AP - 088

STAGE 1 WORKPLAN

7/09/2008

AP088

Highlander Environmental Corp.

Midland, Texas

Stage 1 Abatement Plan
OXY, USA, Inc.
E.M. Elliott Tank Battery
Section 22, T22S, R37E
Lea County, New Mexico
NMOCD AP088

July 9, 2008

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2008 JUL 22 PM 2 20

1.0 EXECUTIVE SUMMARY

As part of a due diligence assessment for Pogo Producing Company (Pogo), this site, formerly operated by Latigo Petroleum, Inc., was inspected by Highlander Environmental Corp. of Midland, Texas. Due to visual historic spills, Highlander supervised the installation of auger holes and soil borings at the site. The site location is shown on Figures 1 and 2.

Three impacted areas were investigated south and north of the facility. One auger hole and one borehole were installed in an area measuring 25'x 30'. One auger hole was placed in the second impacted area measuring 10' x 10'. Two auger holes were placed in a third impacted area measuring 6' x 15'. Auger holes could only be advanced to depths of 1.0'-1.5' due to a dense caliche layer. Elevated chloride concentrations were observed in three of the six auger hole samples analyzed. Total Petroleum Hydrocarbon (TPH) concentrations were above the NMOCD RRAL and not defined in four of the six auger holes. AH-4 and AH-6 has TPH concentrations above the RRAL on the 0-1.0' sample which declined to below the RRAL in the 1.0'-1.5' samples. Borehole BH-1 was drilled at AH-1 and TPH concentrations declined to below the RRAL in the 30'-32' sample. The auger hole and borehole locations are shown on Figure 3. The analytical results are shown in Table 1 and Table 2.

Based on the results, borehole (BH-1) was converted to a temporary 2-inch monitor well. Groundwater was encountered at approximately 70 feet below the top of casing (TOC). On September 25, 2006 and May 15, 2007, Highlander purged and sampled the well per New Mexico Oil Conservation Division (NMOCD) guidelines for analyses of chlorides and BTEX. Chloride concentrations exceeded New Mexico Water Quality Control Commission (NMWQCC) standards, while hydrocarbon constituents (BTEX) were detected at levels below the NMWQCC standards. The well location has not been surveyed at this time. The analytical results are shown in Table 3.

On June 25, 2007, the Director of the (NMOCD), Environmental Bureau was notified in writing of groundwater impact at the above-referenced site in accordance with NM Rule 116. In order to further delineate the site, additional monitor wells were installed. During this time Plains Exploration & Production Company (PXP) purchased Pogo. In March 2008, OXY assumed operating responsibility for this site from PXP.

2.0 BACKGROUND & PREVIOUS WORK

Highlander Environmental Corp. (Highlander) performed a limited subsurface investigation at the Latigo E.M. Elliott Federal Tank Battery, Section 22, Township 22 South, Range 37 East, Lea County, New Mexico. The site location is shown on Figures 1 and 2.

Three impacted areas were investigated south and north of the facility. One auger hole and one borehole were installed in an area measuring 25'x 30'. One auger hole was placed in the second impacted area measuring 10' x 10'. Two auger holes were placed in a third impacted area measuring 6' x 15'. Auger holes could only be advanced to depths of 1.0'-1.5' due to a dense caliche layer. Elevated chloride concentrations were observed in three of the six auger hole samples analyzed. Total Petroleum Hydrocarbon (TPH) concentrations were above the NMOCD RRAL and not defined in four of the six auger holes. AH-4 and AH-6 has TPH concentrations above the RRAL on the 0-1.0' sample which declined to below the RRAL in the 1.0'-1.5' samples. Borehole BH-1 was drilled at AH-1 and TPH concentrations declined to below the RRAL in the 30'-32' sample. The auger hole and borehole locations are shown on Figure 3. The analytical results are shown in Table 1 and Table 2.

