ENVIRONMENTAL PLUS, INC. Micro-Blaze Micro-Blaze Out™
STATE APPROVED LAND FARM AND ENVIRONMENTAL SERVICES

16 August 2004

Mr. Larry Johnson
NM Energy, Minerals, and Natural Resources Department
New Mexico Oil Conservation Division – Environmental Bureau
1625 North French Drive
Hobbs, NM 88240

1R-12

Re: Addendum for Site Characterization and Proposal for Risk-Based Closure
Arrowhead Grayburg 8" Gathering – Ref. #2003-00176
UL-P Section 2 T22S R36E, Lea County, New Mexico
Landowner: State of New Mexico

Dear Mr. Johnson,

Environmental Plus, Inc. (EPI), on behalf of Plains All American Pipeline, L.P., submits for your consideration this *Addendum for Site Characterization and Proposal for Risk-Based Closure Report* for the above-referenced site. Based on data collected during the site delineation process, Plains recommends the installation of a clay barrier in the base of the excavation to prevent vertical migration of the remaining contaminants. The excavation will then be backfilled with clean soil and graded to allow natural drainage.

Should you have any questions or comments please call Mr. Ben Miller or me at EPI's offices, or at 505-390-2088 or 505-390-7306 respectively. Mr. Bryant may be contacted through Plain's Midland office at 432-684-3497.

All official correspondence should be addressed to:

Ms. Camille Reynolds
Plains All American Pipeline, L.P.
5805 East Highway 80
Midland, Texas 79706

Sincerely,

ENVIRONMENTAL PLUS, INC.

Iain Olness, P.G.
Hydrogeologist

cc: Camille Reynolds, Plains – Midland
Jeff Dann, Plains – Houston
Sherry Miller, EPI President
Ben Miller, EPI Vice President and General Manager

P.O. BOX 1558 ••• 2100 AVENUE O ••• EUNICE, NEW MEXICO 88231
TELEPHONE 505•394•3481 ••• FAX 505•394•2601

ENVIRONMENTAL PLUS, INC.

PLAINS
ALL AMERICAN
PIPELINE, L.P.

1RP-12

ADDENDUM FOR SITE CHARACTERIZATION
AND
PROPOSAL FOR RISK-BASED CLOSURE

ARROWHEAD GRAYBURG 8" GATHERING
PLAINS REF: 2003-00176

SE¼ OF THE SE¼ OF SECTION 2, TOWNSHIP 22 SOUTH, RANGE 36 EAST
LEA COUNTY, NEW MEXICO

~4.5 MILES SOUTHWEST (342°) OF
EUNICE, LEA COUNTY, NEW MEXICO
LATITUDE: N32° 24' 55.774" LONGITUDE: W103° 13' 51.267"

AUGUST 12, 2004
PREPARED BY:

Environmental Plus, Inc.
2100 Avenue O
P.O. Box 1558
Eunice, NM 88231
Phone: (505)394-3481
FAX: (505)394-2601

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Pursuant to the request of Mr. Larry Johnson with the New Mexico Oil Conservation Division (NMOCD), Environmental Plus, Inc. (EPI) is submitting this addendum to provide the NMOCD with the additional requested information.

I. Background

On June 30, 2003, a release of approximately 20 barrels of crude oil occurred from the Arrowhead Grayburg 8-Inch Gathering Line in Lea County, New Mexico (reference Figures 1 and 2). No product was recovered from the release, which covered an area of approximately 2,100 square feet and was 300 feet by 7 feet. Based on the previously submitted *Site Characterization Report*, the cleanup goals for this site are as follows:

Parameter	Remedial Action Levels
Benzene[A]	10 parts per million
BTEX	50 parts per million
TPH	100 parts per million

[A] – 100 ppm field analysis may be substituted for laboratory analyses.

II. Site Delineation

A total of seven soil borings were advanced from September 10 through 12, 2003 to depths ranging from 15 to 35 feet bgs (reference Figure 4). During the advancement of the soil borings, samples were collected at five-foot intervals for field and laboratory analyses. Upon collection of the samples, a portion was immediately placed in laboratory provided containers and placed on ice for transport to an independent laboratory for quantification of total petroleum hydrocarbons (TPH) and benzene, toluene, ethylbenzene and total xylenes (BTEX). The remainder of the sample was placed in a one-quart polyethylene bag and screened for the presence of organic vapors utilizing an UltraRae photoionization detector (PID) equipped with a 10.6 electron volt (eV) lamp. The soil borings were advanced until organic vapor concentrations were recorded at <100 parts per million (ppm) for two consecutive samples.

Analytical results for these samples indicated that contaminant concentrations were above the NMOCD remedial thresholds to depths of 10 feet bgs. The only exception was the sample collected from the 25 to 27 foot sampling interval in soil boring BH-4. Analytical results for this sample indicated TPH concentrations of 151 milligrams per kilogram (mg/Kg) and were reported as non-detectable (ND) for BTEX at or above each analytes respective laboratory method detection limit (MDL). Based on these results, it was decided to excavate the hydrocarbon impacted soil to a depth of approximately 10 feet bgs.

III. Excavation Activities

Remediation excavation activities commenced on February 16, 2004 and continued through February 18, 2004. A total of 866 cubic yards of soil were excavated during this

time and transported to the Lea Station Land Farm. On February 18, 2004, the excavation basin was split into five separate sections and composite samples were collected from the excavation floor and analyzed in the field for the presence of organic vapors utilizing an UltraRae PID equipped with 10.6 eV lamp (reference Figure 5). Results of the field analyses indicated organic vapors present at concentrations ranging from 228 to 1,144 ppm. Samples were not submitted for laboratory analyses due to the elevated levels of organic vapors detected in the field analyses.

