1R - 425-27

REPORTS

DATE:

5-29-08

R. T. HICKS CONSULTANTS, LTD.
PO Box 7624 ▲ Midland, Texas 79708 ▲ 432.528.3878 ▲ Fax: 432.689.4578

May 29, 2008

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

RE: **Vacuum SWD System F-31-1 Junction Box Site (NMOCD CASE #: 1R425-27)**

Dear Mr. Hanson:

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is submitting this request to close the regulatory file for the above referenced site. The investigation demonstrated that neither salt nor hydrocarbons are present in the vadose zone in quantities that represent a threat to ground water quality.

Background
The Vacuum SWD F-31-1 Junction Box Site is located southeast of Buckeye, NM at T-17-S, R-35-E, Section 31, in Unit F. A release of produced water was identified during an excavation that ROC conducted in July of 2005. The NMOCD-approved Investigation Characterization Plan (ICP), dated April 13, 2007, (Attachment A), includes background information and a map that shows the site location relative to the regional setting.

Field Program
Following the initial junction box investigation in 2005, ROC obtained soil samples which indicated that chloride impacted soil was present above 500 ppm from 8 to at least 12 feet below the surface. Photo-ionization detector readings in excess of 100 ppm suggested that hydrocarbon-impacted soil was present from 2 to 4 feet below the surface. The surrounding area was then excavated such that a one foot thick clay liner (10'x 10') could be installed at a depth of approximately 5 to 6 feet below the surface. The removed soil was blended such that chloride concentrations were below 3,600 mg/kg and returned to the excavation, both above and below the liner. Two to three feet of clean top soil (12 yds^3) was placed at the surface and the area was re-seeded in March of 2006. Information concerning the activities conducted by ROC in 2005 is included in Attachment A.

As a part of the approved ICP, Hicks Consultants supervised a deep soil sampling program to delineate the horizontal and vertical extent of the chloride- and hydrocarbon-impacted soil. On February 19 and 20, 2008 nine soil borings (SB-1 to SB-9) were installed within and surrounding the 2005 excavation as shown on Plate 1. Soil samples were collected and field screened by ROC for chloride and hydrocarbons. Each boring was terminated when either:

- The occurrence of five consecutive samples that exhibit decreasing concentrations with depth (chloride and hydrocarbons) and the deepest sample containing less than 250 ppm chloride and 100 ppm PID or

- The occurrence of three consecutive samples that exhibit concentrations of less than 250 ppm chloride and 100 ppm PID

Attachment B provides soil lithology logs, which include the field chloride and hydrocarbon screening data, and Attachment C provides the laboratory report for field data verification samples.

Results

Data from the deep soil boring program indicates that highest chloride concentrations (<500 ppm) are present from just below the clean top soil to the depth of a consistent quartzite bed that exists across the site at approximately 16 to 24 feet. The horizontal extent of the chloride-impacted soil is approximately 700 ft^2.

All soil sample hydrocarbon (PID) readings from the borings were below 5.5 ppm and do not extend beyond the limits identified during the 2005 investigation.

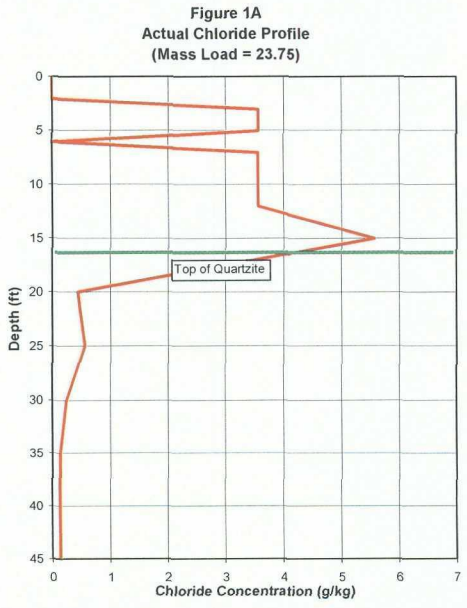
Simulation Modeling

We used the HYDRUS-1D model to simulate the impact to ground water due to chloride transport through the vadose zone. The input to the model employed field data from the site or nearby locations and conservative input data for parameters that were not measured at or near the site. Attachment D provides a summary description of the HYDRUS-1D model used in this simulation and a general discussion of the input parameters. The specific parameters used in the simulation at the F-31-1 site include the following:

Model Parameter	Value	Source of Value
Climate (non-smoothed)	1946 - 1992	Pearl, NM Station
Input for distant or hypothetical well (ft)	NA	Not Required
Background Chloride in Aquifer (mg/L)	<50	NM WAIDS
Aquifer Porosity (unitless)	0.30	Sample Description
Groundwater Table Depth (ft)	100	DCP Lee Plant Site
Aquifer Thickness (ft)	30	NM WAIDS
Slope of Water Table	0.005	USGS Data
Hydraulic Conductivity (ft/d)	20	Musharrafieh 1999
Average Chloride Load (kg/m^2)	*30	Calc. from Site Data
Max length of spill in dir. of GW flow (ft)	30	Site Data
Plant Uptake Trigger (%)	1.0	Most Conserv. Option
Surface Layer	Med. Sand	Boring Logs
Soil Profile (clay:caliche:sand ratio)	1:1:1	Boring Logs

Well depth information from NM WAIDS in the same section as the F-31-1 site indicates an aquifer thickness of at least 30 feet and Musharrafieh and Chudnoff (1999) predict that the saturated thickness of the alluvial aquifer beneath the site will remain at least 50 feet from now to the year 2040. Data from similar sites show that, unlike hydrocarbons, chloride that enters the upper portion of an aquifer will become distributed throughout the entire saturated thickness within a relatively short travel distance from the source. Therefore the arbitrary selection of a 10-foot thick mixing zone (used as a default value for hydrocarbon sites) is unrealistic where the chemical of concern is chloride. In our opinion, a simulation using the 30-foot thickness of the aquifer is appropriate for this site.

As described in Appendix D, the HYDRUS-1D model assumes a single surface spill is the initial source of chloride that is subsequently observed in the subsurface. In order to apply this version of the HYDRUS-1D model to the F-31-1 site, we calibrated the model by adjusting the chloride load parameter such that an emulated chloride concentration profile three years after the surface release compared favorably with a chloride concentration profile from soil samples measured at the source area. A favorable but conservative comparison was achieved as demonstrated below:



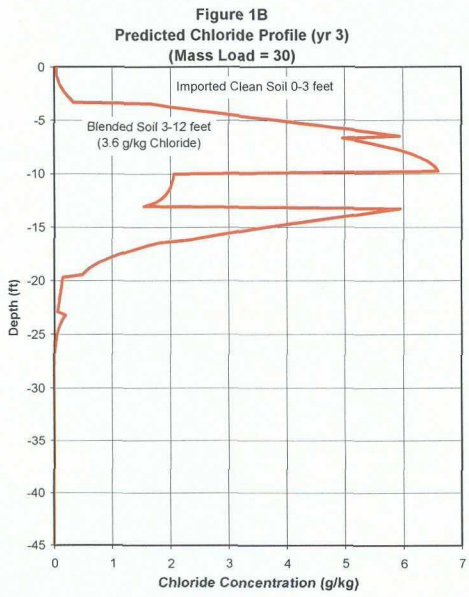
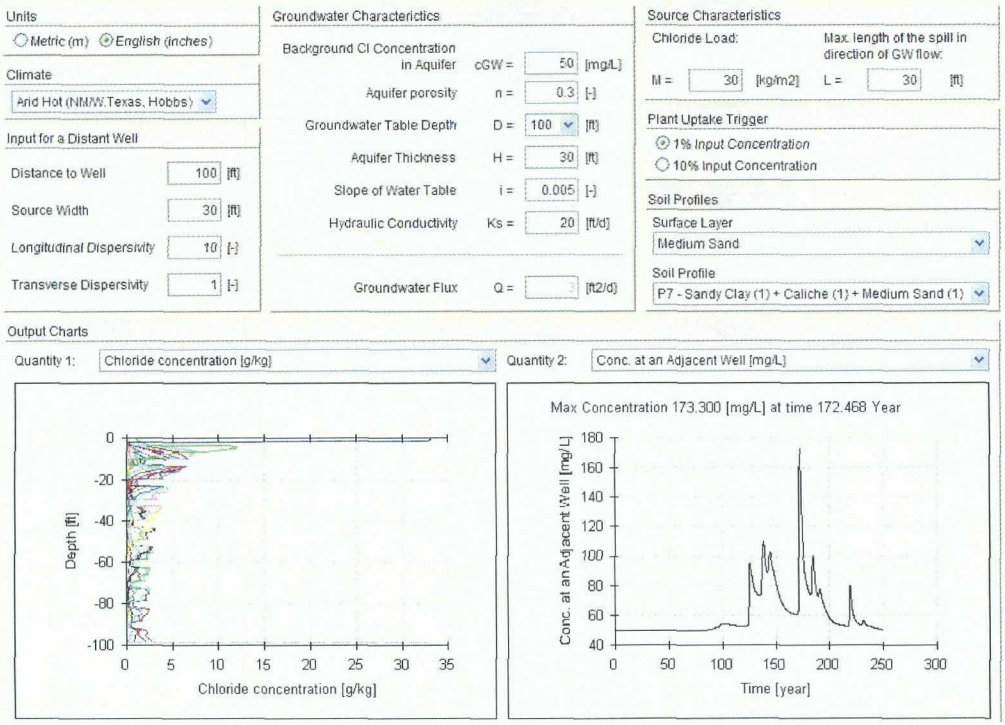


Figure 1A is the profile using field chloride analysis from the original source area excavation (to 12 feet bgs) and SB-5 (below 12 feet). It takes into account the blended soil used for backfill, the reiterate clay liner, and the clean soil placed at the surface. The calculated chloride load for this profile is 23.75 kg/m^2. Figure 1B is the predicted chloride profile at year 3 of the simulation using a chloride load of 30 kg/m^2.

