model for Xylenes (Present to 600 years from now)



In order to compare the modeled results to the NMED ground water standard, the VLEACH output data required a conversion from g/yr to mg/L. This was performed by calculating the annual recharge (flux) volume from the spill area and the annual ground water flow volume below the spill area as shown:

Recharge is defined as: $Flux_{flow}(L/yr) = A \times R \times 29.317$ where,

A = spill area (ft^2)
R = recharge rate (ft/yr), and
29.317 = conversion factor from ft^3 to liters

Groundwater flow is defined as: $GW_{flow}(L/yr) = \left(\frac{k \times i}{\theta_T}\right) \times T_{aq} \times W \times 29.317$ where,

k = hydraulic conductivity of the aquifer (ft/yr)
i = groundwater gradient (ft/ft)
θ_T = porosity of the aquifer
T_{aq} = aquifer mixing zone thickness (ft) and,
W = length of the spill area (ft) perpendicular to the ground water gradient direction

The relationship between the annual recharge volume and the annual ground water flow volume was used to calculate the predicted ground water concentration for the initial (year zero) time and the maximum impact year time (also year zero) for the constituent of concern as demonstrated in Table 2 below.

Table 2

Chemical of Concern	Present Impact Data Year	Impact (g/yr)	Leachate Conc. (mg/L)	GW Conc. (mg/L)	Maximum Impact Data Year	Impact (g/yr)	Leachate Conc. (mg/L)	GW Conc. (mg/L)	NM Water Quality (mg/L)
Benzene	0	29	5.6	0.008	0	29	5 6	0.008	0.01
Total Xylenes	0	250	48	0.068	0	250	48	0.068	0 6

Bold text values indicate concentrations that exceed the NMED Water Quality Standard values for groundwater

Present impact concentrations and maximum impact concentrations are compared with NMED ground water standards in blue. As shown, predicted concentrations of benzene and total xylenes in ground water are below ground water standards. The VLEACH model, conservative of ground water quality by construction, predicts that concentrations of benzene and total xylenes decline in the future. No exceedance of NMED ground water standards is predicted.