2R - 22

REPORTS

DATE:

Nov. 2, 1994

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, TX 79702-0552
Telephone 915/682-1626

November 2, 1994

Mr. William Olson
State of New Mexico
Oil Conservation Division
2040 South Pacheco St.
Santa Fe, New Mexico 87505

RE: Indian Basin Gas Plant
Pipeline Spill (Line #1) Remediation Report

Dear Mr. Olson:

Enclosed is the Pipeline Spill (Line #1) Remediation Report which is submitted to satisfy the Oil Conservation Division (OCD) requirement in your letter to me dated August 25, 1994. The report summarizes the activities that were undertaken on August 31 and September 1, 1994 to address contaminated soil related to a 552-barrel spill consisting of 125 barrels of condensate and 427 barrels of produced water from Line #1 at the Indian Basin Gas Plant. If you have any questions concerning this project, please contact me at (915) 687-8312.

Sincerely,

Robert J. Menzie, Jr.
Production Environmental Representative

Attachment

xc: Mark W. Ashley, NMOCD-Artesia
N. R. Garza, Indian Basin Gas Plant

INDIAN BASIN GAS PLANT
PIPELINE (LINE #1) SPILL
REMEDIATION REPORT

Indian Basin Gas Plant
329 Marathon Road
Lakewood, New Mexico 88254
Eddy County

Submitted by
Marathon Oil Company
on behalf of the
Indian Basin Gas Plant Owners

November 2, 1994

INTRODUCTION

On July 15, 1994, a 552-barrel spill of condensate and produced water occurred from a production pipeline within the Indian Basin Gas Plant on Marathon-owned property. The spill consisted of approximately 125 barrels of condensate and 427 barrels of produced water. The Indian Basin Gas Plant is located in Eddy County, New Mexico (Figure 1).

A workplan, dated July 29, 1994 and describing proposed remedial activities, was prepared in response to the 15-day written report requirement in the State of New Mexico Water Quality Control Commission (WQCC) Regulations Part 1, Section 1-203(6), "Notification of Discharge- Removal." The Oil Conservation Division (OCD) approved the workplan in a letter dated August 25, 1994. This Pipeline Spill (Line #1) Remediation Report satisfies the OCD requirement to submit a report by November 4, 1994 containing the results of the remedial activities conducted on August 31 and September 1, 1994.

INTERIM MEASURES

The Line #1 leak was discovered on the afternoon of July 13 by a plant operator on routine rounds. A wet area was observed above Line #1 at the southern plant area approximately 80 feet west of the inlet separators (Figure 2). Marathon immediately took steps to shut in and blow down Line #1. One high pressure dry gas pipeline is buried beneath Line #1 and presented a safety hazard during the excavation to repair Line #1. Marathon shut in and blew down this dry gas pipeline. Shovels and a backhoe were then used to excavate around the pipelines to expose the problem area. A corroded dresser coupling connecting two lengths of polyvinyl chloride (PVC) piping was leaking from one 1/8-inch hole. This faulty coupling was replaced with a section of poly pipe and the excavation was backfilled.

VERBAL AND WRITTEN SPILL REPORTING

On July 15, 1994 a verbal notification of the spill event was made to Mr. Mark W. Ashley (OCD) in Artesia, New Mexico by Noel R. Garza, Plant Superintendent. On July 22, 1994 a written report summarizing the spill nature, volume, and description of repair was submitted to OCD offices in Santa Fe and Artesia via an OCD Notification of Fire, Breaks, Spills, Leaks, and Blowouts standard reporting form (Appendix A).

REMEDIATION ACTIVITIES

Source reduction activities to remove contaminated soil adjacent to and below the Line #1 pipeline commenced on the morning of August 31, 1994. Remediation efforts were delayed until this date due to the hazards of excavating near high pressure gas pipelines. Since a limited

one-day shut down of the gas plant was scheduled for other required maintenance work, the Line #1 remediation work was postponed until August 31 to avoid additional excavation safety hazards. A site safety meeting was conducted before work began. Excavation safety and other hazards associated with the workscope activities were discussed. An exclusion or safe zone was established around the excavation to prevent onsite personnel from approaching the edge of the excavation.

Excavation

Two hundred sixty yards of hydrocarbon-contaminated soil were excavated along a 45-foot long section of Line #1 (Figure 3). Surface soils above the pipeline were removed with hand shovels in the area of the initial pipeline leak. The pipeline was approximately 3 feet below grade. A backhoe was used to excavate the remaining contaminated soil to a depth of approximately 13 feet below grade which was the depth limitation for safe operation of the backhoe. Stained soil was observed immediately below the pipeline and in the bottom and north and south side walls of the excavation below approximately eight feet.

Soil Sampling

Figure 3 shows the soil sample locations. Two grab soil samples were collected from contaminated soils immediately below the pipeline several feet east and west of the leak point. Eleven other samples were collected from select locations at the bottom of the excavation. In addition, two soil samples were collected from the east and west sidewalls of the excavation. A total of 13 samples were collected. The samples were collected from the backhoe bucket at the edge of the exclusion zone after the backhoe removed undisturbed soil from the bottom and sidewalls of the excavation. The soil samples were contained in wide-mouth jars and placed on ice in a cooler. Proper chain-of-custody documentation was conducted and the samples were sent overnight to Analytical Technologies, Inc. in Albuquerque, New Mexico for benzene, toluene, ethylbenzene, and total xylene (BTEX; EPA Method 8020), and total (recoverable) petroleum hydrocarbon (TPH; EPA Method 418.1) analyses.

Laboratory Analysis Results

The following table summarizes the laboratory results for the 13 samples collected from the excavation. Laboratory results for TPH in soil samples collected from the excavation ranged from 280 to 16,000 mg/kg. The total BTEX concentration in soil ranged from 9.22 to 375.3 mg/kg. Benzene concentration in soil ranged from <0.25 to 3.8 mg/kg.

Sample No.-Depth (ft)	TPH (mg/kg)	Total BTEX (mg/kg)	Benzene (mg/kg)
1-4BPW	3800	307.4	1.4
2-4BPE	2000	115.1	3.8
3-13S	970	40.0	<0.5
4-9N	3200	128.02	0.62
5-12N	440	9.22	<0.25
6-12S	280	106.1	3.5
7-13N	6800	172.74	0.84
8-13S	3500	118.5	<0.5
9-13N	6000	204.5	<0.5
10-13S	2100	96.5	<0.5
11-13S	4200	157.2	<0.5
12-8S	1200	31.1	<0.5
13-10N	16000	375.3	1.3

BPW= sample collected below the pipeline toward the west end of the excavation
BPE= sample collected below the pipeline toward the east end of the excavation
S= sample collected south of pipeline
N= sample collected north of pipeline

Marathon had proposed to remove soil that exceeds the suggested concentrations in the OCD Guidelines for Remediation of Leaks, Spills, and Releases for sites where the depth to groundwater is less than 50 feet. These guideline standards for TPH, total BTEX, and benzene concentration in soil are 100, 50, and 10 mg/kg, respectively. Although benzene concentrations in soil samples collected from the bottom of the excavation met these guideline levels, TPH concentrations were not met. Ten of thirteen total BTEX concentrations did not met these guidelines either. However, the backhoe could not be used to excavate contaminated soil that remained below approximately 13 feet. The excavation was also limited to the south by the southern plant fence and to the north by Line #2 pipeline (Figure 3). The fence is located 21 feet south of the limit of the excavation. The northern limit of the excavation was 3 feet from Line #2. Since further excavation was deemed unsafe, clean fill dirt was placed in the excavation and compacted with the backhoe. The clean fill dirt was purchased and trucked in from off site.

