# STAGE 2 ABATEMENT PLAN

**HOLLY ENERGY PARTNERS**
**NORTH MONUMENT 6-INCH GATHERING LINE**
**NW 1/4 of the SW 1/4 of SECTION 30 TOWNSHIP 19-SOUTH**
**RANGE 37 EAST, LEA COUNTY, NEW MEXICO**

**Prepared For:**

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**OCTOBER 2012**
**REF. NO. 078802 (1)**

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## 1.0 INTRODUCTION

This Stage 2 Abatement Plan is submitted on behalf of Holly Energy Partners (HEP) for the North Monument 6-inch Gathering Line Release (Site) located in Lea County, New Mexico (Figure 1).The release was a result of leaks from a pipeline owned by Holly Energy Partners. This Stage 2 Abatement Plan proposes to remove the crude oil found on groundwater in the area of the Site and to monitor groundwater and fluid levels at the Site. The plan is being required pursuant to New Mexico Oil Conservation Division (NMOCD) Rule 19.15.30 NMAC. The notification of the leak that occurred on October 5, 2002 was submitted to NMOCD (Appendix A, AP#34). The Stage 1 Abatement Plan was submitted to the NMOCD in April 2004. The Stage 2 Abatement Plan presented herein complies with the requirements of these rules and incorporates work already performed at the Site since detection of the crude oil release described below.

## 1.1 DESCRIPTION OF THE SITE

The Site is located approximately 2 miles northwest of Monument, New Mexico on State of New Mexico land, in the NW ¼ of the SW ¼ of Section 30, Township 19 South, Range 37 East (N 32° 37′ 50.2″, W 103° 17′ 52.8″). The topography at the Site is relatively flat and the elevation is at 3,637 feet mean sea level (Figure 2). The Site is located on the HEP pipeline Right-of Way, approximately 0.5 miles north of NM 322 (County Road 42) and adjacent to Maddox Road (County Road 41). The surrounding land contains oil and gas production well pads and open range land.

## 1.2 SITE HISTORY AND NATURE OF THE RELEASE

On October 5, 2002, a leak was discovered in a 6-inch crude oil gathering line as a result of a 2,100 barrels (bbls) inventory discrepancy. The line was relatively new, having been installed in 2000, and the leak may have been a result of acidized crude oil in the line. The line was exposed in the area of the leak and a 600-foot section of the damaged pipe was removed. Between five and seven leaks were found in this section of pipe. The crude oil leaks were mainly located east of Maddox Road. The corroded section was replaced with a new pipe and relocated approximately 150 feet to the south of the Site so as to not hamper remedial efforts. Petroleum-stained soil was removed from an area encompassing approximately 300 feet by 700 feet. During the removal of the leaking pipe section, the excavation was deepened to approximately 15 feet along the north side of the line to help delineate the extent of impacts.

## 1.3 SUMMARY OF PREVIOUS INVESTIGATIONS

All of the available data collected prior to 2012 is contained in Appendix B. Based on the available site information, in October 2002, approximately 2,100 bbls of crude oil were released from a 6-inch crude oil pipeline to the subsurface, impacting an area of approximately 700 feet by 300 feet oriented in the direction of the pipeline (east-west) and encompassing the west and east sides of Maddox Road (Figure 3). To date, seven groundwater monitoring wells and 164 temporary borehole wells have been used to characterize the subsurface soil and groundwater and to recover the crude oil at the Site. Of the 164 borehole wells, 102 were completed as temporary borehole wells. Oil observed on groundwater is between 0.01 to over 1.00 feet in thickness, encompassing an area spanning Maddox Road (Appendix B-2). Approximately 1,079 bbls of crude oil were recovered prior to March 2004 and records indicate approximately 100 barrels have been recovered from 2004 to 2011 using manually-controlled pumps.

The dissolved phase hydrocarbon concentrations in groundwater have been below the New Mexico Water Quality Control Commission (NMWQCC)standards for benzene, toluene, ethylbenzene and total xylenes (BTEX)since 2004 (Appendix B-4).

## 2.0 GEOLOGY AND HYDROGEOLOGY

The *Geologic Map of New Mexico* (2003) prepared by the New Mexico Bureau of Geology and Mineral Resources *and Geology and Ground-Water Conditions in Southern Lea County, New Mexico (Ground-Water Report 6)* prepared on behalf of the United States Geological Survey was reviewed in association with the evaluation of regional geology and hydrogeology for the Site.

The geologic map for the area of site is shown in Figure 4. The surficial geologic unit *(Qep)* mapped for the location is described as Quaternary aged "Eolian and piedmont deposits (Holocene to middle Pleistocene) – Interlayered eolian sands and piedmont slope deposits along the eastern flank of the Pecos River valley. "Typically capped by thin eolian deposits." This sediment ranges from zero to 20feet in thickness in this portion of Lea County. The Quaternary sediment unconformably overlies the Tertiary age Ogallala Formation. The Ogallala Formation is comprised of sands, silts, indurated calcium carbonate, gravel, and some clay.

Groundwater in this area is primarily produced from the Ogallala aquifer. The Ogallala Formation unconformably overlies the Triassic age Dockum group. The Dockum group consists of red shale and sandstone and is commonly referred to as "red beds". The red beds can exceed 1,000 feet in thickness in this region and may produce small amounts of poor quality water at the bottom of the formation.

The regional groundwater flow direction in the Ogallala is toward the southeast and follows the Triassic subcrop surface. Groundwater quality is very good with total dissolved solids (TDS) concentrations typically well below 1,000 mg/L. Recharge primarily occurs via infiltration from precipitation events.

### 2.1 SITE GEOLOGY/HYDROGEOLOGY

The surface soils encountered at the Site are a non-homogenous mixture of sand, silt and clay alternating with consolidated caliche and sandstone layers from the surface to 25 feet below ground surface (ft-bgs), with the amount of clay increasing with depth (Appendix B-6).

This surface soil is consistent with the literature description (Quaternary sediment) for this physiographic province. The soil types encountered below this surface layer at the Site are of variable thickness, carbonate-indurated, locally referred to as "caliche", fine-grained sand, gravelly sand, caliche sandstone, and fractured silica-indurated sandstone.

No water wells are known to have been affected by the leak. An evaluation of water well information obtained from the New Mexico Office of the State Engineer indicated that there are six water supply wells located within one-mile of the Site (Figure 5, Table 1).

A windmill water well used for stock watering is located less than one-half mile to the east of the Site (Figure 4). There were no records found for this well. This well was sampled for BTEX compounds several days following the discovery of the leak and no BTEX was detected above the laboratory's minimum reporting levels (Appendix B-4).

The depth to groundwater is approximately 17 to 25ft-bgs. Groundwater flow is towards the east and the groundwater gradient is relatively flat with a gradient of 0.006 feet/foot (Appendix B-1). Based on the current understanding of the Site subsurface conditions, the saturated zone consisting of a mixture of sand and clay with some gravel is overlain by alternating sand, silt, clay and caliche (Appendix B-7).

## 2.2 CURRENT SITE CONDITIONS

Following the discovery of the pipeline release, approximately 600 feet of the pipeline was replaced and repositioned south of the release location. Impacted soil was removed from the Site when an excavation in the area adjacent to the north side of the pipeline was completed to a depth of approximately 15 ft-bgs. Impacted soil was encountered to the depth of the original excavation and in soil borings throughout the area of the release on both the west and east sides of Maddox Road (Appendix B-5).

Of the five original monitoring wells that were installed following the release, two of the monitoring wells (MW-2 and MW-4) were abandoned in 2002 after free product was detected (Appendix B-3). Two additional monitoring wells (MW-6 and MW-7) were installed in 2008, bringing the total number of monitoring wells to five. Low level detections of BTEX compounds (below NMWQCC standards) have been detected in all monitoring wells except for MW-1, which is located to the northwest of the release area, or in the up-gradient direction (Appendix B-4).

Of the original boreholes, 74 were completed as temporary recovery wells. The boreholes not completed as temporary recovery wells were plugged and abandoned to surface. Since 2004, approximately 100 bbls of product have been recovered at the Site.

Following the original investigation, 28 additional borehole wells have been added to bring the current number to 102 temporary borehole wells (Figure 3). Photographs of the Site and surrounding area are presented in Appendix C.

## 2.3 WELL EVALUATIONS

An evaluation of all of the monitoring and borehole wells located at the Site included validation of all well locations, measurement of the fluid levels and the total well depths. The available well and borehole logs are in Appendices B-6 and B-7. The well evaluation information can be found in Appendix D.

In July 2012, fluid levels were measured in 102 temporary borehole wells and five monitoring wells. Crude oil was measured in 78 of the borehole wells used to recover product.

Of the 16 wells located in the western area of the Site, 11 wells had measurable product and one well had a product thickness greater than 1.0 feet.

Of the 86 temporary borehole wells located east of Maddox Road, 66 wells contained measurable product and five wells had product thickness greater than 1.0 feet. Temporary borehole well BH-64 located on the eastern side of the site had the greatest product thickness, 1.64 feet (Figure 3).

The evaluation of the temporary borehole wells indicated that many of the wells were outside of the impacted area and would not be needed for the Stage 2 abatement activities. Approximately 29 of the temporary wells are proposed to be abandoned, as they will not be necessary to monitor the Site and may contribute to the migration of product to a larger area.

Well abandonment will be completed per State guidelines (NMAC19.27.4.30). To plug a well, the entire well will be filled from the bottom of the well upwards to land surface using a tremie pipe. The well will be plugged with neat cement slurry, bentonite based plugging material, or other sealing material approved by the state engineer for use in the plugging of non-artesian wells.

## 2.4 SITE CONCEPTUAL MODEL

The Site is located on New Mexico State land within the pipeline Right-of-Way for the 6-inch gathering line associated with area oil production (Figure 3). The Site impact is a result of several leaks in the 6-inch pipeline. The primary chemicals of concern are hydrocarbon constituents that originated from the crude oil.

Hydrocarbon impacts at the Site are limited to soil and groundwater in the area of the leaks. Petroleum-stained soil located on the east side of Maddox Road and in an area adjacent to the north side of the pipeline, to a depth of approximately 15 feet was excavated in 2004. Saturated hydrocarbons were observed below the bottom of the excavation. For safety reasons, the excavation was backfilled. Due to the presence of wells, only a limited amount of soil was removed from the south side of the pipeline. Soil borings located within close proximity to the leak area did detect hydrocarbons above the NMOCD action levels (Appendix B-5). A monitoring well located approximately 150 feet to the northwest from the release did not have soil staining or detection of hydrocarbons in the soil, and is believed to represent "background" un-impacted conditions.

Groundwater at the Site is found at approximately 17 to 25 ft-bgs and groundwater flow direction is towards the east. The wells located within close proximity to the release contain crude oil with a maximum observed thickness of 3.37 feet (MW-2). In July 2012, a Site maximum thickness of 1.64 feet was measured in BH-64.

The impacts to groundwater appear to be limited to the immediate area of the leaks. Dissolved phase hydrocarbons were detected in low concentrations (below NMWQCC standards) in four of the five monitoring wells located outside the leak area from 2003 to 2011. Hydrocarbons have not been detected in monitoring well MW-1 (Appendix B-4).

The Site is located in area of multiple crude oil gathering lines and is about 2 miles east of Monument, New Mexico. The closest residences are approximately 0.8 miles southeast from the area. A water well search was conducted to identify wells within a one mile radius of the Site (Figure 5). A windmill well is located approximately one-half mile to the east. This well was sampled for hydrocarbons following the discovery of the release and was found to be un-impacted.

There appears to be no immediate threat to the environment or to drinking water wells located in the area caused by the release and any remaining impacts. The crude oil has a very low mobility and does not readily desorb nor dissolve and therefore, any remaining impacts are in the immediate area of the release.

The low mobility rate may be attributed to the high percentage of paraffin in the crude oil which is characteristic of this type of crude oil found in the eastern New Mexico Permian Basin area. The crude oil thickness has been measured at the Site since 2002 and has not migrated from the area, suggesting that soil impacts have been mitigated and the released crude oil has a low mobility rate and is not readily dissolved in groundwater.

The removal of the crude oil by the current method, which is a manually-operated total fluid pumping method that recovers minimal amounts of product and predominantly water, is not effective because the groundwater table is not being depressed in the area so that that the crude oil can be removed more effectively from groundwater.

The lowering of groundwater table in the area of the crude oil would allow for more of the crude oil to be removed efficiently under a depressed water table, however, the current groundwater regulations for Lea County, New Mexico do not allow for the removal of any groundwater if the TDS in groundwater is less than 10,000 mg/L. The TDS at his site is less than 2,000 mg/L.

The remedial strategy for site closure is based on the current NMOCD requirements. To close the Site with no further action, the crude oil would have to be removed separately from groundwater (19.15.17.13 NMAC). Once the phase-separated hydrocarbons (crude oil) have been removed to a *de minimis* thickness, remedial actions would then focus on the low-level dissolved phase concentrations. Based on existing conditions, it is likely that monitoring of the dissolved phase hydrocarbons and natural attenuation parameters, the state standards could be met as a site closure strategy.

The proposed remedial technology for the Site uses a crude oil only skimming system that does not depress the groundwater table to remove the crude oil. This system is designed to shut down automatically when water is encountered in the pump and can be restarted remotely without visiting the Site.

# 3.0 CHARACTERIZATION, MONITORING AND PRODUCT RECOVERY PLAN

## 3.1 DOCUMENTATION

All information collected will be documented in such a manner that it can be easily transferred and interpreted by those not familiar with the field activities being conducted for the investigation. In accordance with this goal, bound field logbooks will be maintained throughout the project. Each page will be legible when copied and written using an indelible ink pen for all records. The pages in the logbook will be dated, numbered and initialed by the recorder. All field data such as monitoring well number, depth to water and product, total well depth, and any other qualitative observations will be documented in the field log book. In addition to the field data, general information will also be recorded, such as equipment used, daily weather conditions, personnel onsite, site safety and any anomalies that may have occurred during field activities.

## 3.2 GROUNDWATER CHARACTERIZATION

Fourteen additional wells will be installed to remove the crude oil impacts from the present locations (east and west of Maddox Road) at the Site (Figure 3). The wells will be constructed using 4-inch PVC and installed with 15 feet of 20-slot (0.020 inches) screen so that 5 feet of the screen is above the static fluid level and 10 feet is below the static fluid level (Figure 6).

The wells will be installed according to New Mexico Office of the State Engineer rules (19.27.4 NMAC) using an air rotary drill rig. The boring diameter is expected to be 8¼ inches and the total depth of the well will be approximately 10 feet below the top of the fluid, approximately 27 to 40ft-bgs. Total depths of the wells may vary based on observations of subsurface conditions and the fluid level of the product, as determined by the on-site geologist. The well borings will be logged by the on-site geologist based on the cuttings.

Figure 6 depicts a typical well construction that will be used for the Site wells. The wells will be constructed with 4-inch diameter schedule 40 PVC casing and screen, consisting of 15 feet of 20-slot (0.020 inch) screen. In addition, a 1-inch piezometer will be installed alongside the 4-inch well and constructed the same as the 4-inch well (Figure 6). This piezometer will be used to measure fluid levels so that the pumps will not have to be removed for fluid level measurement. A 10/20 sand filter pack will be placed in the boring from the bottom of the well boring to approximately 2 feet above the well

screens. A bentonite seal will be placed from the top of the sand pack to approximately 5 feet above the sand pack. The bentonite will be hydrated with potable water to create a seal. A grout seal will be placed from the top of the bentonite seal to 3 ft-bgs. A 3-foot manhole cover will be placed on each well and cemented in place.

If soil staining is observed or if volatiles are detected with the photo-ionization detector (PID) in the cuttings, a sample will be collected and analyzed for BTEX compounds. The cuttings will be collected and temporarily stockpiled on plastic. The cuttings may be separated on-site into impacted and non-impacted soil, based on visual observation and head space analysis for waste management. The impacted cuttings will be sampled for BTEX, total petroleum hydrocarbons (TPH) and RCRA metals analyses at the conclusion of drilling activities. If the results indicate the waste is above state standards, the waste will be handled and disposed of properly at an offsite disposal facility.

The final well locations are based on historical crude oil thickness data, utility clearances and will be determined by the Site geologist. Prior to drilling, private and public utilities will be cleared and additionally, each well location will be cleared to 5 ft-bgs using a Hydrovac, if necessary. The NMOCD will be notified approximately one week prior to drilling activities, as required by 19.15.30.14.B NMAC.