Based on the elevated concentrations of organic vapors in the soil samples, a decision was made to complete test trenches in each of the sections and collect soil samples for laboratory analyses to determine the vertical extent of the release. The trenches were completed to depths ranging from 9 to 25 feet bgs, depending on the field analyses completed on February 18, 2004. The samples were collected on February 26, 2004 and submitted to an independent laboratory for quantification of TPH and BTEX (reference Figure 5). Analytical results indicated concentrations below the remedial goals as set by the NMOCD for all analytes with the exception of TPH in the samples collected from Section A and Section D. Analytical results for these samples (Section A – 242 ppm TPH at 25 feet bgs and Section D – 161 ppm TPH at 21 feet BGS) indicated TPH concentrations slightly above the remedial threshold of 100 ppm.

Based on analytical results for the samples collected on February 26, 2004, excavation activities resumed and continued on March 8, 2004. During this time, approximately 508 cubic yards of soil were excavated and transported to the Lea Station Land Farm. The excavation depth varied from 11 feet at the western end to 6 feet at the eastern end; however, the ground surface slopes downward from west to east, so the bottom the excavation was at approximately the same elevation throughout. The excavation was split into three sections and samples collected from the sidewalls and base of the excavation (reference Figure 6). The samples were submitted to an independent laboratory for quantification of TPH and BTEX. Analytical results for these samples indicated contamination remaining above the remedial thresholds in five of the eight samples.

IV. Contamination Extents

Soil samples collected from the soil borings indicated contaminant concentrations above the NMOCD remedial threshold of 100 ppm for TPH to a depth of generally 10 feet bgs. The only exception to this was the sample collected from soil boring BH-4 at 25 feet bgs. Analytical results for this sample indicated TPH concentrations of 151 ppm.

Soil samples collected during the completion of the test trenches within the excavation indicated hydrocarbon impacted soil above the NMOCD TPH remedial threshold of 100 ppm to depths of 21 to 25 feet bgs in the western and eastern portions of the excavation.

As can be seen from the analytical results (reference Tables 1 and 2 and Figure 7), there is some discrepancy in contaminant concentrations between the samples collected via the soil borings and the samples collected via excavation. The samples collected via excavation, either trenching or final excavation sampling, indicate contaminant

concentrations considerably higher than the samples collected via soil borings at similar depths. While the exact cause of this discrepancy is not known, the most plausible explanation is that the samples collected during the advancement of the soil borings may have been heated due to friction as the coring sampler was advanced through the soil. This heating of the samples could result in the loss of organic vapors during the transference of the sample from the coring tube to the jar, thus resulting in lower contaminant concentrations. While the contaminant concentrations reported for the samples collected during the advancement of the soil borings may be somewhat lower, the results do give an indication of the presence of contaminants. Used in conjunction with the analytical results for the samples collected via excavation, the extents of contamination can be delineated.

Therefore, based on these analytical results, it appears that hydrocarbon impacted soil above NMOCD guidelines extends to a depth of approximately 30 feet bgs with contaminant concentrations decreasing with depth (reference Figure 7).

The horizontal extents of hydrocarbon impacted soil appear to be limited to the excavation limits, with the exception of the western end of the excavation. Soil samples collected from the north and south sidewalls in this area of the excavation indicated soil impacted above the NMOCD TPH remedial threshold of 100 ppm remains and will need to be removed prior to closure.

V. Closure Proposal

It is proposed to isolate the remaining source term with an impermeable barrier constructed of dense compactable red clay with a minimum permeability of 1×10^{-5} cm/sec. The barrier will extend a minimum of four feet beyond the edges of soil impacted above the NMOCD remedial thresholds and will be a minimum of one-foot thick. The barrier will be installed in six-inch lifts, compacted and tested to verify that the compaction has achieved a minimum of 95% its Proctor Density. Installation of the clay barrier at a depth of approximately 11 feet bgs will protect the barrier from erosion and human intrusion for a term sufficient to allow natural biodegradation of contaminants in the soil. After the barrier has been installed and tested to be acceptable, the excavation will be backfilled with clean soil obtained from the Lea Station Land Farm.

Prior to completing any of this work, removal of the impacted soil situated in the north and south sidewalls in the western end of the excavation will be removed and transported to the Lea Station Land Farm. Soil samples will be collected to verify that soil impacted above the NMOCD remedial thresholds has been removed prior to the placement of the impermeable barrier.