The results of the simulation are shown below on the HYDRUS-1D model output summary page. It indicates that the ground water below the site will not

exceed 174 mg/L (below WQCC standards) if no further corrective actions are taken.



We believe the simulated concentration in ground water is a "worst-case" prediction because of the conservative input parameters used in the model.

Recommendations

We conclude, based on these results that this site is in compliance with the mandates of Rule 116 such that the remaining chloride-impacted soil does not and will not endanger fresh water, public health or the environment.

Please contact Marvin Burrows of ROC if you have any questions concerning this submission.

Sincerely,
R.T Hicks Consultants, Ltd.

Dale T Littlejohn
Geologist

Copy: Marvin Burrows, ROC
NMOCD Hobbs


N
SB-6
(Field Screening)
Depth Cl
5 213
10 1,021
15 435
20 173
25 295
30 302
35 115
40 121
Verification Lab
Sample at 10' & 40'
Buried Pipeline
Lease Road
SB-5
(Field Screening)
Depth Cl
15 5,575
20 448
25 568
30 253
35 143
40 144
45 149
Verification Lab
Sample at 15' & 45'
Buried Pipeline
SB-7
(Field Screening)
Depth Cl
5 586
10 410
15 241
20 211
25 143
30 146
No Lab Samples
SB-9
(Field Screening)
Depth Cl
5 111
10 115
15 122
No Lab Samples
Excavated
Area
6
7
5
9
8
2
1
3
4
SB-8
(Field Screening)
Depth Cl
5 140
10 144
15 378
No Lab Samples
Buried Pipeline
Buried Pipeline
SB-2
(Field Screening)
Depth Cl
5 576
10 2,401
15 1,584
20 369
25 320
30 204
Verification Lab
Sample at 15' & 30'
SB-3
(Field Screening)
Depth Cl
5 200
10 1,148
15 170
20 171
25 237
30 148
Verification Lab
Sample at 10' & 30'
SB-1
(Field Screening)
Depth Cl PID
15 2,697 3.3
20 646 5.4
25 230 3.5
30 171 --
35 182 --
Verification Lab
Sample at 15' & 35'
SB-4
(Field Screening)
Depth Cl
5 598
10 1,175
15 566
20 846
25 204
30 111
35 208
40 218
Verification Lab
Sample at 10' & 40'
Plate 1
Site Detail Map
Rice Operating Company
Vacuum SWD F-31-1
T-17-S R-35-E Sec. 31 (F)
Lea County, New Mexico
Scale - Feet
0 45 90
0 15 30
Scale - Meters

ATTACHMENT A

Investigation Characterization Plan and Data from Initial Excavation and Placement of Clay Liner

R. T. HICKS CONSULTANTS, LTD.

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

April 13, 2007

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

RE: Investigation Characterization Plan:
Jct. F-31-1 Junction, Vacuum Salt Water Disposal System

Dear Mr. Price:

On behalf of Rice Operating Company (ROC), R.T. Hicks Consultants, Ltd. is pleased to submit this Investigation Characterization Plan (ICP) for above- referenced site within the Vacuum Salt Water Disposal System. Plate 1 is a map showing the site relative to major roads in the area, nearby ROC sites and nearby USGS monitoring wells. GPS coordinates for this site are 32° 47.636 N, 103° 29.938 W. This site had a junction box that that was addressed as part of Vacuum System abandonment and excavated to 10L x 10W x 12D feet and backfilled with blended dirt to 6' below ground surface, capped with a one foot clay barrier, backfilled to the surface with blended soil and topped with 12 yards of clean top soil contoured to shed precipitation. NMOCD was notified that this site is a source of potential ground water impact on 4-17-06.

The work elements proposed to characterize this site sufficiently to develop an appropriate corrective action are presented below.

1. ROC will identify and document the location of all current and historic equipment and pipelines associated with the site.
2. ROC and Hicks Consultants 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. Soil samples employed for delineation will be obtained from regular intervals below ground surface in each trench.
4. A representative number of the soil samples will be sent to a laboratory to allow for verification of the field results.
5. General soil texture descriptions will be provided for each sample trench.
6. The criteria to delineate the extent of impact is 5 point chloride decline vs. depth or:
   a. 250 ppm chloride using field analyses (see attached ROC Quality Procedure in Appendix A), whichever occurs first.
   b. 100 ppm total hydrocarbon vapors using the headspace method analysis (Appendix A).
   c. Soil boring to ground water depth should neither (a) or (b) apply
   d. Monitoring well installation if warranted to asses ground water quality at the site.

Following the site characterization described above, we will submit the data and analysis with a Corrective Action Plan that outlines the procedures for closure of the site.

Rice Operating Company (ROC) is the service provider (agent) for the Vacuum 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.

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:

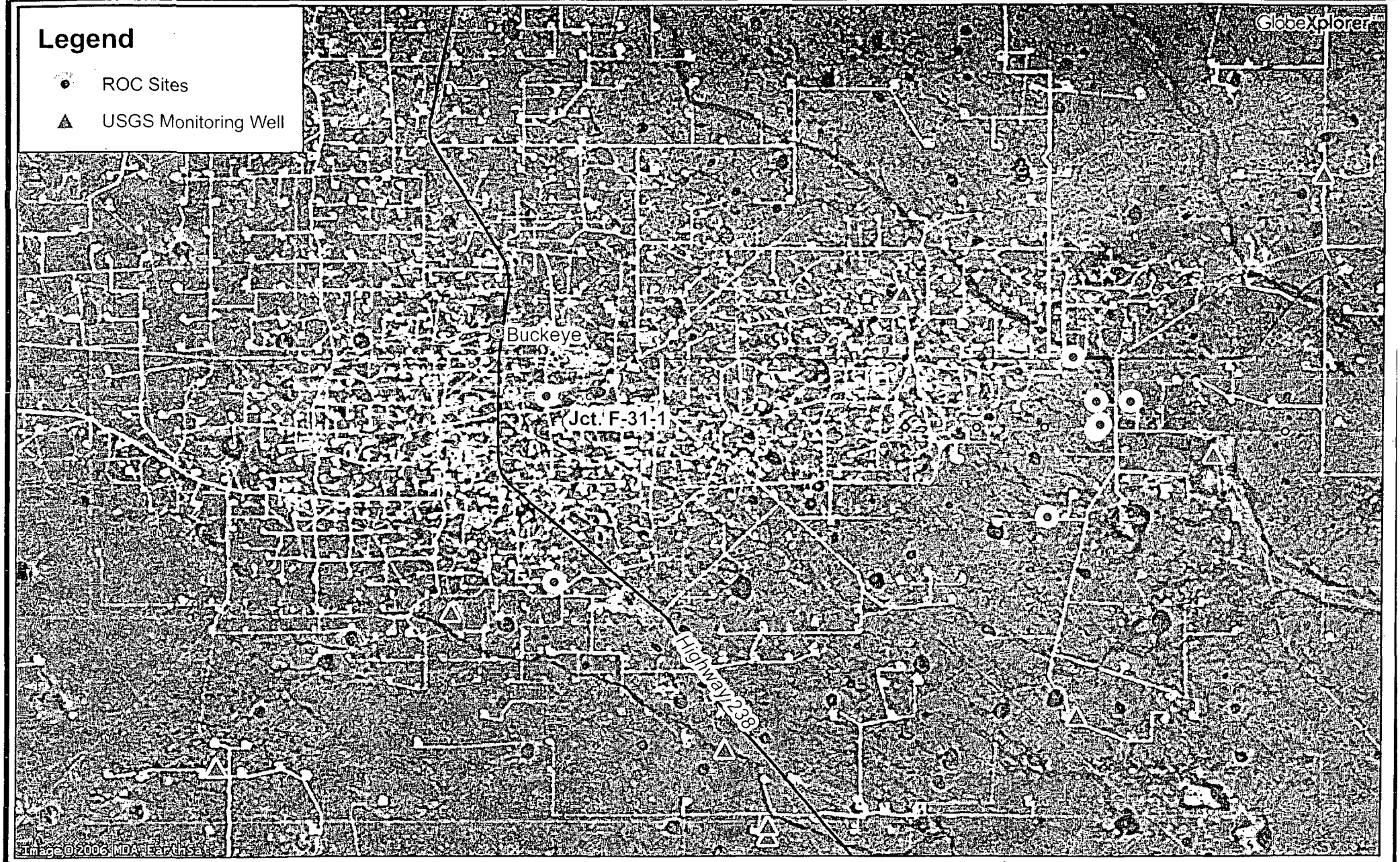
1. This Investigation and Characterization Plan (ICP), which is a proposal for data gathering, and site characterization and assessment (this submission).
2. Upon evaluation of the data and results from the ICP, a recommended remedy will be submitted in a Corrective Action Plan (CAP).
3. Finally, after implementing the remedy, a closure report with final documentation will be submitted.

If you have any questions or comments regarding this ICP, please contact Kristin Pope of Rice Operating Company as she has reviewed and approved this submission.

Sincerely,
R.T. Hicks Consultants, Ltd.

Randall T. Hicks
Principal

Copy: Rice Operating Company



R.T. Hicks Consultants, Ltd 901 Rio Grande Blvd NW Suite F-142 Albuquerque, NM 87104 Ph: 505.266.5004	Location of Jct. F-31-1 relative to Buckeye, New Mexico	Plate 1
	Rice Operating Company: Vacuum SWD System	April 2007

N
W E
S

RICE OPERATING COMPANY
JUNCTION BOX **DISCLOSURE*** REPORT

BOX LOCATION

SWD SYSTEM	JUNCTION	UNIT	SECTION	TOWNSHIP	RANGE	COUNTY	BOX DIMENSIONS - FEET		
							Length	Width	Depth
Vacuum	jct. F-31-1	F	31	17S	35E	Lea	box eliminated--System Abandonment		

LAND TYPE: BLM ____ STATE X FEE LANDOWNER ____ OTHER ____

Depth to Groundwater 117 feet NMOCD SITE ASSESSMENT RANKING SCORE: 0

Date Started 7/19/2005 Date Completed 2/17/2006 NMOCD Witness no

Soil Excavated 44 cubic yards Excavation Length 10 Width 10 Depth 12 feet

Soil Disposed 24 cubic yards Offsite Facility Sundance/Parabo Location Eunice, NM

FINAL ANALYTICAL RESULTS: **Sample Date** 7/21/2005 **Sample Depth** 12 ft

5-point composite sample of bottom and 4-point composite sample of excavation sidewalls. TPH and chloride laboratory test results completed by using an approved laboratory and testing procedures pursuant to NMOCD guidelines.