If product is not measured, each well will be surged with a surge block assembly 24-hours after the bentonite seal is placed, and developed further with a bailer or pump to remove any sediment. All development water will be placed in totes and disposed of properly.

All drilling and well development equipment will be cleaned prior to initiation of drilling activities and in between all borings using a high pressure washer.

The locations of the wells and the relative elevation of the top of the PVC casing of each well will be surveyed by a licensed surveyor to an accuracy of +/- 0.01 ft. The ground surface in the area of the well will also be surveyed to +/- 0.1 ft. The wells will be plugged and abandoned according to state regulations upon completion of all groundwater monitoring activities. Total depths of the wells may vary based on observations of subsurface conditions and the fluid level of the product, as determined by the on-site geologist.

## 3.3 PRODUCT RECOVERY

A Small Diameter Filter Scavenger™ (SDFS) product recovery system will be installed in each of the new 4-inch recovery wells. This system will separate product from water

within the recovery wells, eliminating the need for an above ground separation system. The Filter Scavenger pumps will pump the recovered product into a collection tank for recycling.

This pump is designed to remove product only off the top of groundwater. The pump utilizes a floating intake cartridge to recover hydrocarbons and will turn on and off in response to signals sent to the control module by a conductivity/density (reservoir) probe, the tank full probe, on-site control panel and remote telemetry system. A portion of the conductivity probe is located inside the pump's product reservoir to turn the pump off when water is encountered during pumping. The reservoir probe consists of a HI and LO float actuated sensors. When the reservoir fills with product and water is encountered, the float rises, trips the HI sensor and turns on the product pump. When the product level falls, the float trips the LO sensor and shuts off the pump. A water override conductivity sensor is located inside the product reservoir. Once the pump canister is filled via gravity, the magnetically coupled gear pump pressurizes the system and pumps the recovered fluid to the surface and into the tank. The floating cartridge follows the water table and consists of a float with a treated oleophilic/hydrophobic screen. The oleophilic/hydrophobic screen allows hydrocarbons to enter the pump cartridge while repelling water.

The system will be monitored on a monthly basis in the field to assess the amount of recovered crude oil, the effectiveness of the pump and equipment maintenance. Fluid levels will be measured in the newly installed wells and all other wells that contain crude oil using an oil/water interface probe. Additionally, the fluid level will be measured in the recovery tank. The recovered crude oil will be scheduled for recycling when the tank is at 80 percent of capacity.

## 3.4 GROUNDWATER MONITORING

Groundwater monitoring will be conducted at the Site in June and December. Prior to groundwater sampling, fluid levels will be measured in all wells using a water level indicator or an oil/water interface probe. If crude oil is not observed in the monitoring well, dissolved oxygen will be measured using a downhole probe. Groundwater samples will only be collected from the monitoring wells that do not contain crude oil.

The wells will be purged and groundwater samples will be collected using the low flow purging technique and monitored during purging of each well for chemical stability. All purged water will be managed in accordance to state and federal requirements and temporarily placed in a plastic tote. The samples sent to the laboratory for analysis will be given the well name, date and time of the sample collection, requested analyses and

the initials of the sampler. Field parameters obtained during purging will include temperature, specific conductance, pH, and oxidation reduction potential (ORP). The meter used for the field parameters will be calibrated daily when in use and the calibration will be recorded in the logbook. Groundwater samples will be placed into the appropriate laboratory provided containers following field parameter measurements. The samples will be placed in an ice-chilled cooler for transport to the laboratory under chain-of-custody procedures.

The fluid levels will be used for analysis of the product recovery system. The groundwater sampling will be used to characterize the extent of dissolved-phase hydrocarbon distribution. An annual report containing the results of the product recovery, groundwater monitoring, and any recommendations for the monitoring and recovery network will be submitted at the end of each calendar year.

## 3.5 ANALYTICAL PROGRAM

All groundwater and quality assurance and quality control (QA/QC) samples will be analyzed for BTEX by Method 8120B or 8260B. Soil samples will be analyzed for BTEX by Method 8120B or 8260B and TPH by Method 8015M, and if needed, for RCRA metals (Arsenic, Barium, Cadmium, Chromium, Lead, Mercury, Selenium and Silver) by Method 6010/6020. The laboratory reporting limits will meet state cleanup levels.

## 4.0 QUALITY ASSURANCE/QUALITY CONTROL

With the report of results, evidence will be presented that the sampling and analysis is consistent with the techniques listed in Subsection B of the 20.6.3107 NMAC and with 20.6.4.13 NMAC of the NMWQCC standards. Each groundwater sampling event will include one duplicate sample, which will be analyzed for BTEX. A trip blank will be included in each cooler shipped to the laboratory and analyzed for BTEX. A temperature blank will be included with each submitted cooler and used to determine temperature at the time of submission to the laboratory. One equipment blank (pump) will be submitted for each sampling event and analyzed for BTEX.

## 5.0 POST CLOSURE PLAN

HEP will petition for closure of the Abatement Plan, when eight consecutive sampling events or evidence demonstrates to the satisfaction of the NMOCD that the NMWQCC standards of 20.6.4 NMAC are met. HEP will plug and abandon all wells according to the New Mexico Office of the State Engineer Rules and restore the site.

## 6.0 SCHEDULE

The schedule anticipated at this time for abatement plan is as follows:

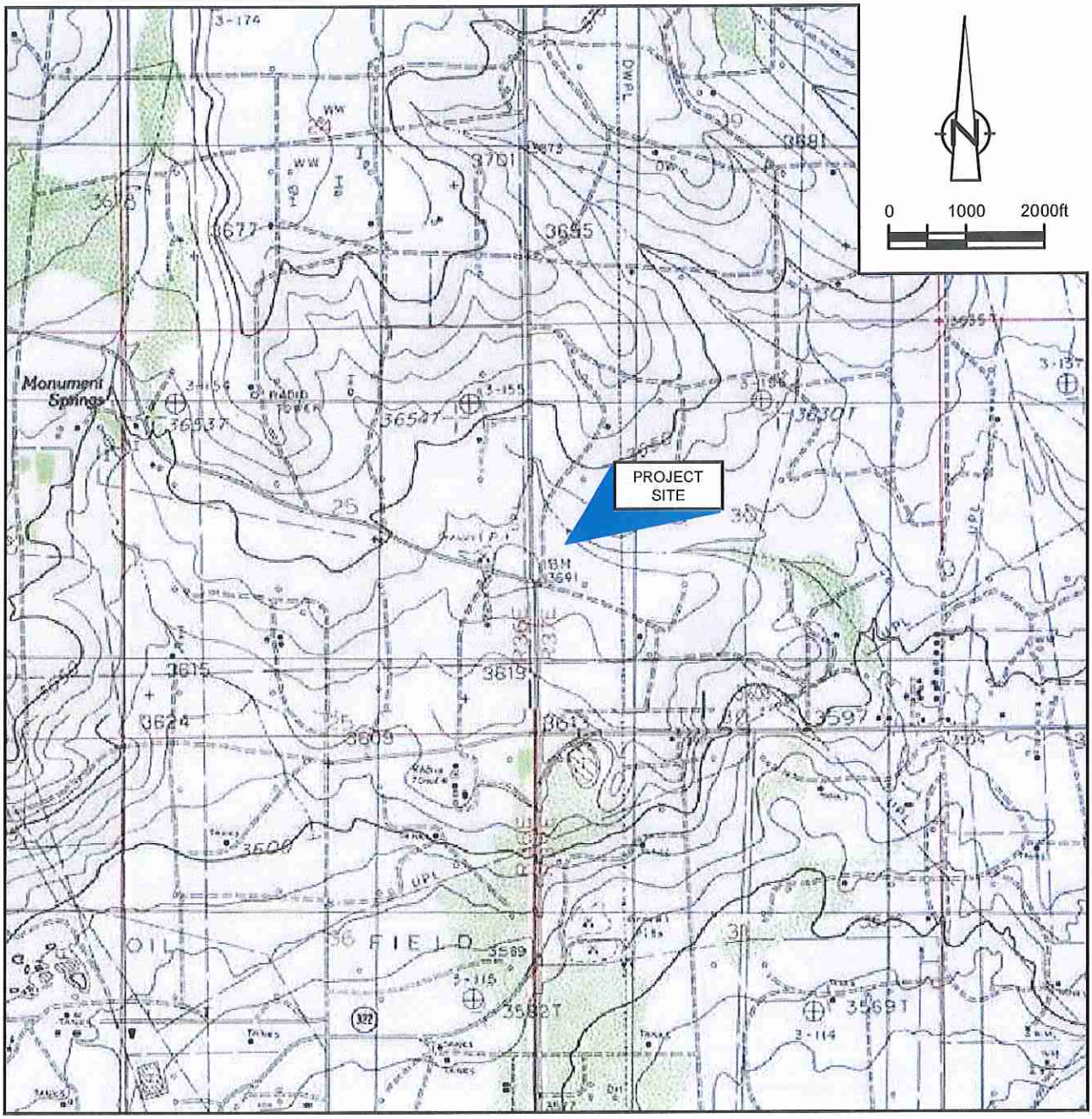
- Well installations – 30 days after Abatement Plan approval
- Completion of the pump system – 60 days after approval of Abatement Plan
- Installation of conveyance piping – 60 days after approval of Abatement Plan
- Groundwater Monitoring – June and December
- Annual Report – 30 days following the receipt of the December laboratory analytical report.

All of Which is Respectfully Submitted,

Thomas C. Larson
Senior Project Manager

Brad Stephenson
Senior Project Manager

# FIGURES



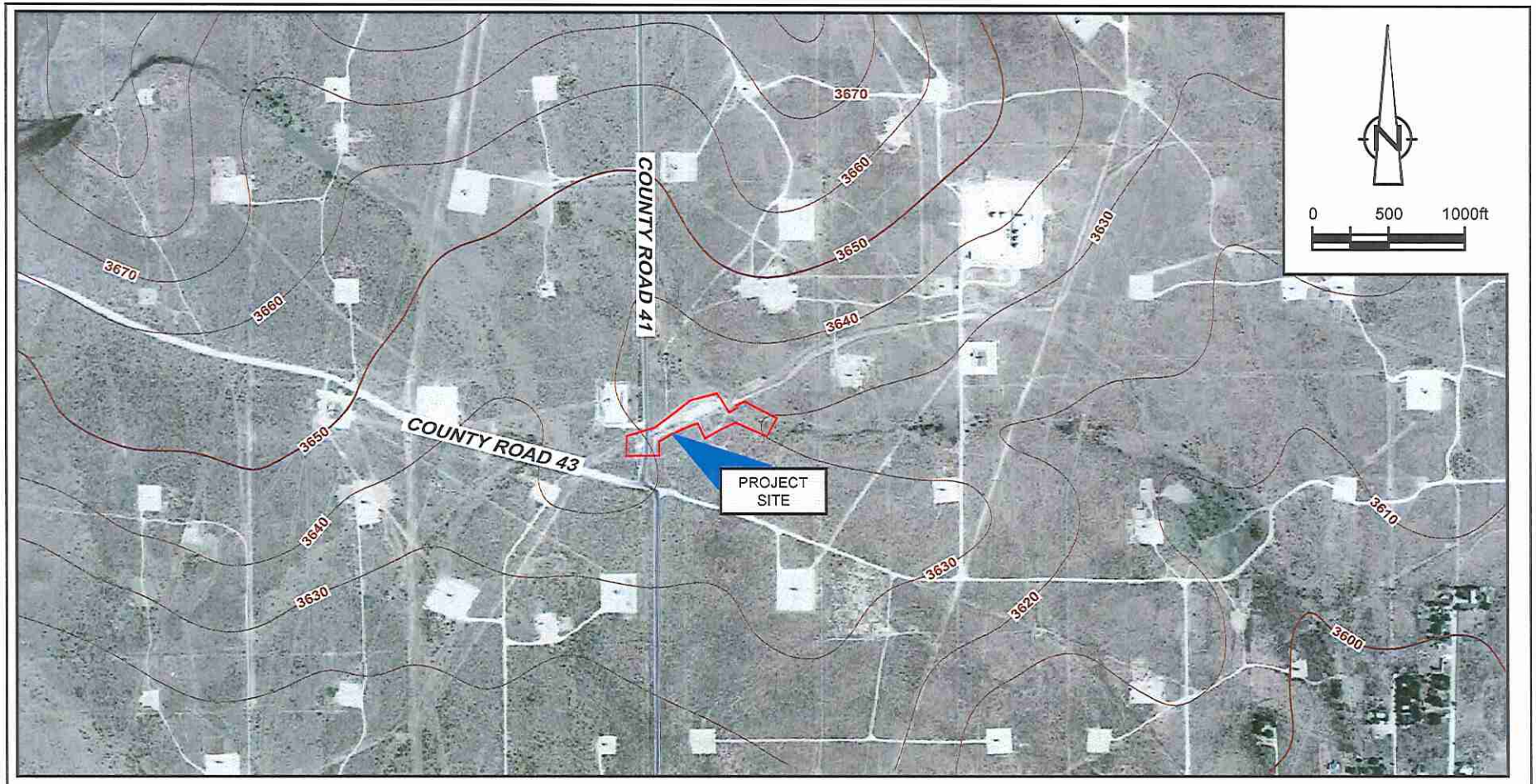

SOURCE: USGS 7.5 MINUTE QUAD
"MONUMENT NORTH, NEW MEXICO"

LAT/LONG: 32.6306° NORTH, 103.2980° WEST
COORDINATE: NAD83 DATUM, U.S. FOOT
STATE PLANE ZONE - NEW MEXICO EAST

figure 1

SITE LOCATION MAP
NORTH MONUMENT 6"
HOBBS, NEW MEXICO
*Holly Energy Partners*

078802-98(000)GN-DL001 MAY 14/2012




LAT/LONG: 32.6306° NORTH, 103.2980° WEST
COORDINATE: NAD83 DATUM, U.S. FOOT
STATE PLANE ZONE - NEW MEXICO EAST

*NOTE:*

Topographic contours taken from USGS Topo map "Monument North, NM" dated 2010.

figure 2

AERIAL WITH GROUND SURFACE CONTOURS
NORTH MONUMENT 6"
HOBBS, NEW MEXICO
*Holly Energy Partners*

078802-01(CLIENT-REF)GN-DL001 SEP 26/2012

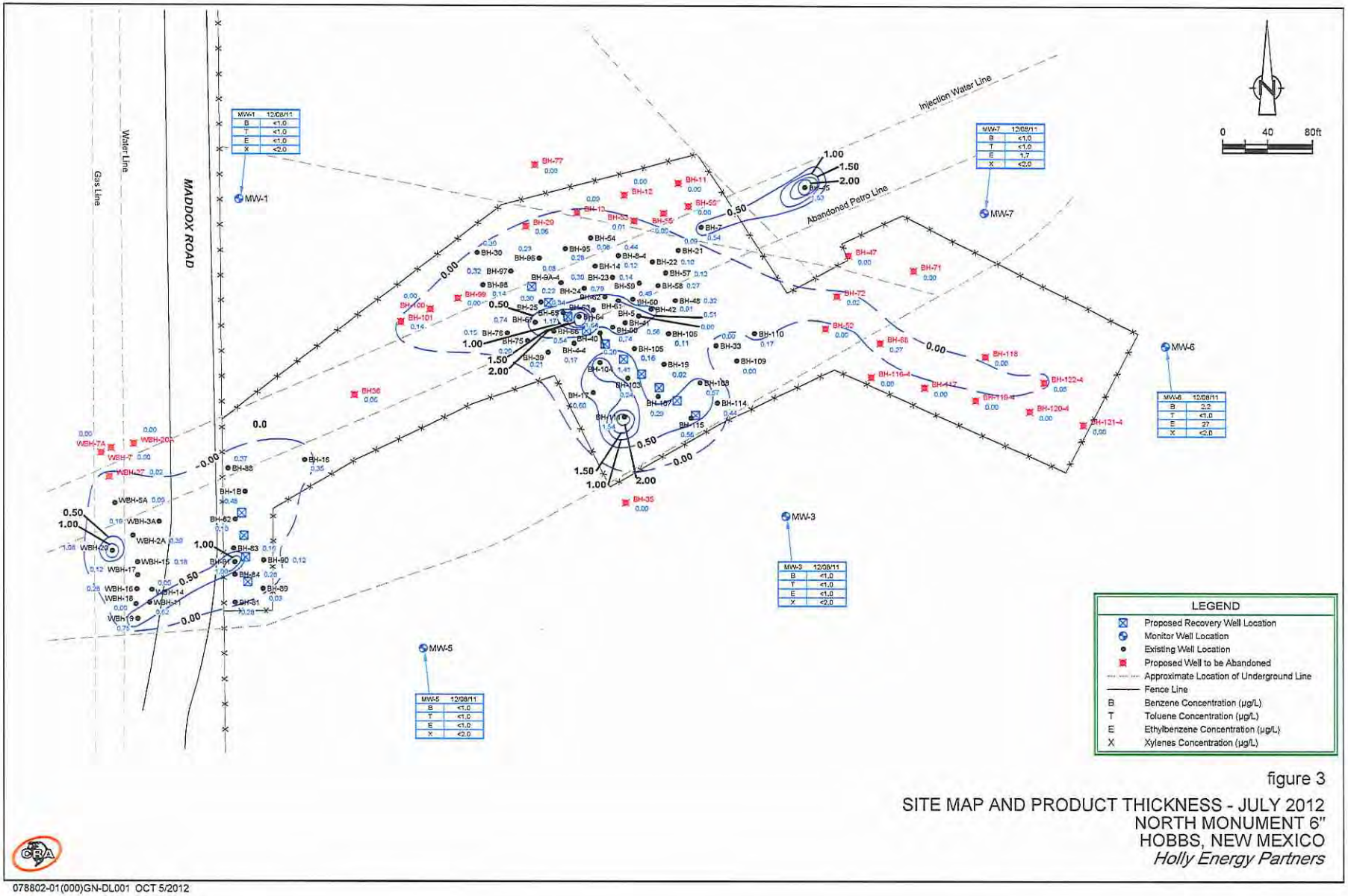



figure 3

SITE MAP AND PRODUCT THICKNESS - JULY 2012
NORTH MONUMENT 6"
HOBBS, NEW MEXICO
*Holly Energy Partners*