FIGURES

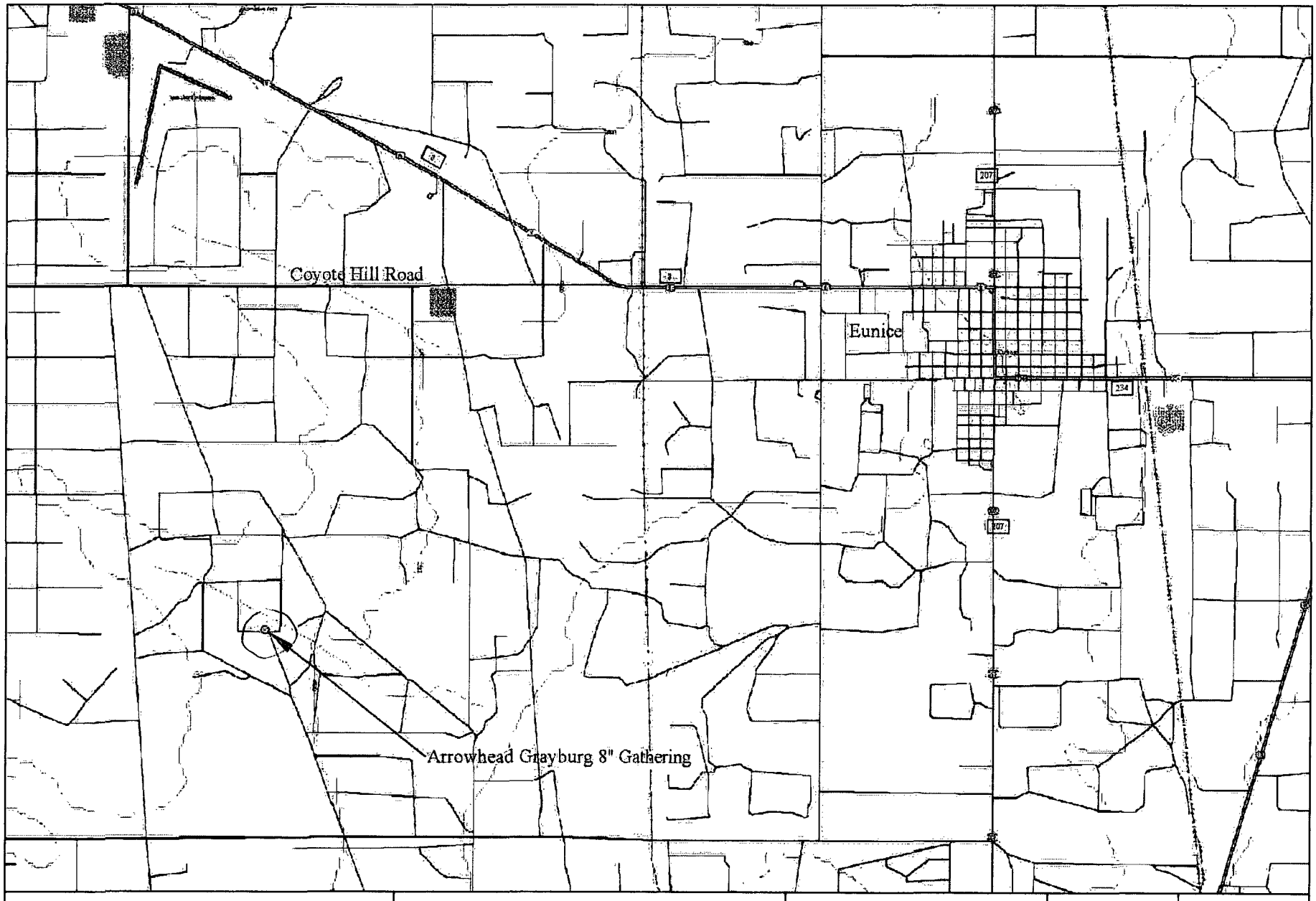

Figure 1 Area Map Plains All American Arrowhead Grayburg 8" Gathering	Lea County, New Mexico SE 1/4 of the SE 1/4, Sec. 2, T22S, R36E N 32° 24' 55.8" W 103° 13' 51.3" Elevation: 3,512 feet amsl	DWG By: Iain Olness May 2004	REVISED:	N
		0 0.75 1.5 Miles	SHEET 1 of 1	

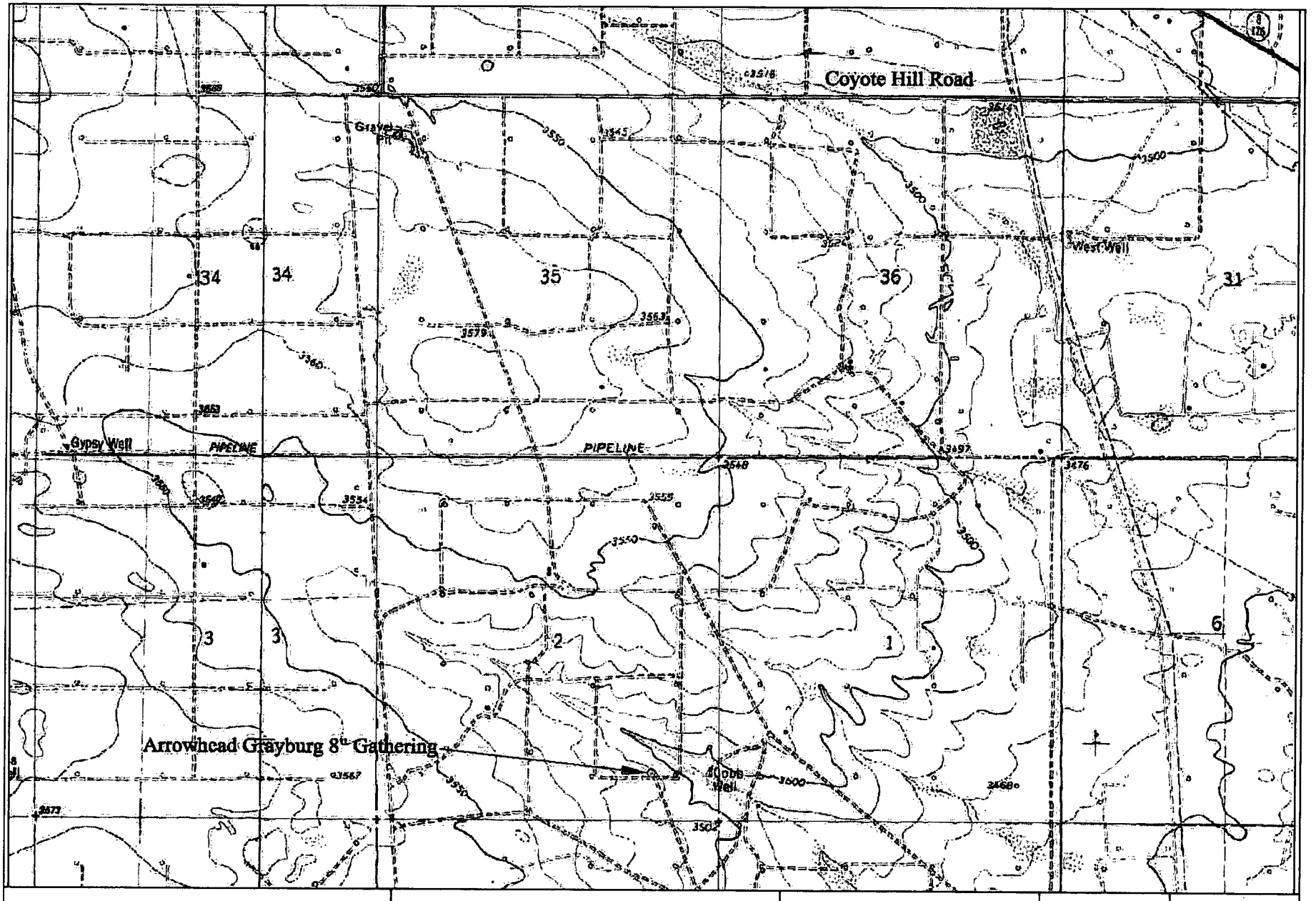

Figure 2
Site Location Map
Plains All American
Arrowhead Grayburg 8" Gathering

Lea County, New Mexico
SE 1/4 of the SE 1/4, Sec. 2, T22S, R36E
N 32° 24' 55.8" W 103 °13' 51.3"
Elevation: 3,512 feet amsl