Sample Location	PID ppm	GRO mg/kg	DRO mg/kg	Chloride mg/kg
4-WALL COMP.	XXX	<10.0	<10.0	4990
BOTTOM COMP.	1.5	<10.0	<10.0	6170
BACKFILL COMP.	4.6	<10.0	<10.0	3570

CHLORIDE FIELD TESTS

LOCATION	DEPTH (ft)	ppm
vertical delineation trench at junction	3	873
	4	1481
	5	231
	6	198
	7	458
	8	1891
	9	2993
	10	4112
	11	4731
	12	6073
4-wall comp.	n/a	4867
bottom comp.	12	7947
backfill comp.	n/a	3467

General Description of Remedial Action:

This junction box was addressed as part of the Vacuum SWD System abandonment. After removing the box materials, delineation trenches were excavated at the site using a backhoe while soil samples were collected at regular intervals. Chloride field tests and PID screenings were conducted on each sample. Chloride concentrations were high at 12 ft while PID concentrations were relatively low throughout. After composite samples from the 10 x 10 x 12-ft excavation were collected for laboratory analysis, the excavation was backfilled with the excavated soil to 6 ft BGS. At 6 ft BGS, a 1-ft-thick compacted clay barrier was installed in the excavation. The remaining excavated soil was backfilled on top of the clay. Additional topsoil was imported and backfilled on top of the area. The disturbed surface has been seeding with a blend of native vegetation and will be monitored for growth. An identification plate was placed on the surface of this site to mark the former junction box location for future environmental considerations. NMOCD has been notified of potential groundwater impact at this site. A replacement junction box is not required because the Vacuum SWD System has been abandoned.

ADDITIONAL EVALUATION IS *LOW* PRIORITY

enclosures: chloride graph, photos, lab results, PID field screenings, clay test, clay diagram

I HEREBY CERTIFY THAT THE INFORMATION ABOVE IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

SITE SUPERVISOR Israel Juarez SIGNATURE Israel Juarez COMPANY RICE Operating Company

REPORT ASSEMBLED BY Kristin Farris Pope SIGNATURE Kristin Farris Pope

DATE 4/17/2006 TITLE Project Scientist

** This site is a "DISCLOSURE." It will be placed on a prioritized list of similar sites for further consideration.*

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. Ifnecessary, 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 m1 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.

RICE OPERATING COMPANY

JUNCTION BOX **DISCLOSURE*** REPORT

BOX LOCATION

SWD SYSTEM	JUNCTION	UNIT	SECTION	TOWNSHIP	RANGE	COUNTY	BOX DIMENSIONS - FEET		
							Length	Width	Depth
Vaccum	jct. F-31-1	F	31	17S	35E	Lea	box eliminated--System Abandonment		

LAND TYPE: BLM _____ STATE X FEE LANDOWNER _____ OTHER _____

Depth to Groundwater 117 feet NMOCD SITE ASSESSMENT RANKING SCORE: 0

Date Started 7/19/05 Date Completed 2/17/06 NMOCD Witness no

Soil Excavated 44 cubic yards Excavation Length 10 Width 10 Depth 12 feet

Soil Disposed 24 cubic yards Offsite Facility Sundance/Parabo Location Eunice, NM

FINAL ANALYTICAL RESULTS: **Sample Date** 7/21/05 **Sample Depth** 12 ft

5-point composite sample of bottom and 4-point composite sample of excavation sidewalls. TPH and chloride laboratory test results completed by using an approved laboratory and testing procedures pursuant to NMOCD guidelines.

Sample Location	PID ppm	GRO mg/kg	DRO mg/kg	Chloride mg/kg
4-WALL COMP.	XXX	<10.0	<10.0	4990
BOTTOM COMP.	1.5	<10.0	<10.0	6170
BACKFILL COMP.	4.6	<10.0	<10.0	3570

CHLORIDE FIELD TESTS

LOCATION	DEPTH (ft)	ppm
vertical delineation trench at junction	3	873
	4	1481
	5	231
	6	198
	7	458
	8	1891
	9	2993
	10	4112
	11	4731
	12	6073
4-wall comp.	n/a	4867
bottom comp.	12	7947
backfill comp.	n/a	3467

General Description of Remedial Action:

This junction box was addressed as part of the Vacuum SWD System abandonment. After removing the box materials, delineation trenches were excavated at the site using a trackhoe while soil samples were collected at regular intervals. Chloride field tests and PID screenings were conducted on each sample. Chloride concentrations were high at 12 ft while PID concentrations were relatively low throughout. After composite samples from the 10 x 10 x 12-ft excavation were collected for laboratory analysis, the excavation was backfilled with the excavated soil to 6 ft BGS. At 6 ft BGS, a 1-ft-thick compacted clay barrier was installed in the excavation. The remaining excavated soil was backfilled on top of the clay. Additional topsoil was imported and backfilled on top of the area. The disturbed surface has been seeding with a blend of native vegetation and will be monitored for growth. An identification plate was placed on the surface of this site to mark the former junction box location for future environmental considerations. NMOCD has been notified of potential groundwater impact at this site. A replacement junction box is not required because the Vacuum SWD System has been abandoned.

ADDITIONAL EVALUATION IS *LOW* PRIORITY

enclosures: chloride graph, photos, lab results, PID field screenings, clay test, clay diagram

I HEREBY CERTIFY THAT THE INFORMATION ABOVE IS TRUE AND COMPLETE TO THE BEST OF MY KNOWLEDGE AND BELIEF.

SITE SUPERVISOR Israel Juarez SIGNATURE _____ COMPANY RICE Operating Company

REPORT ASSEMBLED BY Kristin Farris Pope SIGNATURE _____

DATE 4/17/2006 TITLE Project Scientist

This site is a "DISCLOSURE." It will be placed on a prioritized list of similar sites for further consideration.

ENVIRONMENTAL LAB OF

12600 West I-20 East - Odessa, Texas 79765

Analytical Report

Prepared for:

Roy Rascon

Rice Operating Co.

122 W. Taylor

Hobbs, NM 88240

Project: Vacuum Jct. F-31-1

Project Number: None Given

Location: None Given

Lab Order Number: 5G25007

Report Date: 07/29/05

Rice Operating Co.	Project: Vacuum Jct. F-31-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	07/29/05 12:06

ANALYTICAL REPORT FOR SAMPLES

Sample ID	Laboratory ID	Matrix	Date Sampled	Date Received
Remediated Backfill	5G25007-01	Soil	07/21/05 09:20	07/22/05 18:15
Bottom Comp.@ 12'	5G25007-02	Soil	07/21/05 09:15	07/22/05 18:15
4 Wall Comp.	5G25007-03	Soil	07/21/05 09:55	07/22/05 18:15

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

Rice Operating Co.	Project: Vacuum Jct. F-31-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	07/29/05 12:06

Organics by GC

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Remediated Backfill (5G25007-01) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EG52514	07/25/05	07/26/05	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*81.6 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*89.8 %*	*70-130*		"	"	"	"	
Bottom Comp.@ 12' (5G25007-02) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EG52513	07/25/05	07/26/05	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*74.4 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*92.4 %*	*70-130*		"	"	"	"	
4 Wall Comp. (5G25007-03) Soil									
Gasoline Range Organics C6-C12	ND	10.0	mg/kg dry	1	EG52514	07/25/05	07/26/05	EPA 8015M	
Diesel Range Organics >C12-C35	ND	10.0	"	"	"	"	"	"	
Total Hydrocarbon C6-C35	ND	10.0	"	"	"	"	"	"	
Surrogate: 1-Chlorooctane		*74.8 %*	*70-130*		"	"	"	"	
Surrogate: 1-Chlorooctadecane		*82.8 %*	*70-130*		"	"	"	"	

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

Rice Operating Co.	Project: Vacuum Jct. F-31-1	Fax: (505) 397-1471
122 W. Taylor	Project Number: None Given	**Reported:**
Hobbs NM, 88240	Project Manager: Roy Rascon	07/29/05 12:06

General Chemistry Parameters by EPA / Standard Methods

Environmental Lab of Texas

Analyte	Result	Reporting Limit	Units	Dilution	Batch	Prepared	Analyzed	Method	Notes
Remediated Backfill (5G25007-01) Soil									
Chloride	**3570**	50.0	mg/kg	100	EG52811	07/27/05	07/27/05	EPA 300.0	
% Moisture	**5.5**	0.1	%	1	EG52601	07/25/05	07/26/05	% calculation	
Bottom Comp.@ 12' (5G25007-02) Soil									
Chloride	**6170**	100	mg/kg	200	EG52811	07/27/05	07/27/05	EPA 300.0	
% Moisture	**7.0**	0.1	%	1	EG52601	07/25/05	07/26/05	% calculation	
4 Wall Comp. (5G25007-03) Soil									
Chloride	**4990**	50.0	mg/kg	100	EG52811	07/27/05	07/27/05	EPA 300.0	
% Moisture	**7.1**	0.1	%	1	EG52601	07/25/05	07/26/05	% calculation	