078802-01(000)GN-DL001 OCT 5/2012

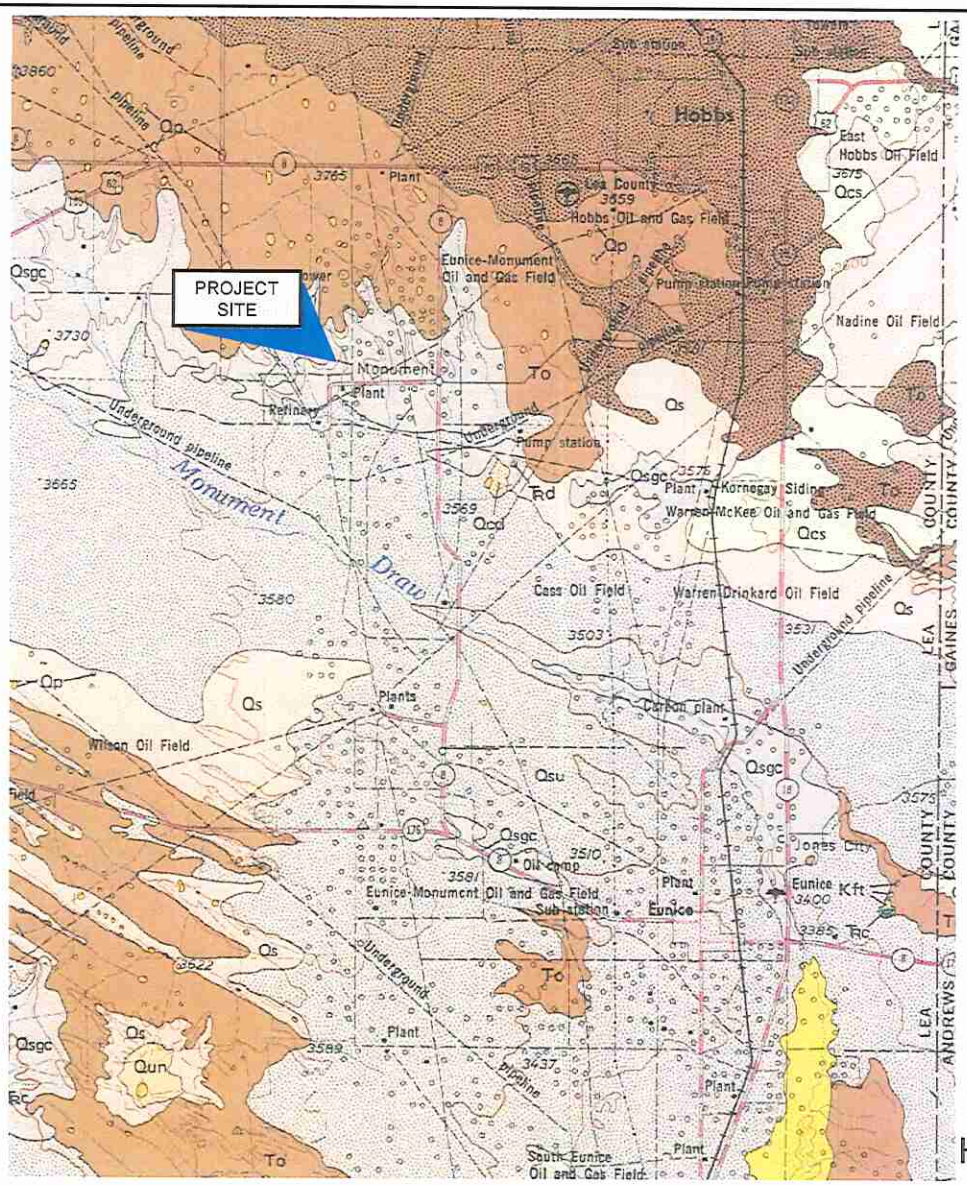
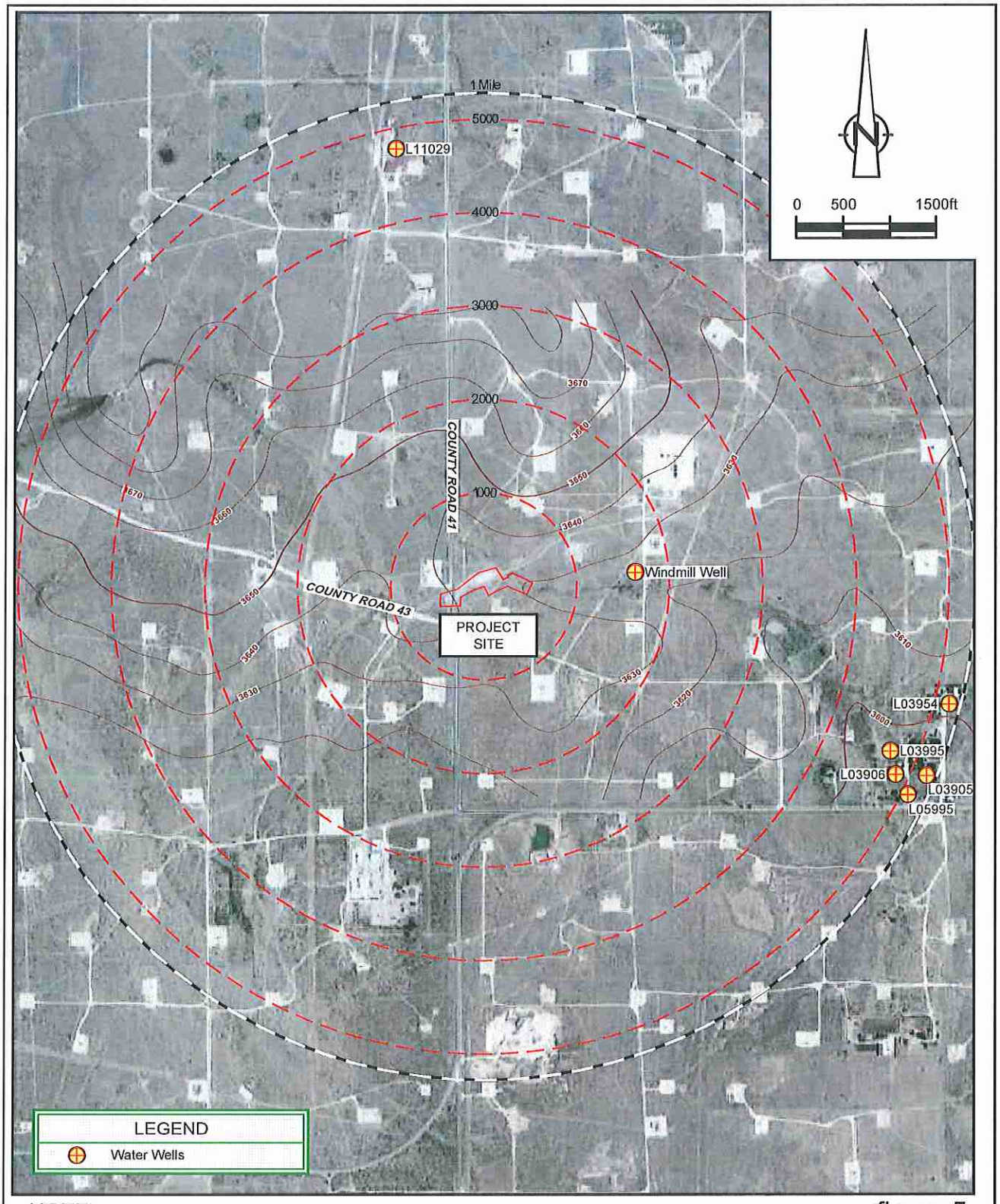



figure 4

HOBBS, NM AREA GEOLOGIC MAP
NORTH MONUMENT 6"
HOBBS, NEW MEXICO
*Holly Energy Partners*

078802-01(000)GN-DL004 OCT 17/2012




NOTE:

Topographic contours taken from USGS Topo map "Monument North, NM" dated 2010.

figure 5

WELLS WITHIN 1 MILE
NORTH MONUMENT 6"
HOBBS, NEW MEXICO
*Holly Energy Partners*

078802-01(000)GN-DL002 OCT 17/2012

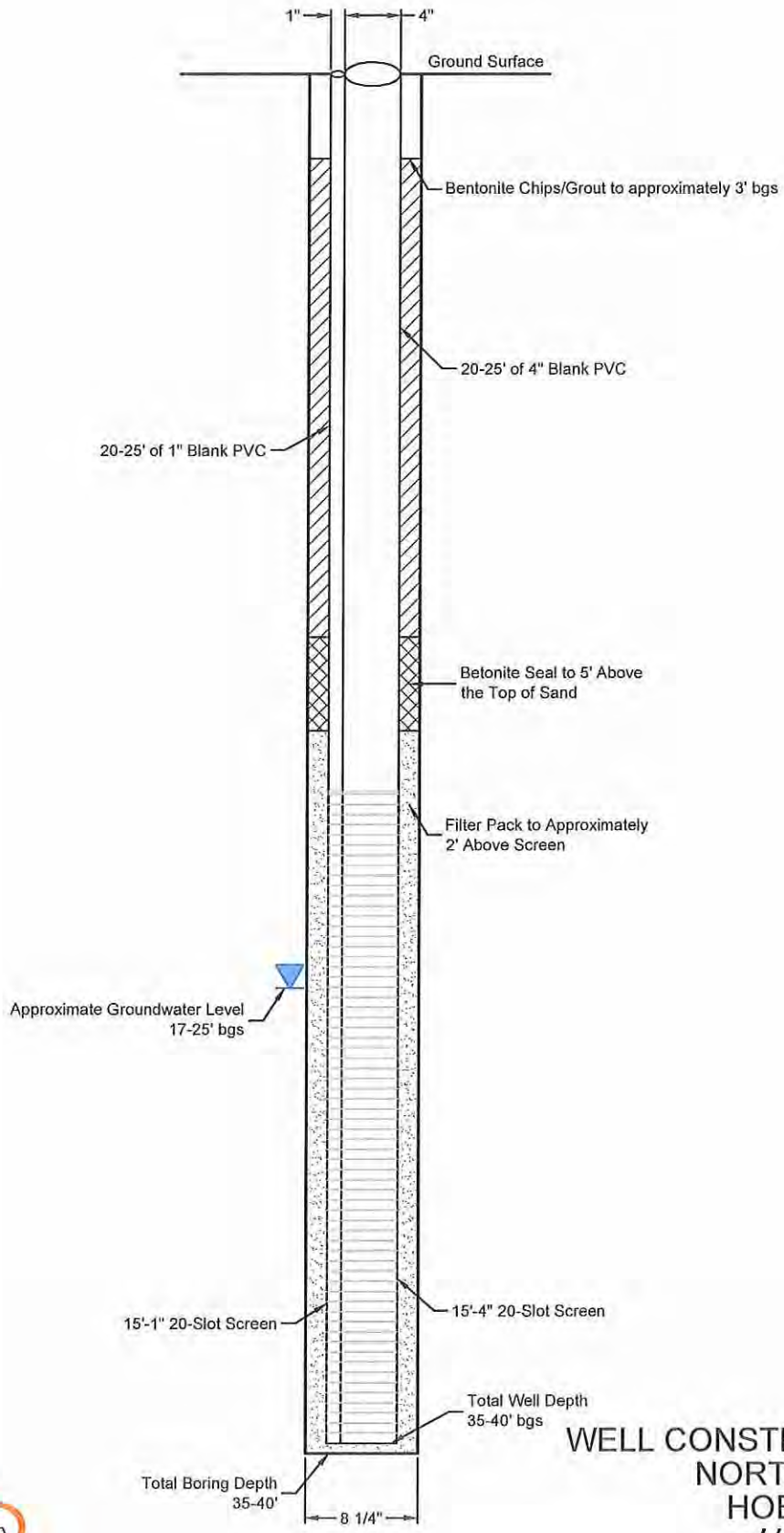



figure 6

WELL CONSTRUCTION DETAILS
NORTH MONUEMENT 6"
HOBBS, NEW MEXICO
*Holly Energy Partners*

078802-01(000)GN-DL003 OCT 17/2012

# TABLE

**Table 1**

**Water Well Information for the Monument area**

| Well # | Diversion | Owner | Use | Twsp | Rng | Sec q q q | Latitude | Longitude | Date Installed | Death to Water (feet) | Distance from Site (feet) | Total Well Depth (feet) |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| L11029 | 3 | Chevron USA Inc. | POL | 19S | 36E | 24 2 4 | 32.644 | -103.301 | 10/14/1999 | 59 | 4,800 | 75 |
| L03995 | 3 | W.E. Copeland | DOM | 19S | 37E | 30 4 4 | 32.625 | -103.284 | 9/26/1958 | 20 | 4,800 | 35 |
| L05995 | 3 | H.L. Stephens | DOM | 19S | 37E | 30 4 4 | 32.624 | -103.283 | 8/31/1966 | 23 | 5,050 | 40 |
| L03905 | 3 | M.L Fullingim | DOM | 19S | 37E | 30 4 4 | unknown | unknown | 8/12/1958 | 20 | unknown | 35 |
| L03906 | 3 | Robert P. Short III | DOM | 19S | 37E | 30 4 4 | unknown | unknown | 8/11/1958 | 20 | unknown | 35 |
| L03954 | 3 | K.W. Little | DOM | 19S | 37E | 30 4 4 | unknown | unknown | 8/10/1958 | 20 | unknown | 35 |
| Windmill | | No records were found | | 19S | 37E | 30 center | 32.105 | -103.048 | unknown | unknown | 1,500 | unknown |

# APPENDIX A

## OCD Form C-141

District I
1625 N. French Dr., Hobbs, NM 88240
District II
811 South First, Artesia, NM 88210
District III
1000 Rio Brazos Road, Aztec, NM 87410
District IV
2040 South Pacheco, Santa Fe, NM 87505

State of New Mexico
Energy Minerals and Natural Resources

Oil Conservation Division
2040 South Pacheco
Santa Fe, NM 87505

Form C-141
Revised March 17, 1999

Submit 2 Copies to appropriate District Office in accordance with Rule 116 on back side of form

# Release Notification and Corrective Action

## OPERATOR

☒ Initial Report ☐ Final Report

| | |
|---|---|
| Name of Company: Navajo Refining Co. | Contact: Darrell Moore Dickie Townley |
| Address: 501 E. Main Artesia NM | Telephone No.: 505-748-3311 |
| Facility Name: | Facility Type: Pipeline. |

| Surface Owner | Mineral Owner | Lease No. |
|---|---|---|
| State of NM | | |

## LOCATION OF RELEASE

| Unit Letter | Section | Township | Range | Feet from the | North/South Line | Feet from the | East/West Line | County |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | Lea |

10 miles west of Hobbs. Turn south on Maddox Rd. Go 2.5 miles. Leak site is on both sides of Maddox Rd.