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3.0 GEOLOGY & HYDROGEOLOGY

3.1 Regional and Local Geology

The Site is underlain by windblown sand of Recent-age. The windblown sand deposits range in thickness from a few feet to as much as 40 feet. The windblown sand is underlain by the Pliocene-age Ogallala Formation. The Ogallala Formation

consists of quartz sand, which is poorly to well cemented with calcium carbonate. The Ogallala Formation contains minor amounts of clay and is capped most everywhere by a dense layer of caliche. The Ogallala Formation ranges in thickness up to approximately 100 feet.

The Ogallala Formation is underlain by the Triassic-age Chinle Formation. The Chinle Formation consists of interbedded layers of greenish colored mudstone and sandstone. The thickness of the Chinle Formation ranges up to about 300 feet.

3.2 Regional and Local Hydrogeology

Groundwater occurs under unconfined conditions in the Ogallala Formation. The Ogallala Formation is regionally known as the High Plains Aquifer. Recharge to the Ogallala Formation occurs through infiltration of rainfall and snowmelt. Discharge occurs principally through pumping from wells.

Based upon the recorded depth-to-groundwater measurements, groundwater flow is consistent with the regional flow direction for groundwater in the High Plains aquifer and is primarily to the south-southeast.

The hydrogeologic data presented in this section was derived from Ground Water Report 6, "Geology and Ground Water Conditions in Southern Lea County, New Mexico," published by New Mexico Institute of Mining & Technology (1961). Water was encountered in the monitor wells at approximately 82' (TOC).

3.3 Water Well Inventory

Highlander performed an internet search of the New Mexico Office of the State Engineer (OSE) and the United States Geologic Survey (USGS) databases for water wells within a ½ mile radius of the subject site.

According to the New Mexico State Engineer Office W.A.T.E.R.S. database, Average Depth to Water Report, the closest water wells are located in Sections 14, 15, 21, 26 and 27, Township 22 South, Range 37 East, with an average depth to water of 53 to 125'. Based on monitor wells installed at the Site the depth to groundwater at the Site is approximately 70.0' below surface. The water well inventory data sheet is included in Appendix A.

4.0 SUBSURFACE SOILS

The soils in the vicinity of this site are loamy fine sands of the Tonuco Series. The Tonuco Series consists of excessively drained loamy fine sands 10 to 20 inches thick over indurated caliche. These sands are yellowish-red over white caliche.

5.0 GROUNDWATER QUALITY

5.1 Installation of Additional Monitor Wells

Additional monitor wells will be required at this facility to further delineate the source and extent of groundwater impact. One additional monitor well, as required in the April 25, 2008 NMOCD letter, will be installed with the screened interval placed entirely below the water table. If the sampling data indicate the necessity for additional monitor wells, they will be installed accordingly, to complete delineation. A copy of the boring log is included in Appendix B.

5.2 Monitoring Program

The original monitoring well, MW-1, was sampled on September 25, 2006 and May 15, 2007. The well has not yet been surveyed. Once surveyed, all four monitor wells will be inspected prior to sampling. Quarterly sampling of all wells will commence in the third quarter of 2008 and continue until further notice.

5.3 Hydrocarbons in Groundwater

Traces of benzene, ethylbenzene and xylene observed in MW-1, were at concentrations below the NMWQCC standards.

5.4 Other Constituents of Concern

The initial chloride concentration in MW-1 wâs 8,260 mg/l, which declined to 2,020 mg/L in the May 2007 sampling event.

6.0 CONCLUSIONS

The extent of chloride impact in the groundwater has not been defined at this site, and no BTEX constituents currently exceed the WQCC standards. There does not appear to be any receptors in close proximity to this site. Quarterly groundwater gauging and sampling will commence in the third quarter of 2008. Additional monitor wells and soil borings will be required to define the extent of TPH impact in soils and chlorides in groundwater.

7.0 SOIL CORRECTIVE ACTION PLAN (CAP)

Auger holes could only be advanced to depths of 1.0'-1.5', due to a dense caliche layer. Further evaluation with the placement of additional boreholes will be required to properly delineate the extent of TPH impact above the RRAL. Those areas where the TPH was confined to surficial soils will either be tilled and treated or excavated for proper disposal.