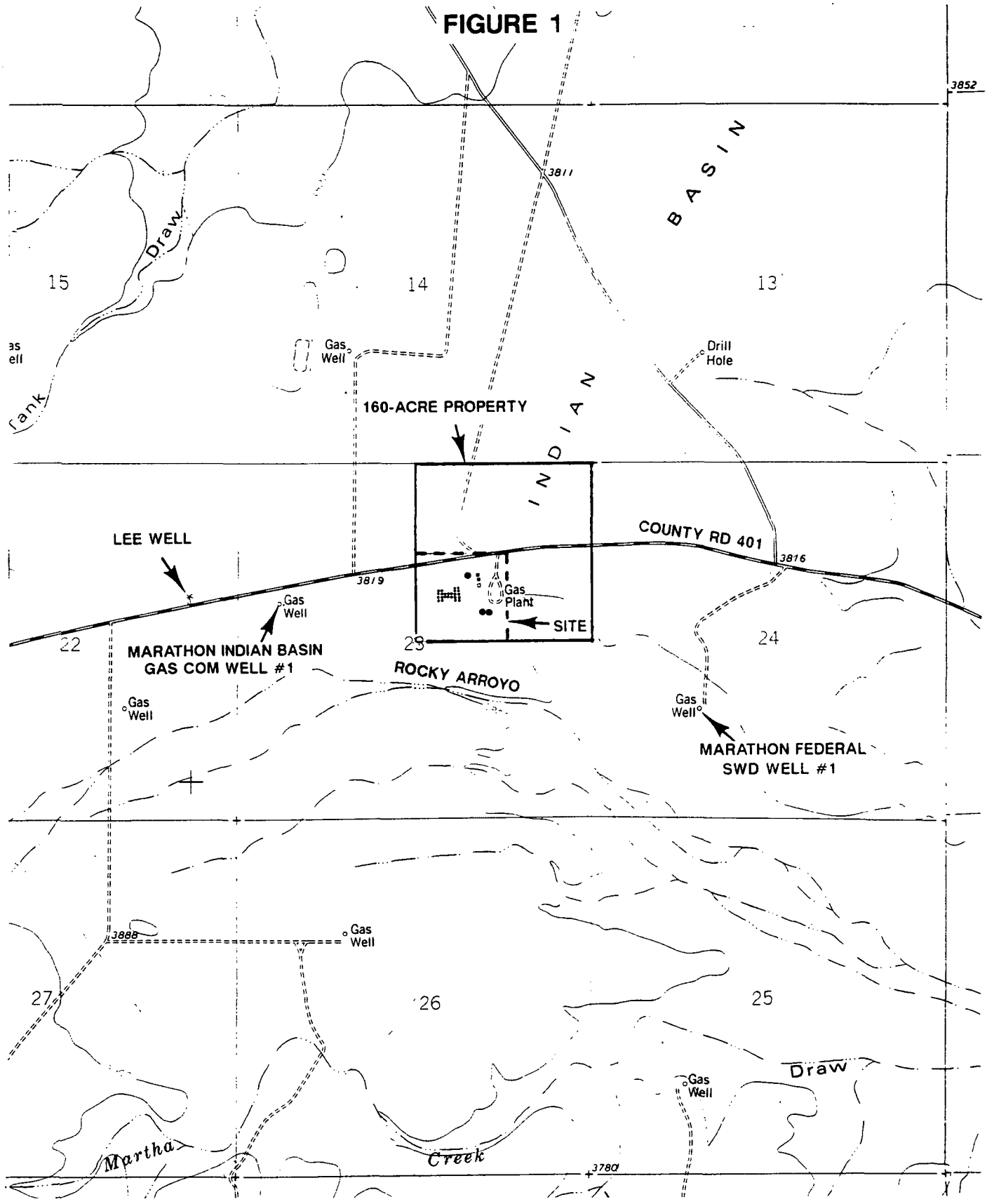
Marathon stockpiled the 260 yards of excavated contaminated soil in the Indian Basin Gas Plant landfarm staging area. The soil is awaiting treatment in the plant landfarm area. This soil will be treated to the guideline standards of 100 and 50 mg/kg for TPH and total BTEX, respectively, for reburial associated with future projects at the gas plant.

CLOSURE

Marathon proposes no further cleanup action relating to the Line #1 spill. Source reduction has been accomplished by the excavation of soils adjacent to and beneath the pipeline to approximately 13 feet. These soils, containing the highest hydrocarbon concentrations, have been removed so that the potential for contamination of groundwater has been reduced substantially. Based on assessment of risk, contaminated soils remaining below the safe limits of excavation should not pose an undue threat to present or future beneficial use of groundwater, public health, or the environment. While shallow groundwater is present in the vicinity of the Indian Basin Gas Plant, the nearest downgradient shallow groundwater water-source well is more than two miles east. Rocky Arroyo, an intermittent dry watercourse is located approximately 1200 feet south of the leak site. In addition, downgradient shallow groundwater monitoring wells are present which would detect noticeable contaminant entry into the shallow groundwater aquifer. Given the environmental setting and the excavation of the contaminated soils to the maximum depth and horizontal extent practicable per OCD guidelines, no additional remedial action is warranted for soils remaining below Line #1.

FIGURES

FIGURE 1


3852
3811
INDIAN BASIN
Draw
15
14
13
Gas Well
Drill Hole
160-ACRE PROPERTY
Tank
LEE WELL
COUNTY RD 401
3816
3819
Gas Well
Gas Plant
SITE
22
23
24
MARATHON INDIAN BASIN GAS COM WELL #1
ROCKY ARROYO
Gas Well
Gas Well
MARATHON FEDERAL SWD WELL #1
3888
Gas Well
27
26
25
Gas Well
Draw
Martha Creek
3780

