1R - 426-153

WORKPLANS

DATE:
5-21-08

ARCADIS

Infrastructure, buildings, environment, communications

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Ed Hansen
New Mexico Oil Conservation Division
1220 So. Saint Francis Drive
Santa Fe, New Mexico 87505

Certified Mail Receipt No. 7002 2410 0001 5813 3616

Subject:
Investigation and Characterization Plan
Blinebry-Drinkard (BD) Junction N-32 Vent
T21S, R37E, Section 32, Unit N, Eunice, Lea County, New Mexico

Date:
May 21, 2008

Contact:
Sharon Hall

Phone:
432 687-5400

Email:
shall@arcadis-us.com

Dear Mr. Hansen,

RICE Operating Company (ROC) has retained ARCADIS U.S., Inc. to address potential environmental concerns at the above-referenced site. ROC is the service provider (agent) for the Blinebry-Drinkard (BD) SWD System and has no ownership of any portion of the pipeline, well, or facility. The System is owned by a consortium of oil producers, System Partners, who provide all operating capital on a percentage ownership/usage basis. Environmental projects of this magnitude require System Partner AFE approval and work begins as funds are received. In general, project funding is not forthcoming until NMOCD approves the work plan. Therefore, your timely review of this submission is requested.

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

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

Each site shall have three submissions or a combination of:

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

2. Upon evaluating 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.

On behalf of ROC, ARCADIS respectfully submits this ICP for the above-referenced site.

SITE HISTORY AND BACKGROUND

The site is located west of the town off Eunice, New Mexico (Figure 1). Elevated chlorides in this area have been reported since as early as 1952 (*Ground-Water Report 6, Geology and Ground-Water conditions in Southern Lea County,* Alexander Nicholson, Jr. and Alfred Clebsch, Jr.). The expected depth to groundwater at this site is approximately 100 feet below ground surface.

The junction was eliminated and replaced with a new junction box located 80 feet northeast of the former junction box location (Figure 2). Initial delineation began on August, 2007 and was completed on November 2, 2007. A backhoe was used to collect soil samples at one foot intervals to a depth of 12 feet below ground surface five, ten and fifteen feet north, south, east and west of the junction box locations. Soil samples were analyzed in the field for chlorides using field-adapted Method 9253 and screened in the field using a photoionization detector (PID). Field analytical results are shown in Table 1.

A backhoe was used to excavate soils from a an excavation around the former junction box measuring 30 feet by 30 feet by 12 feet deep. A four wall composite sample was collected from each of the four walls and five-point composite sample was collected from the bottom of the excavation and submitted to Cardinal Laboratories for gasoline range organics (GRO) and diesel range organics (DRO) and chloride analysis. Some elevated PID readings were observed near the source. DRO was detected at a concentration of 57.8 milligrams per kilogram (mg/kg) in the four-point composite wall sample and at a concentration of 36 mg/kg in the five point composite bottom sample. GRO was not detected. Field and Laboratory analytical results are summarized in Table 2.

Based on the results of the soil sampling analytical results, elevated chloride concentrations are present at the subject site (Figure 2).

The site was further excavated (40 feet by 45 feet by 5 feet deep along the perimeter) to allow for installation of a clay barrier in the 12 foot deep excavation. The excavated soils were blended on-site and returned to the excavation to a depth six feet below grade. A six-foot deep shelf extending five-feet from the north, south and west walls and ten-feet from the east wall was excavated to prepare the excavation for a clay barrier. A one-foot thick clay barrier was installed at a depth of 5 to 6 feet below ground surface. The clay layer was compacted to a dry density of 93.4% and 14% moisture. The remaining fill was used to backfill the excavation to ground surface and to contour the surrounding area. An identification plate was placed on the surface at the location of the former junction box to mark the presence of the clay liner.

A sample of the blended backfill material was submitted to Cardinal Laboratories for GRO, DRO and chloride analysis. GRO was detected at a concentration of 517 mg/kg and chlorides were detected at a concentration of 1,090 mg/kg.

To further investigate the depth of chloride impacts a soil boring (SB-1) was installed to a depth of 90 feet below ground surface at a location five-feet north of the former junction box. Soil samples were collected every five-feet and analyzed in the field for chlorides using field-adapted Method 9253 and screened in the field using a PID. One sample, collected from a depth of 90 feet below ground surface was submitted to Cardinal Laboratories and analyzed for chlorides. Laboratory analysis confirms the presence of an elevated chloride concentration (1,296 mg/kg) at a depth of 90 feet below ground surface.