## NATURE OF RELEASE

| | | |
|---|---|---|
| Type of Release: Crude Oil | Volume of Release: 2024 bbls. | Volume Recovered: |
| Source of Release: Leak in pipeline | Date and Hour of Occurrence: 10/5/02 | Date and Hour of Discovery: 10/5/02 11:00 am |
| Was Immediate Notice Given? ☒ Yes ☐ No ☐ Not Required | If YES, To Whom? Larry Johnson | |
| By Whom? Dickie Townley | Date and Hour: 10/5/02 4:00 pm | |
| Was a Watercourse Reached? ☐ Yes ☒ No | If YES, Volume Impacting the Watercourse. | |

If a Watercourse was Impacted, Describe Fully.*

Describe Cause of Problem and Remedial Action Taken.* A corrosive was introduced into the pipeline by unknown persons and/or producers. This caused several leaks in the pipeline. We are currently delineating and putting pumps in wells that show free product.

Describe Area Affected and Cleanup Action Taken.* Area affected is still being determined.

I hereby certify that the information given above is true and complete to the best of my knowledge and understand that pursuant to NMOCD rules and regulations all operators are required to report and/or file certain release notifications and perform corrective actions for releases which may endanger public health or the environment. The acceptance of a C-141 report by the NMOCD marked as "Final Report" does not relieve the operator of liability should their operations have failed to adequately investigate and remediate contamination that pose a threat to ground water, surface water, human health or the environment. In addition, NMOCD acceptance of a C-141 report does not relieve the operator of responsibility for compliance with any other federal, state, or local laws and/or regulations.

| | |
|---|---|
| Signature: Darrell Moore | OIL CONSERVATION DIVISION |
| Printed Name: Darrell Moore | Approved by District Supervisor: |
| Title: Env. Mgr. for Waters Waste | Approval Date: / Expiration Date: |
| Date: 10/16/02 Phone: 505-748-3311 | Conditions of Approval: / Attached ☐ |

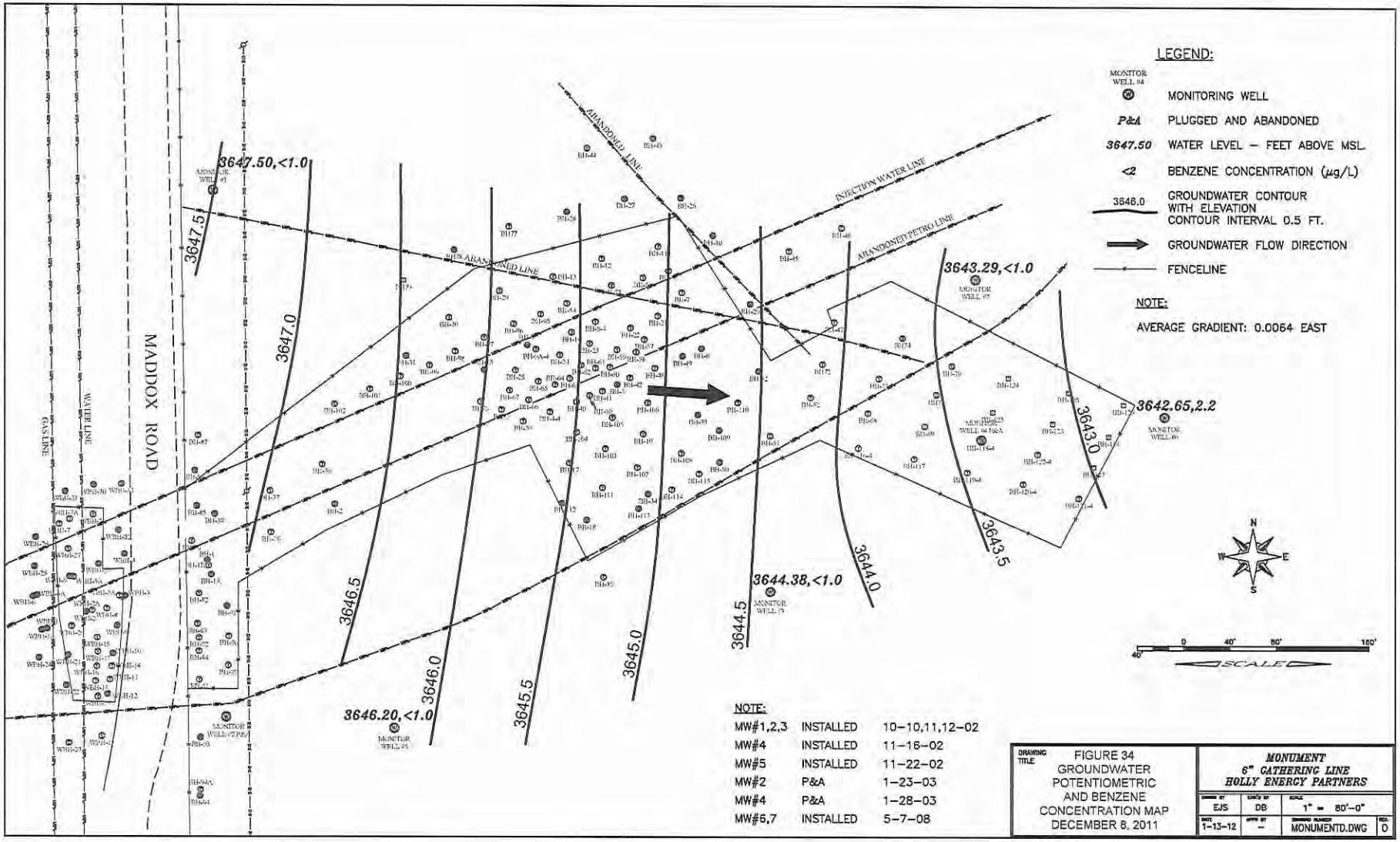
* Attach Additional Sheets If Necessary

# APPENDIX B

## Historical Data

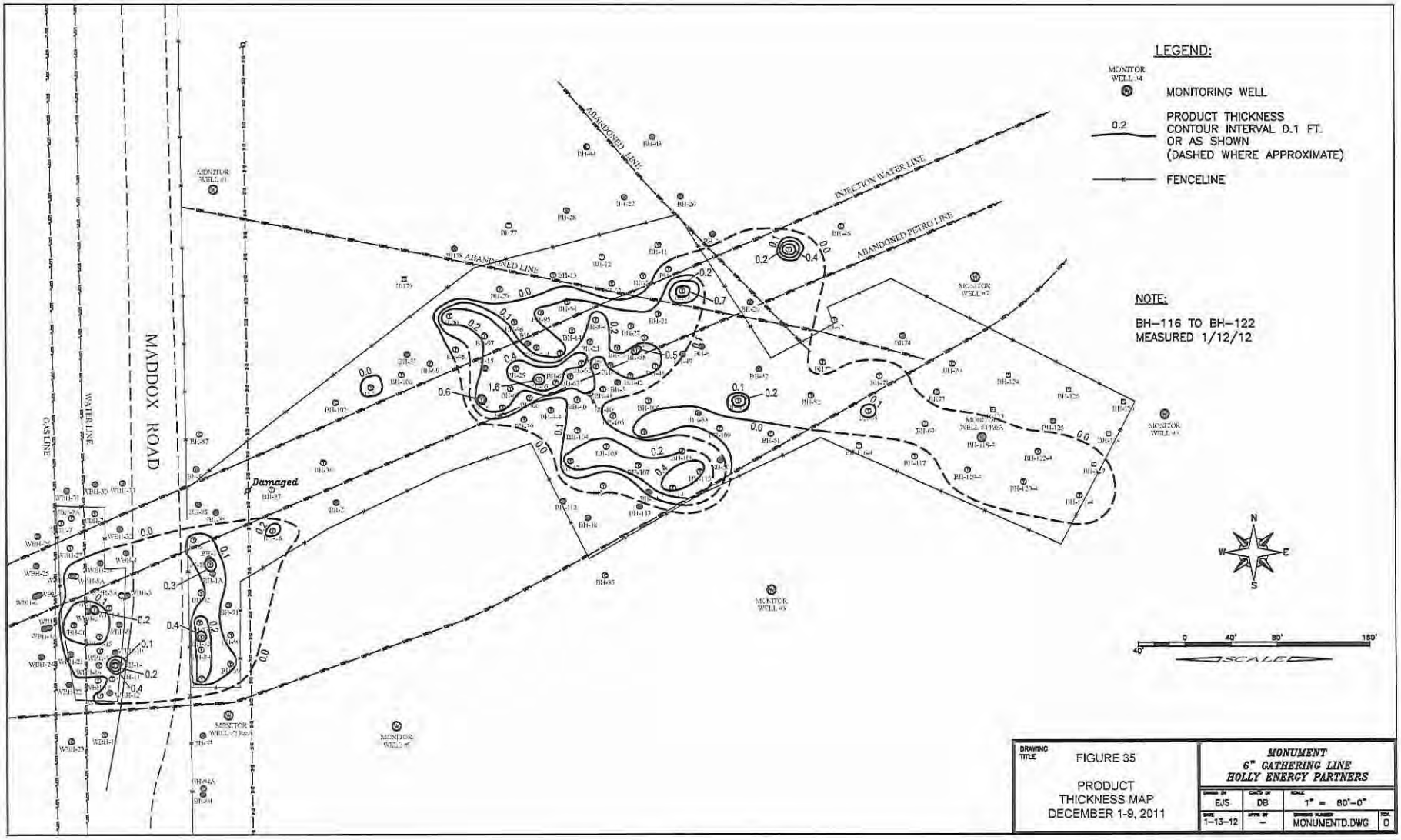
# APPENDIX B-1

## Groundwater Gradient Map December 2011


LEGEND:
MONITOR WELL #4
MONITORING WELL
P&A
PLUGGED AND ABANDONED
3647.50
WATER LEVEL – FEET ABOVE MSL
<2
BENZENE CONCENTRATION (µg/L)
3646.0
GROUNDWATER CONTOUR WITH ELEVATION CONTOUR INTERVAL 0.5 FT.
GROUNDWATER FLOW DIRECTION
FENCELINE
NOTE:
AVERAGE GRADIENT: 0.0064 EAST
3647.50,<1.0
3643.29,<1.0
3642.65,2.2
3644.38,<1.0
3646.20,<1.0
MADDOX ROAD
ABANDONED LINE
INJECTION WATER LINE
ABANDONED PETRO LINE
3647.5
3647.0
3646.5
3646.0
3645.5
3645.0
3644.5
3644.0
3643.5
3643.0
N
S
E
W
0
40'
80'
160'
SCALE
NOTE:
MW#1,2,3 INSTALLED 10-10,11,12-02
MW#4 INSTALLED 11-16-02
MW#5 INSTALLED 11-22-02
MW#2 P&A 1-23-03
MW#4 P&A 1-28-03
MW#6,7 INSTALLED 5-7-08
DRAWING TITLE
FIGURE 34
GROUNDWATER POTENTIOMETRIC AND BENZENE CONCENTRATION MAP
DECEMBER 8, 2011
MONUMENT
6" GATHERING LINE
HOLLY ENERGY PARTNERS
EJS
DB
1" = 80'-0"
1-13-12
MONUMENTD.DWG
0

# APPENDIX B-2

## Product Thickness Map December 2011


LEGEND:
MONITOR WELL #4
MONITORING WELL
0.2
PRODUCT THICKNESS CONTOUR INTERVAL 0.1 FT. OR AS SHOWN (DASHED WHERE APPROXIMATE)
FENCELINE
NOTE:
BH–116 TO BH–122 MEASURED 1/12/12
MADDOX ROAD
ABANDONED LINE
INJECTION WATER LINE
ABANDONED PETRO LINE
GAS LINE
WATER LINE
Damaged
N
S
E
W
0
40'
80'
160'
SCALE
DRAWING TITLE
FIGURE 35
PRODUCT THICKNESS MAP DECEMBER 1-9, 2011
MONUMENT
6" GATHERING LINE
HOLLY ENERGY PARTNERS
EJS
DB
1" = 80'-0"
1-13-12
MONUMENTD.DWG
0

# APPENDIX B-3

## Historical Fluid Levels

Monitor Well Water Levels, North Monument Crude Release Investigation

| Well Name, Elevation AGS (ft.) | Elevation Top of Casing (feet) | Date Measured | Depth to Product Below TOC (feet) | Depth to Water Below TOC (feet) | Total Depth below TOC (feet) | Product Thickness (feet) | Corrected Depth to Water (feet) | Corrected Water Level Elev. (feet) | Water Saturated Thickness (feet) | Change from previous reading (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1** | 3,670.05 | 10/14/02 | -- | 25.51 | -- | 0 | 25.51 | 3,644.54 | -- | -- |
| 2.57 | | 10/20/02 | -- | 25.44 | -- | 0 | 25.44 | 3,644.61 | -- | 0.07 |
| | | 10/21/02 | -- | 25.44 | -- | 0 | 25.44 | 3,644.61 | -- | 0.00 |
| | | 11/18/02 | -- | 25.02 | -- | 0 | 25.02 | 3,645.03 | -- | 0.42 |
| | | 12/27/02 | -- | 25.17 | 37.72 | 0 | 25.17 | 3,644.88 | 12.6 | -0.15 |
| | | 05/21/03 | -- | 25.58 | 37.73 | 0 | 25.58 | 3,644.47 | 12.2 | -0.41 |
| | | 10/14/03 | -- | 26.42 | 37.73 | 0 | 26.42 | 3,643.63 | 11.3 | -0.84 |
| | | 03/15/04 | -- | 26.40 | 37.68 | 0 | 26.40 | 3,643.65 | 11.3 | 0.02 |
| | | 10/08/04 | -- | 20.04 | 37.73 | 0 | 20.04 | 3,650.01 | 17.7 | 6.36 |
| | | 01/12/05 | -- | 21.60 | 37.74 | 0 | 21.60 | 3,648.45 | 16.1 | -1.56 |
| | | 10/24/05 | -- | 23.02 | 37.82 | 0 | 23.02 | 3,647.03 | 14.8 | -1.42 |
| | | 03/07/06 | -- | 23.30 | 37.82 | 0 | 23.30 | 3,646.75 | 14.5 | -0.28 |
| | | 06/27/06 | -- | 23.82 | 37.82 | 0 | 23.82 | 3,646.23 | 14.0 | -0.52 |
| | | 09/08/06 | -- | 19.27 | 37.82 | 0 | 19.27 | 3,650.78 | 18.6 | 4.55 |
| | | 12/19/06 | -- | 22.98 | 37.82 | 0 | 22.98 | 3,647.07 | 14.8 | -3.71 |
| | | 03/13/07 | -- | 22.31 | 37.82 | 0 | 22.31 | 3,647.74 | 15.5 | 0.67 |
| | | 06/21/07 | -- | 21.95 | 37.86 | 0 | 21.95 | 3,648.10 | 15.9 | 0.36 |
| | | 09/21/07 | -- | 22.29 | 37.86 | 0 | 22.29 | 3,647.76 | 15.6 | -0.34 |
| | | 12/06/07 | -- | 21.79 | 37.92 | 0 | 21.79 | 3,648.26 | 16.1 | 0.50 |
| | | 03/04/08 | -- | 22.02 | 37.92 | 0 | 22.02 | 3,648.03 | 15.9 | -0.23 |
| | | 06/03/08 | -- | 22.30 | 37.92 | 0 | 22.30 | 3,647.75 | 15.6 | -0.28 |
| | | 09/23/08 | -- | 22.37 | 37.73 | 0 | 22.37 | 3,647.68 | 15.4 | -0.07 |
| | | 12/22/08 | -- | 22.07 | 37.73 | 0 | 22.07 | 3,647.98 | 15.7 | 0.30 |
| | | 03/12/09 | -- | 22.43 | 37.75 | 0 | 22.43 | 3,647.62 | 15.3 | -0.36 |
| | | 06/23/09 | -- | 21.69 | 37.96 | 0 | 21.69 | 3,648.36 | 16.3 | 0.74 |
| | | 09/08/09 | -- | 22.01 | 37.75 | 0 | 22.01 | 3,648.04 | 15.7 | -0.32 |
| | | 12/17/09 | -- | 22.48 | 37.70 | 0 | 22.48 | 3,647.57 | 15.2 | -0.47 |
| | | 03/09/10 | -- | 22.23 | 37.70 | 0 | 22.23 | 3,647.82 | 15.5 | 0.25 |
| | | 06/16/10 | -- | 22.37 | 37.71 | 0 | 22.37 | 3,647.68 | 15.3 | -0.14 |
| | | 08/30/10 | -- | 21.41 | 37.91 | 0 | 21.41 | 3,648.64 | 16.5 | 0.96 |
| | | 12/06/10 | -- | 22.15 | 37.74 | 0 | 22.15 | 3,647.90 | 15.6 | -0.74 |