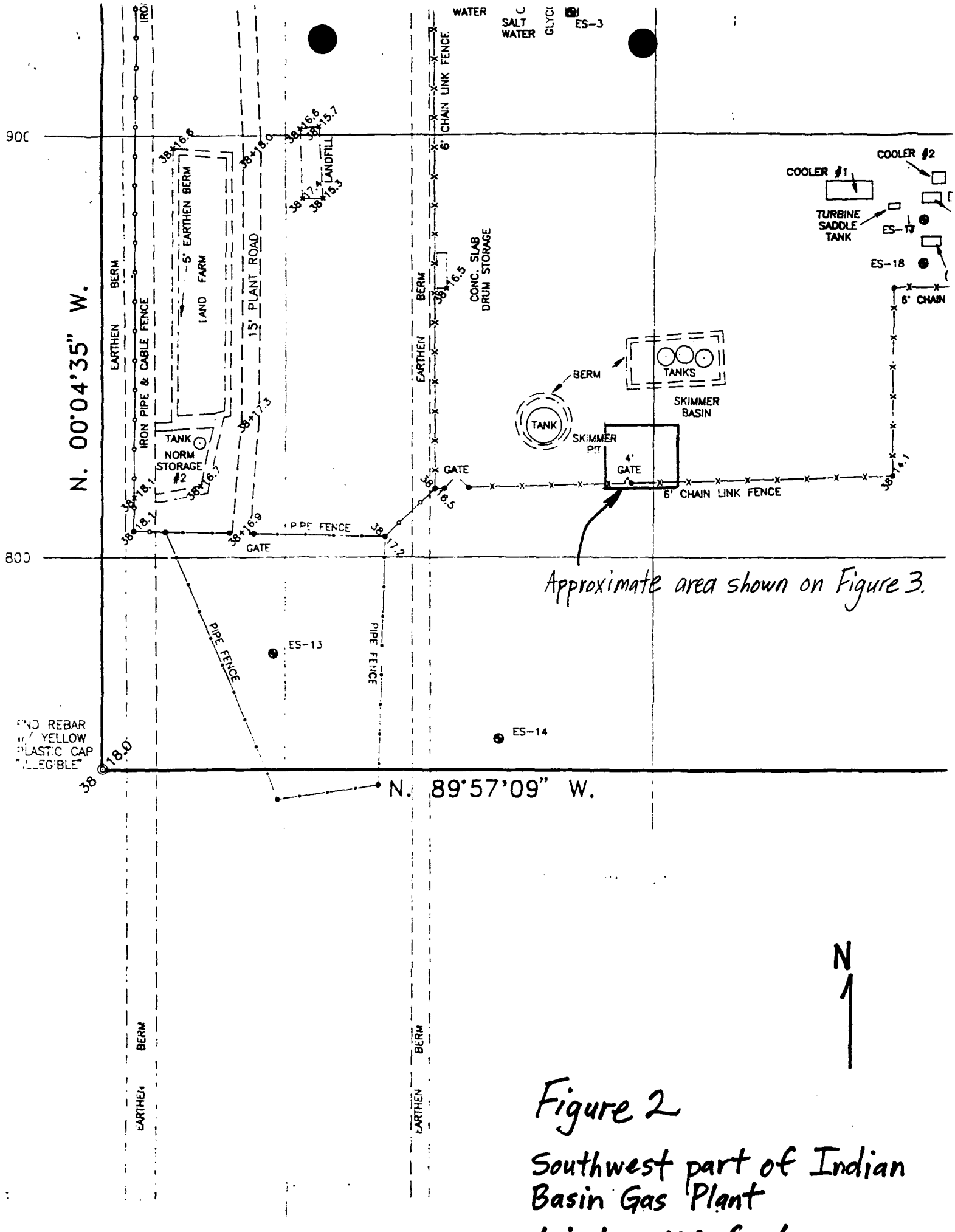


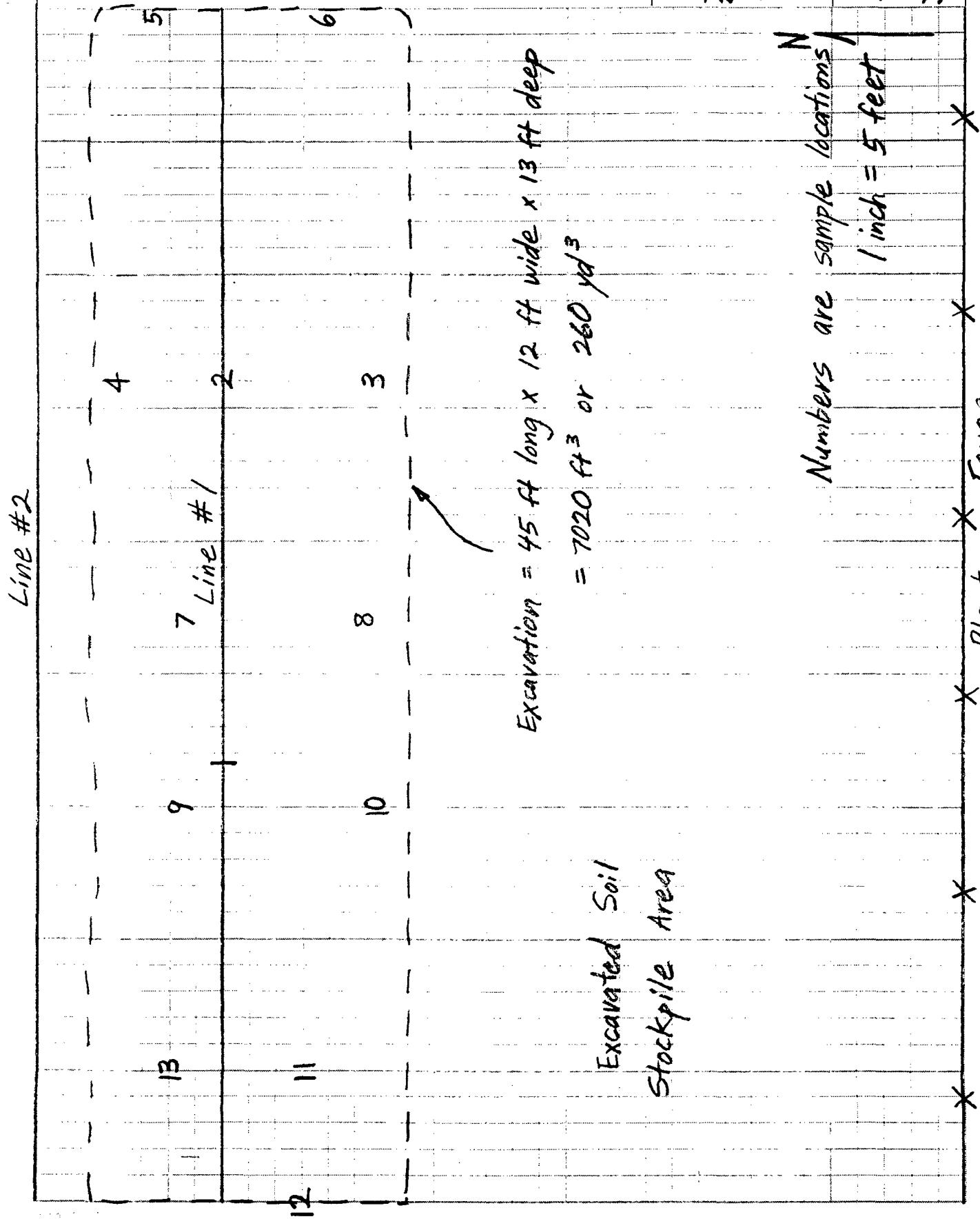
Figure 2

Southwest part of Indian Basin Gas Plant

1 inch = 100 feet

Marathon Pipe Line Company

Subject	Page No.	Of
Figure 3 - Excavation Plan View		
File	By RJM	Date 11-2-94



APPENDIX A

OCD NOTIFICATION OF FIRE, BREAKS, SPILLS, LEAKS, AND BLOWOUTS

RJM
EIH - Hobbs MP file

NEW MEXICO OIL CONSERVATION COMMISSION

NOTIFICATION OF FIRE, BREAKS, SPILLS, LEAKS, AND BLOWOUTS

NAME OF OPERATOR	MARATHON OIL CO.				ADDRESS	P.O. BOX 1324, ARTESIA, NM 88210		
REPORT OF	FIRE	BREAK	SPILL X	LEAK X	BLOWOUT	OTHER*		
TYPE OF FACILITY	DRLG WELL	PROD WELL	TANK BTTY	PIPE LINE	GASO PLNT X	OIL RFY	OTHER*	
NAME OF FACILITY	INDIAN BASIN GAS PLANT							
LOCATION OF FACILITY (QUARTER/QUARTER SECTION OR FOOTAGE DESCRIPTION)	SW/NE				SEC. 23	TWP. 21S	RGE. 23E	COUNTY EDDY
DISTANCE AND DIRECTION FROM NEAREST TOWN OR PROMINENT LANDMARK	25 MILES WEST OF CARLSBAD							
DATE AND HOUR OF OCCURENCE	APP. 10:00 p.m. 7/10/94				DATE AND HOUR OF DISCOVERY	7/13/94 APP. 1:00 p.m.		
WAS IMMEDIATE NOTICE GIVEN?	YES X	NO	NOT REQUIRED		IF YES, TO WHOM	MARK ASHLEY - NMOCD		
BY WHOM	NOEL GARZA				DATE AND HOUR	* 8:30 a.m. 7/15/94		
TYPE OF FLUID LOST	CONDENSATE/PRODUCED WATER				QUANTITY OF LOSS	125 bbls Cond. 427 bbls Prod. H_2O	VOLUME RECOVERED	2 bbls
DID ANY FLUIDS REACH A WATERCOURSE?	YES	NO X	QUANTITY					

IF YES, DESCRIBE FULLY**

DESCRIBE CAUSE OF PROBLEM AND REMEDIAL ACTION TAKEN**

Leak was inside the Plant fence, south of the Skimmer Basin on Line 1 Liquid Line (PVC). Caused by externally corroded hole in a steel dresser coupling. The coupling was removed and a section of poly pipe flanged on both ends to the PVC was installed. All steel was eliminnated.

DESCRIBE AREA AFFECTED AND CLEANUP ACTION TAKEN** on 8/31/94 RP 7-22

The area on surface was approximately seven feet in diameter as was the area on the pipeline around the dresser. Excavation work will continue to 8/10/94 when the plant is down for 24 hours maintenence. At this time all the lines will be located while the plant is down to permit further excavation after start-up if necessary.

DESCRIPTION OF AREA	FARMING	GRAZING	URBAN	OTHER*			
SURFACE CONDITIONS	SANDY X	SANDY LOAM	CLAY	ROCKY X	WET	DRY	SNOW

DESCRIBE GENERAL CONDITIONS PREVAILING (TEMPERATURE, PRECIPITATION, ETC.)**

Hot dry and breezy. Ambient temp. in the high 90's to 100's.

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

SIGNED Noel R. Garza TITLE Plant Supt. DATE 7/15/94

*SPECIFY **ATTACH ADDITIONAL SHEETS IF NECESSARY

* Mark Ashley & Jim Morrow out of town on 7/14/94 (3:30 p.m.) when volumes of product spilled were determined to be reportable.

APPENDIX B

LABORATORY RESULTS (SOIL)

Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **409314**

September 13, 1994

Marathon Oil Company
P.O. Box 552
Midland, TX 79701

Project Name/Number: LINE #1 REMEDIATION

Attention: Bob Menzie

On **09/03/94**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **non-aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

SEP 15 1994

Analytical Technologies, Inc.