ROC disclosed potential groundwater impact at the site to New Mexico Oil Conservation Division (NMOCD) via e-mail on December 6, 2007. A disclosure report was submitted to NMOCD with all of the ROC 2007 Junction Box Reports in March 2008 per the ROC Junction Box Upgrade Workplan.

INVESTIGATION AND CHARACTERIZATION PLAN

As discussed above existing site data suggest a potential for impairment of ground water quality. Therefore the work elements described below are designed to assist ROC in selecting an appropriate vadose zone remedy and, if necessary, a ground water remedy.

Task 1- Collect Regional Hydrogeologic Data

Chloride impacted regional groundwater has been reported in this area near the towns of Eunice and Monument since as early as 1952 (Groundwater Report 6, Geology and Ground-Water Conditions in Southern Lea County , New Mexico, Nicholson and Clebsch, United States Geological Survey).

A one-half mile water well inventory will be performed. The water well inventory will include a review of water well records listed on the New Mexico State Engineer Office and United States Geological Survey (USGS) websites and windmills indicated on applicable USGS topographic maps.

Task 2- Evaluate Concentrations of Constituents of Concern in Soil and Groundwater

One 2- inch monitor well will be installed at the site (Figure 3). The monitor well will be constructed of Schedule 40 PVC blank and the well screen will consist of Schedule 40 PVC with 0.020 inch slots. 15 feet of well screen will be installed, 5 feet above the groundwater table and 10 foot below. During the installation of the monitor well soil samples will be collected at regular intervals no greater than five feet, screened in the field using a photo

ionization detector (PID) and field tested for chlorides. Soil lithology and the presence of any observed staining or odor will be recorded. Representative select samples will be submitted to a laboratory for analysis as confirmation of the field sampling.
The monitor well will be constructed, developed and sampled in accordance with Environmental Protection Agency and NMOCD standards. A groundwater sample will be collected and submitted for laboratory analysis for chlorides, BTEX and general chemistry.

If analytical results indicate that chloride and/or BTEX concentrations in groundwater exceed New Mexico Water Quality Control Commission standards, additional monitoring wells may be installed as warranted by the results of the investigation.

Additional soil borings will be used to evaluate soil impacts. Soil borings will be installed in the approximate locations shown in Figure 3 in order to delineate the lateral extent of impacts to soil. Soil samples will be collected at regular intervals no greater than five feet, screened in the field using a photo ionization detector (PID) and field tested for chlorides. Soil lithology and the presence of any observed staining or odor will be recorded. Representative select samples will be submitted to a laboratory for laboratory analysis as confirmation of the field sampling.

Task 3 Evaluate Potential Flux from the Vadose Zone to Ground Water

The information gathered from Tasks 1 and 2 will be evaluated and utilized to design a groundwater remedy, if needed. The ground water remedy that offers the greatest environmental benefit while causing the least environmental impairment will be selected. If the evaluation demonstrates that residual constituents pose no threat to ground water quality, only a surface restoration plan protective of groundwater will be proposed. Such recommendations and findings will be presented to NMOCD in a subsequent Corrective Action Plan (CAP). When evaluating any proposed remedy or investigative work, ROC will confirm that there is a reasonable relationship between the benefits created by the proposed remedy or assessment and the economic and social costs.

A report that details the investigation activities and results will be submitted to the OCD. The report will include recommendations for further action (CAP) if necessary or for closure of the site.

The surface landowner is anxious to proceed with this investigation. Therefore, your prompt approval will be appreciated.

Very Truly Yours,

ARCADIS U.S, Inc.