DWG By: Iain Olness
May 2004

REVISED:

0 2,000 4,000
Miles

SHEET
1 of 1

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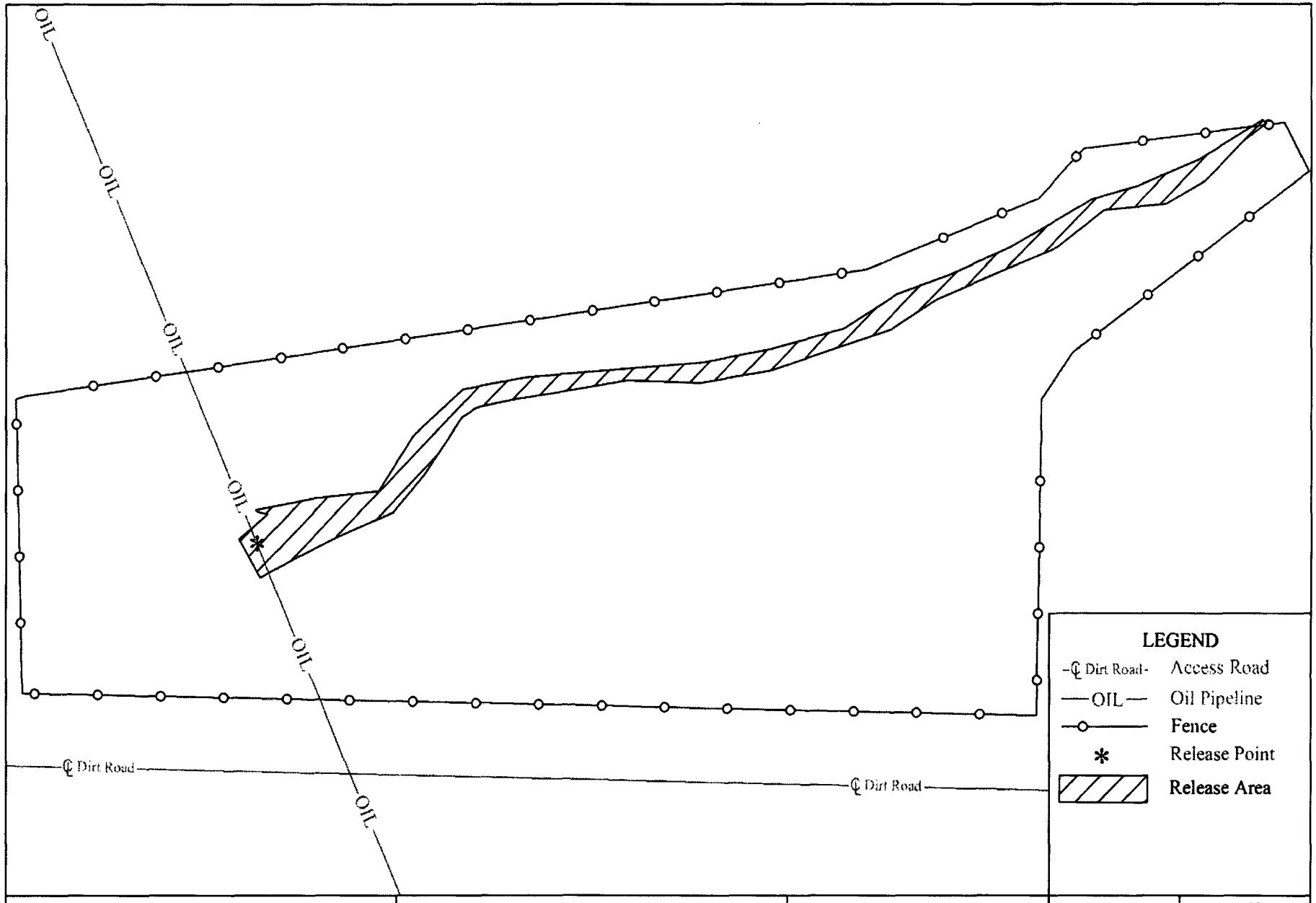

Figure 3 Site Map Plains All American Arrowhead Grayburg 8" Gathering	Lea County, New Mexico SE 1/4 of the SE 1/4, Sec. 2, T22S, R36E N 32° 24' 55.8" W 103° 13' 51.3" Elevation: 3,512 feet amsl	DWG By: Iain Olness May 2004 0 40 80 Feet	REVISED: SHEET 1 of 1 N