CLIENT : MARATHON OIL COMPANY
PROJECT # : (NONE)
PROJECT NAME : LINE #1 REMEDIATION

DATE RECEIVED : 09/03/94
REPORT DATE : 09/13/94

ATI ID: 409314

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	L1-1-4BPW	NON-AQ	08/31/94
02	L1-2-4BPE	NON-AQ	08/31/94
03	L1-3-13S	NON-AQ	08/31/94
04	L1-4-9N	NON-AQ	08/31/94
05	L1-5-12N	NON-AQ	08/31/94
06	L1-6-12S	NON-AQ	08/31/94
07	L1-7-13N	NON-AQ	09/01/94
08	L1-8-13S	NON-AQ	09/01/94
09	L1-9-13N	NON-AQ	09/01/94

---TOTALS---

MATRIX	#SAMPLES
NON-AQ	9

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

CLIENT	: MARATHON OIL COMPANY	ATI I.D.	: 409314
PROJECT #	: (NONE)	DATE RECEIVED	: 09/03/94
PROJECT NAME	: LINE #1 REMEDIATION	DATE ANALYZED	: 09/08/94

PARAMETER	UNITS	01	02	03	04
PETROLEUM HYDROCARBONS, IR	MG/KG	3800	2000	970	3200

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

CLIENT	: MARATHON OIL COMPANY	ATI I.D.	: 409314
PROJECT #	: (NONE)	DATE RECEIVED	: 09/03/94
PROJECT NAME	: LINE #1 REMEDIATION	DATE ANALYZED	: 09/08/94

PARAMETER	UNITS	05	06	07	08
PETROLEUM HYDROCARBONS, IR	MG/KG	440	280	6800	3500

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

CLIENT	: MARATHON OIL COMPANY	ATI I.D.	: 409314
PROJECT #	: (NONE)	DATE RECEIVED	: 09/03/94
PROJECT NAME	: LINE #1 REMEDIATION	DATE ANALYZED	: 09/08/94

PARAMETER	UNITS	09
PETROLEUM HYDROCARBONS, IR	MG/KG	6000

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT	: MARATHON OIL COMPANY	ATI I.D.	: 409314
PROJECT #	: (NONE)	SAMPLE MATRIX	: NON-AQ
PROJECT NAME	: LINE #1 REMEDIATION	UNITS	: MG/KG

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC.	% REC
PETROLEUM HYDROCARBONS	090894C	<20	<20	NA	180	150	120

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT	: MARATHON OIL COMPANY	ATI I.D.	: 409314
PROJECT #	: (NONE)	SAMPLE MATRIX	: NON-AQ
PROJECT NAME	: LINE #1 REMEDIATION	UNITS	: MG/KG

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC.	% REC
PETROLEUM HYDROCARBONS	090894B	<20	<20	NA	170	150	113

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 409314

PROJECT # : (NONE)

PROJECT NAME : LINE #1 REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	L1-1-4BPW	NON-AQ	08/31/94	09/06/94	09/08/94	10
02	L1-2-4BPE	NON-AQ	08/31/94	09/06/94	09/08/94	20
03	L1-3-13S	NON-AQ	08/31/94	09/06/94	09/08/94	20

PARAMETER	UNITS	01	02	03
BENZENE	MG/KG	1.4	3.8	<0.5
TOLUENE	MG/KG	67	14	3.7
ETHYLBENZENE	MG/KG	19	7.3	2.8
TOTAL XYLENES	MG/KG	220	90	33
SURROGATE:				
BROMOFLUOROBENZENE (%)		92	78	65

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 409314

PROJECT # : (NONE)

PROJECT NAME : LINE #1 REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	L1-4-9N	NON-AQ	08/31/94	09/06/94	09/08/94	20
05	L1-5-12N	NON-AQ	08/31/94	09/06/94	09/08/94	10
06	L1-6-12S	NON-AQ	08/31/94	09/06/94	09/08/94	20

PARAMETER	UNITS	04	05	06
BENZENE	MG/KG	0.62	<0.25	3.5
TOLUENE	MG/KG	24	0.29	30
ETHYLBENZENE	MG/KG	7.4	0.58	6.6
TOTAL XYLENES	MG/KG	96	8.1	66
SURROGATE:				
BROMOFLUOROBENZENE (%)		87	99	53*

*OUTSIDE ATI QUALITY CONTROL LIMITS DUE TO MATRIX INTERFERENCE

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL COMPANY ATI I.D.: 409314

PROJECT # : (NONE)

PROJECT NAME : LINE #1 REMEDIATION

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
07	L1-7-13N	NON-AQ	09/01/94	09/06/94	09/08/94	20
08	L1-8-13S	NON-AQ	09/01/94	09/06/94	09/08/94	20
09	L1-9-13N	NON-AQ	09/01/94	09/06/94	09/08/94	20

PARAMETER	UNITS	07	08	09
BENZENE	MG/KG	0.84	<0.5	<0.5
TOLUENE	MG/KG	32	16	31
ETHYLBENZENE	MG/KG	9.9	7.0	13
TOTAL XYLENES	MG/KG	130	95	160
SURROGATE:				
BROMOFLUOROBENZENE (%)		160*	127*	149*

*OUTSIDE ATI QUALITY CONTROL LIMITS DUE TO MATRIX INTÊRFERENCE

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 409314
BLANK I.D.	: 090694B	MATRIX	: NON-AQ
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: 09/06/94
PROJECT #	: (NONE)	DATE ANALYZED	: 09/08/94
PROJECT NAME	: LINE #1 REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/KG	<0.025
TOLUENE	MG/KG	<0.025
ETHYLBENZENE	MG/KG	<0.025
TOTAL XYLENES	MG/KG	<0.025
SURROGATE:		
BROMOFLUOROBENZENE (%)		100

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 409314
BLANK I.D.	: 090694	MATRIX	: NON-AQ
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: 09/06/94
PROJECT #	: (NONE)	DATE ANALYZED	: 09/06/94
PROJECT NAME	: LINE #1 REMEDIATION	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/KG	<0.025
TOLUENE	MG/KG	<0.025
ETHYLBENZENE	MG/KG	<0.025
TOTAL XYLENES	MG/KG	<0.025
SURROGATE:		
BROMOFLUOROBENZENE (%)		100

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 40931304	ATI I.D.	: 409314
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: 09/06/94
PROJECT #	: (NONE)	DATE ANALYZED	: 09/06/94
PROJECT NAME	: LINE #1 REMEDIATION	SAMPLE MATRIX	: NON-AQ
REF. I.D.	: 40931304	UNITS	: MG/KG

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.025	1.0	0.96	96	0.97	97	1
TOLUENE	<0.025	1.0	0.98	98	0.95	95	3
ETHYLBENZENE	<0.025	1.0	0.98	98	0.92	92	6
TOTAL XYLENES	<0.025	3.0	30	100	3.0	100	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 090694	ATI I.D.	: 409314
CLIENT	: MARATHON OIL COMPANY	DATE EXTRACTED	: 09/06/94
PROJECT #	: (NONE)	DATE ANALYZED	: 09/09/94
PROJECT NAME	: LINE #1 REMEDIATION	SAMPLE MATRIX	: NON-AQ
REF. I.D.	: 090694	UNITS	: MG/KG

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.025	1.0	1.0	100	1.0	100	0
TOLUENE	<0.025	1.0	1.0	100	1.0	100	0
ETHYLBENZENE	<0.025	1.0	1.0	100	1.0	100	0
TOTAL XYLENES	<0.025	3.0	3.1	103	3.1	103	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc., Albuquerque, NM
San Diego • Phoenix • Seattle • Pensacola • Ft. Collins • Portland • Albuquerque

CHAIN OF CUSTODY

DATE: 8-31-94 PAGE 1 OF 2

ATI LAB I.D. 409812

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: 125 W. Missouri St.
Midland, TX 79701
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO: Bob Menzie
COMPANY: Marathon Oil Company
ADDRESS: Midland TX 79702-0552
P.O. Box 552

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/MTBE (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)	NUMBER CONTAINERS
L1-1-4BPW	8-31-94	10:20a	SOIL	01	✓			✓																1
L1-2-4BPE		12:25P		02	✓			✓																1
L1-3-13S		5:15P		03	✓			✓																1
L1-4-9N		5:20P		04	✓			✓																1
L1-5-12N		5:55P		05	✓			✓																1
L1-6-12S		6:25P		06	✓			✓																1
L1-7-13N	9-1-94	1:35P		07	✓			✓																1
L1-8-13S	9-1-94	1:45P		08	✓			✓																1
L1-9-13N	9-1-94	3:10PM		09	✓			✓																1

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:		NO. CONTAINERS	9
PROJ. NAME:	Line #1 Remediation	CUSTODY SEALS	Y / N (NA)
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:	Greyhound	RECEIVED COLD	NOT TAKEN

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☒ 2 WEEK

Comments:
on ICE 2.5°C

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Robert Menzie Time: 1:30 PM	Signature: Time:	Signature: Time:
Printed Name: Robert Menzie Date: 9-2-94	Printed Name: Date:	Printed Name: Date:
Company: Marathon Phone: 915-687-8312	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time:
Printed Name: Date:	Printed Name: Date:	Printed Name: Date:
Company:	Company:	Analytical Technologies, Inc.