Sharon E. Hall
Associate Vice President

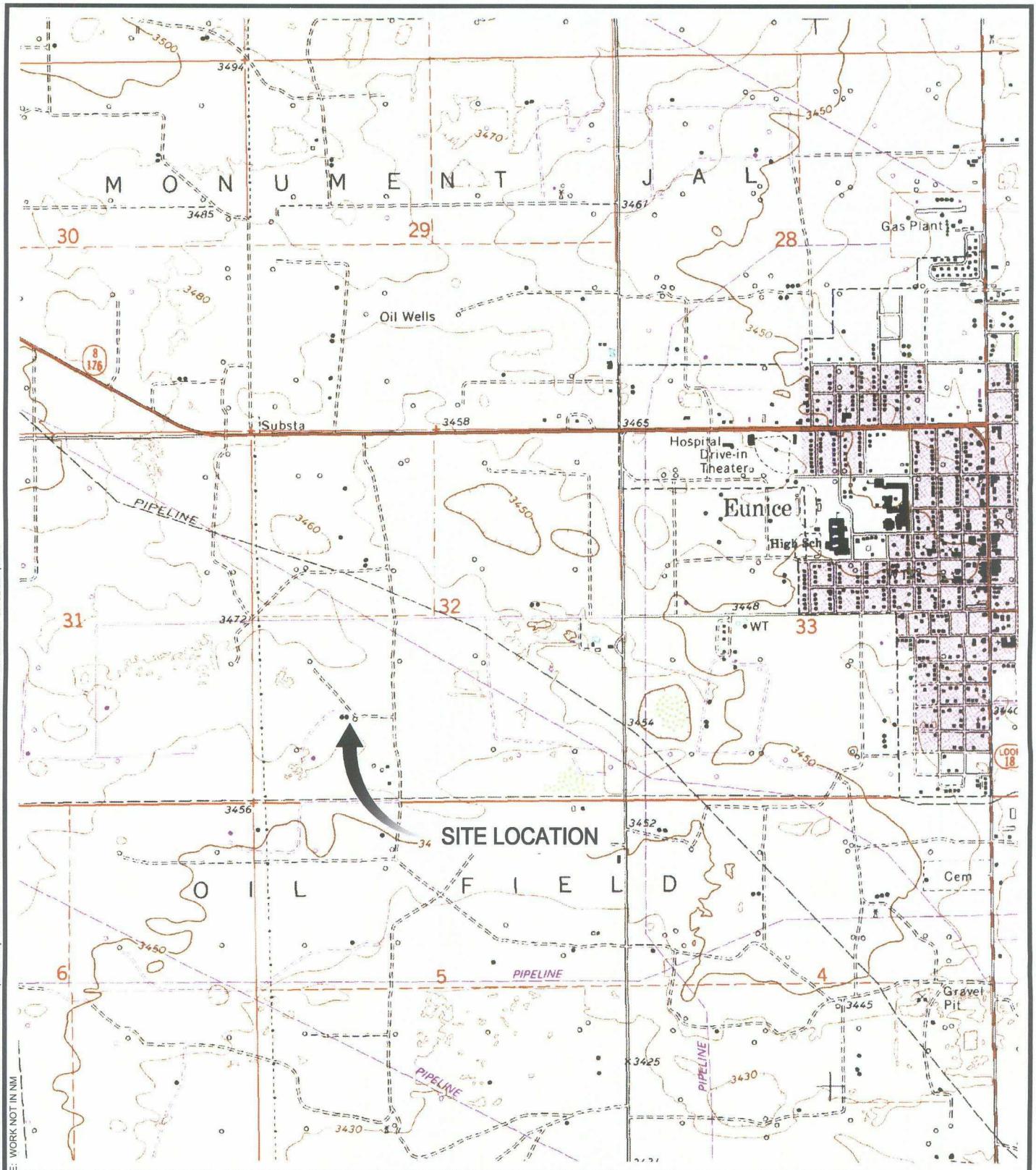
Copies:
Kristin Pope- Rice Operating Company

Attachments:

Figures 1, 2 and 3

Disclosure report with field sampling results

Data tables 1 and 2 .



SOURCE: U.S. GEOLOGICAL SURVEY 7½ MINUTE TOPOGRAPHIC SERIES, EUNICE, NEW MEXICO QUADRANGLE, PUBLISHED 1979.