Monitor Well Water Levels, North Monument Crude Release Investigation

| Well Name, Elevation AGS (ft.) | Elevation Top of Casing (feet) | Date Measured | Depth to Product Below TOC (feet) | Depth to Water Below TOC (feet) | Total Depth below TOC (feet) | Product Thickness (feet) | Corrected Depth to Water (feet) | Corrected Water Level Elev. (feet) | Water Saturated Thickness (feet) | Change from previous reading (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| **MW-1** | | 03/18/11 | - - | | | 0 | | 3,670.05 | 0.0 | 22.15 |
| | | 06/23/11 | - - | 22.50 | 37.86 | 0 | 22.50 | 3,647.55 | 15.4 | -22.50 |
| | | 10/07/11 | - - | 22.60 | 37.63 | 0 | 22.60 | 3,647.45 | 15.0 | -0.10 |
| | | 12/08/11 | - - | 22.55 | 37.64 | 0 | 22.55 | 3,647.50 | 15.1 | 0.05 |
| | | | | | | | | | | |
| **MW-2** | 3,671.40 | 10/14/02 | - - | 27.42 | - - | 0 | 27.42 | 3,643.98 | 10.2 | - - |
| 2.58 | | 10/20/02 | - - | 27.35 | - - | 0 | 27.35 | 3,644.05 | 10.3 | 0.07 |
| | | 10/21/02 | - - | 27.36 | - - | 0 | 27.36 | 3,644.04 | 10.3 | -0.01 |
| | | 11/18/02 | 26.98 | 27.69 | - - | 0.71 | 27.10 | 3,644.30 | 10.5 | 0.26 |
| | | 12/27/02 | 26.62 | 29.99 | 37.65 | 3.37 | 27.21 | 3,644.19 | 10.4 | -0.11 |
| Note: Corrected depth to water = Static DTW - (Prod. Thickness x SG), SG = 0.8251 (API=40); plugged 01/23/03 | | | | | | | | | | |
| | | | | | | | | | | |
| **MW-3** | 3,666.41 | 10/14/02 | - - | 24.31 | - - | 0 | 24.31 | 3,642.10 | - - | - - |
| 2.77 | | 10/20/02 | - - | 24.20 | - - | 0 | 24.20 | 3,642.21 | - - | 0.11 |
| | | 10/21/02 | - - | 24.21 | - - | 0 | 24.21 | 3,642.20 | - - | -0.01 |
| | | 11/18/02 | - - | 23.82 | - - | 0 | 23.82 | 3,642.59 | - - | 0.39 |
| | | 12/27/02 | - - | 23.96 | 37.47 | 0 | 23.96 | 3,642.45 | 13.5 | -0.14 |
| | | 05/21/03 | - - | 24.36 | 37.49 | 0 | 24.36 | 3,642.05 | 13.1 | -0.40 |
| | | 10/14/03 | - - | 25.07 | 37.49 | 0 | 25.07 | 3,641.34 | 12.4 | -0.71 |
| | | 03/15/04 | - - | 25.01 | 37.45 | 0 | 25.01 | 3,641.40 | 12.4 | 0.06 |
| | | 10/08/04 | - - | 19.95 | 37.49 | 0 | 19.95 | 3,646.46 | 17.5 | 5.06 |
| | | 01/12/05 | - - | 20.44 | 37.49 | 0 | 20.44 | 3,645.97 | 17.1 | -0.49 |
| | | 10/24/05 | - - | 22.08 | 37.15 | 0 | 22.08 | 3,644.33 | 15.1 | -1.64 |
| | | 03/07/06 | - - | 22.38 | 37.15 | 0 | 22.38 | 3,644.03 | 14.8 | -0.30 |
| | | 06/27/06 | - - | 22.91 | 37.15 | 0 | 22.91 | 3,643.50 | 14.2 | -0.53 |
| | | 09/08/06 | - - | 18.90 | 37.15 | 0 | 18.90 | 3,647.51 | 18.3 | 4.01 |
| | | 12/19/06 | - - | 21.24 | 37.15 | 0 | 21.24 | 3,645.17 | 15.9 | -2.34 |
| | | 03/13/07 | - - | 21.66 | 37.15 | 0 | 21.66 | 3,644.75 | 15.5 | -0.42 |
| | | 06/21/07 | - - | 21.58 | 37.61 | 0 | 21.58 | 3,644.83 | 16.0 | 0.08 |
| | | 09/21/07 | - - | 21.78 | 37.61 | 0 | 21.78 | 3,644.63 | 15.8 | -0.20 |
| | | 12/06/07 | - - | 21.58 | 37.66 | 0 | 21.58 | 3,644.83 | 16.1 | 0.20 |

Monitor Well Water Levels, North Monument Crude Release Investigation

| Well Name, Elevation AGS (ft.) | Elevation Top of Casing (feet) | Date Measured | Depth to Product Below TOC (feet) | Depth to Water Below TOC (feet) | Total Depth below TOC (feet) | Product Thickness (feet) | Corrected Depth to Water (feet) | Corrected Water Level Elev. (feet) | Water Saturated Thickness (feet) | Change from previous reading (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| MW-3 | | 03/04/08 | -- | 21.68 | 37.66 | 0 | 21.68 | 3,644.73 | 16.0 | -0.10 |
| | | 06/03/08 | -- | 21.86 | 37.66 | 0 | 21.86 | 3,644.55 | 15.8 | -0.18 |
| | | 09/23/08 | -- | 21.93 | 37.48 | 0 | 21.93 | 3,644.48 | 15.6 | -0.07 |
| | | 12/22/08 | -- | 21.57 | 37.48 | 0 | 21.57 | 3,644.84 | 15.9 | 0.36 |
| | | 03/12/09 | -- | 21.90 | 37.81 | 0 | 21.90 | 3,644.51 | 15.9 | -0.33 |
| | | 06/23/09 | -- | 20.96 | 37.70 | 0 | 20.96 | 3,645.45 | 16.7 | 0.94 |
| | | 09/08/09 | -- | 21.36 | 37.81 | 0 | 21.36 | 3,645.05 | 16.5 | -0.40 |
| | | 12/17/09 | -- | 21.88 | 37.47 | 0 | 21.88 | 3,644.53 | 15.6 | -0.52 |
| | | 03/09/10 | -- | 21.27 | 37.47 | 0 | 21.27 | 3,645.14 | 16.2 | 0.61 |
| | | 06/16/10 | -- | 21.85 | 37.44 | 0 | 21.85 | 3,644.56 | 15.6 | -0.58 |
| | | 08/30/10 | -- | 20.69 | 37.66 | 0 | 20.69 | 3,645.72 | 17.0 | 1.16 |
| | | 12/06/10 | -- | 21.53 | 37.74 | 0 | 21.53 | 3,644.88 | 16.2 | -0.84 |
| | | 03/18/11 | -- | | | 0 | 0.00 | 3,666.41 | 0.0 | 21.53 |
| | | 06/23/11 | -- | 21.94 | 37.63 | 0 | 21.94 | 3,644.47 | 15.7 | -21.94 |
| | | 10/07/11 | -- | 22.06 | 37.40 | 0 | 22.06 | 3,644.35 | 15.3 | -0.12 |
| | | 12/08/11 | -- | 22.03 | 37.39 | 0 | 22.03 | 3,644.38 | 15.4 | 0.03 |
| | | | | | | | | | | |
| | | | | | | | | | | |
| MW-4 | 3,661.76 | 11/18/02 | -- | 20.26 | -- | 0 | 20.26 | 3,641.50 | 8.7 | -- |
| 2.63 | | 12/27/02 | -- | 20.52 | 28.93 | 0 | 20.52 | 3,641.24 | 8.4 | -0.26 |
| | | 12/30/02 | 20.30 | 21.92 | -- | 1.62 | 20.58 | 3,641.18 | 8.3 | -0.06 |
| Note: Corrected depth to water = Static DTW - (Prod. Thickness x SG), SG = 0.8251 (API=40); plugged 01/28/03 | | | | | | | | | | |
| | | | | | | | | | | |
| MW-5 | 3,670.43 | 12/27/02 | -- | 26.53 | 35.80 | 0 | 26.53 | 3,643.90 | 9.3 | -- |
| 2.08 | | 05/21/03 | -- | 26.88 | 39.32 | 0 | 26.88 | 3,643.55 | 12.4 | -0.35 |
| | | 10/14/03 | -- | 27.66 | 39.32 | 0 | 27.66 | 3,642.77 | 11.7 | -0.78 |
| | | 03/15/04 | -- | 27.64 | 39.33 | 0 | 27.64 | 3,642.79 | 11.7 | 0.02 |
| | | 10/08/04 | -- | 22.90 | 39.32 | 0 | 22.90 | 3,647.53 | 16.4 | 4.74 |
| | | 01/12/05 | -- | 23.21 | 39.30 | 0 | 23.21 | 3,647.22 | 16.1 | -0.31 |
| | | 10/24/05 | -- | 24.56 | 39.55 | 0 | 24.56 | 3,645.87 | 15.0 | -1.35 |
| | | 03/07/06 | -- | 24.80 | 39.55 | 0 | 24.80 | 3,645.63 | 14.8 | -0.24 |

Monitor Well Water Levels, North Monument Crude Release Investigation

| Well Name, Elevation AGS (ft.) | Elevation Top of Casing (feet) | Date Measured | Depth to Product Below TOC (feet) | Depth to Water Below TOC (feet) | Total Depth below TOC (feet) | Product Thickness (feet) | Corrected Depth to Water (feet) | Corrected Water Level Elev. (feet) | Water Saturated Thickness (feet) | Change from previous reading (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| **MW-5** | | 06/27/06 | - - | 25.32 | 39.55 | 0 | 25.32 | 3,645.11 | 14.2 | -0.52 |
| | | 09/08/06 | - - | 21.84 | 39.55 | 0 | 21.84 | 3,648.59 | 17.7 | 3.48 |
| | | 12/19/06 | - - | 23.66 | 39.55 | 0 | 23.66 | 3,646.77 | 15.9 | -1.82 |
| | | 03/13/07 | - - | 23.97 | 39.55 | 0 | 23.97 | 3,646.46 | 15.6 | -0.31 |
| | | 06/21/07 | - - | 23.74 | 39.49 | 0 | 23.74 | 3,646.69 | 15.8 | 0.23 |
| | | 09/21/07 | - - | 24.01 | 39.49 | 0 | 24.01 | 3,646.42 | 15.5 | -0.27 |
| | | 12/06/07 | - - | 23.70 | 39.53 | 0 | 23.70 | 3,646.73 | 15.8 | 0.31 |
| | | 03/04/08 | - - | 23.81 | 39.53 | 0 | 23.81 | 3,646.62 | 15.7 | -0.11 |
| | | 06/03/08 | - - | 24.05 | 39.53 | 0 | 24.05 | 3,646.38 | 15.5 | -0.24 |
| | | 09/23/08 | - - | 24.13 | 39.33 | 0 | 24.13 | 3,646.30 | 15.2 | -0.08 |
| | | 12/22/08 | - - | 23.76 | 39.33 | 0 | 23.76 | 3,646.67 | 15.6 | 0.37 |
| | | 03/12/09 | - - | 24.12 | 39.35 | 0 | 24.12 | 3,646.31 | 15.2 | -0.36 |
| | | 06/23/09 | - - | 23.51 | 39.57 | 0 | 23.51 | 3,646.92 | 16.1 | 0.61 |
| | | 09/08/09 | - - | 23.70 | 39.31 | 0 | 23.70 | 3,646.73 | 15.6 | -0.19 |
| | | 12/17/09 | - - | 24.13 | 39.32 | 0 | 24.13 | 3,646.30 | 15.2 | -0.43 |
| | | 03/09/10 | - - | 23.96 | 39.32 | 0 | 23.96 | 3,646.47 | 15.4 | 0.17 |
| | | 06/16/10 | - - | 24.10 | 39.31 | 0 | 24.10 | 3,646.33 | 15.2 | -0.14 |
| | | 08/30/10 | - - | 23.15 | 39.53 | 0 | 23.15 | 3,647.28 | 16.4 | 0.95 |
| | | 12/06/10 | - - | 23.81 | 39.32 | 0 | 23.81 | 3,646.62 | 15.5 | -0.66 |
| | | 03/18/11 | - - | | | 0 | 0.00 | 3,670.43 | 0.0 | 23.81 |
| | | 06/23/11 | - - | 24.20 | 39.42 | 0 | 24.20 | 3,646.23 | 15.2 | -24.20 |
| | | 10/07/11 | - - | 24.33 | 39.31 | 0 | 24.33 | 3,646.10 | 15.0 | -0.13 |
| | | 12/08/11 | - - | 24.23 | 39.24 | 0 | 24.23 | 3,646.20 | 15.0 | 0.10 |
| | | | | | | | | | | |
| **MW-6** | 3,660.50 | 05/12/08 | - - | 17.61 | 32.70 | 0 | 17.61 | 3,642.89 | 15.1 | - - |
| 2.85 | | 06/02/08 | - - | 17.65 | 32.70 | 0 | 17.65 | 3,642.85 | 15.1 | -0.04 |
| | | 09/23/08 | - - | 17.71 | 32.50 | 0 | 17.71 | 3,642.79 | 14.8 | -0.06 |
| | | 12/22/08 | - - | 17.20 | 32.50 | 0 | 17.20 | 3,643.30 | 15.3 | 0.51 |
| | | 03/12/09 | - - | 24.97* | 32.51 | 0 | 24.97* | 3635.53* | - - | - - |
| | | 06/23/09 | - - | 16.42 | 32.72 | 0 | 16.42 | 3,644.08 | 16.3 | - - |
| | | 09/08/09 | - - | 17.03 | 32.51 | 0 | 17.03 | 3,643.47 | 15.5 | -0.61 |

