AP - 112

STAGE 2 WORKPLAN

8/15/2012

AP-112

Larson & Associates, Inc.
Environmental Consultants

August 13, 2012

VIA EMAIL: Glenn.VonGonten@state.nm.us

Mr. Glenn Von Gonten, Acting Chief
Environmental Bureau
New Mexico Oil Conversation Division
1220 S. St. Francis Drive
Santa Fe, New Mexico 87505

RECEIVED OCD
2012 AUG 15 P 12:0

Re: Groundwater Remediation Pilot Test Work Plan, Frontier Field Services, LLC, Empire Abo Gas Plant, Eddy County, New Mexico

1.0 INTRODUCTION

Larson & Associates, Inc. (LAI) submits this work plan to the New Mexico Oil Conservation Division (OCD) on behalf of Frontier Field Services, LLC (Frontier), a wholly owned subsidiary of AKA Energy, to evaluate options for groundwater remediation at the Empire Abo Gas Plant (Facility). The Facility is located in Unit I (NE/4, SE/4), Section 3, Township 18 South, Range 37 East in Eddy County, New Mexico. The physical address is 257 Empire Road, Artesia, New Mexico. The GPS coordinates are N32° 46' 33.7" and W104° 15' 37.22".

Frontier owns approximately 40 acres of land encompassing the Facility. Land to the north and west of the Facility is administered by the U.S. Bureau of Land Management (BLM). Land to the south and east of the Facility is administered by the New Mexico State Land Office (SLO). There are no private residences or water supply wells within 2 miles of the Facility. Figure 1 presents a location and topographic map. Figure 2 presents a Facility drawing.

1.1 Problem Statement

The problem statement identified for this work plan is recovering light non-aqueous phase liquid (LNAPL) on groundwater and remediation of dissolved benzene in groundwater. LNAPL and dissolved benzene are present in 4 areas including the southeast, east central, northeast and east areas of the Facility. Groundwater is naturally poor in quality due to high sulfate and total dissolved solids (TDS). Figure 3 and Figure 4 present the LNAPL and dissolved benzene remediation areas, respectively.

2.0 Pilot Testing

2.1 Groundwater Extraction Pilot

The principal consideration for groundwater extraction is acquiring a water right through the State of New Mexico Office of the State Engineer (OSE). LAI will review the feasibility of a water right through the OSE. Groundwater extraction will provide hydraulic control of the LNAPL and dissolved benzene while providing a mechanism for total fluid (LNAPL and water) recovery. The recovered fluid would be processed through the

Facility's existing oil recovery and separation equipment with disposal of recovered water in a non-commercial onsite salt water disposal (SWD) well.

Slug testing has identified great variability across the Facility due to what is believed to be secondary porosity from fractures and solution cavities. Some of the secondary features appear to have been filled with silt and clay over the ages, yielding localized low hydraulic conductivity zones.

Groundwater extraction will be performed in existing 4"-diameter monitor well (MW-10 while measuring pumping responses in nearby monitoring (observation) wells. Sufficient data will be obtained from the pumping test to calculate localized groundwater yield, storativitiy and transmissivity which will be used to calculate the radius of influence. This information will be used to approximate hydraulic control and determine if the monitoring wells may be used as extraction points and the volume of groundwater needed for appropriation. The extraction test will also determine if a dual extraction system is necessary to recover LNAPL separately from groundwater.

An electric submersible pump will be used to extract groundwater and LNAPL from the pumping well while responses to pumping stresses are recorded in the observation wells with pressure transducers and electronic data recorders. The groundwater extraction test will be performed for a period of no less than 48 hours to observe responses in the observation wells. Changes in aquifer level will be recorded during the recovery phase of the extraction test. The recovered fluid will be pumped to frac tanks and disposed in an offsite OCD permitted Class II disposal well. Data from the groundwater extraction pilot test will be evaluated using commercially available computer modeling software. Figure 5 presents the location for the proposed groundwater extraction pilot test.

2.2 High Vacuum Extraction Pilot

A high vacuum extraction pilot will be performed to assess the potential for LNAPL recovery using this insitu process. Vacuum extraction will be initiated in monitoring well MW-02-10 while vacuum response is monitored in nearby wells using vacuum gauges. The radius of influence will be calculated from the responses in the observation wells to determine other wells for vacuum extraction. LNAPL and water will be recovered in a knock out tank and pumped to a portable tank. The LNAPL and water will be transferred to the condensate tanks near the south side of the Facility or as directed by Facility personnel. LAI will evaluate mechanisms for managing off-gasses including a temporary permit, portable flame oxidizer or vapor recovery unit (VRU). Data from the high vacuum extraction pilot test will be evaluated using commercially available computer modeling software. Figure 5 presents the proposed location of high vacuum extraction well.