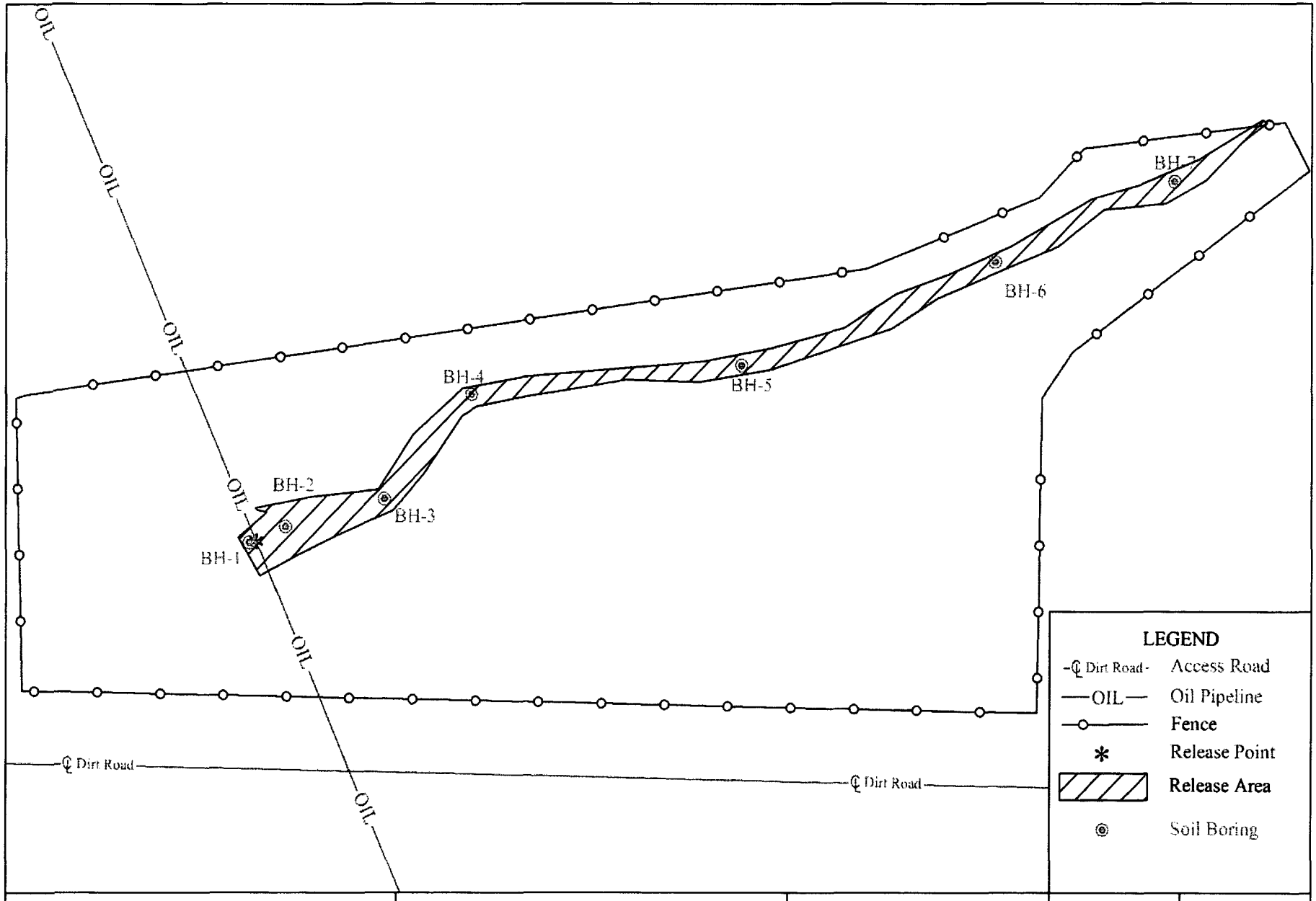

Figure 4
Soil Boring Location Map
Plains All American
Arrowhead Grayburg 8" Gathering

Lea County, New Mexico
SE 1/4 of the SE 1/4, Sec. 2, T22S, R36E
N 32° 24' 55.8" W 103° 13' 51.3"
Elevation: 3,512 feet amsl

DWG By: Iain Olness
May 2004

REVISED:

0 40 80
Feet

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1 of 1

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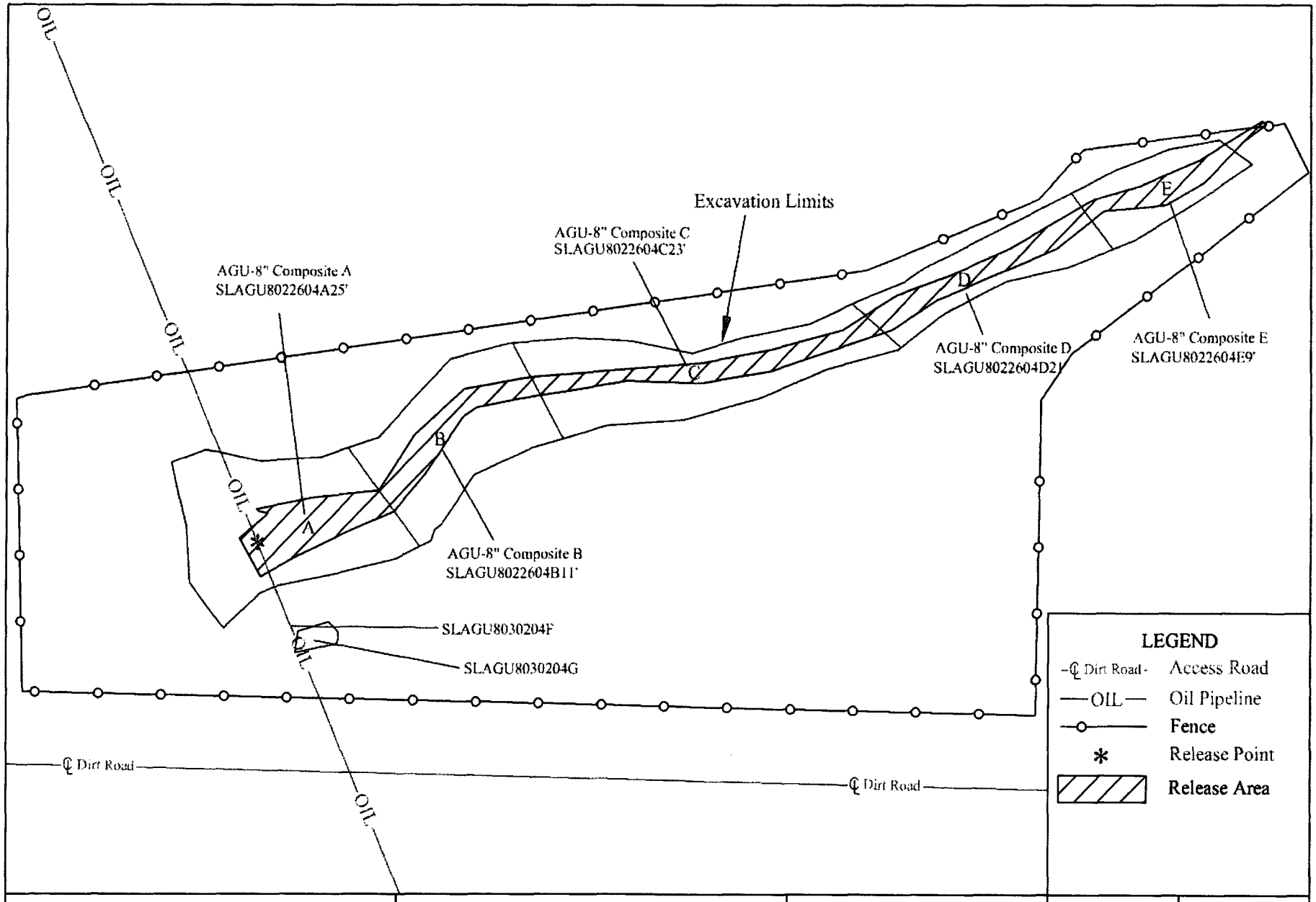