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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 EG52513 - Solvent Extraction (GC)										
Blank (EG52513-BLK1)				Prepared & Analyzed: 07/25/05						
Gasoline Range Organics C6-C12	ND	10.0	mg/kg wet							
Diesel Range Organics >C12-C35	ND	10.0	"							
Total Hydrocarbon C6-C35	ND	10.0	"							
Surrogate: 1-Chlorooctane	*35.6*		*mg/kg*	*50.0*		*71.2*	*70-130*			
Surrogate: 1-Chlorooctadecane	*38.0*		*"*	*50.0*		*76.0*	*70-130*			
LCS (EG52513-BS1)				Prepared & Analyzed: 07/25/05						
Gasoline Range Organics C6-C12	441	10.0	mg/kg wet	500		88.2	75-125			
Diesel Range Organics >C12-C35	445	10.0	"	500		89.0	75-125			
Total Hydrocarbon C6-C35	886	10.0	"	1000		88.6	75-125			
Surrogate: 1-Chlorooctane	*41.4*		*mg/kg*	*50.0*		*82.8*	*70-130*			
Surrogate: 1-Chlorooctadecane	*38.5*		*"*	*50.0*		*77.0*	*70-130*			
Calibration Check (EG52513-CCV1)				Prepared: 07/25/05 Analyzed: 07/26/05						
Gasoline Range Organics C6-C12	467		mg/kg	500		93.4	80-120			
Diesel Range Organics >C12-C35	486		"	500		97.2	80-120			
Total Hydrocarbon C6-C35	953		"	1000		95.3	80-120			
Surrogate: 1-Chlorooctane	*47.7*		*"*	*50.0*		*95.4*	*70-130*			
Surrogate: 1-Chlorooctadecane	*35.0*		*"*	*50.0*		*70.0*	*70-130*			
Matrix Spike (EG52513-MS1)	**Source: 5G25007-02**			Prepared & Analyzed: 07/25/05						
Gasoline Range Organics C6-C12	517	10.0	mg/kg dry	538	ND	96.1	75-125			
Diesel Range Organics >C12-C35	486	10.0	"	538	ND	90.3	75-125			
Total Hydrocarbon C6-C35	1000	10.0	"	1080	ND	92.6	75-125			
Surrogate: 1-Chlorooctane	*45.7*		*mg/kg*	*50.0*		*91.4*	*70-130*			
Surrogate: 1-Chlorooctadecane	*35.3*		*"*	*50.0*		*70.6*	*70-130*			
Matrix Spike Dup (EG52513-MSD1)	**Source: 5G25007-02**			Prepared & Analyzed: 07/25/05						
Gasoline Range Organics C6-C12	481	10.0	mg/kg dry	538	ND	89.4	75-125	7.21	20	
Diesel Range Organics >C12-C35	504	10.0	"	538	ND	93.7	75-125	3.64	20	
Total Hydrocarbon C6-C35	985	10.0	"	1080	ND	91.2	75-125	1.51	20	
Surrogate: 1-Chlorooctane	*45.2*		*mg/kg*	*50.0*		*90.4*	*70-130*			
Surrogate: 1-Chlorooctadecane	*35.1*		*"*	*50.0*		*70.2*	*70-130*			

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 EG52514 - Solvent Extraction (GC)										
Blank (EG52514-BLK1)				Prepared: 07/25/05 Analyzed: 07/26/05						
Gasoline Range Organics C6-C12	ND	10.0	mg/kg wet							
Diesel Range Organics >C12-C35	ND	10.0	"							
Total Hydrocarbon C6-C35	ND	10.0	"							
Surrogate: 1-Chlorooctane	*47.1*		*mg/kg*	*50.0*		*94.2*	*70-130*			
Surrogate: 1-Chlorooctadecane	*63.0*		*"*	*50.0*		*126*	*70-130*			
LCS (EG52514-BS1)				Prepared: 07/25/05 Analyzed: 07/26/05						
Gasoline Range Organics C6-C12	449	10.0	mg/kg wet	500		89.8	75-125			
Diesel Range Organics >C12-C35	461	10.0	"	500		92.2	75-125			
Total Hydrocarbon C6-C35	910	10.0	"	1000		91.0	75-125			
Surrogate: 1-Chlorooctane	*51.0*		*mg/kg*	*50.0*		*102*	*70-130*			
Surrogate: 1-Chlorooctadecane	*62.6*		*"*	*50.0*		*125*	*70-130*			
Calibration Check (EG52514-CCV1)				Prepared: 07/25/05 Analyzed: 07/26/05						
Gasoline Range Organics C6-C12	425		mg/kg	500		85.0	80-120			
Diesel Range Organics >C12-C35	450		"	500		90.0	80-120			
Total Hydrocarbon C6-C35	875		"	1000		87.5	80-120			
Surrogate: 1-Chlorooctane	*42.6*		*"*	*50.0*		*85.2*	*70-130*			
Surrogate: 1-Chlorooctadecane	*55.9*		*"*	*50.0*		*112*	*70-130*			
Matrix Spike (EG52514-MS1)	**Source: 5G25007-03**			Prepared: 07/25/05 Analyzed: 07/26/05						
Gasoline Range Organics C6-C12	519	10.0	mg/kg dry	538	ND	96.5	75-125			
Diesel Range Organics >C12-C35	523	10.0	"	538	ND	97.2	75-125			
Total Hydrocarbon C6-C35	1040	10.0	"	1080	ND	96.3	75-125			
Surrogate: 1-Chlorooctane	*46.7*		*mg/kg*	*50.0*		*93.4*	*70-130*			
Surrogate: 1-Chlorooctadecane	*52.1*		*"*	*50.0*		*104*	*70-130*			
Matrix Spike Dup (EG52514-MSD1)	**Source: 5G25007-03**			Prepared: 07/25/05 Analyzed: 07/26/05						
Gasoline Range Organics C6-C12	533	10.0	mg/kg dry	538	ND	99.1	75-125	2.66	20	
Diesel Range Organics >C12-C35	534	10.0	"	538	ND	99.3	75-125	2.08	20	
Total Hydrocarbon C6-C35	1070	10.0	"	1080	ND	99.1	75-125	2.84	20	
Surrogate: 1-Chlorooctane	*47.1*		*mg/kg*	*50.0*		*94.2*	*70-130*			
Surrogate: 1-Chlorooctadecane	*53.1*		*"*	*50.0*		*106*	*70-130*			

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 EG52601 - General Preparation (Prep)										
Blank (EG52601-BLK1)				Prepared: 07/25/05 Analyzed: 07/26/05						
% Moisture	ND	0.1	%							
Duplicate (EG52601-DUP1)	**Source: 5G22016-01**			Prepared: 07/25/05 Analyzed: 07/26/05						
% Moisture	0.7	0.1	%		0.8			13.3	20	
Batch EG52811 - Water Extraction										
Blank (EG52811-BLK1)				Prepared & Analyzed: 07/27/05						
Chloride	ND	0.500	mg/kg							
LCS (EG52811-BS1)				Prepared & Analyzed: 07/27/05						
Chloride	10.8		mg/L	10.0		108	80-120			
Calibration Check (EG52811-CCV1)				Prepared & Analyzed: 07/27/05						
Chloride	10.4		mg/L	10.0		104	80-120			
Duplicate (EG52811-DUP1)	**Source: 5G25007-02**			Prepared & Analyzed: 07/27/05						
Chloride	6010	100	mg/kg		6170			2.63	20	

Notes and Definitions

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: 7/29/2005

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, Inc.

12600 West I-20 East
Odessa, Texas 79763
Phone: 915-563-1800
Fax: 915-563-1713

CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

Project Manager: Roy Rascon
Company Name: Rice Operating Company
Company Address: 122 W Taylor
City/State/Zip: Hobbs, NM 88240
Telephone No: 505-393-9174 Fax No: 505-397-1471
Sampler Signature: Israel Juarez

Project Name: Vacuum Jct E-31-1
Project #:
Project Loc:
PO #:

EG25007

LAB # (lab use only)	FIELD CODE	Date Sampled	Time Sampled	No. of Containers	Preservative: Ice	HNO_3	HCl	NaOH	H_2SO_4	None	Other (Specify)	Matrix: Water	Sludge	Soil	Other (specify):	Analyze For: TCLP: / CL /	TOTAL: / CL /	TPH 418.1	TPH TX 1005/1006	TPH 8015M GRO/DRO	Metals: As Ag Ba Cd Cr Pb Hg Se	Volatiles	Semivolatiles	BTEX 8021B/5030	EC, CEC, SAR, ESP	Major cations/anions, TDS						RUSH TAT (Pre-Schedule)	Standard TAT
-01	Remediated Backfill	7/21/05	9:20	1	X									X		X				X													
-02	Bottom Comp. @ 12'	7/21/05	9:15	1	X									X		X				X													
-03	4 wall Comp.	7/21/05	9:55	1	X									X		X				X													

Special Instructions:

Sample Containers Intact? Y / N
Temperature Upon Receipt: 0.5°C
Laboratory Comments: 4oz glass on ice w/labels + seals
Seal on cooler

Relinquished by:	Date	Time	Received by:	Date	Time
Israel Juarez	7-22-05			7/22	15:30
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
	7/22	1815	Jaime McMurray	7-22-05	1815

Environmental Lab of Texas

Variance / Corrective Action Report – Sample Log-In

Client: Rice Op.