Analytical Technologies, Inc.

2709-D Pan American Freeway, NE Albuquerque, NM 87107
Phone (505) 344-3777 FAX (505) 344-4413

ATI I.D. **409312**

September 9, 1994

Marathon Oil Co.
125 E. Missouri St.
Midland, TX 79701

Project Name/Number: INDIAN BASIN GP

Attention: Bob Menzie

On **09/03/94**, Analytical Technologies, Inc., (ADHS License No. AZ0015), received a request to analyze **aqueous and non-aqueous** samples. The samples were analyzed with EPA methodology or equivalent methods. The results of these analyses and the quality control data, which follow each set of analyses, are enclosed.

Sample "LANDFARM-NW" was heterogenous. Both runs are reported.

If you have any questions or comments, please do not hesitate to contact us at (505) 344-3777.

Letitia Krakowski, Ph.D.
Project Manager

H. Mitchell Rubenstein, Ph.D.
Laboratory Manager

MR:jt

Enclosure

Analytical Technologies, Inc.

CLIENT : MARATHON OIL CO. DATE RECEIVED : 09/03/94
PROJECT # : (NONE)
PROJECT NAME : INDIAN BASIN GP REPORT DATE : 09/09/94

ATI ID: 409312

ATI #	CLIENT DESCRIPTION	MATRIX	DATE COLLECTED
01	L1-10-135	NON-AQ	09/01/94
02	L1-11-135	NON-AQ	09/01/94
03	L1-12-85	NON-AQ	09/01/94
04	L1-13-10N	NON-AQ	09/01/94
05	STRIPPER INLET	AQUEOUS	09/02/94
06	STRIPPER OUTLET	AQUEOUS	09/02/94
07	LANDFARM-SE	NON-AQ	09/02/94
08	LANDFARM-NE	NON-AQ	09/02/94
09	LANDFARM-SW	NON-AQ	09/02/94
10	LANDFARM-NW	NON-AQ	

---TOTALS---

MATRIX	#SAMPLES
NON-AQ	8
AQUEOUS	2

ATI STANDARD DISPOSAL PRACTICE

The samples from this project will be disposed of in thirty (30) days from the date of this report. If an extended storage period is required, please contact our sample control department before the scheduled disposal date.

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)
CLIENT : MARATHON OIL CO. ATI I.D.: 409312
PROJECT # : (NONE)
PROJECT NAME : INDIAN BASIN GP

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
01	L1-10-135	NON-AQ	09/01/94	09/06/94	09/08/94	20
02	L1-11-135	NON-AQ	09/01/94	09/06/94	09/08/94	20
03	L1-12-85	NON-AQ	09/01/94	09/06/94	09/08/94	20

PARAMETER	UNITS	01	02	03
BENZENE	MG/KG	<0.5	<0.5	<0.5
TOLUENE	MG/KG	12	38	5.0
ETHYLBENZENE	MG/KG	5	8.7	1.6
TOTAL XYLENES	MG/KG	79	110	20
SURROGATE:				
BROMOFLUOROBENZENE (%)		134*	128*	103

*OUTSIDE ATI QUALITY CONTROL LIMITS DUE TO MATRIX INTERFERENCE

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 409312

PROJECT # : (NONE)

PROJECT NAME : INDIAN BASIN GP

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
04	L1-13-10N	NON-AQ	09/01/94	09/06/94	09/08/94	20
07	LANDFARM-SE	NON-AQ	09/02/94	09/06/94	09/08/94	1
08	LANDFARM-NE	NON-AQ	09/02/94	09/06/94	09/08/94	1

PARAMETER	UNITS	04	07	08
BENZENE	MG/KG	1.3	<0.025	<0.025
TOLUENE	MG/KG	93	<0.025	<0.025
ETHYLBENZENE	MG/KG	21	<0.025	<0.025
TOTAL XYLENES	MG/KG	260	0.032	<0.025
SURROGATE:				
BROMOFLUOROBENZENE (%)		237*	86	89

*OUTSIDE ATI QUALITY CONTROL LIMITS DUE TO MATRIX INTERFERENCE

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 409312

PROJECT # : (NONE)

PROJECT NAME : INDIAN BASIN GP

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
09	LANDFARM-SW	NON-AQ	09/02/94	09/06/94	09/08/94	1
10	LANDFARM-NW	NON-AQ	09/02/94	09/06/94	09/08/94	1

PARAMETER	UNITS	09	10
BENZENE	MG/KG	<0.025	<0.025
TOLUENE	MG/KG	<0.025	<0.025
ETHYLBENZENE	MG/KG	0.033	<0.025
TOTAL XYLENES	MG/KG	<0.025	<0.025
SURROGATE:			
BROMOFLUOROBENZENE (%)		89	88

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 409312
BLANK I.D.	: 090694	MATRIX	: NON-AQ
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: 09/06/94
PROJECT #	: (NONE)	DATE ANALYZED	: 09/06/94
PROJECT NAME	: INDIAN BASIN GP	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	MG/KG	<0.025
TOLUENE	MG/KG	<0.025
ETHYLBENZENE	MG/KG	<0.025
TOTAL XYLENES	MG/KG	<0.025
SURROGATE:		
BROMOFLUOROBENZENE (%)		100

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 40931304	ATI I.D.	: 409312
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: 09/06/94
PROJECT #	: (NONE)	DATE ANALYZED	: 09/06/94
PROJECT NAME	: INDIAN BASIN GP	SAMPLE MATRIX	: NON-AQ
REF. I.D.	: 40931304	UNITS	: MG/KG

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	<0.025	1.0	0.96	96	0.97	97	1
TOLUENE	<0.025	1.0	0.98	98	0.95	95	3
ETHYLBENZENE	<0.025	1.0	0.98	98	0.92	92	6
TOTAL XYLENES	<0.025	3.0	30	100	3.0	100	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

TEST : BTEX (EPA 8020)

CLIENT : MARATHON OIL CO. ATI I.D.: 409312

PROJECT # : (NONE)

PROJECT NAME : INDIAN BASIN GP

SAMPLE ID. #	CLIENT I.D.	MATRIX	DATE SAMPLED	DATE EXTRACTED	DATE ANALYZED	DIL. FACTOR
05	STRIPPER INLET	AQUEOUS	09/02/94	NA	09/09/94	1
06	STRIPPER OUTLET	AQUEOUS	09/02/94	NA	09/09/94	1

PARAMETER	UNITS	05	06
BENZENE	UG/L	23	<0.5
TOLUENE	UG/L	18	8.6
ETHYLBENZENE	UG/L	17	0.9
TOTAL XYLENES	UG/L	110	12
SURROGATE:			
BROMOFLUOROBENZENE (%)		90	102

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY RESULTS

REAGENT BLANK

TEST	: BTEX (EPA 8020)	ATI I.D.	: 409312
BLANK I.D.	: 090994	MATRIX	: AQUEOUS
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 09/09/94
PROJECT NAME	: INDIAN BASIN GP	DILUTION FACTOR	: 1

PARAMETER	UNITS	
BENZENE	UG/L	<0.5
TOLUENE	UG/L	<0.5
ETHYLBENZENE	UG/L	<0.5
TOTAL XYLENES	UG/L	<0.5
SURROGATE:		
BROMOFLUOROBENZENE (%)		94

Analytical Technologies, Inc.

GAS CHROMATOGRAPHY - QUALITY CONTROL

MSMSD

TEST	: BTEX (EPA 8020)		
MSMSD #	: 40931601	ATI I.D.	: 409312
CLIENT	: MARATHON OIL CO.	DATE EXTRACTED	: NA
PROJECT #	: (NONE)	DATE ANALYZED	: 09/09/94
PROJECT NAME	: INDIAN BASIN GP	SAMPLE MATRIX	: AQUEOUS
REF. I.D.	: 40931601	UNITS	: UG/L

PARAMETER	SAMPLE RESULT	CONC SPIKE	SPIKED SAMPLE	% REC	DUP SPIKE	DUP % REC	RPD
BENZENE	1.0	10	11	100	10	90	10
TOLUENE	0.6	10	10	94	10	94	0
ETHYLBENZENE	<0.5	10	10	100	10	100	0
TOTAL XYLENES	0.7	30	31	101	31	101	0

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

CLIENT	: MARATHON OIL CO.	ATI I.D.	: 409312
PROJECT #	: (NONE)	DATE RECEIVED	: 09/03/94
PROJECT NAME	: INDIAN BASIN GP	DATE ANALYZED	: 09/08/94

PARAMETER	UNITS	01	02	03	04
PETROLEUM HYDROCARBONS, IR	MG/KG	2100	4200	1200	16000

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

CLIENT	: MARATHON OIL CO.	ATI I.D.	: 409312
PROJECT #	: (NONE)	DATE RECEIVED	: 09/03/94
PROJECT NAME	: INDIAN BASIN GP	DATE ANALYZED	: 09/08/94

PARAMETER	UNITS	07	08	09	10A
PETROLEUM HYDROCARBONS, IR	*MG/KG*	*580*	410	39	460

Analytical Technologies, Inc.