Monitor Well Water Levels, North Monument Crude Release Investigation

| Well Name, Elevation AGS (ft.) | Elevation Top of Casing (feet) | Date Measured | Depth to Product Below TOC (feet) | Depth to Water Below TOC (feet) | Total Depth below TOC (feet) | Product Thickness (feet) | Corrected Depth to Water (feet) | Corrected Water Level Elev. (feet) | Water Saturated Thickness (feet) | Change from previous reading (ft) |
|---|---|---|---|---|---|---|---|---|---|---|
| **MW-6** | | 12/17/09 | - - | 17.67 | 32.48 | 0 | 17.67 | 3,642.83 | 14.8 | -0.64 |
| | | 03/09/10 | - - | 17.58 | 32.48 | 0 | 17.58 | 3,642.92 | 14.9 | 0.09 |
| | | 06/16/10 | - - | 17.67 | 32.50 | 0 | 17.67 | 3,642.83 | 14.8 | -0.09 |
| | | 08/30/10 | - - | 16.26 | 32.70 | 0 | 16.26 | 3,644.24 | 16.4 | 1.41 |
| | | 12/06/10 | - - | 17.31 | 32.50 | 0 | 17.31 | 3,643.19 | 15.2 | -1.05 |
| | | 03/18/11 | - - | | | 0 | 0.00 | 3,660.50 | 0.0 | 17.31 |
| | | 06/23/11 | - - | 17.73 | 32.68 | 0 | 17.73 | 3,642.77 | 15.0 | -17.73 |
| | | 10/07/11 | - - | 17.88 | 32.47 | 0 | 17.88 | 3,642.62 | 14.6 | -0.15 |
| | | 12/08/11 | - - | 17.85 | 32.46 | 0 | 17.85 | 3,642.65 | 14.6 | 0.03 |
| | * Meter malfunction | | | | | | | | | |
| | | | | | | | | | | |
| **MW-7** | 3,662.47 | 05/12/08 | - - | 18.93 | 32.68 | 0 | 18.93 | 3,643.54 | 13.8 | - - |
| 2.87 | | 06/02/08 | - - | 18.96 | 32.67 | 0 | 18.96 | 3,643.51 | 13.7 | -0.03 |
| | | 09/23/08 | - - | 19.04 | 32.47 | 0 | 19.04 | 3,643.43 | 13.4 | -0.08 |
| | | 12/22/08 | - - | 18.60 | 32.47 | 0 | 18.60 | 3,643.87 | 13.9 | 0.44 |
| | | 03/12/09 | - - | 19.01 | 32.47 | 0 | 19.01 | 3,643.46 | 13.5 | -0.41 |
| | | 06/23/09 | - - | 18.02 | 32.67 | 0 | 18.02 | 3,644.45 | 14.7 | 0.99 |
| | | 09/08/09 | - - | 18.47 | 32.47 | 0 | 18.47 | 3,644.00 | 14.0 | -0.45 |
| | | 12/17/09 | - - | 19.02 | 32.44 | 0 | 19.02 | 3,643.45 | 13.4 | -0.55 |
| | | 03/09/10 | - - | 18.91 | 32.44 | 0 | 18.91 | 3,643.56 | 13.5 | 0.11 |
| | | 06/16/10 | - - | 19.01 | 32.45 | 0 | 19.01 | 3,643.46 | 13.4 | -0.10 |
| | | 08/30/10 | - - | 17.81 | 32.68 | 0 | 17.81 | 3,644.66 | 14.9 | 1.20 |
| | | 12/06/10 | - - | 18.71 | 32.45 | 0 | 18.71 | 3,643.76 | 13.7 | -0.90 |
| | | 03/18/11 | - - | | | 0 | 0.00 | 3,662.47 | 0.0 | 18.71 |
| | | 06/23/11 | - - | 19.10 | 32.58 | 0 | 19.10 | 3,643.37 | 13.5 | -19.10 |
| | | 10/07/11 | - - | 19.23 | 32.35 | 0 | 19.23 | 3,643.24 | 13.1 | -0.13 |
| | | 12/08/11 | - - | 19.18 | 32.34 | 0 | 19.18 | 3,643.29 | 13.2 | 0.05 |
| | | | | | | | | | | |
| Note: TOC -Top of Casing, AGS - Above Ground Surface | | | | | | | | | | |

# APPENDIX B-4

## Historical Groundwater Quality Data

Monitor Well Water Quality, North Monument Crude Release Investigation

| Monitoring Well | Sample Date | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | Xylenes (total, µg/L) | Chloride (mg/L) | Total Dissolved Solids (mg/L) | Notes |
|---|---|---|---|---|---|---|---|---|
| MW-1 | 10/21/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 12/27/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 05/21/03 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 10/15/03 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 03/15/04 | <2 | <2 | <2 | <6 | 264 | 950 | 1,5 |
| | 10/08/04 | <2 | <2 | <2 | <6 | 256 | 946 | 1,5 |
| | 01/12/05 | <2 | <2 | <2 | <6 | 252 | 1,009 | 1,5 |
| | 10/24/05 | <2 | <2 | <2 | <6 | 260 | 1,021 | 1,5 |
| | 03/07/06 | <2.00 | <2.00 | <2.00 | <6.00 | 244 | 957 | 1 |
| | 06/27/06 | <2.00 | <2.00 | <2.00 | <6.00 | 220 | 921 | 1 |
| | 09/07/06 | <0.5 | <0.5 | <0.5 | <1.0 | 190 | 890 | 2 |
| | 12/19/06 | <0.5 | <0.5 | <0.5 | <1.0 | 210 | 1,000 | 2 |
| | 03/13/07 | <0.5 | <0.5 | <0.5 | <1.0 | 240 | 1,000 | 2 |
| | 06/21/07 | <0.5 | <0.5 | <0.5 | <1.0 | 270 | 1,000 | 2 |
| | 09/21/07 | <0.5 | <0.5 | <0.5 | <1.0 | 220 | 1,100 | 2 |
| | 12/06/07 | <0.5 | <0.5 | <0.5 | <1.0 | 230 | 920 | 2 |
| | 03/04/08 | <0.5 | <0.5 | <0.5 | <1.0 | 180 | 810 | 2 |
| | 06/03/08 | <0.5 | <0.5 | <0.5 | <1.0 | 180 | 1,000 | 2 |
| | 09/23/08 | <0.5 | <0.5 | <0.5 | <1.0 | 140 | 830 | 2 |
| | 12/22/08 | <0.5 | <0.5 | <0.5 | <1.0 | 43 | 830 | 2 |
| | 03/12/09 | <0.5 | <0.5 | <0.5 | <1.0 | 140 | 890 | 2 |
| | 06/23/09 | <1.0 | <1.0 | <1.0 | <2.0 | 180 | 920 | 3 |
| | 09/08/09 | <1.0 | <1.0 | <1.0 | <2.0 | 160 | 921 | 3 |
| | 12/17/09 | <1.0 | <1.0 | <1.0 | <2.0 | 160 | 902 | 3 |
| | 03/09/10 | <1.0 | <1.0 | <1.0 | <1.5 | 190 | 951 | 3 |
| | 06/16/10 | <1.0 | <1.0 | <1.0 | <2.0 | 150 | 953 | 3 |
| | 08/30/10 | <1.0 | <1.0 | <1.0 | <2.0 | 160 | 1,010 | 3 |
| | 12/06/10 | <1.0 | <1.0 | <1.0 | <2.0 | 150 | 1,050 | 3 |
| | 03/18/11 | <1.0 | <1.0 | <1.0 | <2.0 | 180 | 1,080 | 3 |
| | 06/23/11 | <1.0 | <1.0 | <1.0 | <2.0 | 170 | 1,000 | 3 |
| | 10/07/11 | <1.0 | <1.0 | <1.0 | <2.0 | 150 | 883 | 3 |
| | 12/08/11 | <1.0 | <1.0 | <1.0 | <2.0 | 140 | 827 | 3 |

Monitor Well Water Quality, North Monument Crude Release Investigation

| Monitoring Well | Sample Date | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | Xylenes (total, µg/L) | Chloride (mg/L) | Total Dissolved Solids (mg/L) | Notes |
|---|---|---|---|---|---|---|---|---|
| | | | | | | | | |
| **MW-2** | 10/21/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 12/27/02 | Hydrocarbon product detected, plugged 01/23/03 | | | | | | |
| | | | | | | | | |
| **MW-3** | 10/21/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 12/27/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 05/21/03 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 10/15/03 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 03/15/04 | 10 | <2 | <2 | <6 | 144 | 837 | 1,5 |
| | 10/08/04 | 19 | <2 | <2 | <6 | 148 | 704 | 1,5 |
| | 01/12/05 | 43 | <2 | <2 | <6 | 128 | 768 | 1,5 |
| | 10/24/05 | 80 | <2 | <2 | <6 | 180 | 778 | 1,5 |
| | 03/07/06 | 25.7 | <2.00 | <2.00 | 7.1 | 184 | 758 | 1 |
| | 06/27/06 | <2.00 | <2.00 | <2.00 | <6.00 | 204 | 831 | 1 |
| | 09/07/06 | 8.2 | <0.5 | <0.5 | <1.0 | 230 | 1,000 | 2 |
| | 12/19/06 | 23 | <0.5 | <0.5 | <1.0 | 150 | 740 | 2 |
| | 03/13/07 | 35 | <0.5 | <0.5 | <1.0 | 170 | 810 | 2 |
| | 06/21/07 | 1.6 | <0.5 | <0.5 | <1.0 | 260 | 960 | 2 |
| | 09/21/07 | <0.5 | <0.5 | <0.5 | <1.0 | 290 | 1,200 | 2 |
| | 12/06/07 | 0.6 | <0.5 | <0.5 | <1.0 | 310 | 1,000 | 2 |
| | 03/04/08 | <0.5 | <0.5 | <0.5 | <1.0 | 310 | 1,100 | 2 |
| | 06/03/08 | <0.5 | <0.5 | <0.5 | <1.0 | 310 | 1,300 | 2 |
| | 09/23/08 | <0.5 | <0.5 | <0.5 | <1.0 | 320 | 1,300 | 2 |
| | 12/22/08 | <0.5 | <0.5 | <0.5 | <1.0 | 300 | 1,300 | 2 |
| | 03/12/09 | <0.5 | <0.5 | <0.5 | <1.0 | 230 | 1,400 | 2 |
| | 06/23/09 | <1.0 | <1.0 | <1.0 | <2.0 | 380 | 1,100 | 3 |
| | 09/08/09 | <1.0 | <1.0 | <1.0 | <2.0 | 370 | 1,090 | 3 |
| | 12/17/09 | <1.0 | <1.0 | <1.0 | <2.0 | 390 | 1,070 | 3 |
| | 03/09/10 | <1.0 | <1.0 | <1.0 | <1.5 | 370 | 1,030 | 3 |
| | 06/16/10 | <1.0 | <1.0 | <1.0 | <2.0 | 390 | 1,160 | 3 |
| | 08/30/10 | <1.0 | <1.0 | <1.0 | <2.0 | 400 | 1,270 | 3 |
| | 12/06/10 | <1.0 | <1.0 | <1.0 | <2.0 | 400 | 1,110 | 3 |

Monitor Well Water Quality, North Monument Crude Release Investigation

| Monitoring Well | Sample Date | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | Xylenes (total, µg/L) | Chloride (mg/L) | Total Dissolved Solids (mg/L) | Notes |
|---|---|---|---|---|---|---|---|---|
| MW-3 | 03/18/11 | <1.0 | <1.0 | <1.0 | <2.0 | 360 | 1,090 | 3 |
| | 06/23/11 | <1.0 | <1.0 | <1.0 | <2.0 | 390 | 1,110 | 3 |
| | 10/07/11 | <1.0 | <1.0 | <1.0 | <2.0 | 400 | 1,120 | 3 |
| | 12/08/11 | <1.0 | <1.0 | <1.0 | <2.0 | 380 | 1,130 | 3 |
| | | | | | | | | |
| MW-4 | 12/27/02 | Hydrocarbon product detected, plugged 01/28/03 | | | | | | |
| | | | | | | | | |
| MW-5 | 12/30/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 05/21/03 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 10/15/03 | 45 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 11/06/03 | 70 | <2 | <2 | <6 | -- | -- | 1,5 |
| | 03/16/04 | 56 | <2 | <2 | <6 | 132 | 797 | 1,5 |
| | 10/08/04 | 55 | <2 | <2 | <6 | 128 | 765 | 1,5 |
| | 01/12/05 | <2 | <2 | <2 | <6 | 128 | 880 | 1,5 |
| | 10/24/05 | <2 | <2 | <2 | <6 | 140 | 758 | 1,5 |
| | 03/07/06 | <2.00 | <2.00 | <2.00 | <6.00 | 136 | 781 | 1 |
| | 06/27/06 | <2.00 | <2.00 | <2.00 | <6.00 | 148 | 689 | 1 |
| | 09/07/06 | <0.5 | <0.5 | <0.5 | <1.0 | 120 | 780 | 2 |
| | 12/19/06 | <0.5 | <0.5 | <0.5 | <1.0 | 130 | 690 | 2 |
| | 03/13/07 | <0.5 | <0.5 | <0.5 | <1.0 | 110 | 730 | 2 |
| | 06/21/07 | <0.5 | <0.5 | <0.5 | <1.0 | 140 | 760 | 2 |
| | 09/21/07 | <0.5 | <0.5 | <0.5 | <1.0 | 130 | 840 | 2 |
| | 12/06/07 | <0.5 | <0.5 | <0.5 | <1.0 | 160 | 710 | 2 |
| | 03/04/08 | <0.5 | <0.5 | <0.5 | <1.0 | 170 | 750 | 2 |
| | 06/03/08 | <0.5 | <0.5 | <0.5 | <1.0 | 150 | 940 | 2 |
| | 09/23/08 | <0.5 | <0.5 | <0.5 | <1.0 | 180 | 900 | 2 |
| | 12/22/08 | <0.5 | <0.5 | <0.5 | <1.0 | 180 | 910 | 2 |
| | 03/12/09 | <0.5 | <0.5 | <0.5 | <1.0 | 180 | 990 | 2 |
| | 06/23/09 | <1.0 | <1.0 | <1.0 | <2.0 | 250 | 940 | 3 |
| | 09/08/09 | <1.0 | <1.0 | <1.0 | <2.0 | 240 | 937 | 3 |
| | 12/17/09 | <1.0 | <1.0 | <1.0 | <2.0 | 280 | 909 | 3 |
| | 03/09/10 | <1.0 | <1.0 | <1.0 | <1.5 | 320 | 931 | 3 |

Monitor Well Water Quality, North Monument Crude Release Investigation

| Monitoring Well | Sample Date | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | Xylenes (total, µg/L) | Chloride (mg/L) | Total Dissolved Solids (mg/L) | Notes |
|---|---|---|---|---|---|---|---|---|
| **MW-5** | 06/16/10 | <1.0 | <1.0 | <1.0 | <2.0 | 320 | 1,080 | 3 |
| | 08/30/10 | <1.0 | <1.0 | <1.0 | <2.0 | 360 | 1,130 | 3 |
| | 12/06/10 | <1.0 | <1.0 | <1.0 | <2.0 | 340 | 1,030 | 3 |
| | 03/18/11 | <1.0 | <1.0 | <1.0 | <2.0 | 340 | 1,050 | 3 |
| | 06/23/11 | <1.0 | <1.0 | <1.0 | <2.0 | 380 | 1,090 | 3 |
| | 10/07/11 | <1.0 | <1.0 | <1.0 | <2.0 | 360 | 1,110 | 3 |
| | 12/08/11 | <1.0 | <1.0 | <1.0 | <2.0 | 350 | 1,120 | 3 |
| | | | | | | | | |
| **MW-6** | 06/03/08 | 2.7 | 1.3 | 49 | 53 | 110 | 870 | 2 |
| | 09/23/08 | 2.0 | 0.9 | 47 | 9.6 | 120 | 680 | 2 |
| | 12/22/08 | 2.0 | 0.6 | 28 | 3.1 | 110 | 710 | 2 |
| | 03/12/09 | 1.4 | <0.5 | 18 | 2.2 | 90 | 740 | 2 |
| | 06/23/09 | 1.4 | <1.0 | 19 | <2.0 | 140 | 710 | 3 |
| | 09/08/09 | 2.2 | <1.0 | 18 | <2.0 | 140 | 726 | 3 |
| | 12/17/09 | 1.1 | <1.0 | 12 | <2.0 | 130 | 713 | 3 |
| | 03/09/10 | <1.0 | <1.0 | 17 | <1.5 | 140 | 723 | 3 |
| | 06/16/10 | 1.0 | <1.0 | 16 | <2.0 | 130 | 716 | 3 |
| | 08/30/10 | 20 | <1.0 | 31 | <2.0 | 140 | 703 | 3 |
| | 12/06/10 | 7.3 | <1.0 | 20 | <2.0 | 130 | 810 | 3 |
| | 03/18/11 | 3.2 | <1.0 | 16 | 2.5 | 130 | 728 | 3 |
| | 06/23/11 | 2.7 | <1.0 | 25 | <2.0 | 120 | 704 | 3 |
| | 10/07/11 | 1.7 | <1.0 | 20 | <2.0 | 120 | 705 | 3 |
| | 12/08/11 | 2.2 | <1.0 | 27 | <2.0 | 120 | 699 | 3 |
| | | | | | | | | |
| **MW-7** | 06/03/08 | 0.9 | 0.6 | 1.5 | 1.7 | 60 | 740 | 2 |
| | 09/23/08 | 0.5 | <0.5 | 0.8 | 1.9 | 79 | 610 | 2 |
| | 12/22/08 | <0.5 | <0.5 | 0.8 | 1.0 | 66 | 570 | 2 |
| | 03/12/09 | <0.5 | <0.5 | 0.9 | 1.6 | 77 | 630 | 2 |
| | 06/23/09 | <1.0 | <1.0 | <1.0 | <2.0 | 81 | 610 | 3 |
| | 09/08/09 | <1.0 | <1.0 | 1.4 | <2.0 | 81 | 630 | 3 |
| | 12/17/09 | <1.0 | <1.0 | 1.0 | <2.0 | 86 | 625 | 3 |
| | 03/09/10 | <1.0 | <1.0 | <1.0 | <1.5 | 88 | 632 | 3 |