0 2000' 4000'

APPROXIMATE SCALE: 1" = 2000'

RICE OPERATING COMPANY
LEA COUNTY, NEW MEXICO

BLINEBRY-DRINKARD (BD) N-32 VENT INVESTIGATION AND CHARACTERIZATION PLAN

SITE LOCATION MAP

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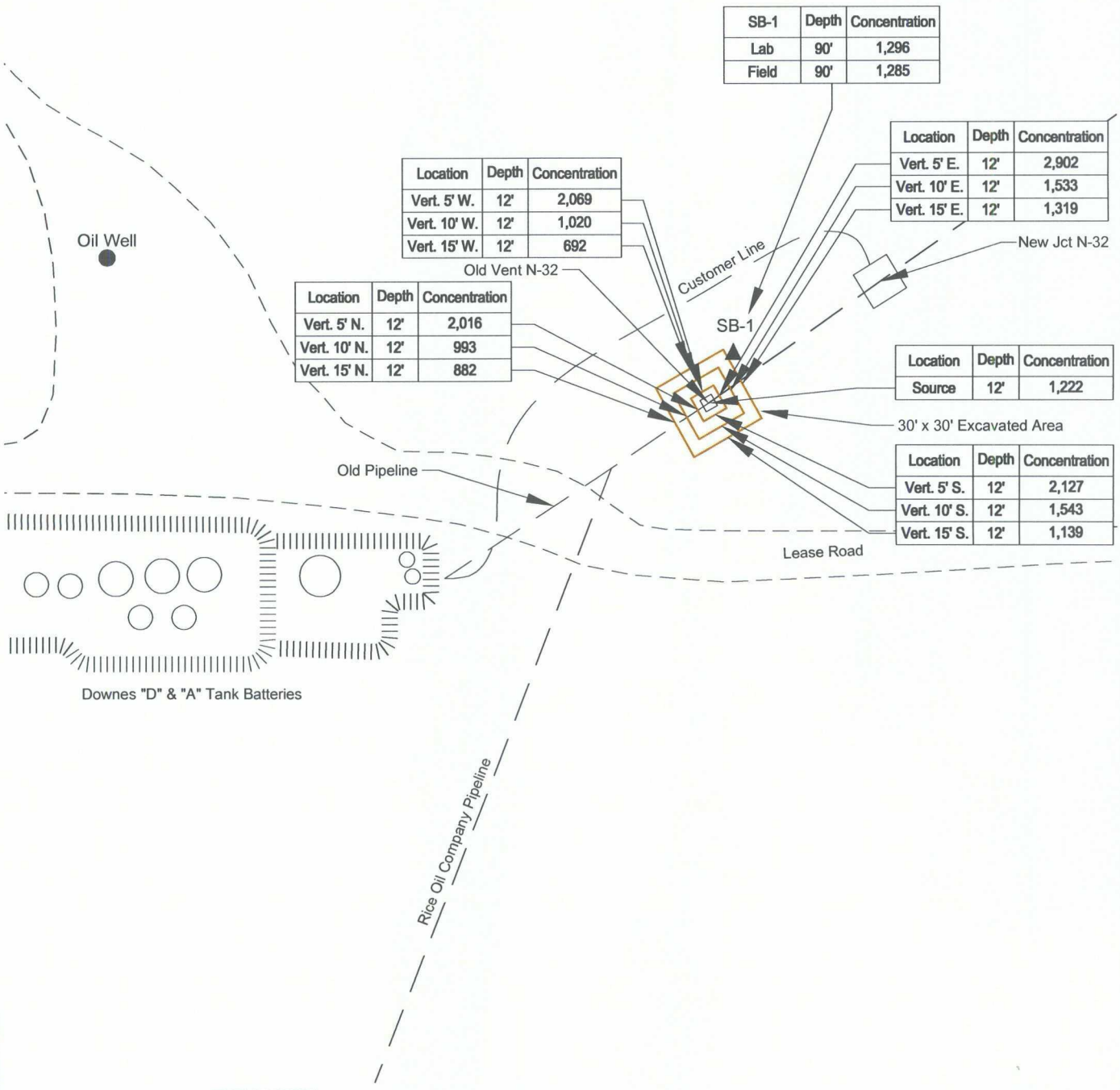
FIGURE 1

CITY: MIDLAND TX DIV/GROUP: ENV DB: HC LD: HC PIC: PM: SH TM: SH LYR: ON=*;OFF=*REF* UN:
G:\CAD\ACTMT00101950001\0000101\DWG\0101950801.DWG LAYOUT: 1 SAVED: 5/22/2008 10:30 AM ACADVER: 18.2S (LMS TECH) PAGESETUP: — PLOTSTYLETABLE: AGANDM.CTB PLOTTED: 5/22/2008 10:33 AM BY: CLARDY, HERB
XREFS: Basemap
IMAGES: o3210302.tif
PROJECTNAME: WORK NOT IN NM