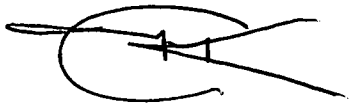
3.0 SCHEDULE AND NOTIFICATION

LAI proposes 90 days to complete the groundwater and high vacuum extraction pilot tests, including data reduction, evaluation and 45 days after completion of the pilot testing and data evaluation to submit a the results to the OCD. The results of the pilot testing will be used to select a remedy for the groundwater abatement and submitted to the OCD in a Stage II abatement plan. LAI is preparing an application for installing a non-commercial Class II SWD well at the Facility.

The OCD in Artesia and Santa Fe, New Mexico, will be notified at least 72 hours prior to commencing pilot tests.

Please contact Ms. Fran Brown with AKA Energy by phone (970-764-6655) or email (fbrown@akaenergy) or myself if you have any questions.

Sincerely,
Larson & Associates, Inc.



Mark J. Larson
mark@laenvironmental.com

Encl.

Cc: Fran Brown – AKA
John Prentiss – Frontier
David Feather – Frontier

FIGURES

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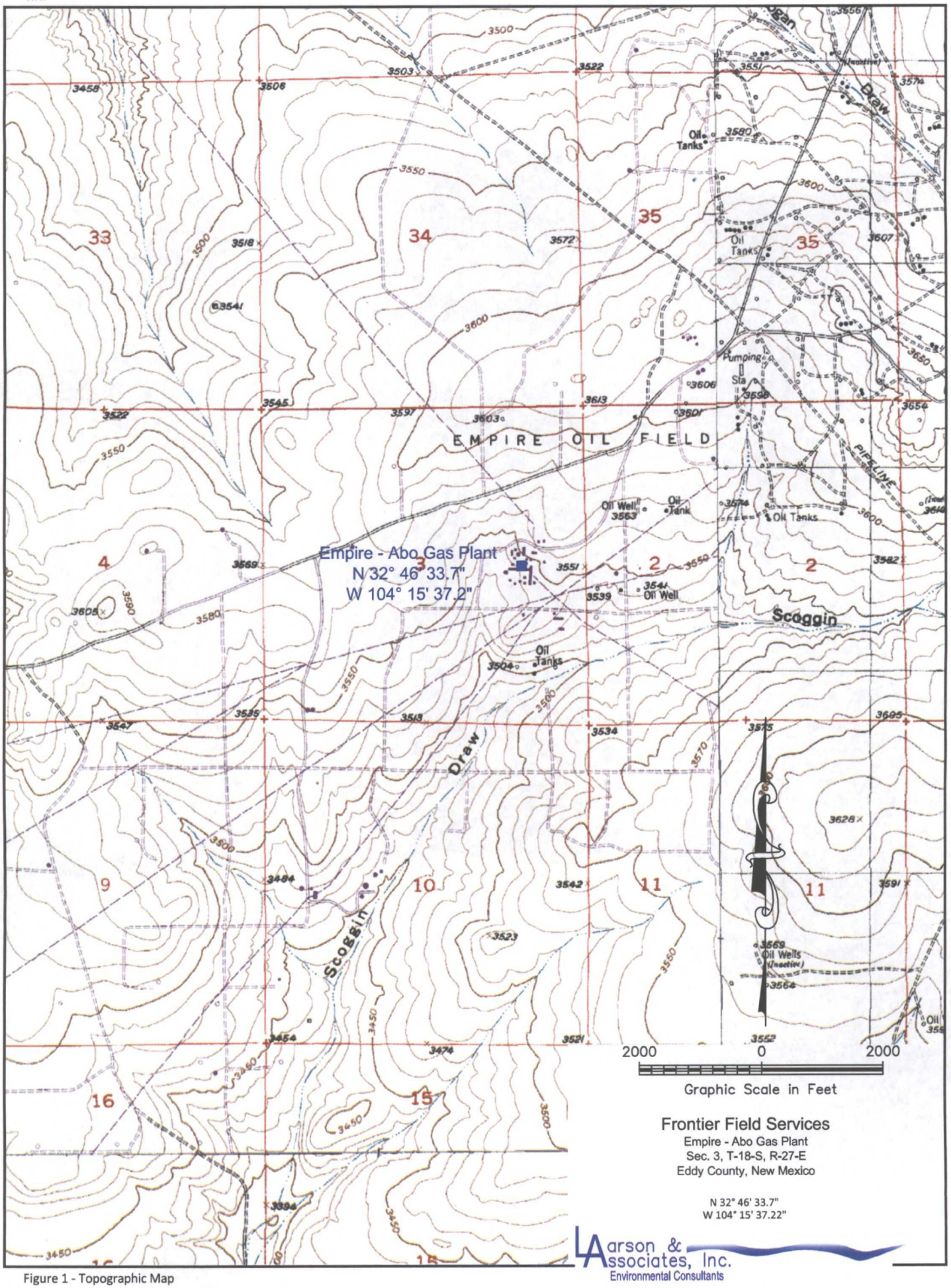