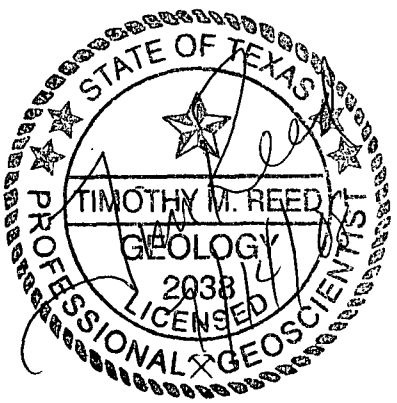
8.0 QUALITY ASSURANCE/ QUALITY CONTROL

The monitor well was constructed to EPA and industry standards. All downhole equipment (i.e., drill rods, drill bits, etc.) were thoroughly decontaminated between each use with a steam cleaner.

The well was inspected for the presence of phase-separated hydrocarbons (PSH) and found not to contain any. The well was properly purged and sampled with a clean, dedicated, polyethylene bailer and disposable line. The groundwater samples were submitted to a laboratory for analysis of Benzene, Toluene, Ethylbenzene, and Xylene (BTEX) by method EPA 8021B and chloride.

9.0 PROPOSED SCHEDULE OF ACTIVITIES

The monitor well will be surveyed and gauged. Quarterly sampling of the existing monitor well will be commenced and all results will be submitted in an annual summary report within the first quarter of 2009. As additional monitor wells are installed, they will be incorporated into the sampling program.



Respectfully submitted,
Highlander - Tetra Tech

Timothy M. Reed, P.G.
Senior Project Manager

cc: Daniel Sanchez-NMOCD
enclosures: figures, water well information, boring and completion logs, tables