Date/Time: 7/25/05

Order #: 5G25007

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:

ATTACHMENT B

Lithology Logs from Soil Borings (Vertical Delineation)
Conducted by ROC and RTH in February 2008

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-1
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/19/08
WELL PLACEMENT: SW edge of the source area
COMMENTS: Lat. 32° 47' 38.5" North, Long. 103° 29' 58.0" West (Hand-Held GPS)

TOTAL DEPTH: 35 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

	Lithology	SAMPLE DATA (PPM) TYPE	DEPTH	% REC	PID	Cl (Fld)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
BENTONITE		excav	3	--	276	873		SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
		excav	4	--	155	1,481		
		excav	5	--	2.3	231	5	
		excav	6	--	12.1	198		CALICHE, white, hard, very little silt.
		excav	7	--	2.9	458		
		excav	8	--	2.6	1,891		
		excav	9	--	0.7	2,993		
		excav	10	--	2.5	4,112	10	
		excav	11	--	2.1	4,731		
		excav	12	--	1.8	6,073		CALICHE AND SILT, Light brown to tan silt and soft caliche with interbedded hard white caliche.
		cuttings	15	--	3.3	2,697	15	Lab Data: Chloride 293 (mg/kg); BTEX ND; Benz ND; Naphthalene ND
		cuttings	20	--	5.4	646	20	
								QUARTZITE, Brown, fine to medium crystilline, very hard drilling.
		cuttings	25	--	3.5	230	25	SAND, Brown, fine grain, medium sorted, angular.
		cuttings	30	--	--	171	30	
		cuttings	35	--	--	182	35	Lab Data: Chloride 77 (mg/kg); BTEX ND; Benz ND; Naphthalene ND

TD = 35 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-2
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/19/08
WELL PLACEMENT: 10 Feet west of SB-1
COMMENTS: Lat. 32° 47' 38.5" North, Long. 103° 29' 58.2" West (Hand-Held GPS)

TOTAL DEPTH: 30 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

Lithology	SAMPLE DATA (PPM) TYPE	DEPTH	% REC	PID	Cl (Fld)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
							SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
	cuttings	5	--	--	576	5	CALICHE, white to grayish white, hard, very little silt.
	cuttings	10	--	--	2,401	10	
	cuttings	15	--	--	1,584	15	CALICHE AND SILT, Light brown to tan silt and soft caliche with interbedded hard white caliche. Lab Data: Chloride (mg/kg) 2,800
	cuttings	20	--	--	369	20	
							QUARTZITE, Brown, fine to medium crystilline, very hard drilling.
	cuttings	25	--	--	320	25	SAND, Brown, fine grain, medium sorted, angular.
	cuttings	30	--	--	204	30	Lab Data: Chloride (mg/kg) 43.0

BENTONITE

TD = 30 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-3
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/20/08
WELL PLACEMENT: 10 Feet east of Pit Marker
COMMENTS: Lat. 32° 47' 38.5" North, Long. 103° 29' 57.8" West (Hand-Held GPS)

TOTAL DEPTH: 30 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

Lithology	SAMPLE DATA (PPM) TYPE	DEPTH	% REC	PID	Cl (Fld)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
							SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
							CALICHE, white to grayish white, hard, very little silt.
	cuttings	5	--	--	200	5	CALICHE AND SILT, Light brown to tan silt and soft caliche with interbedded hard white caliche.
	cuttings	10	--	--	1,148	10	Lab Data: Chloride (mg/kg) 115
	cuttings	15	--	--	170	15	
	cuttings	20	--	--	171	20	QUARTZITE, Brown, fine to medium crystilline, very hard drilling.
	cuttings	25	--	--	237	25	
	cuttings	30	--	--	148	30	SAND, Light brown, fine grain, well sorted, sub-angular. Lab Data: Chloride (mg/kg) <5.0

BENTONITE

TD = 30 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-4
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/20/08
WELL PLACEMENT: 10 Feet south of former. pit
COMMENTS: Lat. 32° 47' 38.3" North, Long. 103° 29' 58.0" West (Hand-Held GPS)

TOTAL DEPTH: 40 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

Lithology	SAMPLE DATA (PPM) TYPE	DEPTH	% REC	PID	Cl (Fld)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
							SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
	cuttings	5	--	--	598	5	CALICHE Gray, interbedded with brown fine grain silty sand.
	cuttings	10	--	--	1,175	10	Lab Data: Chloride (mg/kg) 3,670
	cuttings	15	--	--	566	15	CALICHE AND SILT, Light brown, soft, with interbedded hard caliche and quartzite.
	cuttings	20	--	--	846	20	
							QUARTZITE, Brown, fine to medium crystilline, very hard drilling.
	cuttings	25	--	--	204	25	SAND, Light reddish brown, fine grain, well sorted, sub-angular.
	cuttings	30	--	--	111	30	
	cuttings	35	--	--	208	35	
	cuttings	40	--	--	218	40	Lab Data: Chloride (mg/kg) 87.5

BENTONITE

TD = 40 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-5
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/20/08
WELL PLACEMENT: North end of original pit
COMMENTS: Lat. 32° 47' 38.6" North, Long. 103° 29' 58.0" West (Hand-Held GPS)

TOTAL DEPTH: 45 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

Lithology	SAMPLE DATA (PPM) TYPE	DEPTH	% REC	PID	Cl (Fld)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
BENTONITE	excav	3	--	276	873		SILT AND CALICHE, Dark brown silt, with loose (soft) caliche (fill material) with red, soft clay at 4 to 4.5 feet (liner).
	excav	4	--	155	1,481		
	excav	5	--	2.3	231	5	
	excav	6	--	12.1	198		CALICHE AND SILT, Light brown, soft, with interbedded hard caliche and quartzite.
	excav	7	--	2.9	458		
	excav	8	--	2.6	1,891		
	excav	9	--	0.7	2,993		
	excav	10	--	2.5	4,112	10	
	excav	11	--	2.1	4,731		
	excav	12	--	1.8	6,073		
	cuttings	15	--	--	5,575	15	Lab Data: Chloride (mg/kg) 5,330
	cuttings	20	--	--	448	20	QUARTZITE, Grayish brown, with interbedded silt and caliche.
	cuttings	25	--	--	568	25	QUARTZITE, Brown, fine to medium crystilline, very hard drilling.
	cuttings	30	--	--	253	30	SAND, Light reddish brown, fine grain, well sorted, sub-angular, with some thin quartzite and interbedded sandstone.
	cuttings	35	--	--	143	35	
	cuttings	40	--	--	144	40	SANDSTONE, very fine grain, moderately sorted, angular.
	cuttings	45	--	--	149	45	SAND Light brown, to tan very fine grain, well sorted, angular.

Lab Data: Chloride (mg/kg) 20.1

TD = 45 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.:	SB-6	TOTAL DEPTH:	40 Ft
SITE ID:	Vacuum F-31-1Junction	CLIENT:	Rice Operating Company
SURFACE ELEVATION:	3,980 (USGS Map)	COUNTY:	Lea County
CONTRACTOR:	Harrison & Cooper, Inc.	STATE:	New Mexico
DRILLING METHOD:	Air-Rotary	LOCATION:	T-17-S, R-35-E, Sec. 31 (F)
INSTALLATION DATE:	2/20/08	FIELD REP.:	Dale Littlejohn
WELL PLACEMENT:	10 feet north of SB-5	FILE NAME:	\Vacuum SWD\F-31-1 Lithlogs
COMMENTS:	Lat. 32° 47' 38.8" North, Long. 103° 29' 58.0" West (Hand-Held GPS)		

	Lithology	SAMPLE DATA (PPM)					DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
		TYPE	DEPTH	% REC	PID	Cl (Fld)		
BENTONITE								SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
		cuttings	5	--	--	213	5	CALICHE, Gray to white, soft.
		cuttings	10	--	--	1,021	10	CALICHE AND SILT, Light brown, soft. Lab Data: Chloride (mg/kg) 1,010
		cuttings	15	--	--	435	15	CALICHE AND SILT, Light brown, soft, with interbedded hard sandstone and quartzite.
		cuttings	20	--	--	173	20	
		cuttings	25	--	--	295	25	QUARTZITE, Reddish brown, fine crystilline, very hard drilling.
		cuttings	30	--	--	302	30	SAND, Light reddish brown, fine grain, well sorted, sub-angular, with some interbedded quartzite.
		cuttings	35	--	--	115	35	
		cuttings	40	--	--	121	40	Lab Data: Chloride (mg/kg) <5.0

TD = 40 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-7
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/20/08
WELL PLACEMENT: 18 Feet wast of SB-5
COMMENTS: Lat. 32° 47' 38.6" North, Long. 103° 29' 58.2" West (Hand-Held GPS)

TOTAL DEPTH: 30 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

	Lithology	SAMPLE DATA (PPM) TYPE	DEPTH	% REC	PID	Cl (Fld)	DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
BENTONITE								SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
		cuttings	5	--	--	586	5	CALICHE, white to grayish white, hard, with interbedded soft caliche and light brown to tan silt.
		cuttings	10	--	--	410	10	CALICHE AND SILT, Light brown to tan, soft.
		cuttings	15	--	--	241	15	
		cuttings	20	--	--	211	20	
								QUARTZITE, Grayish to reddish brown, fine crystilline, hard.
		cuttings	25	--	--	143	25	SAND, Light brown, very fine grain, medium sorted, with interbedded quartzite layers.
		cuttings	30	--	--	146	30	

TD = 30 Feet

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-8
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3,980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/20/08
WELL PLACEMENT: 10 Feet wast of SB-2
COMMENTS: Lat. 32° 47' 38.4" North, Long. 103° 29' 58.3" West (Hand-Held GPS)

TOTAL DEPTH: 15 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

	Lithology	SAMPLE DATA (PPM)					DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
		TYPE	DEPTH	% REC	PID	Cl (Fld)		
BENTONITE								SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
								CALICHE, white, hard, .
		cuttings	5	--	--	140	5	CALICHE AND SILT, Light brown to tan, soft.
		cuttings	10	--	--	144	10	
		cuttings	15	--	--	378	15	

TD = 15 Feet

QUARTZITE at TD

LITHOLOGIC LOG (SOIL BORING)

R T Hicks Consultants Ltd

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

MONITOR WELL NO.: SB-9
SITE ID: Vacuum F-31-1Junction
SURFACE ELEVATION: 3980 (USGS Map)
CONTRACTOR: Harrison & Cooper, Inc.
DRILLING METHOD: Air-Rotary
INSTALLATION DATE: 2/20/08
WELL PLACEMENT: 5' N and 36' E of Pit Marker
COMMENTS: Lat. 32° 47' 38.5" North, Long. 103° 29' 57.6" West (Hand-Held GPS)

TOTAL DEPTH: 15 Ft
CLIENT: Rice Operating Company
COUNTY: Lea County
STATE: New Mexico
LOCATION: T-17-S, R-35-E, Sec. 31 (F)
FIELD REP.: Dale Littlejohn
FILE NAME: \Vacuum SWD\F-31-1 Lithlogs

	Lithology	SAMPLE DATA (PPM)					DEPTH	LITHOLOGIC DESCRIPTION: LITHOLOGY, COLOR, GRAIN SIZE SORTING, ROUNDING, CONSOL., DIST. DEATURES
		TYPE	DEPTH	% REC	PID	Cl (Fld)		
BENTONITE								SILT AND CALICHE, Dark brown silt, with loose (soft) caliche.
								CALICHE, white to grayish white, hard.
		cuttings	5	--	--	111	5	CALICHE AND SILT, Light brown to tan, soft, with interbedded hard caliche.
		cuttings	10	--	--	115	10	
		cuttings	15	--	--	122	15	

TD = 15 Feet

QUARTZITE at TD

ATTACHMENT C

Laboratory Reports and Chain-of-Custody Documentation

Analytical Report 298154

for

Rice Operating Co.