GENERAL CHEMISTRY RESULTS

CLIENT	: MARATHON OIL CO.	ATI I.D.	: 409312
PROJECT #	: (NONE)	DATE RECEIVED	: 09/03/94
PROJECT NAME	: INDIAN BASIN GP	DATE ANALYZED	: 09/08/94

PARAMETER	UNITS	10B
PETROLEUM HYDROCARBONS, IR	MG/KG	630

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT	: MARATHON OIL CO.	ATI I.D.	: 409312
PROJECT #	: (NONE)	SAMPLE MATRIX	: NON-AQ
PROJECT NAME	: INDIAN BASIN GP	UNITS	: MG/KG

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC.	% REC
PETROLEUM HYDROCARBONS	090894B	<20	<20	NA	170	150	113

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc.

GENERAL CHEMISTRY - QUALITY CONTROL

CLIENT	: MARATHON OIL CO.	ATI I.D.	: 409312
PROJECT #	: (NONE)	SAMPLE MATRIX	: NON-AQ
PROJECT NAME	: INDIAN BASIN GP	UNITS	: MG/KG

PARAMETER	ATI I.D.	SAMPLE RESULT	DUP. RESULT	RPD	SPIKED SAMPLE	SPIKE CONC.	% REC
PETROLEUM HYDROCARBONS	40932301	<20	<20	NA	170	150	113

$$\% \text{ Recovery} = \frac{(\text{Spike Sample Result} - \text{Sample Result})}{\text{Spike Concentration}} \times 100$$

$$\text{RPD (Relative Percent Difference)} = \frac{(\text{Sample Result} - \text{Duplicate Result})}{\text{Average Result}} \times 100$$

Analytical Technologies, Inc., Albuquerque, NM

San Diego ▪ Phoenix ▪ Seattle ▪ Pensacola ▪ Ft. Collins ▪ Portland ▪ Albuquerque

CHAIN OF CUSTODY

DATE: 9-2-94 PAGE 2 OF 2

ATI LAB I.D.: 409812

PLEASE FILL THIS FORM IN COMPLETELY. SHADED AREAS ARE FOR LAB USE ONLY.

PROJECT MANAGER: Bob Menzie

COMPANY: Marathon Oil Company
ADDRESS: 125 W. Missouri St.
Midland, TX 79701
PHONE: 915-687-8312
FAX: 915-687-8337

BILL TO: Bob Menzie
COMPANY: Marathon Oil Company
ADDRESS: P.O. Box 552
Midland, TX 79702-0552

ANALYSIS REQUEST

SAMPLE ID	DATE	TIME	MATRIX	LAB ID	Petroleum Hydrocarbons (418.1)	(MOD 8015) Gas/Diesel	Diesel/Gasoline/BTXE/MTBE (MOD 8015/8020)	BTXE/~~MTBE~~ (8020)	Chlorinated Hydrocarbons (601/8010)	Aromatic Hydrocarbons (602/8020)	SDWA Volatiles (502.1/503.1), 502.2 Reg. & Unreg.	Pesticides/PCB (608/8080)	Herbicides (615/8150)	Base/Neutral/Acid Compounds GC/MS (625/8270)	Volatile Organics GC/MS (624/8240)	Polynuclear Aromatics (610/8310)	SDWA Primary Standards - Arizona	SDWA Secondary Standards - Arizona	SDWA Primary Standards - Federal	SDWA Secondary Standards - Federal	The 13 Priority Pollutant Metals	RCRA Metals by Total Digestion	RCRA Metals by TCLP (1311)	NUMBER OF CONTAINERS
L1-10-13S	9-1-94	3:15P	SOIL	01	✓			✓																1
L1-11-13S	9-1-94	4:30P	SOIL	02	✓			✓																1
L1-12-8S	9-1-94	4:40P	SOIL	03	✓			✓																1
L1-13-10N	9-1-94	5:10P	SOIL	04	✓			✓																1
STRIPPER INLET	9-2-94	11:20a	Water	05				✓																1
STRIPPER OUTLET	9-2-94	11:25a	Water	06				✓																1
LANDFARM-SE		11:40a	SOIL	07	✓			✓																1
LANDFARM-NE		11:45a		08	✓			✓																1
~~LANDFARM-NW~~		11:50a		10	✓			✓																1
LANDFARM-SW		11:55a		09	✓			✓																1

PROJECT INFORMATION		SAMPLE RECEIPT	
PROJ. NO.:		NO. CONTAINERS	9
PROJ. NAME:	INDIAN BASIN GP	CUSTODY SEALS	(Y) / N / NA
P.O. NO.:		RECEIVED INTACT	Y
SHIPPED VIA:	Greyhound	RECEIVED COLD	Y

PRIOR AUTHORIZATION IS REQUIRED FOR RUSH PROJECTS

(RUSH) ☐ 24hr ☐ 48hr ☐ 72hr ☐ 1 WEEK (NORMAL) ☑ 2 WEEK

Comments:

SAMPLED & RELINQUISHED BY: 1.	RELINQUISHED BY: 2.	RELINQUISHED BY: 3.
Signature: Robert Menzie Time: 1:30 PM	Signature: Time:	Signature: Time:
Printed Name: Robert Menzie Date: 9-2-94	Printed Name: Date:	Printed Name: Date:
Company: Marathon Phone: 915-687-8312	Company:	Company:

RECEIVED BY: 1.	RECEIVED BY: 2.	RECEIVED BY: (LAB) 3.
Signature: Time:	Signature: Time:	Signature: Time: 1:30
Printed Name: Date:	Printed Name: Date:	Printed Name: C.F. Fechik Date: 9/2/94
Company:	Company:	Analytical Technologies, Inc.

2R - 22

REPORTS

DATE:

Nov 5, 1991

Mid-Continent Region
Production United States

Marathon Oil Company

P.O. Box 552
Midland, Texas 79702
Telephone 915/682-1626

November 13, 1991

Mr. William J. LeMay, Director
State of New Mexico
Oil Conservation Division
P. O. Box 2088
State Land Office Building
Santa Fe, New Mexico 87504

Mr. Larry L. Woodard, Director
Bureau of Land Management
P. O. Box 27115
Santa Fe, New Mexico 87502

Gentlemen:

As promised, attached is a report summarizing the highlights of the Indian Basin, 1991 Maintenance Turnaround activities relating to the Plant's gas and liquid gathering systems.

The report documents Marathon's commitment to ensuring the longevity and integrity of those systems. Equally rewarding was the fact that this work, coupled with that performed in the Plant, represented almost 10,000 man-hours of multi-discipline work without any accidents; a credit to all who were involved. New technologies, as well as the successful application of proven technologies were applied in this effort. These experiences, among others, we plan to share with the other members of the New Mexico Oil Conservation Division Aging Infrastructure Task Force.

Should you require any additional information, feel free to call; as documented, the test records are available for inspection.

Sincerely,

Robert F. Unger

Robert F. Unger
Production Manager
Midland Operations

RFU/elk

Attachment

cc: M. B. Williams (OCD-Artesia)
D. L. Manus (BLM-Carlsbad)

Bxc: L. J. Oswald
T. N. Tipton
A. R. Kukla w/o Attachment
J. L. Benson w/o Attachment

INDIAN BASIN GAS AND LIQUID GATHERING SYSTEM MODIFICATIONS AND TESTING REPORT SEPTEMBER, 1991 TURNAROUND

November 5, 1991

MARATHON OIL COMPANY
MIDLAND, TEXAS

TABLE OF CONTENTS PAGE

INDIAN BASIN GAS AND LIQUID GATHERING SYSTEM

MODIFICATIONS AND TESTING REPORT

I. INTRODUCTION

For thirteen days in September, 1991 the Indian Basin Gas Plant suspended operation to undergo a major turnaround. During this time Marathon Oil Company conducted an intensive and significant program to inspect, modify and integrity test the gas and liquid gathering systems. The primary objective of the effort was to ensure the operational longevity of the systems, and to minimize or eliminate possible leaks. Both conventional and non-conventional methods were used to verify the integrity of both systems.