Figure 1 - Topographic Map

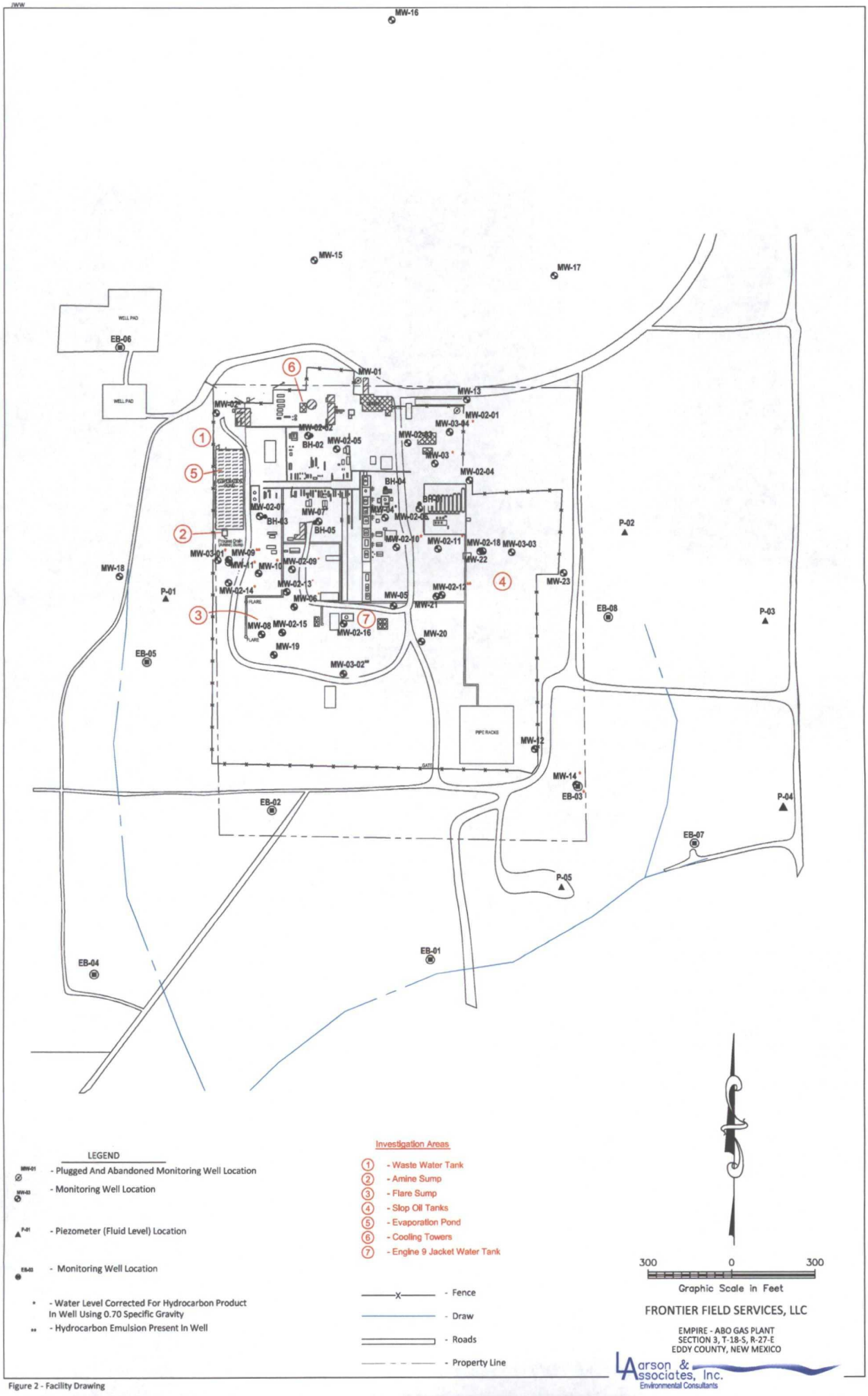

Figure 2 - Facility Drawing

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LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- MW-10 (4.14) - Monitoring Well Location and Apparent LNAPL Thickness, Feet, May 30, 2012
- P-03 - Piezometer (Fluid Level) Location
- EB-04 - Monitoring Well Location
- Proposed SVE Extraction Point
- Proposed SVE Remediation Areas
- N/S - Not Sampled
- ** - Hydrocarbon Product Present In Well
- *** - Insufficient Water for Sample
- 8 - Contour of Apparent LNAPL Thickness, Feet, May 30, 2012
- Fence
- Draw
- Roads
- Property Line