Project Manager: Kristin Pope

Vacuum F-31-1 Junction Box

Vacuum SWD System

28-FEB-08

ENVIRONMENTAL LAB OF

12600 West I-20 East Odessa, Texas 79765

Texas certification numbers:
Houston, TX T104704215

Florida certification numbers:
Houston, TX E871002 - Miami, FL E86678 - Tampa, FL E86675
Norcross(Atlanta), GA E87429

South Carolina certification numbers:
Norcross(Atlanta), GA 98015

North Carolina certification numbers:
Norcross(Atlanta), GA 483

Houston - Dallas - San Antonio - Austin - Tampa - Miami - Latin America
Midland - Corpus Christi - Atlanta

28-FEB-08

Project Manager: **Kristin Pope**
Rice Operating Co.
122 West Taylor
Hobbs, NM 88240

Reference: XENCO Report No: **298154**
Vacuum F-31-1 Junction Box
Project Address: T17S, R35E, Sec 31, Unit Letter F

Kristin Pope:

We are reporting to you the results of the analyses performed on the samples received under the project name referenced above and identified with the XENCO Report Number 298154. All results being reported under this Report Number apply to the samples analyzed and properly identified with a Laboratory ID number. Subcontracted analyses are identified in this report with either the NELAC certification number of the subcontract lab in the analyst ID field, or the complete subcontracted report attached to this report.

Unless otherwise noted in a Case Narrative, all data reported in this Analytical Report are in compliance with NELAC standards. Estimation of data uncertainty for this report is found in the quality control section of this report unless otherwise noted. Should insufficient sample be provided to the laboratory to meet the method and NELAC Matrix Duplicate and Matrix Spike requirements, then the data will be analyzed, evaluated and reported using all other available quality control measures.

The validity and integrity of this report will remain intact as long as it is accompanied by this letter and reproduced in full, unless written approval is granted by XENCO Laboratories. This report will be filed for at least 5 years in our archives after which time it will be destroyed without further notice, unless otherwise arranged with you. The samples received, and described as recorded in Report No. 298154 will be filed for 60 days, and after that time they will be properly disposed without further notice, unless otherwise arranged with you. We reserve the right to return to you any unused samples, extracts or solutions related to them if we consider so necessary (e.g., samples identified as hazardous waste, sample sizes exceeding analytical standard practices, controlled substances under regulated protocols, etc).

We thank you for selecting XENCO Laboratories to serve your analytical needs. If you have any questions concerning this report, please feel free to contact us at any time.

Respectfully,

Brent Barron, II
Odessa Laboratory Manager

Sample Cross Reference 298154

Rice Operating Co., Hobbs, NM

Vacuum F-31-1 Junction Box

Sample Id	Matrix	Date Collected	Sample Depth	Lab Sample Id
SB-1	S	Feb-19-08 14:59	15 - 17 ft	298154-001
SB-1	S	Feb-19-08 15:16	35 - 37 ft	298154-002
SB-2	S	Feb-19-08 15:44	15 - 15 ft	298154-003
SB-2	S	Feb-19-08 16:05	30 - 30 ft	298154-004
SB-3	S	Feb-20-08 08:56	10 - 10 ft	298154-005
SB-3	S	Feb-20-08 09:14	30 - 30 ft	298154-006
SB-4	S	Feb-20-08 09:36	10 - 10 ft	298154-007
SB-4	S	Feb-20-08 10:06	40 - 40 ft	298154-008
SB-5	S	Feb-20-08 10:29	15 - 15 ft	298154-009
SB-5	S	Feb-20-08 11:04	45 - 45 ft	298154-010
SB-6	S	Feb-20-08 13:41	10 - 10 ft	298154-011
SB-6	S	Feb-20-08 14:07	40 - 40 ft	298154-012

Certificate of Analysis Summary 298154

Rice Operating Co., Hobbs, NM

Project Name: Vacuum F-31-1 Junction Box

Project Id: Vacuum SWD System
Contact: Kristin Pope
Project Location: T17S, R35E, Sec 31, Unit Letter F

Date Received in Lab: Feb-22-08 10:20 am
Report Date: 28-FEB-08
Project Manager: Brent Barron, II

Analysis Requested	*Lab Id:*	298154-001		298154-002		298154-003		298154-004	
	Field Id:	SB-1		SB-1		SB-2		SB-2	
	Depth:	15-17 ft		35-37 ft		15-15 ft		30-30 ft	
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	Feb-19-08 14:59		Feb-19-08 15:16		Feb-19-08 15:44		Feb-19-08 16:05	
Anions by EPA 300/300.1	*Extracted:*								
	Analyzed:	Feb-23-08 10:52		Feb-23-08 10:52		Feb-23-08 10:52		Feb-23-08 10:52	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		293	6.19	77.3	5.26	2800	25.0	43.0	5.00
BTEX by SW 8260B	*Extracted:*	Feb-26-08 11:45		Feb-26-08 11:47					
	Analyzed:	Feb-26-08 14:47		Feb-26-08 15:09					
	Units/RL:	mg/kg	RL	mg/kg	RL				
Benzene		ND	0.0062	ND	0.0053				
Toluene		ND	0.0062	ND	0.0053				
Ethylbenzene		ND	0.0062	ND	0.0053				
m,p-Xylenes		ND	0.0124	ND	0.0105				
o-Xylene		ND	0.0062	ND	0.0053				
Naphthalene		ND	0.062	ND	0.053				
Total BTEX		ND		ND					
Total Xylenes		ND		ND					
Percent Moisture	*Extracted:*								
	Analyzed:	Feb-23-08 17:00		Feb-23-08 17:00					
	Units/RL:	%	RL	%	RL				
Percent Moisture		19.2		4.89					

Brent Barron
Odessa Laboratory Director

ENVIRONMENTAL LAB OF

Certificate of Analysis Summary 298154

Rice Operating Co., Hobbs, NM

Project Name: Vacuum F-31-1 Junction Box

Project Id: Vacuum SWD System
Contact: Kristin Pope
Project Location: T17S, R35E, Sec 31, Unit Letter F

Date Received in Lab: Feb-22-08 10:20 am
Report Date: 28-FEB-08
Project Manager: Brent Barron, II

Analysis Requested									
	Lab Id:	298154-005		298154-006		298154-007		298154-008	
	Field Id:	SB-3		SB-3		SB-4		SB-4	
	Depth:	10-10 ft		30-30 ft		10-10 ft		40-40 ft	
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	Feb-20-08 08:56		Feb-20-08 09:14		Feb-20-08 09:36		Feb-20-08 10:06	
Anions by EPA 300/300.1	*Extracted:*								
	Analyzed:	Feb-23-08 10:52		Feb-23-08 10:52		Feb-23-08 10:52		Feb-23-08 10:52	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		115	5.00	ND	5.00	3670	50.0	87.5	5.00

Brent Barron
Odessa Laboratory Director

Certificate of Analysis Summary 298154
Rice Operating Co., Hobbs, NM

Project Name: Vacuum F-31-1 Junction Box

Project Id: Vacuum SWD System
Contact: Kristin Pope
Project Location: T17S, R35E, Sec 31, Unit Letter F

Date Received in Lab: Feb-22-08 10:20 am
Report Date: 28-FEB-08
Project Manager: Brent Barron, II

Analysis Requested									
	Lab Id:	298154-009		298154-010		298154-011		298154-012	
	Field Id:	SB-5		SB-5		SB-6		SB-6	
	Depth:	15-15 ft		45-45 ft		10-10 ft		40-40 ft	
	Matrix:	SOIL		SOIL		SOIL		SOIL	
	Sampled:	Feb-20-08 10:29		Feb-20-08 11:04		Feb-20-08 13:41		Feb-20-08 14:07	
Anions by EPA 300/300.1	***Extracted:***								
	Analyzed:	Feb-26-08 08:28		Feb-26-08 08:28		Feb-26-08 08:28		Feb-26-08 08:28	
	Units/RL:	mg/kg	RL	mg/kg	RL	mg/kg	RL	mg/kg	RL
Chloride		5330	100	20.1	5.00	1010	10.0	ND	5.00

Brent Barron
Odessa Laboratory Director

Flagging Criteria

X In our quality control review of the data a QC deficiency was observed and flagged as noted. MS/MSD recoveries were found to be outside of the laboratory control limits due to possible matrix /chemical interference, or a concentration of target analyte high enough to effect the recovery of the spike concentration. This condition could also effect the relative percent difference in the MS/MSD.

B A target analyte or common laboratory contaminant was identified in the method blank. Its presence indicates possible field or laboratory contamination.

D The sample(s) were diluted due to targets detected over the highest point of the calibration curve, or due to matrix interference. Dilution factors are included in the final results. The result is from a diluted sample.

E The data exceeds the upper calibration limit; therefore, the concentration is reported as estimated.

F RPD exceeded lab control limits.

J The target analyte was positively identified below the MQL(PQL) and above the SQL(MDL).

U Analyte was not detected.

L The LCS data for this analytical batch was reported below the laboratory control limits for this analyte. The department supervisor and QA Director reviewed data. The samples were either reanalyzed or flagged as estimated concentrations.

H The LCS data for this analytical batch was reported above the laboratory control limits. Supporting QC Data were reviewed by the Department Supervisor and QA Director. Data were determined to be valid for reporting.

K Sample analyzed outside of recommended hold time.