RICE OPERATING COMPANY
LEA COUNTY, NEW MEXICO

BLINEBRY-DRINKARD (BD) N-32 VENT INVESTIGATION AND CHARACTERIZATION PLAN

CHLORIDE CONCENTRATIONS MILLIGRAMS PER KILOGRAM (mg/kg)

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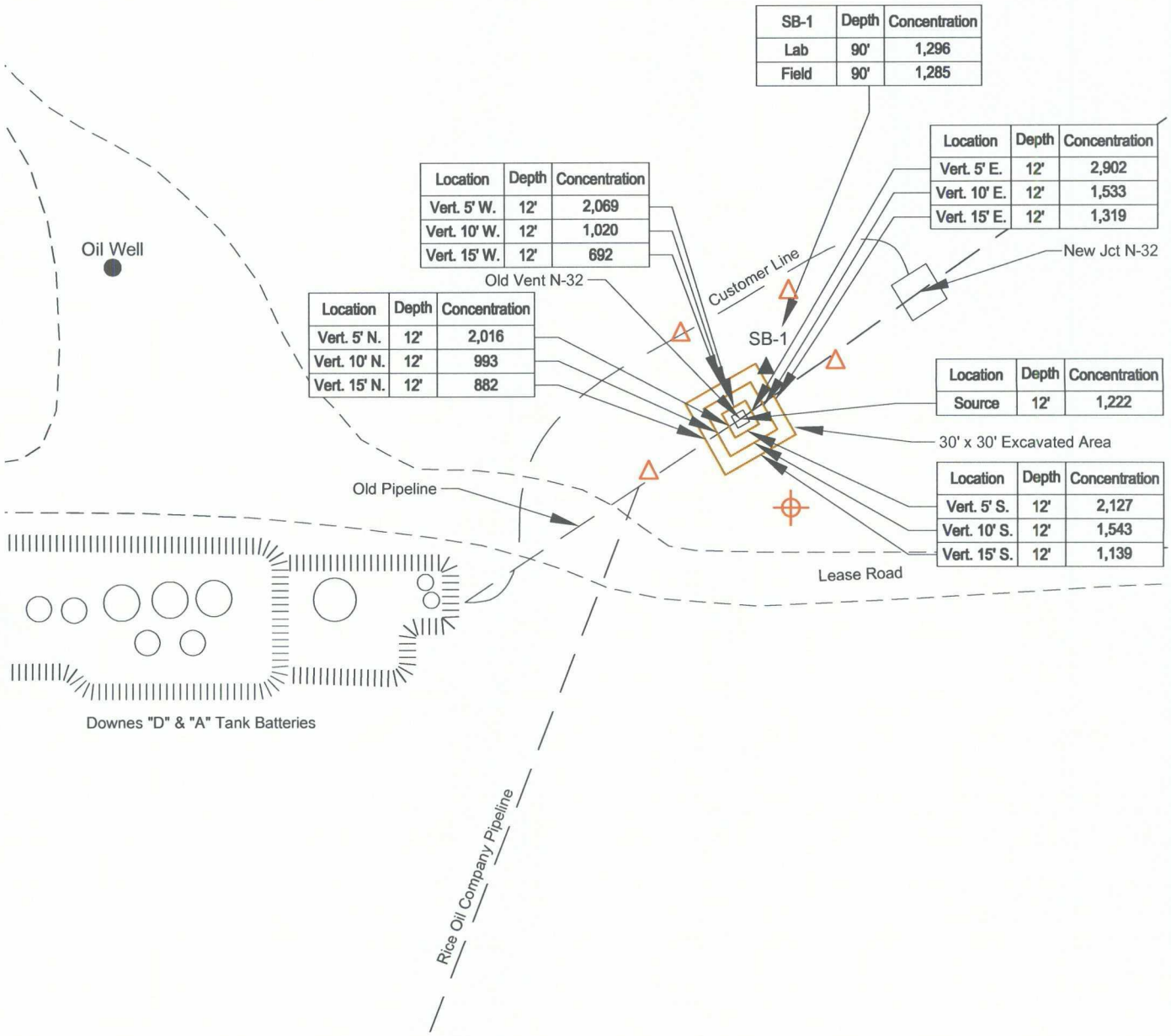
FIGURE 2