300 0 300

Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

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Figure 3 - LNAPL Remediation Areas

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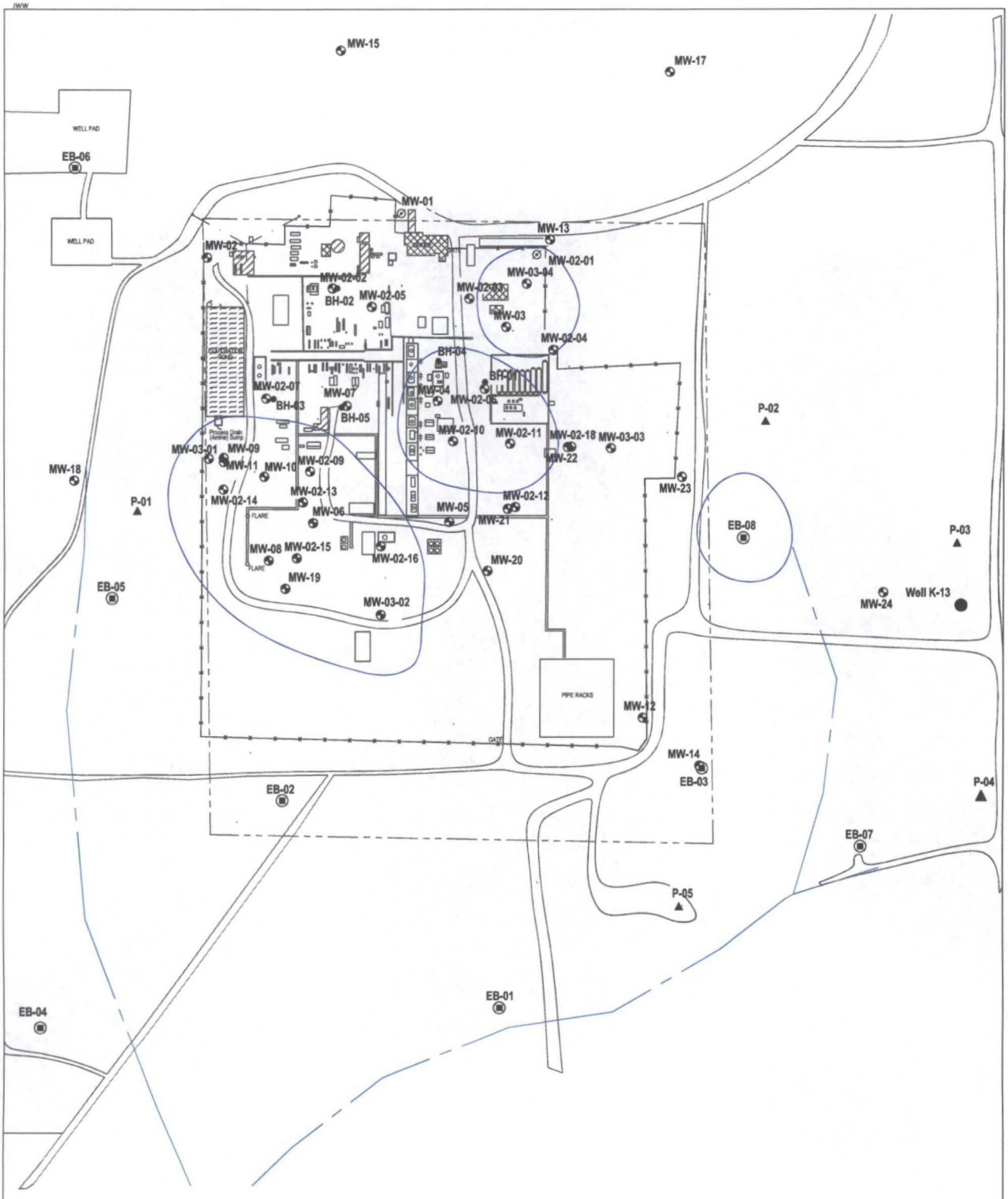