* Outside XENCO'S scope of NELAC Accreditation

Form 2 - Surrogate Recoveries

Project Name: Vacuum F-31-1 Junction Box

Work Order #: 298154 **Project ID:** Vacuum SWD System

Lab Batch #: 715676 **Sample:** 298153-001 S / MS **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0569	0.0500	114	74-121	
Dibromofluoromethane	0.0526	0.0500	105	80-120	
1,2-Dichloroethane-D4	0.0485	0.0500	97	80-120	
Toluene-D8	0.0498	0.0500	100	81-117	

Lab Batch #: 715676 **Sample:** 298153-001 SD / MSD **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0502	0.0500	100	74-121	
Dibromofluoromethane	0.0504	0.0500	101	80-120	
1,2-Dichloroethane-D4	0.0494	0.0500	99	80-120	
Toluene-D8	0.0494	0.0500	99	81-117	

Lab Batch #: 715676 **Sample:** 298154-001 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0470	0.0500	94	74-121	
Dibromofluoromethane	0.0483	0.0500	97	80-120	
1,2-Dichloroethane-D4	0.0462	0.0500	92	80-120	
Toluene-D8	0.0489	0.0500	98	81-117	

Lab Batch #: 715676 **Sample:** 298154-002 / SMP **Batch:** 1 **Matrix:** Soil

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0505	0.0500	101	74-121	
Dibromofluoromethane	0.0494	0.0500	99	80-120	
1,2-Dichloroethane-D4	0.0526	0.0500	105	80-120	
Toluene-D8	0.0482	0.0500	96	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Form 2 - Surrogate Recoveries

Project Name: Vacuum F-31-1 Junction Box

Work Order #: 298154 **Project ID:** Vacuum SWD System

Lab Batch #: 715676 **Sample:** 505147-1-BKS / BKS **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0528	0.0500	106	74-121	
Dibromofluoromethane	0.0505	0.0500	101	80-120	
1,2-Dichloroethane-D4	0.0495	0.0500	99	80-120	
Toluene-D8	0.0485	0.0500	97	81-117	

Lab Batch #: 715676 **Sample:** 505147-1-BLK / BLK **Batch:** 1 **Matrix:** Solid

Units: mg/kg

BTEX by SW 8260B Analytes	SURROGATE RECOVERY STUDY Amount Found [A]	True Amount [B]	Recovery %R [D]	Control Limits %R	Flags
4-Bromofluorobenzene	0.0507	0.0500	101	74-121	
Dibromofluoromethane	0.0498	0.0500	100	80-120	
1,2-Dichloroethane-D4	0.0461	0.0500	92	80-120	
Toluene-D8	0.0479	0.0500	96	81-117	

** Surrogates outside limits; data and surrogates confirmed by reanalysis

*** Poor recoveries due to dilution

Surrogate Recovery [D] = 100 * A / B

All results are based on MDL and validated for QC purposes.

Blank Spike Recovery

Project Name: Vacuum F-31-1 Junction Box

Work Order #: 298154 **Project ID:** Vacuum SWD System

Lab Batch #: 715676 **Sample:** 505147-1-BKS **Matrix:** Solid
Date Analyzed: 02/26/2008 **Date Prepared:** 02/26/2008 **Analyst:** KHM
Reporting Units: mg/kg **Batch #:** 1

BTEX by SW 8260B Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
		BLANK /BLANK SPIKE RECOVERY STUDY				
Benzene	ND	0.0500	0.0486	97	66-142	
Toluene	ND	0.0500	0.0504	101	59-139	
Ethylbenzene	ND	0.0500	0.0462	92	75-125	
m,p-Xylenes	ND	0.1000	0.0957	96	75-125	
o-Xylene	ND	0.0500	0.0476	95	75-125	

Lab Batch #: 715578 **Sample:** 715578-1-BKS **Matrix:** Solid
Date Analyzed: 02/23/2008 **Date Prepared:** 02/23/2008 **Analyst:** IRO
Reporting Units: mg/kg **Batch #:** 1

Anions by EPA 300/300.1 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
		BLANK /BLANK SPIKE RECOVERY STUDY				
Chloride	ND	10.0	9.95	100	75-125	

Lab Batch #: 715635 **Sample:** 715635-1-BKS **Matrix:** Solid
Date Analyzed: 02/26/2008 **Date Prepared:** 02/26/2008 **Analyst:** IRO
Reporting Units: mg/kg **Batch #:** 1

Anions by EPA 300/300.1 Analytes	Blank Result [A]	Spike Added [B]	Blank Spike Result [C]	Blank Spike %R [D]	Control Limits %R	Flags
		BLANK /BLANK SPIKE RECOVERY STUDY				
Chloride	ND	10.0	9.64	96	75-125	

Blank Spike Recovery [D] = 100*[C]/[B]
All results are based on MDL and validated for QC purposes.

Form 3 - MS Recoveries

Project Name: Vacuum F-31-1 Junction Box

Work Order #: 298154

Lab Batch #: 715578 **Project ID:** Vacuum SWD System

Date Analyzed: 02/23/2008 **Date Prepared:** 02/23/2008 **Analyst:** IRO

QC- Sample ID: 298134-001 S **Batch #:** 1 **Matrix:** Soil

Reporting Units: mg/kg

MATRIX / MATRIX SPIKE RECOVERY STUDY						
Inorganic Anions by EPA 300 **Analytes**	**Parent Sample Result [A]**	**Spike Added [B]**	**Spiked Sample Result [C]**	**%R [D]**	**Control Limits %R**	**Flag**
Chloride	987	210	1120	63	75-125	X

Lab Batch #: 715635

Date Analyzed: 02/26/2008 **Date Prepared:** 02/26/2008 **Analyst:** IRO

QC- Sample ID: 298154-009 S **Batch #:** 1 **Matrix:** Soil

Reporting Units: mg/kg

MATRIX / MATRIX SPIKE RECOVERY STUDY						
Inorganic Anions by EPA 300 **Analytes**	**Parent Sample Result [A]**	**Spike Added [B]**	**Spiked Sample Result [C]**	**%R [D]**	**Control Limits %R**	**Flag**
Chloride	5330	2000	7690	118	75-125	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference [E] = 200*(C-A)/(C+B)
All Results are based on MDL and Validated for QC Purposes

ENVIRONMENTAL LAB OF

Form 3 - MS / MSD Recoveries

Project Name: Vacuum F-31-1 Junction Box

ACCREDITED IN ACCORDANCE WITH nelac

Work Order # : 298154 **Project ID:** Vacuum SWD System

Lab Batch ID: 715676 **QC- Sample ID:** 298153-001 S **Batch #:** 1 **Matrix:** Soil

Date Analyzed: 02/26/2008 **Date Prepared:** 02/26/2008 **Analyst:** KHM

Reporting Units: mg/kg

BTEX by SW 8260B	MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY STUDY										
Analytes	**Parent Sample Result [A]**	**Spike Added [B]**	**Spiked Sample Result [C]**	**Spiked Sample %R [D]**	**Spike Added [E]**	***Duplicate* Spiked Sample Result [F]**	***Spiked* Dup. %R [G]**	**RPD %**	***Control* Limits %R**	**Control Limits %RPD**	**Flag**
Benzene	ND	0.2904	0.2849	98	0.2846	0.2811	99	1	66-142	25	
Toluene	0.0057	0.2904	0.2904	98	0.2846	0.2847	98	0	59-139	25	
Ethylbenzene	ND	0.2904	0.2846	98	0.2846	0.2783	98	0	75-125	25	
m,p-Xylenes	ND	0.5808	0.5793	100	0.5692	0.5433	95	5	75-125	25	
o-Xylene	ND	0.2904	0.2833	98	0.2846	0.2709	95	3	75-125	25	

Matrix Spike Percent Recovery [D] = 100*(C-A)/B
Relative Percent Difference RPD = 200*(D-G)/(D+G)

Matrix Spike Duplicate Percent Recovery [G] = 100*(F-A)/E

ND = Not Detected, J = Present Below Reporting Limit, B = Present in Blank, NR = Not Requested, I = Interference, NA = Not ApplicableN = See Narrative, EQL = Estimated Quantitation Limit

Sample Duplicate Recovery

Project Name: Vacuum F-31-1 Junction Box

Work Order #: 298154

Lab Batch #: 715578 **Project ID:** Vacuum SWD System
Date Analyzed: 02/23/2008 **Date Prepared:** 02/23/2008 **Analyst:** IRO
QC- Sample ID: 298134-001 D **Batch #:** 1 **Matrix:** Soil
Reporting Units: mg/kg

Anions by EPA 300/300.1	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	987	991	0	20	

Lab Batch #: 715635
Date Analyzed: 02/26/2008 **Date Prepared:** 02/26/2008 **Analyst:** IRO
QC- Sample ID: 298154-009 D **Batch #:** 1 **Matrix:** Soil
Reporting Units: mg/kg

Anions by EPA 300/300.1	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Chloride	5330	5060	5	20	

Lab Batch #: 715411
Date Analyzed: 02/23/2008 **Date Prepared:** 02/23/2008 **Analyst:** WRU
QC- Sample ID: 298133-001 D **Batch #:** 1 **Matrix:** Sludge
Reporting Units: %

Percent Moisture	SAMPLE / SAMPLE DUPLICATE RECOVERY				
Analyte	Parent Sample Result [A]	Sample Duplicate Result [B]	RPD	Control Limits %RPD	Flag
Percent Moisture	45.6	45.7	0	20	

Spike Relative Difference RPD 200 * | (B-A)/(B+A) |
All Results are based on MDL and validated for QC purposes.