Monitor Well Water Quality, North Monument Crude Release Investigation

| Monitoring Well | Sample Date | Benzene (µg/L) | Toluene (µg/L) | Ethylbenzene (µg/L) | Xylenes (total, µg/L) | Chloride (mg/L) | Total Dissolved Solids (mg/L) | Notes |
|---|---|---|---|---|---|---|---|---|
| **MW-7** | 06/16/10 | <1.0 | <1.0 | <1.0 | <2.0 | 88 | 628 | 3 |
| | 08/30/10 | 1.7 | <1.0 | 1.8 | <2.0 | 90 | 623 | 3 |
| | 12/06/10 | <1.0 | <1.0 | <1.0 | <2.0 | 81 | 649 | 3 |
| | 03/18/11 | <1.0 | <1.0 | <1.0 | <2.0 | 84 | 643 | 3 |
| | 06/23/11 | <1.0 | <1.0 | <1.0 | <2.0 | 71 | 629 | 3 |
| | 10/07/11 | <1.0 | <1.0 | <1.0 | <2.0 | 81 | 631 | 3 |
| | 12/08/11 | <1.0 | <1.0 | 1.7 | <2.0 | 92 | 639 | 3 |
| | | | | | | | | |
| **Sec 30** | 10/08/02 | <2 | <2 | <2 | <6 | -- | -- | 1,5 |
| **Windmill** | 10/10/02 | -- | -- | -- | -- | 100 | 528 | 1,5 |
| | | | | | | | | |
| | | | | | | | | |
| **NM Groundwater Standard[4]:** | | **10** | **750** | **750** | **620** | **250** | **1,000** | |
| | | | | | | | | |
| **Notes:** | | | | | | | | |
| 1. | Analyses performed by Cardinal Laboratories, Hobbs, NM, using EPA SW-846 methods 8260B (volatile organics) | | | | | | | |
| | and 160.1 (TDS), and Standard Method 4500-Cl B (Cl). | | | | | | | |
| 2. | Analyses performed by Argon Laboratories, Hobbs, NM, and Ceres, CA using EPA SW-846 methods | | | | | | | |
| | 8021B (volatile organics), 160.1 (TDS), and 300.0 (Cl). | | | | | | | |
| 3. | Analyses performed by Hall Environmental Analysis Laboratory, Albuquerque, NM using EPA SW-846 | | | | | | | |
| | methods 8021B or 8260B (volatile organics), 2540C (TDS) and 300.0 (Cl). | | | | | | | |
| 4. | Water Quality Control Commission Standards adopted by the NM Oil Conservation Division | | | | | | | |
| 5. | Complete cation/anion analysis on file. | | | | | | | |

**APPENDIX B-5**

**Historical Soil Data**

Table 1. Results of Investigation Soils Testing, Navajo Monument 6" Gathering Line Leak

| Sample Location and Depth | Sample Date | TPH (mg/Kg) | Benzene (mg/Kg) | Toluene (mg/Kg) | Ethyl-benzene (mg/Kg) | Total Xylenes (mg/Kg) | Total BTEX (mg/Kg) |
|---|---|---|---|---|---|---|---|
| **Excavation Samples:** | | | | | | | |
| Trench A, 12 ft. | 10/07/02 | 40,700 | 15.1 | 57.2 | 61.4 | 267 | 401 |
| E. Trench, N. Wall | 10/10/02 | 873 | <0.005 | <0.005 | 0.017 | 0.121 | 0.138 |
| | | | | | | | |
| **Borehole Samples:** | | | | | | | |
| BH-1, 20 ft. | 10/10/02 | 9,500 | 2.90 | 12.8 | 15.6 | 72.5 | 104 |
| BH-1A, 20 ft. | 10/10/02 | <10 | 0.053 | 0.04 | 0.014 | 0.110 | 0.217 |
| BH-2, 15 ft. | 10/10/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-2, 20 ft. | 10/10/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.006 |
| BH-2, 25 ft. | 10/10/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.007 |
| BH-9, 13 ft. | 10/12/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.008 |
| BH-9 20 ft. | 10/12/02 | 3,730 | 0.567 | 2.45 | 4.12 | 19.2 | 26.3 |
| | | | | | | | |
| BH-10, 20 ft. | 10/15/02 | 118 | 0.021 | 0.116 | 0.184 | 0.863 | 1.18 |
| BH-12, 20 ft. | 10/15/02 | 4,940 | 1.89 | 3.82 | 4.87 | 22.5 | 33.1 |
| BH-15, 23 ft. | 10/16/02 | 9,880 | 1.15 | 2.54 | 5.37 | 25.9 | 35.0 |
| BH-18, 21 ft. | 10/19/02 | 35.6 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-18, 24 ft. | 10/19/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| | | | | | | | |
| BH-20, 22 ft. | 10/19/02 | 532 | <0.005 | 0.065 | 0.325 | 1.73 | 2.12 |
| BH-21, 10 ft. | 10/29/02 | 99.3 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-21, 15 ft. | 10/29/02 | 2,910 | 0.524 | 3.55 | 7.76 | 39.0 | 50.8 |
| BH-21, 22 ft. | 10/29/02 | 1,500 | 0.379 | 1.75 | 2.73 | 12.5 | 17.4 |
| BH-22, 10 ft. | 10/29/02 | 20.2 | 0.016 | 0.062 | 0.043 | 0.181 | 0.302 |
| BH-22,13 ft. | 10/29/02 | 857 | 0.808 | 3.02 | 3.73 | 18.1 | 25.7 |
| BH-22, 17 ft. | 10/29/02 | 3,210 | 0.295 | 1.02 | 1.20 | 6.98 | 9.50 |
| BH-23, 13 ft. | 10/29/02 | 922 | 0.446 | 1.62 | 1.74 | 7.71 | 11.5 |
| BH-23, 18 ft. | 10/29/02 | 5,200 | 2.67 | 9.18 | 11.3 | 50.1 | 73.3 |
| BH-24, 13 ft. | 10/29/02 | 2,050 | 0.173 | 0.524 | 3.29 | 17.8 | 21.8 |
| BH-24, 18 ft. | 10/29/02 | 5,070 | 3.99 | 13.8 | 17.0 | 79.4 | 114 |
| BH-25, 15 ft. | 10/30/02 | 3,070 | 0.326 | 0.930 | 3.14 | 16.3 | 20.7 |
| BH-25, 17-18 ft. | 10/30/02 | 9,520 | 1.68 | 13.100 | 19.6 | 88.2 | 123 |
| BH-26, 10 ft. | 10/30/02 | 296 | 0.006 | 0.026 | 0.032 | 0.104 | 0.168 |
| BH-26, 15 ft. | 10/30/02 | 19.4 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-26, 20 ft. | 10/30/02 | 132 | 0.154 | 1.31 | 1.98 | 8.66 | 12.1 |
| BH-26, 23 ft. | 10/30/02 | <10 | 0.007 | 0.038 | 0.066 | 0.343 | 0.454 |
| BH-27, 15-16 ft. | 10/30/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-27, 20 ft. | 10/30/02 | <10 | 0.040 | 0.024 | 0.015 | 0.074 | 0.153 |
| BH-27, 23 ft. | 10/30/02 | <10 | <0.005 | <0.005 | <0.005 | 0.026 | 0.026 |
| BH-28, 15 ft. | 10/30/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-28, 18 ft. | 10/30/02 | 659 | 0.323 | 0.549 | 1.05 | 4.85 | 6.77 |
| BH-28, 23 ft. | 10/30/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-29, 15 ft. | 10/30/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-29, 20 ft. | 10/30/02 | 3,940 | 1.99 | 7.24 | 10.1 | 45.6 | 64.9 |
| BH-29, 24 ft. | 10/30/02 | 108 | 0.088 | 0.477 | 0.516 | 2.28 | 3.36 |
| | | | | | | | |
| BH-30, 20 ft. | 10/31/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-30, 25 ft. | 10/31/02 | 2,750 | 1.75 | 10.5 | 13.8 | 58.5 | 84.6 |
| BH-30, 27 ft. | 10/31/02 | 1,240 | <0.005 | 0.135 | 0.817 | 4.03 | 4.98 |
| BH-31, 21-22 ft. | 10/31/02 | 4,140 | 0.416 | 4.5 | 7.23 | 32.8 | 44.9 |
| BH-31, 26-27 ft. | 10/31/02 | 272 | 0.119 | 0.325 | 0.464 | 2.34 | 3.25 |

Table 1. Results of Investigation Soils Testing, Navajo Monument 6" Gathering Line Leak

| Sample Location and Depth | Sample Date | TPH (mg/Kg) | Benzene (mg/Kg) | Toluene (mg/Kg) | Ethyl-benzene (mg/Kg) | Total Xylenes (mg/Kg) | Total BTEX (mg/Kg) |
|---|---|---|---|---|---|---|---|
| BH-31, 30 ft. | 10/31/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-32, 23-24 ft. | 10/31/02 | 5.84 | <0.005 | <0.005 | <0.005 | 0.093 | 0.093 |
| BH-32, 25 ft. | 10/31/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-33, 21 ft. | 10/31/02 | 1,620 | 2.10 | 7.45 | 8.00 | 34.3 | 51.9 |
| BH-33, 25 ft. | 10/31/02 | 13.7 | <0.005 | <0.005 | 0.005 | 0.055 | 0.060 |
| BH-34, 24 ft. | 11/01/02 | 516 | 0.02 | 0.605 | 1.28 | 5.77 | 7.68 |
| BH-34, 26 ft. | 11/01/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-35, 22-23 ft. | 11/01/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-36, 27.5 ft. | 11/01/02 | 528 | 0.093 | 0.355 | 0.577 | 2.45 | 3.48 |
| BH-36, 29 ft. | 11/01/02 | <10 | <0.005 | <0.005 | 0.005 | 0.034 | 0.039 |
| BH-37, 25-26 ft. | 11/05/02 | 2,000 | 0.301 | 3.11 | 5.15 | 23.4 | 32.0 |
| BH-37, 29 ft. | 11/05/02 | 144 | <0.005 | <0.005 | 0.005 | 0.021 | 0.026 |
| BH-38, 16-17 ft. | 11/05/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-38, 29 ft. | 11/05/02 | 927 | <0.005 | 1.05 | 2.69 | 13.4 | 17.1 |
| BH-39, 25 ft. | 11/05/02 | 1,430 | 0.442 | 3.72 | 5.61 | 25.3 | 35.1 |
| BH-39, 27 ft. | 11/05/02 | 5,080 | 0.467 | 6.40 | 11.7 | 55.6 | 74.2 |
| | | | | | | | |
| BH-41, 25 ft. | 11/06/02 | 1,930 | <0.005 | 0.179 | 0.997 | 5.37 | 6.55 |
| BH-43, 19-20 ft. | 11/06/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-44, 15 ft. | 11/06/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-44, 17-18 ft. | 11/06/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-45, 17-18 ft. | 11/07/02 | 2,060 | 0.464 | 3.34 | 5.87 | 26.3 | 36.0 |
| BH-45, 23 ft. | 11/07/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-46, 18-19 ft. | 11/07/02 | 169 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-46, 22-23 ft. | 11/07/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-47, 17-18 ft. | 11/07/02 | 1,460 | <0.005 | 0.011 | 0.113 | 1.06 | 1.18 |
| BH-47, 22-23 ft. | 11/07/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-49, 25 ft. | 11/08/02 | 1,150 | <0.005 | <0.005 | 0.018 | 0.164 | 0.182 |
| | | | | | | | |
| BH-50, 20 ft. | 11/08/02 | 1,420 | <0.005 | <0.005 | 0.044 | 0.331 | 0.375 |
| BH-50, 22-23 ft. | 11/08/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-51, 23-24 ft. | 11/08/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-51, 27-28 ft. | 11/08/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-52, 18-19 ft. | 11/08/02 | <10 | 0.021 | 0.038 | 0.020 | 0.102 | 0.18 |
| BH-53, 28 ft. | 11/09/02 | 180 | 0.036 | 0.388 | 0.892 | 3.96 | 5.28 |
| BH-56, 25 ft. | 11/12/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| | | | | | | | |
| BH-60, 1-2 ft. | 11/13/02 | 13,300 | <0.005 | 0.314 | 1.54 | 9.62 | 11.5 |
| BH-65, 2-3 ft. | 11/14/02 | 11,900 | <0.005 | 0.788 | 5.33 | 19.8 | 25.9 |
| BH-65, 7-8 ft. | 11/14/02 | 3,260 | 0.336 | 3.29 | 5.14 | 23.4 | 32.2 |
| BH-68, 17-18 ft. | 11/15/02 | 79.0 | 0.065 | 0.239 | 0.278 | 1.25 | 1.83 |
| BH-68, 23 ft. | 11/15/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-69, 17 ft. | 11/15/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-69, 25 ft. | 11/15/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| | | | | | | | |
| BH-70, 22 ft. | 11/15/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-71, 14 ft. | 11/16/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-71, 17-18 ft. | 11/16/02 | 601 | 0.200 | 0.719 | 0.929 | 4.26 | 6.11 |
| BH-71, 24 ft. | 11/16/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-72, 21 ft. | 11/21/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-73, 18 ft. | 11/21/02 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |

Table 1. Results of Investigation Soils Testing, Navajo Monument 6" Gathering Line Leak