LEGEND

- MW-01 - Plugged And Abandoned Monitoring Well Location
- MW-13 - Monitoring Well Location
- P-03 - Piezometer (Fluid Level) Location
- EB-04 - Monitoring Well Location
- Proposed SVE Extraction Point
- Proposed SVE Remediation Areas
- N/S - Not Sampled
- ** - Hydrocarbon Product Present In Well
- *** - Insufficient Water for Sample
- X - Fence
- Draw
- Roads
- Property Line

300 0 300

Graphic Scale in Feet

FRONTIER FIELD SERVICES, LLC

EMPIRE - ABO GAS PLANT
SECTION 3, T-18-S, R-27-E
EDDY COUNTY, NEW MEXICO

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Figure 4 - Benzene Remediation Areas

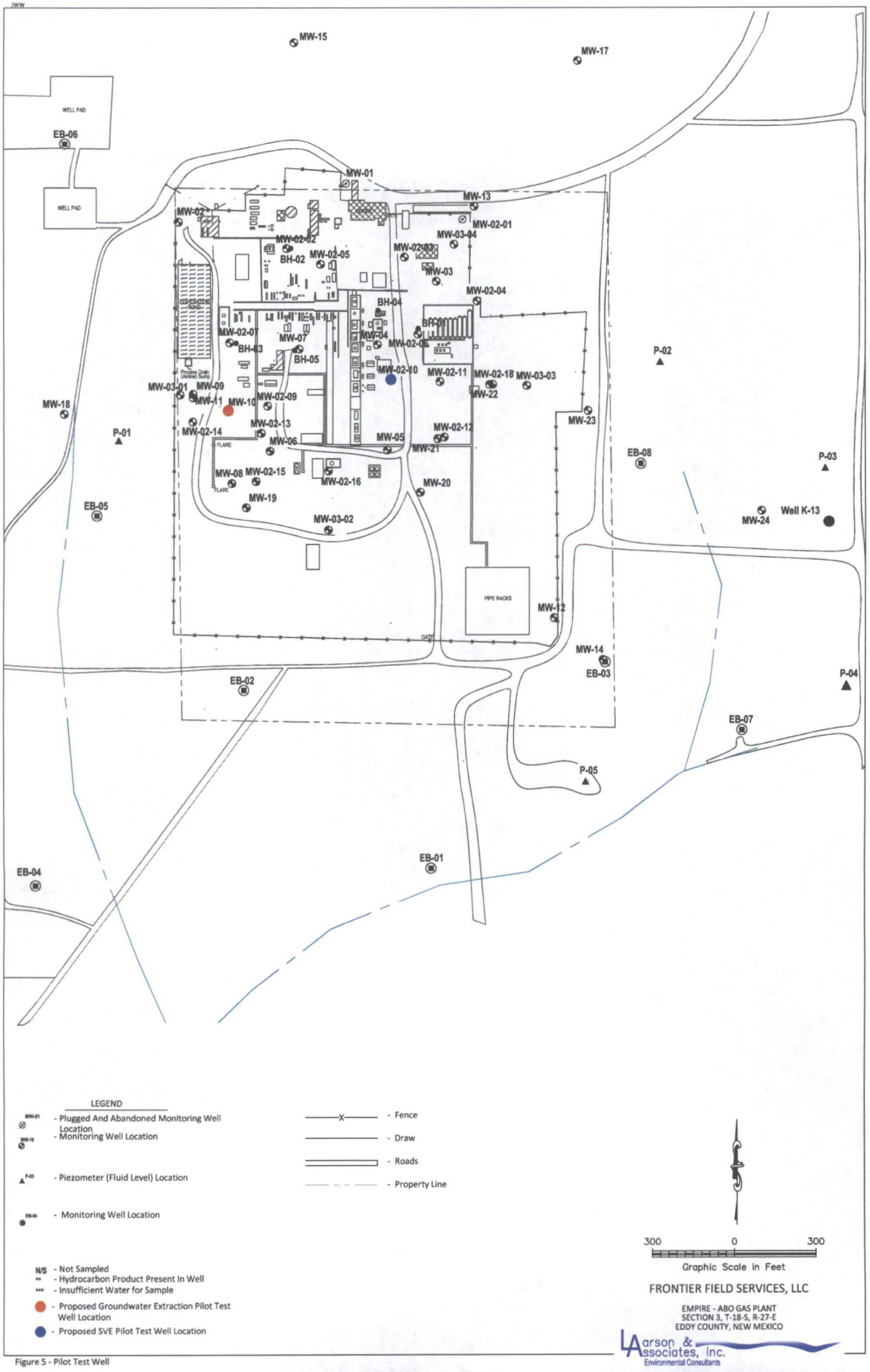

Figure 5 - Pilot Test Well