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
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: dale@rthicksconsult.com, Lweinheimer@riceswd.com,and kpope@riceswd.com
Sampler Signature: Dale T. Littlejohn

Project Name: Vacuum F-31-1 Junction Box
Project #: Vacuum SWD System
Project Location: T17S, R35E, Sec 31, Unit Letter F
ROC Billing Code

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	HNO3	HCl	NaOH	H2SO4	None	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-N (EPA 8260)	RCI	N.O.R.M.	Total Dissolved Solids	Chloride	Moisture Percent	RUSH TAT (Pre-Schedule)	Standard TAT
298154			Begin (ft)	End (ft)																												
-01		SB-1	15.0	17.0	2/19/08	1459	1	X									X								X				X			X
-02		SB-1	35.0	37.0	2/19/08	1516	1	X									X								X				X			X
-03		SB-2	15.0	15.0	2/19/08	1544	1	X									X												X			X
-04		SB-2	30.0	30.0	2/19/08	1605	1	X									X												X			X
-05		SB-3	10.0	10.0	2/20/08	0856	1	X									X												X			X
-06		SB-3	30.0	30.0	2/20/08	0914	1	X									X												X			X
-07		SB-4	10.0	10.0	2/20/08	0936	1	X									X												X			X
-08		SB-4	40.0	40.0	2/20/08	1006	1	X									X												X			X
-09		SB-5	15.0	15.0	2/20/08	1029	1	X									X												X			X
-10		SB-5	45.0	45.0	2/20/08	1104	1	X									X												X			X

Special Instruction

Sample Containers intact? Y N
Temperature Upon Receipt: -2.6
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Dale T. Littlejohn	2/22/08	10:20			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Andrea Fenn	2.22.08	10:20

4oz glass w/ seal on cooler

Environmental Lab of Texas

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CHAIN OF CUSTODY RECORD AND ANALYSIS REQUEST

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Project Name: Vacuum F-31-1 Junction Box
Project #: Vacuum SWD System
Project Location: T17S, R35E, Sec 31, Unit Letter F
ROC Billing Code

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)	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-H (EPA 8260)	RCI	N.O.R.M.	Total Dissolved Solids	Chloride	Moisture Percent	RUSH TAT (Pre-Schedule)	Standard TAT
298154																																
-11		SB-6	10.0	10.0	2/20/08	1341	1	X									X												X		X	X
-12		SB-6	40.0	40.0	2/20/08	1407	1	X									X												X		X	X

Special Instruction

Sample Containers Intact? Y N
Temperature Upon Receipt: -2.0
Laboratory Comments:

Relinquished by:	Date	Time	Received by:	Date	Time
Dale T. Littlejohn	2/22/08	16:10			
Relinquished by:	Date	Time	Received by ELOT:	Date	Time
			Andrea Law	2.22.08	16:20

4 oz glass w/ seal on cooler
2-22-08

Environmental Lab of Texas

Variance/ Corrective Action Report- Sample Log-In

Client: Rice

Date/ Time: 2.22.08 10:20

Lab ID # : 298154

Initials: AL

Sample Receipt Checklist

					Client Initials
#1	Temperature of container/ cooler?	Yes	No	-2.0 °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	Subcontract of sample(s)?	Yes	No	Not Applicable	
#20	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

ATTACHMENT D

Summary Description of the Vadose Zone Screening Tool Model

R. T. HICKS CONSULTANTS, LTD. ATTACHMENT D
901 Rio Grande Blvd NW ▲ Suite F-142 ▲ Albuquerque, NM 87104 ▲ 505.266.5004 ▲ Fax: 505.266-0745

Summary Description of the Vadose Zone Screening Tool Model

The screening tool predicts the impact to ground water from a surface release of brine. The tool uses the HYDRUS-1D model to simulate gravity-driven vertical water flow through the vadose zone. The calculated chloride flux to ground water is the input to a simple ground water mixing model. The output of the mixing model is a predicted chloride concentration in ground water down gradient of the affected area as would be observed in a monitoring or supply well at or near the location.

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) which describes the techniques employed in the screening model.

HYDRUS 1-D INPUTS

Climate – Weather data used in calculation of the initial condition and the predictive modeling was from the Pearl, New Mexico weather station, located approximately 15 miles west of the city of Hobbs, New Mexico. This station has an excellent database of daily weather conditions that are used in the HYDRUS-1D model (e.g. precipitation, temperature, wind speed, etc.). Although the weather on a given day in Roswell, New Mexico may be different from Midland, Texas, the climate in the Permian Basin of New Mexico and Texas is similar. . The weather data spans the 46. 5 year period from July, 1946 to December, 1992,

HYDRUS-1D can also employ a uniform yearly infiltration rate that will obviously smooth the temporal variations that may be caused by a strong El Nino event during a week in July or August. Because the daily atmospheric data are of high quality for Pearl, we have elected to allow the screening tool to predict the deep percolation rate and the resultant variable flux to ground water using actual (non-smoothed data). This choice results in higher predicted peak chloride concentrations in ground water due to temporally variable high fluxes from the vadose zone than would be predicted by an averaged infiltration rate. Where depth to ground water is greater than 30 feet in this climate, using the uniform annual infiltration rate may provide more realistic results. However using daily weather data is conservative of ground water quality as it overestimates any impact.

Initial Soil Moisture - Because soils are relatively dry in this climate and vadose zone hydraulic conductivity varies with moisture content, it is important that simulations start with representative soil moisture content. In the absence of site-specific data, 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. For simulations in the Permian Basin, only minimal changes in the HYDRUS-1D soil moisture content profile occurred after year 15 of the initial condition calculation, therefore, 46.5 years (1 cycle of the weather data) was considered sufficient to establish an initial moisture condition for the screening tool.

Input for a Distant Well – In addition to predicting the chloride concentration for a monitoring well located adjacent to the spill area, the screening tool allows for a prediction of a second well located at a specified distance from the spill in the down gradient direction. This can be utilized to determine the potential threat to an actual water well or a compliance monitoring well located down gradient from the release site.

Background Chloride Concentration in Aquifer – If an actual measured chloride concentration from a near-by well is not available then a background concentration of no less than 50 mg/L generally reflects regional conditions.

Aquifer Porosity – If an actual measured value is not available, a conservative estimate of 0.25 to 0.30 is generally acceptable.

Groundwater Table Depth – Published information on depth to ground water is readily available in the Permian Basin if no site specific data is available.

Aquifer Thickness - The thickness of the mixing zone is an important variable in the model. In the Ogallala Aquifer, which is the water table aquifer throughout much of the Permian Basin of Texas and New Mexico, several case studies show that chloride is distributed throughout the upper 20-50 feet saturated zone down gradient of a release site. At some sites, the nature of the release could cause brine to behave as a dense non-aqueous phase liquid, which could concentrate chloride in the lowermost 10-feet of a thin aquifer. In the absence of site-specific hydrogeologic data, use of the screen length of nearby supply wells is a reasonable choice for the aquifer thickness (mixing zone) input to the model.

Slope of the Water Table – If actual hydraulic gradient data from a nearby site or published information is not available then the slope of the water table is assumed to be approximately parallel to the topography.

Hydraulic Conductivity – If a measured hydraulic conductivity of the saturated zone at the release site is not available then a published value from Freeze and Cherry (1979) or Musharrafieh and Chudnoff (1999) is an acceptable choice.

Groundwater Flux – This is a calculated value based on the aquifer thickness, slope of the water table, and the hydraulic conductivity.

Chloride Load –This input parameter is very important. An estimate of the chloride load (weight/area) can be calculated from the analyses of soil boring samples recovered at the source area of the site multiplied by the bulk moisture and the vertical thickness interval of each sample. The result is the chloride load for the vadose zone profile, from the surface to the ground water depth.

The Hydrus 1-D screening tool model initial condition assumes that the release was a single, instantaneous event that saturated the upper half meter of the vadose zone with produced water, like a pipeline rupture. The chloride concentration of the produced water is set such

that the mass of chloride within the volume of produced water matches the chloride mass calculated from the soil samples. In order to apply the screening tool to a historic spill or other release event, the user must match the vadose zone chloride profile observed in the field to a vadose zone profile generated by the model. In most cases, the user can identify a match between the field data and a generated profile that is several years after time zero of the model. If the screening tool cannot generate an acceptable profile match, a site-specific HYDRUS-1D model with input data that provides a better match than the drop-down menu choices allowed for the screening tool.

Max. Length of the Spill in the Direction of GW Flow - If the exact direction of ground water flow is not known, this value is taken as the maximum dimension of the site.

Plant Uptake Trigger – The screening tool allows for an adjustment to be made in the natural infiltration rate based on the likelihood of vegetation being re-established at the site. Brine spills will often kill vegetation and sites without vegetation allow a higher infiltration rate than sites with vegetation. Over time, the salinity of a relatively porous soil, such as medium-grained sand, will decrease and vegetation will return. The screening tool permits vegetation to return to a spill site when the chloride concentration decreases by to 10% or 1% of the initial concentration. For most sites, vegetation will return when chloride concentrations in soil are 500 mg/kg or less.

Surface Layer and Soil Profile - The screening tool allows for several conservative surface and sub-surface soil types to be utilized based on conditions observed during the installation of soil borings at the site. The texture of the surface layer (the upper meter of the unsaturated zone) is very important. Fine-grained surface soils will prevent infiltration – which is good for the protection of ground water after a surface spill but hinders the natural flushing of salt from the root zone. Coarse-grained soils, such as sand, allow infiltration but natural re-vegetation of such a site can occur after several years, rather than decades for a fine-grained soil.

The screening tool cannot simulate placement of imported fine-grained soil onto a site, which is a common engineered remedy to enhance re-vegetation and to protect ground water by lowering natural infiltration.

Screening Tool (HYDRUS 1-D) OUTPUT CHARTS

The screening tool generates two types of charts. One presents the predicted constituent property profiles in the vadose zone (Quantity 1) and the second predicts ground water quality (Quantity 2) in a down gradient well.

The vadose zone profile chart can display the following constituent properties:

- water content,
- chloride concentration in the soil-water, and
- chloride concentrations of the soil using colored lines to represent future years.

Chloride concentrations in the soil are useful for calibrating the chloride load of the model to actual conditions determined by characterization samples.

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

or down gradient from the release site. 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 a hypothetical monitoring well located at the down gradient edge of the mixing cell (the edge of the release site) or another down gradient location of the users choosing. In addition to the predicted future ground water concentration, the predicted water and chloride flux can also be displayed.