The overall gathering system consists of a PVC condensate pipeline system in conjunction with a steel gas pipeline system. Both pipeline systems reside in the same ditch. Production from each well is separated and metered on-site. Gas and condensate plus water are transported by each respective gathering system to the Indian Basin Gas Plant. The gathering system traverses very rough terrain with large arroyos. Particular attention was focused on providing isolation in the pipeline system across the arroyos to minimize leak exposure. The main Rocky Arroyo crossing had additional modifications made to it to utilize early leak detection methods to eliminate and/or minimize leak exposure in this area.

II. ROCKY ARROYO MODIFICATIONS

The existing 6" PVC and steel condensate line across Rocky Arroyo was removed from service and a 4" polyethylene pipe (PEP) was sliplined into the 6" line across the arroyo. In this manner the 6" line will act as a containment casing for the 4" PEP; the steel providing structural integrity while the fluids travel in the corrosion resistant plastic pipe. Valves were installed on each side of the arroyo to minimize drainage and thus reduce liquid volumes if a leak should occur. The pipe encasement was sealed using a double "Link Seal" and "Trenton Wax" combination at each end. A Link Seal was installed approximately 3' inside the pipe encasement on each end. Another Link Seal was installed at the edge of the pipe encasement on both ends. The void between the link seals was filled with Trenton Casing Filler. This ensures a liquid tight seal between the pipe encasement and the PEP slipline. Please refer to Exhibit #1.

To provide for early detection should a leak occur, a fiberglass tank with a 3/4" stainless steel line was installed to the 2" casing vent. This will allow gas plant personnel to determine if the 4" PEP slipline is leaking. The 6" encasement would capture any escaped condensate and evidence of condensate would appear in the fiberglass tank from the casing vent. Maintenance personnel will periodically check the tank for condensate liquid and/or fumes. The 6" encasement is constructed with 2" vent pipes to the surface at each end of the arroyo. This, too, will be monitored for any escaping condensate fumes.

III. INTEGRITY & LEAK DETECTION OF THE GATHERING SYSTEM

Both conventional and unconventional methods were used in the testing program. For leak detection, a patented odorant used in conjunction with trained dogs was utilized in both systems. A corrosion monitoring tool was used in selected portions of the steel gas line to verify the internal and external integrity. Along with these unique methods of testing both pipeline systems were pressure tested to further verify their integrity.

a) **Leak Detection:**

Both the liquid and gas gathering systems used the TekScent method of leak detection. This method was developed by Exxon Chemical and has been previously used in Canada. However, this was the first time this method was used in the United States. The process included injecting a specialized patented chemical odorant in the gas stream of the pipeline system and then walking the surface above the lines with trained dogs. Migration of the special chemical through the soil from a pipeline leak can be detected by the dogs.

The chemical was injected directly into the produced gas stream of the gas gathering system by injection pumps located at selected well sites. The liquid system was purged with nitrogen to eliminate as much condensate as possible. Initially, there was some uncertainty as to whether the TekScent product would work correctly in the liquid system due to its solubility in condensate. Exxon Chemical verified, by laboratory testing, that by using nitrogen as the carrier and saturating the system with TekScent a viable test could be conducted. The linear footage of each system was 38 miles which was successfully tested in 8 days for the gas system and 4 days for the liquid system. By injecting directly into the produced gas stream of the gas system, this system was able to be leak tested while on-production.

No leaks were found in the gas gathering system. In the liquid system no leaks were indicated in the buried portion of the system. With this method of leak detection being new to the Indian Basin gas gathering operation, certain adjustments to the test procedure were required. Several tests were conducted to determine the concentration of TekScent required in the nitrogen gas medium. Initially, their were doubts about the ability of the dogs to detect leaks. However, once the procedure was optimized and several tests conducted, confidence in the dogs' ability to find leaks was reaffirmed.

Areas of uncertainty still remain for this method of testing. It is still unclear as to the dogs' ability to accurately detect leaks in a strong sour system due to the H_2S affecting their sense of smell. Also, close attention needs to be paid to wind direction and strength as it could affect the concentration of the TekScent being released. Rough terrain poses a problem since the dogs have to walk on top of pipeline system to adequately detect the TekScent.

It is felt that leak testing by using TekScent and dogs was a technical success. However, careful evaluation of a pipeline system (location, proximity to population center, pigging facilities, medium in pipeline, etc.) needs to be done prior to consideration of this type of test due to its high cost.

b) **Internal/External Testing:**

There was some uncertainty about the internal condition of the steel gas gathering system. Even though the integrity was to be verified by a pressure test, the need for actual data related to the internal condition of the pipe was also desired. It was decided to use a camera and wall thickness tool to obtain corrosion information in selected portions of the line. These selected portions represent a worst case condition and were not meant to be representative of the entire pipeline system. The portions were selected based on an evaluation of where water could potentially accumulate based on pipe elevation, pipe drameter and fluid velocity. It was our desire to obtain information on areas believed to be the most conducive to internal/external corrosion.

Schlumberger's Pipe Analyses Tool (PAT-E) was used with their RVC 360° video camera to gather this data. Sections had to be removed from the pipeline (the pipeline had no "pigging" facilities) so that the tool could be inserted. The tool was pushed approximately 500 feet in both directions by using a 3" PEP "fast-line". The tool was then pulled back by its tethered cable for the actual data gathering.

This PAT-E tool is similar in design and works on the same principle of the Pipe Analysis Log (PAL) tool for well casings. An electromagnetic field is produced by the tool around the pipe. Any deflection of the flux leakage is determined to be a corrosion thinning. The eddy current pads located on the tool determines if the deflection is caused by an anomaly internally. If no disruption is indicated by the eddy current pads, then the deflection is determined to be external. This technology is well proven to be successful with well casings, but is relatively new for pipelines.

The video camera was used on portions of Line #4 in the 16" main steel gas line and a 6" steel gas lateral. The video results of the 16" line showed the internal surface to be very clean with little or no scale. Corrosion in this area was limited to very light general pitting. The welds showed no apparent defects. The 6" line showed standing water in several places and pits along the bottom portion of the pipe. Outside of the standing water areas only scattered light, individual pits were observed.

The PAT-E was run in this same Line #4 - 6" pipe as well as a Line #1 - 6" portion. The PAT-E was not run in the 16" main line. The PAT-E tool was not able to traverse the bends that the video camera could, but it provided some good results. The Line #4 - 6" showed various internal light and moderate pits. No external corrosion thinning was observed. The Line #1 - 6" indicated similar conditions. Again the PAT-E could not make all of the bends that the video camera could, particularly in the areas of the standing water. Study of this information is presently being conducted to decide if any action is necessary in light of these observations.

Due to the absence of "pigging" facilities this method of inspection is labor intensive and operationally disruptive. However, the data received is valuable and can be used to determine the condition of the pipeline at that specific location. Inspection spool pieces were installed for future repeat inspections, and the actual sections removed were sent to Marathon's Petroleum Technology Center for further analysis. All documentation including video

tapes, charts and logs of this process are kept at the Indian Basin Gas Plant office for future reference.

c) **Pressure Testing:**

To further substantiate the pipeline system integrity 15 of the 20 gas and liquid pipeline sections were pressure tested. These sections were tested by using nitrogen gas as the test medium. The gas sections were tested to 1150 psi which correlate to the setting of the pressure relief system for the gathering system and plant. The liquid sections were tested to 125% of the maximum working pressure in each section. The remaining 5 sections that were not tested during the turnaround will be tested under the same criteria before the end of the year.

It was decided to gas test the system using nitrogen instead of hydrotesting due to the field's operational constraints. Various field constraints, such as varying pipeline size, preclude pigging facilities. This system also could not be equipped with temporary pigging facilities without making major design changes. With the gas gathering system any water used for hydrostatic testing could not be effectively evacuated from the system once the test was completed. The trapped water would later cause severe corrosion problems. With the liquid gathering system, the main problem was the large elevation changes which in some cases had a difference of 300'. With liquid testing this elevation change would create a hydrostatic head which would exceed the pressure rating of the PVC once test pressure was added to the system.

The decision to use nitrogen instead of produced gas was also due to safety. The produced gas is sour and explosive and not considered viable for this type of test. Nitrogen is an inert gas and is much safer to work with. The produced gas is sour and posed a possible health risk. The cost of $78,000 to use nitrogen over produced gas was well worth the expense due to the safety aspects.