FIGURES

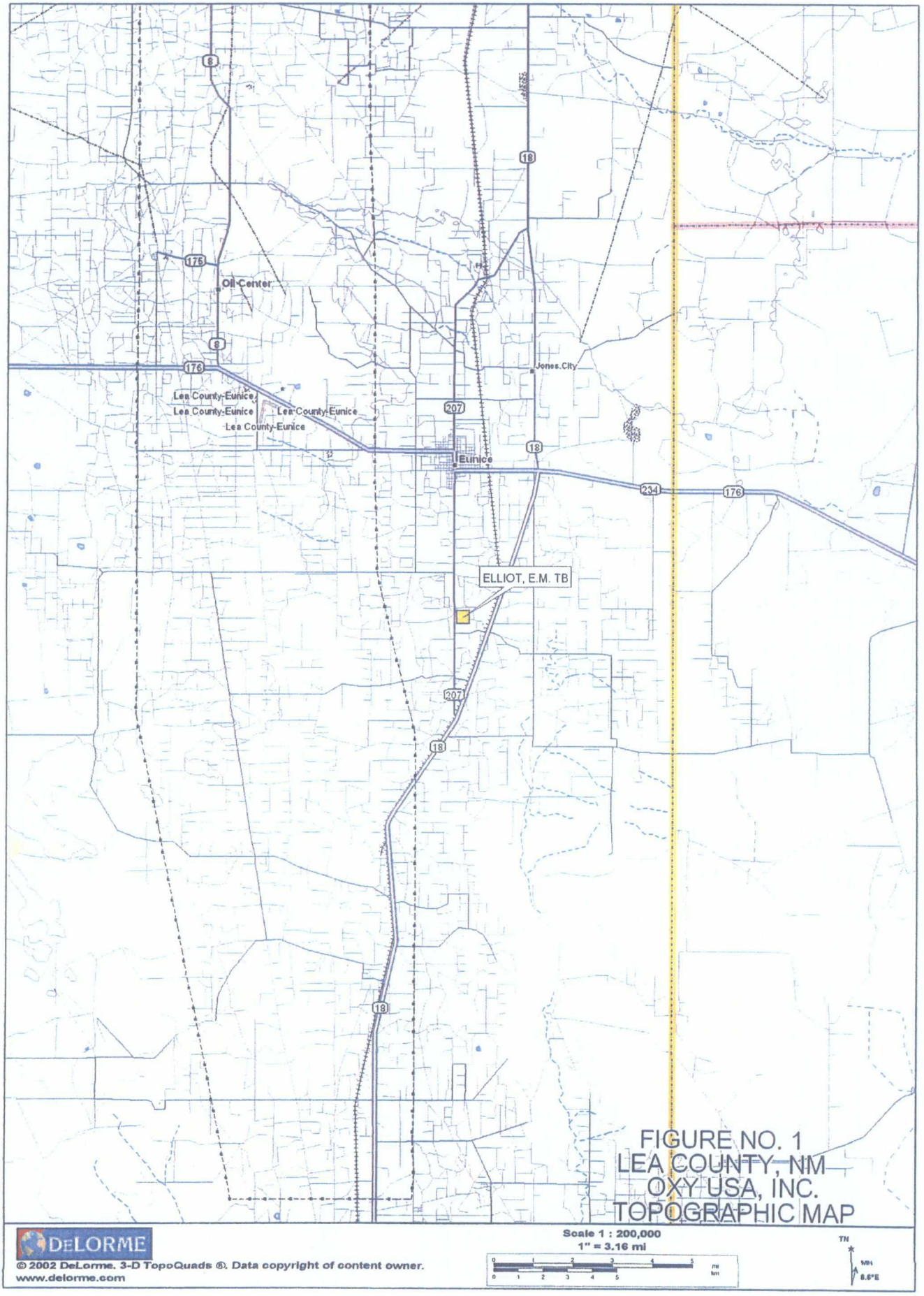


FIGURE NO. 1
LEA COUNTY, NM
OXY USA, INC.
TOPOGRAPHIC MAP

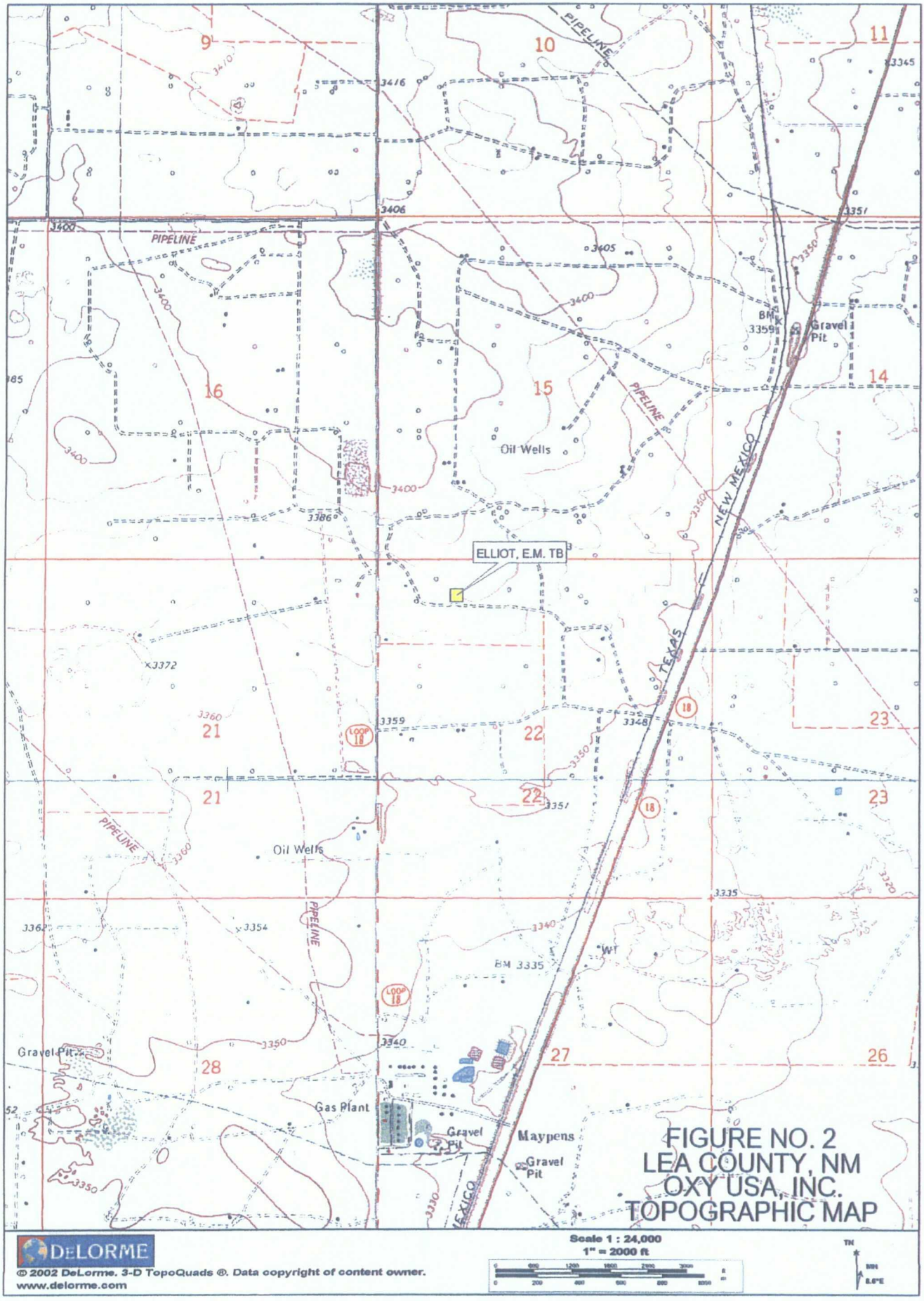


FIGURE NO. 2
LEA COUNTY, NM
OXY USA, INC.
TOPOGRAPHIC MAP

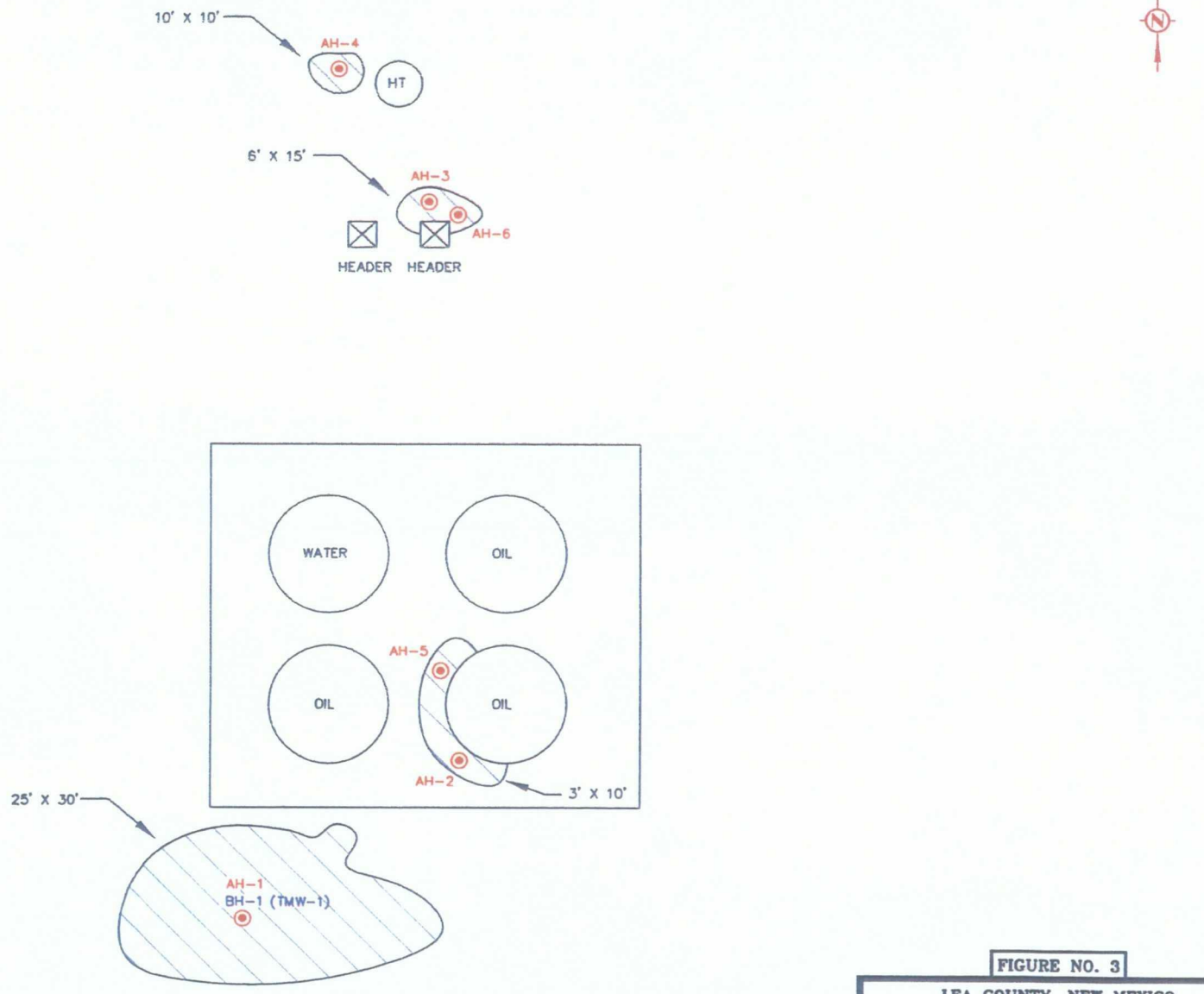


FIGURE NO. 3

LEA COUNTY, NEW MEXICO

OXY USA, INC.
ELLIOTT E.M. TB

DATE: 7/18/07
DWN. BY: RC
FILE: C:\PGDO\2617\EM ELLIOTT FED TB

HIGHLANDER ENVIRONMENTAL CORP.
MIDLAND, TEXAS

TABLES

Table 1
Pogo Producing Company