Figure 5
February 18 thru March 2, 2004
Sampling Location Map
Plains All American
Arrowhead Grayburg 8" Gathering

Lea County, New Mexico
SE 1/4 of the SE 1/4, Sec. 2, T22S, R36E
N 32° 24' 55.8" W 103° 13' 51.3"
Elevation: 3,512 feet amsl

DWG By: Iain Olness
May 2004

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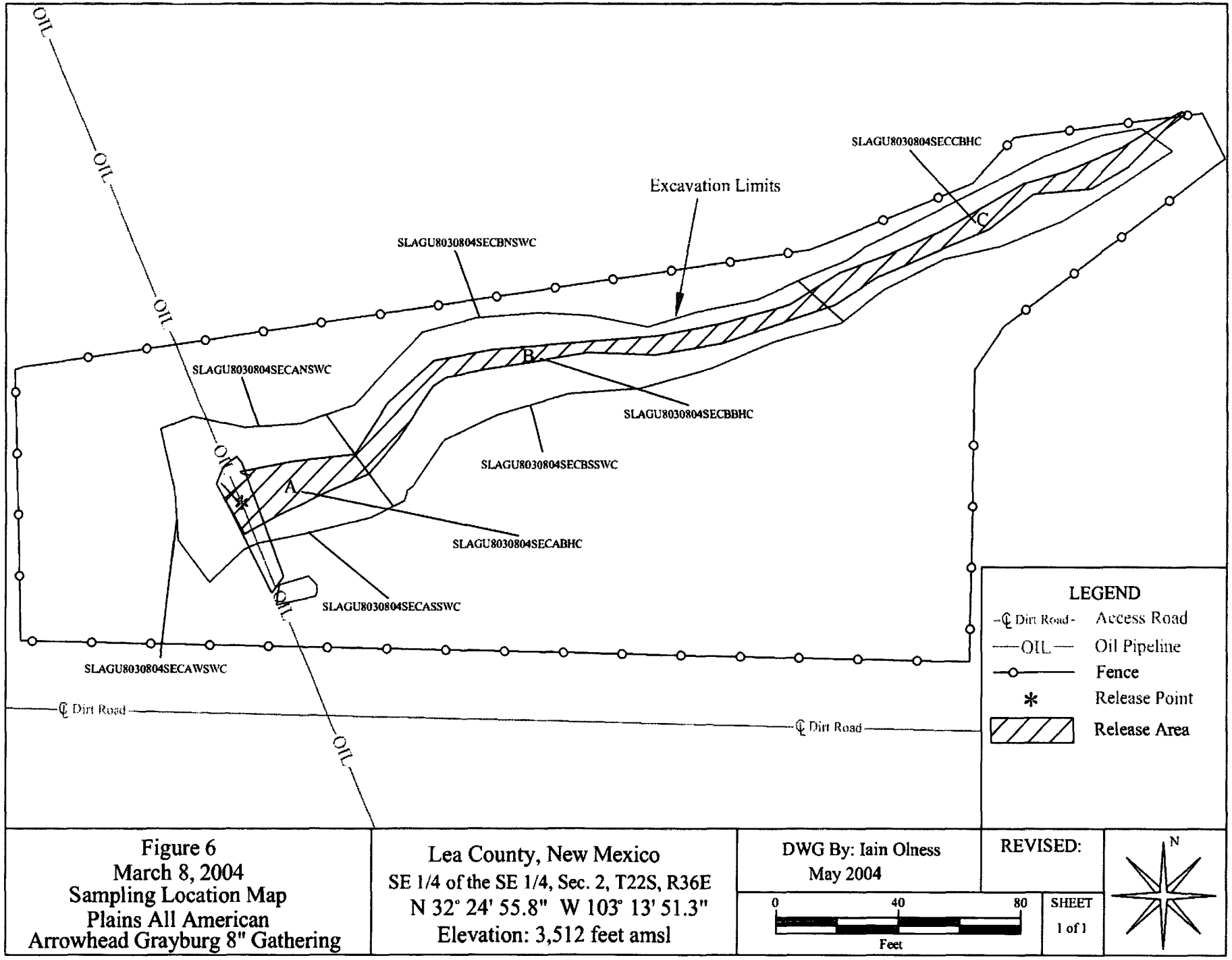
OIL
OIL
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OIL
OIL
Excavation Limits
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SLAGU8030804SECBNSWC
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SLAGU8030804SECBBHC
SLAGU8030804SECBSSWC
SLAGU8030804SECABHC
SLAGU8030804SECASSWC
SLAGU8030804SECAWSWC
A
B
C
℄ Dirt Road
℄ Dirt Road
LEGEND
℄ Dirt Road - Access Road
OIL Oil Pipeline
Fence
Release Point
Release Area
Figure 6
March 8, 2004
Sampling Location Map
Plains All American
Arrowhead Grayburg 8" Gathering
Lea County, New Mexico
SE 1/4 of the SE 1/4, Sec. 2, T22S, R36E
N 32° 24' 55.8" W 103° 13' 51.3"
Elevation: 3,512 feet amsl
DWG By: Iain Olness
May 2004
REVISED:
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40