The gas system was successfully tested without incident. The liquid system failed to test at various locations. This was primarily due to the testing of the lines prior to adequate drying time of newly cemented joints. Once adequate drying time was given, this system also tested successfully.

The hilly terrain that these systems traversed made it difficult to purge the pipelines due to liquid left in low spots. The compressible properties of nitrogen gas also made it difficult at times to maintain a uniform pressure. However, both systems were pressure tested successfully and the integrity of the gas and liquid gathering systems were verified. All data and pressure charts associated with this testing are located at the Indian Basin Gas Plant office.

d) **Discussion:**

All three methods for testing the integrity of the gas and liquid gathering systems were completed successfully. Of the three methods used, two, TekScent and Schlumberger's PAT-E tool, were unconventional and new to this type of system. Both methods performed well and produced favorable results. Minor procedural problems were encountered but were overcome. Weather and terrain

conditions hampered progress slightly, but the project was considered a success.

IV. GATHERING SYSTEM MODIFICATIONS

Significant line modifications were made to both the gas gathering and liquid gathering systems on Lines #1 and #4. These modifications included adding new valves to effectively isolate line sections, replacement of old valves, removal of steel sections in the PVC liquid gathering system and elimination of Dresser sleeves. These modifications were made to minimize exposure to potential leaks and to better respond to potential problem areas. Line #2 is presently out of service. However, prior to reactivation this line will undergo the required evaluation and modifications.

New valves were either added to the system, or installed as replacements to old valves. Some of the new valves were installed on the gas gathering system for isolation purposes. These valves were fabricated with a spool piece in the shop and installed in the field as one unit. Along with the new valves, old valves were replaced that leaked, worn trim, or no longer worked properly. The valves installed meet NACE MRO-175 requirements and are constructed of suitable materials.

Along with the gas gathering system, new and additional valves were added to the liquid gathering system. Again, these new valves meet NACE MRO-175 standards. Isolation valves were strategically placed at main arroyos to minimize exposure to leaks in environmentally sensitive areas. Isolation valves were installed on both sides to isolate the pipeline across the draw. This work was done at three locations along Marathon Creek Draw, Lower Bone Tank Draw, and Upper Bone Tank Draw. As was previously mentioned, isolation valves were also installed at Rocky Arroyo. In addition to valve isolation, any steel across these draws was replaced with PVC and encased with concrete which will eliminate exposure to corrosion and offer the required itegrity to resist washouts. By effectively isolating line sections, earlier detection can occur and drainage due to any future leaks will be minimized. In all, 13 new valves were installed on the Gas Gathering and 41 new valves were installed on the Liquid Gathering system.

Additional modifications made to the liquid gathering system included removal of numerous Dresser sleeves. When located, Dresser sleeves were replaced with a section of PVC. Dresser sleeves are easily and quickly installed, but create a risk due to leakage if left unattended for long periods of time or if not installed properly. During the modifications, approximately 18 Dresser sleeves were removed and replaced with sections of PVC.

V. FUTURE METERING SEPARATORS

Provisions were made to accommodate future separators, for the liquid entering the plant, to more effectively meter condensate, water and gas. During the turnaround, valves were installed on the inlet lines such that the separators could be installed without incurring another operational shutdown. Engineering work has been done and bids have been sent out to perform this work. Additional piping and separator fabrication has yet to be done. It is expected to have the separators in place with proper metering by mid-February, 1992.

In addition to the liquid system, annubar meters were installed on the gas gathering inlet lines to measure gas volumes coming into the plant from each line. These additions will not only provide a better operation, but will also be used as a check against the sum of the individual well meters feeding into that line. Such meters are seen as the best means of detection for future leaks between wellheads and the gas plant.

VI. CONCLUSION

A large amount of work has been done in a short period of time to enhance and secure the Indian Basin Gas Plant Gathering System. As indicated, modification of the Rocky Arroyo crossing far exceeds what was previously in place for early leak detection and elimination.

Integrity testing of the pipeline system was done by both conventional and non-conventional methods. Regardless of the method, a better understanding and a large amount of knowledge has been gained of the system we are using. In addition, information obtained will help in determining the course of action needed to mitigate corrosion within the pipeline system. Overall, the testing methods performed to date confirm that the present system is adequate and integrity is maintained.

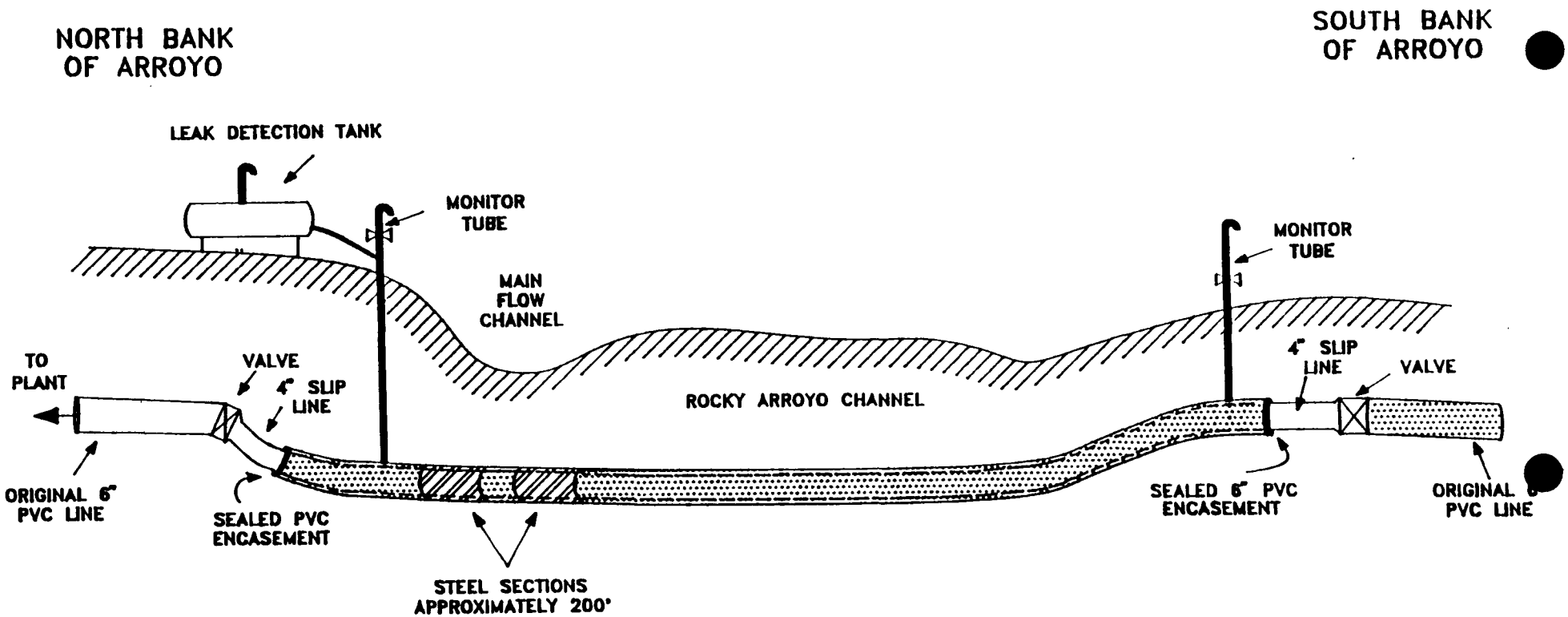
The modifications made to both pipeline systems greatly enhance the ability to isolate potential leaks and also greatly reduces the chances of having a leak. By removing the known steel sections and Dresser sleeves in the PVC lines, the probability of leaks at these points has been reduced. The replacement and addition of new valves effectively allows isolation of various pipeline sections.

With the planned addition of separators and metering facilities, the operation of the plant will be more efficient. Also, detection of problem areas or possible volume loss due to a leak will easily be determined in a timely manner. The cost for the gathering system work described in Sections II to IV totaled $900,000. Installation of the metering separators is estimated to cost an additional $240,000. This money was and will be spent to ensure a functional, safe and environmentally sound operation for years to come.

SDH050/lgh

SCHEMATIC OF
CONDENSATE LINE #4 MODIFICATION

(NOT TO SCALE)



NOTE: 4" PEP SLIP LINE GOES FROM NORTH BANK OF ARROYO TO SOUTH BANK (APPROXIMATELY 1700')

9/27/91