E.M. ELLIOTT FEDERAL TANK BATTERY
Lea County, New Mexico

Sample ID	Date Sampled	Sample Depth (ft)	TPH (mg/kg)			Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylene (mg/kg)	Chloride (mg/kg)
			C6-C12	C12-C35	Total					
AH-1	8/10/2006	0-1	431	6140	6571	<.500	<.500	<.500	2.69	316
	8/10/2006	1-1.5	301	3370	3671	0.266	0.331	3.67	5.30	870
AH-2	8/10/2006	0-1	16.8	9200	9216.8	<.100	<.100	<.100	<.100	1900
AH-3	8/10/2006	0-1	91.6	17300	17391.6	<.100	<.100	<.100	1.23	<50
	8/10/2006	1-1.5	256	16800	17056	0.0915	<.0500	1.86	3.25	<50
AH-4	8/10/2006	0-1	150	6030	6180	<.0500	<.0500	<.0500	0.0625	<50
	8/10/2006	1-1.5	<1.00	<50.0	<50.0	<.0100	<.0100	<.0100	<.0100	<50
AH-5	10/29/2007	0-1	7440	263	7703	-	-	-	-	1250
AH-6	10/29/2007	0-1	11800	<20.0	11800	-	-	-	-	158
AH-6	10/29/2007	1-1.5	203	<5.00	203	-	-	-	-	90.8

(-) not analyzed

Table 2
Pogo Producing Company
E.M. ELLIOTT FEDERAL TANK BATTERY
Lea County, New Mexico