EXPLANATION

- SOIL BORING LOCATION
- OIL WELL LOCATION
- PROPOSED SOIL BORING
- PROPOSED MONITOR WELL
- PIPELINE TRACE
- LEASE ROADS
- BERMED AREAS

TABLES SHOW CHLORIDE CONCENTRATIONS
IN MILLIGRAMS PER KILOGRAM (mg/kg)

0 60' 120'

APPROXIMATE SCALE: 1" = 60'

RICE OPERATING COMPANY
LEA COUNTY, NEW MEXICO

BLINEBRY-DRINKARD (BD) N-32 VENT INVESTIGATION AND CHARACTERIZATION PLAN

PROPOSED SOIL BORING AND MONITOR WELL LOCATIONS

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FIGURE 3

RICE OPERATING COMPANY
JUNCTION BOX DISCLOSURE* REPORT

BOX LOCATION

SWD SYSTEM	JUNCTION	UNIT	SECTION	TOWNSHIP	RANGE	COUNTY	NEW BOX DIMENSIONS - FEET		
							Length	Width	Depth
Blinebry-Drinkard (BD)	N-32 vent	N	32	21S	37E	Lea	moved 80 ft northeast		

LAND TYPE: BLM _____ STATE _____ FEE LANDOWNER G.P. Sims OTHER _____

Depth to Groundwater 99 feet NMOCD SITE ASSESSMENT RANKING SCORE: 40 *

Date Started 8/8/2007 Date Completed 11/2/2007 NMOCD Witness no

Soil Excavated 566 cubic yards Excavation Length 45 Width 40 Depth 5-12 feet

Soil Disposed 0 cubic yards Offsite Facility n/a Location n/a

FINAL ANALYTICAL RESULTS: **Sample Date** 10/11/2007, 10/12/2007, 11/2/2007 **Sample Depth** 12, 90 ft

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

Sample Location	Benzene mg/kg	Toluene mg/kg	Ethyl Benzene mg/kg	Total Xylenes mg/kg	GRO mg/kg	DRO mg/kg	Chlorides mg/kg
4-WALL COMP.	<0.001	<0.001	0.011	0.01	<10.0	57.8	688
BOTTOM COMP.	PID = 8.8 (field reading)				<10.0	36	2400
BACKFILL	PID = 20.1 (field reading)				<10.0	517	1090
SOIL BORING grab							1296

General Description of Remedial Action:

This junction was moved 80 ft northeast as part of the pipeline replacement program. After the box was removed from the former junction site, a backhoe was used to collect soil samples at regular intervals to produce a 30 x 30 x 12 ft deep excavation. Chloride field tests were conducted on each sample and concentrations did not relent with depth. Organic vapors were also measured on each sample. Composite samples were collected from the excavation floor and walls for laboratory analysis. The excavated soil was blended on site and returned to the excavation up to 6 ft below ground surface. A 6-ft-deep shelf was excavated extending 5 ft out from the north, south, and west walls and 10 ft out from the east wall to prepare the surface for a clay barrier. At 6-5 ft BGS, a 1-ft-thick clay barrier was installed. The remaining fill was used to backfill the 45 x 40 x 5 ft excavation to ground surface and to contour to the surrounding area. An identification plate was placed on the surface at the former junction site to mark the presence of the clay below. NMOCD was notified of potential groundwater impact at this site on 10/18/2007. To further investigate depth of chloride presence, a soil boring was initiated on 11/2/2007 at 5 ft north of the former junction. The boring was advanced to 90 ft BGS while soil samples were collected every 5 ft and tested for chloride concentrations. The 90 ft sample was analyzed at a commercial laboratory for chloride and confirmed an elevated concentration. The entire borehole was plugged with bentonite to ground surface. The consultants of Arcadis of Midland, Texas have been assigned to this project.