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Feet
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1 of 1
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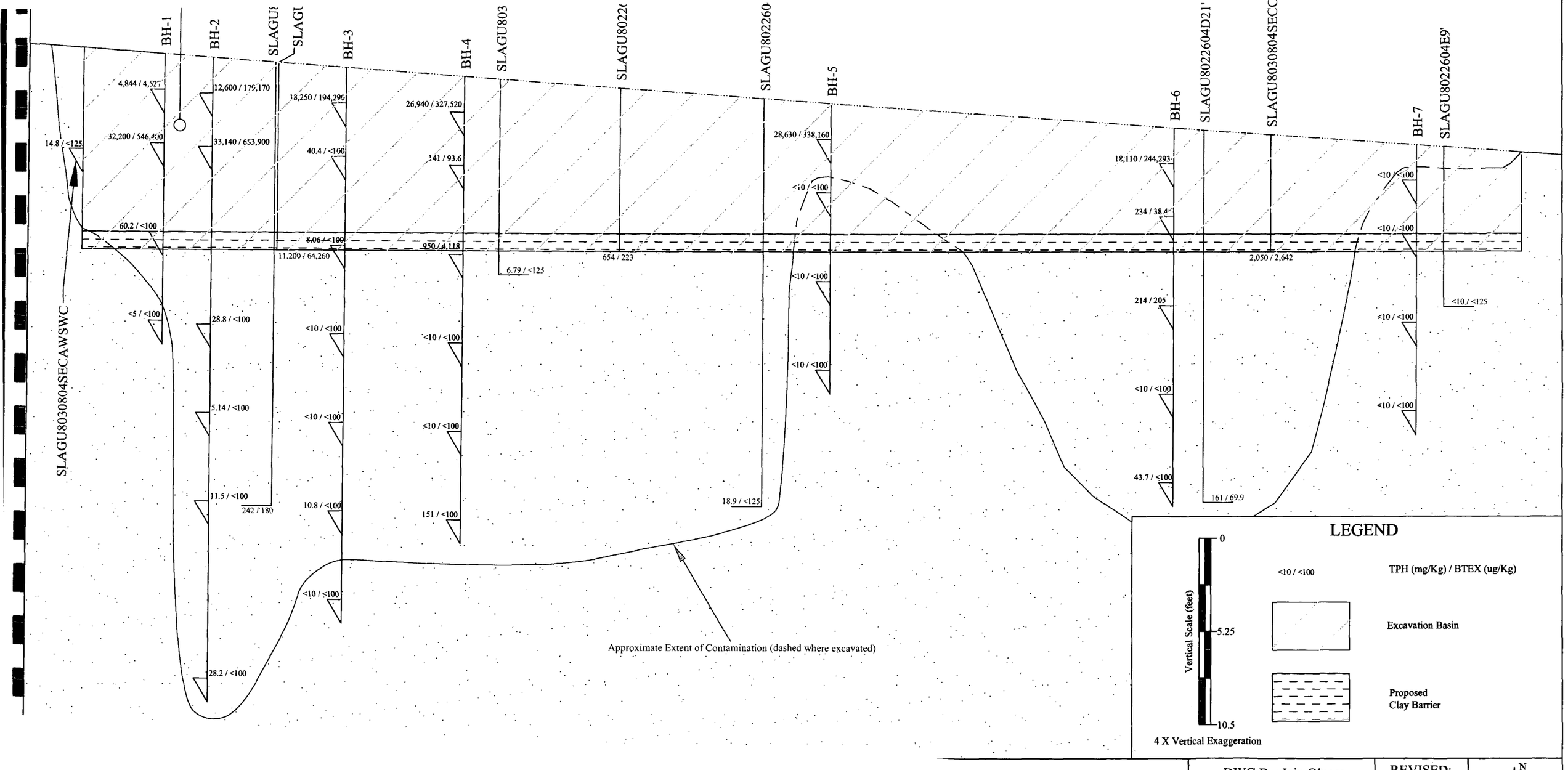
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BH-5
BH-6
SLAGU8022604D21
SLAGU8030804SECC
BH-7
SLAGU8022604E9
SLAGU8030804SECAWSWC
4,844 / 4,527
12,600 / 179,170
18,250 / 194,296
26,940 / 327,520
28,630 / 338,160
18,110 / 244,293
32,200 / 546,400
33,140 / 653,900
14.8 / <125
40.4 / <100
141 / 93.6
<10 / <100
234 / 38.4
<10 / <100
60.2 / <100
8.06 / <100
950 / 4,118
11,200 / 64,260
6.79 / <125
654 / 223
2,050 / 2,642
<10 / <100
<10 / <125
<5 / <100
28.8 / <100
<10 / <100
<10 / <100
214 / 205
<10 / <100
<10 / <100
<10 / <100
5.14 / <100
<10 / <100
<10 / <100
<10 / <100
43.7 / <100
<10 / <100
11.5 / <100
242 / 180
10.8 / <100
151 / <100
18.9 / <125
161 / 69.9
<10 / <100
28.2 / <100
Approximate Extent of Contamination (dashed where excavated)
LEGEND
0
5.25
10.5
Vertical Scale (feet)
4 X Vertical Exaggeration
<10 / <100
TPH (mg/Kg) / BTEX (ug/Kg)
Excavation Basin
Proposed
Clay Barrier
DWG By: Iain Olness
REVISED:
N