Sample ID	Date Sampled	Sample Depth (ft)	TPH (mg/kg)			Benzene (mg/kg)	Toluene (mg/kg)	Ethylbenzene (mg/kg)	Xylene (mg/kg)	Chloride (mg/kg)
			C6-C12	C12-C35	Total					
BH-1	9/14/2006	5-7'	**884**	**5300**	**6184**	**0.285**	<0.200	**9.76**	**17.6**	<200
	9/14/2006	10-12'	**246**	**983**	**1229**	-	-	-	-	<200
	9/14/2006	15-17'	**153**	**1510**	**1663**	-	-	-	-	<200
	9/14/2006	20-22'	**197**	**1030**	**1227**	-	-	-	-	<200
	9/14/2006	30-32'	<1.00	<50.0	<50.0	-	-	-	-	<200
	9/14/2006	40-42'	<1.00	<50.0	<50.0	-	-	-	-	<200
	9/14/2006	50-52'	<1.00	<50.0	<50.0	-	-	-	-	**215**
	9/14/2006	60-62'	<1.00	<50.0	<50.0	-	-	-	-	<200
	9/14/2006	70-72'	<1.00	<50.0	<50.0	-	-	-	-	<200

(-) not analyzed

Table 3
Pogo Producing Company
E.M. ELLIOTT FEDERAL TANK BATTERY
Lea County, New Mexico

Sample ID	Date Sampled	Sample No.	TPH (mg/kg)			Benzene (mg/L)	Toluene (mg/L)	Ethlybenzene (mg/L)	Xylene (mg/L)	Chloride (mg/L)
			C6-C12	C12-C35	Total					
TMW-1	9/25/2006	104457	-	-	-	**0.00130**	<0.00100	<0.00100	**0.00650**	**8,260**
	5/15/2007	-	-	-	-	<0.001	<0.001	<0.001	**0.00150**	**2,020**

(-) not analyzed

APPENDIX A

New Mexico Office of the State Engineer
POD Reports and Downloads

Township: 22S Range: 37E Sections:

NAD27 X: Y: Zone: Search Radius:

County: Basin: Number: Suffix:

Owner Name: (First) (Last) ○ Non-Domestic ○ Domestic ◉ All

POD / Surface Data Report | Avg Depth to Water Report | Water Column Report

Clear Form | iWATERS Menu | Help

AVERAGE DEPTH OF WATER REPORT 07/10/2008

								(Depth Water in Feet)		
Bsn	Tws	Rng	Sec	Zone	X	Y	Wells	Min	Max	Avg
CP	22S	37E	04				1	92	92	92
CP	22S	37E	05				2	79	90	85
CP	22S	37E	09				2	85	94	90
CP	22S	37E	14				1	65	65	65
CP	22S	37E	15				7	75	185	125
CP	22S	37E	18				1	190	190	190
CP	22S	37E	21				1	65	65	65
CP	22S	37E	24				1	60	60	60
CP	22S	37E	26				1	65	65	65
CP	22S	37E	27				2	52	54	53
CP	22S	37E	34				1	60	60	60
CP	22S	37E	35				1	35	35	35

Record Count: 21

APPENDIX B

SAMPLE LOG

Boring/Well: MW-1
Project Number: 2617
Client: Pogo Production Inc.
Site Location: E. M. Elliott Federal Tank Battery
Location: Lea County, New Mexico
Total Depth 83
Date Installed: 09/22/06

DEPTH (Ft)	OVM	SAMPLE DESCRIPTION
0-4	--	Sandy topsoil with some black and gray caliche
5-30	--	Sandy caliche with very fine silty tan sand
30-40	--	Tan to reddish tan very fine grain silty sand
40-50	--	Reddish/tan very fine grain silty sand
50-70	--	Reddish/tan very fine grain silty sand becoming slightly damp
70-78	--	Reddish/tan very fine grain silty sand that is wet
78-83	--	Hard sandstone (damp)

Total Depth is 83 feet Groundwater encountered at 70 feet below ground surface.