** Two inactive private livestock wells are located within 1000 ft southeast of this site.*

enclosures: photos, excavation plan view, cross-section, boring log, lab results, BTEX comparison table, PID screenings, clay test

CHLORIDE FIELD TESTS

LOCATION	DEPTH (ft)	ppm
4-wall comp.	n/a	976
bottom comp.	12	1708
backfill comp.	n/a	894
SOIL BORING 5 ft north of former junction 11/2/2007	15	1042
	20	968
	25	2102
	30	2960
	35	2449
	40	1368
	45	1883
	50	1393
	55	1405
	60	1437
	65	1349
	70	1315
	75	1505
	80	1412
	85	1247
	90	1285

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

SITE SUPERVISOR L. Bruce Baker SIGNATURE Larry Bruce Baker COMPANY RICE Operating Company

REPORT ASSEMBLED BY Kristin Farris Pope SIGNATURE Kristin Farris Pope

DATE 12/6/2007 TITLE Project Scientist

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

Table 1 - Field Delineation Results

N/S Delineation CL

Depth	15' S	10' S	5' S	Source	5' N	10' N	15' N
1'	230	259	150		272	247	286
2'	180	211	139		289	321	332
3'	260	621	1200		344	633	313
4'	276	840	2437	435	258	1399	780
5'	175	2017	2127	603	258	1932	457
6'	338	1748	2652	988	263	1162	625
7'	455	1287	2043	2529	1315	4401	1874
8'	1829	581	1234	4294	2903	2220	1433
9'	639	686	1283	5288	1112	903	784
10'	1587	1469	1239	2009	2015	589	1403
11'	1494	1226	1041	5244	2973	1160	701
12'	1139	1543	886	1222	2016	993	882

W/E Delineation CL

Depth	15' W	10' W	5' W	Source	5' E	10' E	15' E
1'	253	194	400		143	432	145
2'	299	148	660		260	213	306
3'	358	235	795		140	241	300
4'	437	355	1092	435	168	565	782
5'	256	257	3529	603	447	2806	1646
6'	290	268	3411	988	322	3048	3198
7'	432	1537	1723	2529	1490	2061	2779
8'	973	3690	2443	4294	4618	2264	2738
9'	1644	1835	2031	5288	2065	2972	3184
10'	551	2822	1051	2009	994	1976	1115
11'	598	1701	1389	5244	1848	1462	1554
12'	692	1020	2069	1222	2902	1533	1319

N/S Delineation PID

Depth	15' S	10' S	5' S	Source	5' N	10' N	15' N
1'	3.9	7.4	92.9		0.7	5.5	0
2'	131	8.8	65		0	0	0
3'	50.2	49.9	179		0	0.8	0
4'	7.3	195	582	32.9	27.7	863	455
5'	8.8	700	778	106	511	944	493
6'	0	584	1180	417	714	898	486
7'	0	316	860	892	754	512	204
8'	0	76.9	1227	928	367	209	163
9'	0	34.9	977	772	82.1	76.3	56.5
10'	0	22.5	1096	757	73.6	38.3	39.9
11'	0	24.2	478	1124	28.4	23.9	10.1
12'	0	106	292	333	18.5	23.3	13.1

W/E Delineation PID

Depth	15' W	10' W	5' W	Source	5' E	10' E	15' E
1'	16.3	8.9	44.5		29.9	4.6	2.3
2'	7.7	7.8	80.3		23	3.5	0
3'	5.3	5.4	768		77.4	13.1	0
4'	3.4	7.8	875	32.9	49.3	67.1	11.4
5'	2.3	6.5	685	106	622	22.6	0
6'	1.5	6.6	846	417	902	377	0
7'	4.6	6.1	718	892	1116	162	0
8'	2.5	4.6	891	928	1183	29.1	0
9'	2.5	6.2	1116	772	908	14.7	0
10'	1.9	3.3	929	757	1079	10.1	0
11'	6.5	5.3	202	1124	1341	11.8	0
12'	2.5	2.6	118	333	790	13.6	0

Table 2- Field and Laboratory Results - Excavation and Backfill Sampling

Test		Field			Lab Results		
		CL	PID		CL	DRO	GRO
Wall Composite Samples	N	834	170				
	S	873	23.5				
	E	989	12.6				
	W	772	8.3				
4 Wall Composite 30 x 30		**976**	**106**		**688**	**57.8**	**<10**
Blended Backfill		**894**	**20.1**		**1090**	**517**	**<10**
Bottom Samples	1	1353					
	2	1311					
	3	1758					
	4	1318					
	5	2754					
5pt Bottom Composite @ 12'		**1708**	**8.8**		**2400**	**36**	**<10**