TABLES

TABLE 1
Summary of Soil Boring Analytical Results

Arrowhead Grayburg 8" Gathering - Ref. #2003-00176

Sample Name	Borehole	Interval	PID Analysis (ppm)	TPH (mg/Kg)	BTEX (µg/Kg)	Benzene (µg/Kg)
SEAGU891003BH1-2'	BH-1	2	496	**4,844**	4,527.8	24.8
SEAGU891003BH1-5'		5	770	**32,200**	**564,400**	**14,600**
SEAGU891003BH1-10'		10	5.7	60.2	<100	<20
SEAGU891003BH1-15'		15	2.4	<5	<100	<20
SEAGU891003BH2-3'	BH-2	3	2,999	**12,600**	**179,170**	2,240
SEAGU891003BH2-7'		7	2,765	**33,140**	**683,900**	**13,100**
SEAGU891003BH2-15'		15	450	28.8	<100	<20
SEAGU891003BH2-20'		20	200	5.14	<100	<20
SEAGU891003BH2-25'		25	25.4	11.5	<100	<20
SEAGU891003BH2-35'		35	1.7	28.2	<100	<20
SEAGU891103BH3-2'	BH-3	2	998	**18,250**	**194,290**	1,990
SEAGU891103BH3-5'		5	84.7	40.4	<100	<20
SEAGU891103BH3-10		10	48.4	8.06	<100	<20
SEAGU891103BH3-15'		15	50.0	<10	<100	<20
SEAGU891103BH3-20'		20	120	<10	<100	<20
SEAGU891103BH3-25'		25	40.7	10.8	<100	<20
SEAGU891103BH3-30'		30	11.7	<10	<100	<20
SEAGU891103BH4-2'	BH-4	2	973	**26,940**	**327,520**	3,520
SEAGU891103BH4-5'		5	550	**140.96**	93.6	<20
SEAGU891103BH4-10'		10	1,150	**950**	4,118	<20
SEAGU891103BH4-15'		15	92.4	<10	<100	<20
SEAGU891103BH4-20'		20	35.9	<10	<100	<20
SEAGU891103BH4-25'		25	17.3	**151**	<100	<20
SEAGU891203BH5-2'	BH-5	2	685	**28,630**	**338,160**	2,460
SEAGU891203BH5-5'		5	32.4	<10	<100	<20
SEAGU891203BH5-10'		10	40.7	<10	<100	<20
SEAGU891203BH5-15'		15	19.2	<10	<100	<20
SEAGU891203BH6-2'	BH-6	2	1,250	**18,110**	**244,293**	793
SEAGU891203BH6-5'		5	260	234	38.4	<20
SEAGU891203BH6-10'		10	147	**214.37**	205.8	<20
SEAGU891203BH6-15'		15	34.7	<10	<100	<20
SEAGU891203BH6-20'		20	20.2	43.7	<100	<20
SEAGU891203BH7-2'	BH-7	2	19.4	<10	<100	<20
SEAGU891203BH7-5'		5	36.7	<10	<100	<20
SEAGU891203BH7-10'		10	16.3	<10	<100	<20
SEAGU891203BH7-15'		15	10.2	<10	<100	<20
NMOCD Remedial Thresholds				100	50,000	10,000

ppm = parts per million, which is equivalent to milligrams per kilogram
mg/Kg = miiligrams per kilogram, which is equivalent to parts per million
µg/Kg = micrograms per kilogram, which is equivalent to 0.001 milligrams per kilogram
NS = Not Sampled
Results in **Bold** are above the remedial action levels as set by the NMOCD.

TABLE 2

Summary of Excavation Analytical Results

Arrowhead Grayburg 8" Gathering - Ref. #2003-00176

Sample Name	Date	Sample Type	Depth	Location	PID Analysis (ppm)	TPH (mg/Kg)	BTEX (µg/Kg)	Benzene (µg/Kg)	Chloride (mg/Kg)
AGU-8" Composite A	18-Feb-04	Composite	10	Section A	685	NS	NS	NS	NS
AGU-8" Composite B	18-Feb-04	Composite	5	Section B	967	NS	NS	NS	NS
AGU-8" Composite C	18-Feb-04	Composite	10	Section C	228	NS	NS	NS	NS
AGU-8" Composite D	18-Feb-04	Composite	7	Section D	1,144	NS	NS	NS	NS
AGU-8" Composite E	18-Feb-04	Composite	1.5	Section E	685	NS	NS	NS	NS
SLAGU8022604A25'	26-Feb-04	Composite	25	Section A	NS	**242**	180	<25	156
SLAGU8022604B11'	26-Feb-04	Composite	11	Section B	NS	6.79	<125	<25	NA
SLAGU8022604C23'	26-Feb-04	Composite	23	Section C	NS	18.9	<125	<25	NA
SLAGU8022604D21'	26-Feb-04	Composite	21	Section D	NS	**161**	69.9	<25	NA
SLAGU8022604E9'	26-Feb-04	Composite	9	Section E	NS	<10	<125	<25	NA
SLAGU8030204F	2-Mar-04	Grab	1	Valve	93.2	NS	NS	NS	NS
SLAGU8030204G	2-Mar-04	Grab	1	Sump	84.7	NS	NS	NS	NS
SLAGU8030804SECANSWC	8-Mar-04	Composite	3-8	Section A North	4.4	**902**	56.2	<25	NA
SLAGU8030804SECASSWC	8-Mar-04	Composite	3-8	Section A South	144	**4,320**	3,974	75.2	NA
SLAGU8030804SECAWSWC	8-Mar-04	Composite	3-8	Section A West Sidewall	2.9	14.8	<125	<25	NA
SLAGU8030804SECABHC	8-Mar-04	Composite	11	Section A Bottomhole	601	**11,200**	**64,260**	1,070	NA
SLAGU8030804SECBNSWC	8-Mar-04	Composite	3-6	Section B North	7.9	33.7	<125	<25	NA
SLAGU8030804SECBSSWC	8-Mar-04	Composite	3-6	Section B South	6.1	7.27	<125	<25	NA
SLAGU8030804SECBBHC	8-Mar-04	Composite	8	Section B Bottomhole	40.4	**654**	223	<25	NA
SLAGU8030804SECCBHC	8-Mar-04	Composite	6	Section C Bottomhole	108	**2,050**	2,642	<25	NA
NMOCD Remedial Thresholds						100	50,000	10,000	250

ppm = parts per million, which is equivalent to milligrams per kilogram
mg/Kg = miiligrams per kilogram, which is equivalent to parts per million
µg/Kg = micrograms per kilogram, which is equivalent to 0.001 milligrams per kilogram
NS = Not Sampled
NA = Not Analyzed
Results in **Bold** are above the remedial action levels as set by the NMOCD.