| Sample Location and Depth | Sample Date | TPH (mg/Kg) | Benzene (mg/Kg) | Toluene (mg/Kg) | Ethyl-benzene (mg/Kg) | Total Xylenes (mg/Kg) | Total BTEX (mg/Kg) |
|---|---|---|---|---|---|---|---|
| BH-74, 16 ft. | 11/21/02 | <10 | 0.048 | 0.277 | 0.332 | 1.80 | 2.46 |
| BH-74, 18 ft. | 11/21/02 | 76.7 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-78, 21 ft. | 11/23/02 | 10,900 | 2.94 | 13.2 | 17.0 | 73.3 | 106 |
| BH-78, 24 ft. | 11/23/02 | 672 | <0.005 | <0.005 | 0.014 | 0.119 | 0.133 |
| | | | | | | | |
| BH-80, 7-8 ft. | 11/23/02 | 16.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-80, 14 ft. | 11/23/02 | 21,500 | 5.83 | 29.9 | 35.8 | 143 | 215 |
| BH-80, 20 ft. | 11/23/02 | 1,950 | <0.005 | 0.162 | 1.01 | 6.04 | 7.21 |
| BH-83, 20-22 ft. | 03/06/03 | 56.2 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-84, 18-19 ft. | 03/06/03 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-85, 21-23 ft. | 03/06/03 | 906 | 0.040 | 0.079 | 0.056 | 0.322 | 0.497 |
| BH-85, 27 ft. | 03/06/03 | 1,920 | 6.55 | 13.9 | 15.5 | 64.9 | 101 |
| BH-86, 28-29 ft. | 03/07/03 | 1,600 | 0.036 | 0.635 | 1.43 | 7.39 | 9.49 |
| BH-87, 29-30 ft. | 03/07/03 | 2.92 | 0.007 | 0.020 | 0.016 | 0.072 | 0.115 |
| BH-88, 22-23 ft. | 03/07/03 | 28,000 | 12.3 | 40.0 | 43.8 | 194 | 290 |
| BH-89, 27-28 ft. | 03/08/03 | 4,140 | 1.72 | 6.74 | 8.94 | 42.6 | 60.0 |
| | | | | | | | |
| BH-90, 25-28 ft. | 03/08/03 | 38.8 | 0.006 | 0.027 | 0.420 | 0.242 | 0.695 |
| BH-91, 26-27 ft. | 03/08/03 | 1,100 | <0.005 | 0.034 | 0.164 | 0.972 | 1.170 |
| BH-92, 24-29 ft. | 03/11/03 | 20,400 | 3.00 | 17.2 | 25.2 | 124 | 169 |
| BH-93, 27-28 ft. | 03/11/03 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| BH-94, 25-29 ft. | 03/11/03 | 36.4 | <0.005 | 0.008 | 0.026 | 0.159 | 0.193 |
| | | | | | | | |
| *West BH-1A, 26-27 ft.* | *10/13/02* | *<10.0* | *<0.005* | *<0.005* | *<0.005* | *<0.015* | *<0.005* |
| *West BH-1, 23-24 ft.* | *04/08/03* | *8,180* | *5.18* | *17.9* | *20.0* | *77.9* | *121* |
| *West BH-2, 20-24 ft.* | *10/13/02* | *<10.0* | *<0.005* | *<0.005* | *<0.005* | *<0.015* | *<0.005* |
| *West BH-3, 23-24 ft.* | *10/14/02* | *727* | *0.010* | *0.061* | *1.127* | *0.701* | *1.90* |
| *West BH-3A, 25-29 ft.* | *03/12/03* | *5,030* | *0.149* | *0.244* | *1.82* | *10.9* | *13.1* |
| *West BH-4, 28 ft.* | *10/14/02* | *3,790* | *0.135* | *2.82* | *6.41* | *30.2* | *39.6* |
| *West BH-6, 25 ft.* | *10/17/02* | *950* | *0.036* | *0.336* | *0.503* | *2.35* | *3.23* |
| *West BH-6, 30 ft.* | *10/17/02* | *1,670* | *1.44* | *2.79* | *45.0* | *21.1* | *70.3* |
| West BH-6A, 27-28 ft. | 04/11/03 | 341 | 0.005 | 0.011 | 0.022 | 0.123 | 0.161 |
| West BH-9, 24-29 ft. | 03/12/03 | 3,520 | 0.317 | 1.37 | 2.09 | 9.69 | 13.5 |
| West BH-9, 28-29 ft. | 03/12/03 | 487 | <0.005 | 0.104 | 0.944 | 3.29 | 4.34 |
| | | | | | | | |
| West BH-10, 25-26 ft. | 03/12/03 | 937 | <0.005 | 0.046 | 0.379 | 2.48 | 2.91 |
| West BH-12, 24-25 ft. | 04/01/03 | 862 | 0.047 | 0.451 | 0.981 | 4.78 | 6.26 |
| West BH-12, 27-29 ft. | 04/01/03 | 96.4 | 0.006 | 0.032 | 0.042 | 0.241 | 0.321 |
| West BH-13, 25-26 ft. | 04/01/03 | <10 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| West BH-13, 28-29 ft. | 04/01/03 | 17.7 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| West BH-15, 28 ft. | 04/02/03 | 1,150 | 0.044 | 0.94 | 2.00 | 9.11 | 12.1 |
| West BH-16, 26 ft. | 04/03/03 | 86.6 | <0.005 | <0.005 | 0.017 | 0.090 | 0.107 |
| West BH-19, 26-27 ft. | 04/04/03 | 2,120 | 1.18 | 4.59 | 5.13 | 21.6 | 32.5 |
| | | | | | | | |
| West BH-21, 27-28 ft. | 04/07/03 | 1,800 | 0.589 | 1.76 | 1.82 | 0.589 | 4.76 |
| West BH-22, 26-29 ft. | 04/07/03 | 4,440 | 2.39 | 7.91 | 8.35 | 33.9 | 52.6 |
| West BH-23, 25-29 ft. | 04/08/03 | 34.5 | <0.005 | <0.005 | 0.010 | 0.048 | 0.058 |
| West BH-24, 27-28 ft. | 04/08/03 | 237 | 0.439 | 0.116 | 0.801 | 3.914 | 5.27 |
| West BH-25, 27-28 ft. | 04/18/03 | 1,900 | 0.416 | 0.397 | 1.86 | 10.5 | 13.2 |
| West BH-26, 27-28 ft. | 04/18/03 | 1,320 | <0.005 | 0.084 | 0.535 | 3.10 | 3.72 |
| West BH-26, 29 ft. | 04/18/03 | 138 | 0.009 | 0.028 | 0.280 | 1.46 | 1.78 |

Table 1. Results of Investigation Soils Testing, Navajo Monument 6" Gathering Line Leak

| Sample Location and Depth | Sample Date | TPH (mg/Kg) | Benzene (mg/Kg) | Toluene (mg/Kg) | Ethyl-benzene (mg/Kg) | Total Xylenes (mg/Kg) | Total BTEX (mg/Kg) |
|---|---|---|---|---|---|---|---|
| West BH-27, 29 ft. | 04/18/03 | 2,190 | 0.010 | 0.220 | 1.26 | 6.89 | 8.38 |
| West BH-27, 30-32 ft. | 04/18/03 | 891 | 0.030 | 0.131 | 0.498 | 2.47 | 3.13 |
| West BH-28, 26-28 ft. | 04/21/03 | 1,800 | <0.005 | 0.488 | 1.74 | 9.40 | 11.6 |
| West BH-28, 31-32 ft. | 04/21/03 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| West BH-29, 25-26 ft. | 04/21/03 | 1,380 | <0.005 | 0.316 | 1.53 | 7.61 | 9.46 |
| | | | | | | | |
| West BH-30, 26 ft. | 04/22/03 | 1,910 | <0.005 | 0.029 | 0.355 | 2.33 | 2.71 |
| West BH-30, 29 ft. | 04/22/03 | 826 | <0.005 | 0.015 | 0.192 | 1.38 | 1.59 |
| West BH-31, 29 ft. | 04/23/03 | 1,550 | <0.005 | 0.020 | 0.116 | 2.03 | 2.17 |
| West BH-32, 27-28 ft. | 04/23/03 | 1,440 | 0.041 | 0.691 | 1.30 | 5.92 | 7.95 |
| West BH-33, 26 ft. | 04/24/03 | 398 | <0.005 | 0.113 | 0.727 | 8.55 | 9.39 |
| | | | | | | | |
| **Monitor Well Samples:** | | | | | | | |
| MW-3, 25 ft. | 10/12/02 | <10.0 | <0.005 | <0.005 | <0.005 | 0.009 | 0.009 |
| MW-4, 13 ft. | 11/16/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| MW-4, 16 ft. | 11/16/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| MW-4, 22 ft. | 11/16/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| MW-4, 30 ft. | 11/16/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| MW-5, 20 ft. | 11/22/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| MW-5, 35 ft. | 11/22/02 | <10.0 | <0.005 | <0.005 | <0.005 | <0.015 | <0.005 |
| | | | | | | | |
| Notes: | | | | | | | |
| Sample from Trench A was from a trench dug 20 ft. north of pipeline and approximately 300 ft. east of Maddox Road | | | | | | | |
| Sample from East Trench was from a trench dug 20 ft. north of pipeline and approximately 475 ft. east of Maddox Road | | | | | | | |
| Samples collected by Safety and Environmental Solutions, Inc., Hobbs. | | | | | | | |
| TPH analyses EPA 600/4-79-020 418.1; BTEX analyses EPA SW-846 method 8260; Cardinal Laboratories, Hobbs, NM | | | | | | | |

**APPENDIX B-6**

**Borehole Logs**
**(BH-4, 21,57,58,61 and 80)**

**Safety & Environmental Solutions, Inc.**

# LOG OF BORING BH-4

(Page 1 of 1)

Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line

Navajo Refining Company
Artesia, New Mexico

Date, Time Started: : 10/10/02, 1600
Date, Time Completed : 10/11/02, 1200
Hole Diameter: : 8-1/4 In.
Drilling Method: : Hollow-stem auger, CME-75
Sampling Method: : Cuttings, core barrel

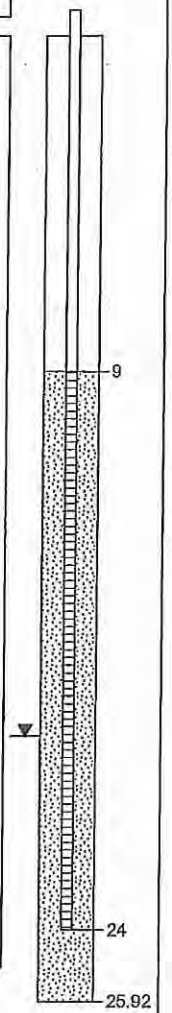
Drilled By: : Eco Drilling
Logged By: : D.G. Boyer

Sample Condition: Remoulded; Undisturbed; Lost; Rock Core

Sample Type: AR Air Rotary Cuttings; CB Core Barrel (2.5' or 5'); CT Auger Cuttings; NR No recovery

| Depth in Feet | Sample Type | Recovery (ft.) | USCS | DESCRIPTION | Lab No. |
|---|---|---|---|---|---|
| 0 | | | Soil | 0-0.5 ft. Surface soil | |
| | CB | 1 | | 0.5-5 ft. Caliche in core tip, no H/C odor | |
| 5 | | | CA/SM | | |
| | CB | 3 | | 5-10 ft. CALICHE with SILTY SAND, light brown, at 7.5 ft. becoming stained with strong H/C odor | |
| 10 | | | SM/CA | 10-11.4 ft. SILTY SAND with CALICHE, sand light brown, very fine grained, H/C odor | |
| | | | CA | 11.4-12.3 ft. CALICHE, stained gray and black, some crystalline calcite, H/C odor | |
| | CB | 3.5 | CL | 12.3-13.3 ft. SANDY CLAY, H/C saturated | |
| 15 | | | CA | 15-15.2 ft. Caliche | |
| | | | | 15.2-16.7 CALICHE and SANDY SILT mixture | |
| | CB | 1.7 | | | |
| 20 | | | CA/ML | | |
| | CB | 1.5 | | 20-25 ft. H/C saturated | |
| 25 | | | | | |
| 30 | | | | | |

BH-4




Notes:
In auger stem: DTP 23.03 ft, no water, oil rising in auger
10/11: DTP 19.50 ft. (18.80 ft. BGS), pumped 13 gallon free product in ~7 min.
Completed as 4-in. temporary recovery well with 15 ft. 20-slot screen, sand pack.

H/C - Petroleum hydrocarbon

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Safety & Environmental Solutions, Inc.

# LOG OF BORING BH-41

(Page 1 of 1)

Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line

Navajo Refining Company
Artesia, New Mexico

Date, Time Started: : 11/06/02, 1000
Date, Time Completed : 11/06/02, 1140
Hole Diameter: : 8-1/4 in.
Drilling Method: : Hollow-stem auger, CME-75
Sampling Method: : Cuttings, core barrel

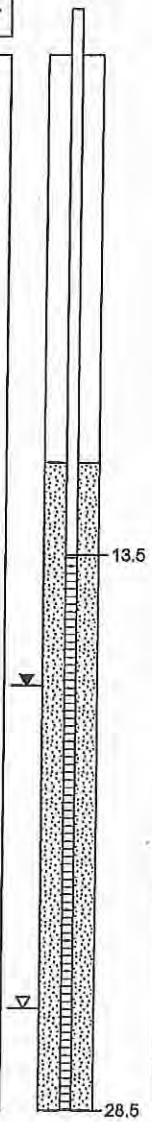
Drilled By: : Eco Drilling
Logged By: : D.G. Boyer

Sample Condition
- Remoulded
- Undisturbed
- Lost
- Rock Core

Sample Type:
- AR Air Rotary Cuttings
- CB Core Barrel (2.5' or 5')
- CT Auger Cuttings
- NR No recovery

| Depth in Feet | Samples | Sample Type | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION | Lab No. |
|---|---|---|---|---|---|---|---|
| 0 | | | | CA/SM | | 0-19 ft. Cuttings, CALICHE with SILTY SAND, hard drilling 9-10 ft. | |
| 10 | | CT | | | | | |
| 15 | | | | | | | |
| 20 | | CB | 3.8 | CL | | Clayey 19-20 ft.<br>20-20.7 ft. GRAVELLY CLAY, H/C saturated<br>20.7-23.8 ft. SILTY CLAY, with frequent caliche rock and sandstone. Occasional fine grained sand, tight, not much saturation | |
| 25 | | CB | 3.9 | | | 25-28.9 ft. SILTY CLAY, with caliche rock and fragments. H/C saturated at 25 ft.and from 28-28.9 ft. Saturated where have more gravel than clay (center of core also saturated, core comressed walls and squeezed H/C out). | H7194-7 |
| 30 | | | | | | | |

BH-41




Notes:
Completed as 2-in. temporary recovery well with 15 ft. 20-slot screen, sand pack to 11 ft. BGS
H/C - Petroleum hydrocarbon
Laboratory analyses by Cardinal Laboratories

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**Safety & Environmental Solutions, Inc.**

# LOG OF BORING BH-57

(Page 1 of 1)

Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line

Navajo Refining Company
Artesia, New Mexico

Date, Time Started: : 11/13/02, 0920
Date, Time Completed : 11/13/02, 1025
Hole Diameter: : 8-1/4 in.
Drilling Method: : Hollow-stem auger, CME-75
Sampling Method: : Cuttings, core barrel

Drilled By: : Eco Drilling
Logged By: : D.G. Boyer

Sample Condition
- Remoulded
- Undisturbed
- Lost
- Rock Core

Sample Type:
- AR Air Rotary Cuttings
- CB Core Barrel (2.5' or 5')
- CT Auger Cuttings
- NR No recovery

| Depth In Feet | Samples | Sample Type | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION | Lab No. |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | 0-15 ft. Borehole installed in excavation trench, approximately 15 ft. deep. Measurements approximate from original ground surface. | |
| 15 | | CB | 1.2 | GC | | 15-20 ft. CLAYEY GRAVEL, gravels caliche with sandy clay, unsaturated, H/C odor | |
| 20 | | | | | | 20-21.3 CLAYEY GRAVEL, caliche gravel and clay, some H/C saturation. | |
| | | CB | 3.6 | CL | | 21.3-23.6 ft. CLAY, with occasional caliche gravel, caliche, and sand, tight | |
| 25 | | | | | | 25-26 ft. SANDY CLAY, H/C saturated | |
| | | CB | 3.4 | | | 26-27.9 ft. CLAY, with occasional sand and caliche, H/C show at 2 ft. | |
| | | | | CA/CL | | 27.9-28.4 ft. CALICHE and CLAY, water saturated with H/C also, drilled to 28.5 ft. | |
| 30 | | | | | | | |

BH-57

16
18.5
28.5

Notes:
Completed as 2-in. temporary recovery well with 10 ft. 20-slot screen, sand pack to 1 ft. below excavation base, bentonite to excavation bottom
H/C - Petroleum hydrocarbon

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Safety & Environmental Solutions, Inc.

# LOG OF BORING BH-58

(Page 1 of 1)

Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line

Navajo Refining Company
Artesia, New Mexico

Date, Time Started: : 11/13/02, 0920
Date, Time Completed : 11/13/02, 1025
Hole Diameter: : 8-1/4 in.
Drilling Method: : Hollow-stem auger, CME-75
Sampling Method: : Cuttings, core barrel

Drilled By: : Eco Drilling
Logged By: : D.G. Boyer

Sample Condition
- Remoulded
- Undisturbed
- Lost
- Rock Core

Sample Type:
- AR Air Rotary Cuttings
- CB Core Barrel (2.5' or 5')
- CT Auger Cuttings
- NR No recovery

| Depth in Feet | Samples | Sample Type | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION | Lab No. |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | 0-15 ft. Borehole installed in excavation trench, approximately 15 ft. deep. Measurements approximate from original ground surface. | |
| 15 | | CB | 3 | CA | | 15-17.8 ft. CALICHE, hard, dry, H/C odor | |
| | | | | | | light brown, 17.8-18 ft. SANDY CLAY | |
| 20 | | CB | 4 | CL | | 20-23 ft. CLAY, brown, occasional thin sandy zones<br>23-23.7 ft. CLAY, brown, soft becoming sandy<br>23.7-24 ft. SANDY CLAY, brown, sandstone pieces, H/C odor throughout | |
| 25 | | CB | 3.7 | | | 25-25.6 ft. SANDY CLAY, brown, strong H/C odor<br>25.6-28.1 ft. CLAY, mottled brown and chalk color<br>28.1-28.7 ft. GRAVELLY CLAY, H/C and water saturated | |
| 30 | | | | | | | |

BH-58

16
18.5
28.5
29.5

Notes:
Completed as 2-in. temporary recovery well with 10 ft. 20-slot screen, sand pack to 1 ft. below excavation base, bentonite to excavation bottom
Product level shown is in auger before screen placement
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc.**

# LOG OF BORING BH-61

(Page 1 of 1)

Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line

Navajo Refining Company
Artesia, New Mexico

Date, Time Started: : 11/13/02, 1250
Date, Time Completed : 11/13/02, 1400
Hole Diameter: : 8-1/4 In.
Drilling Method: : Hollow-stem auger, CME-75
Sampling Method: : Cuttings, core barrel

Drilled By: : Eco Drilling
Logged By: : D.G. Boyer

Sample Condition
- Remoulded
- Undisturbed
- Lost
- Rock Core

Sample Type:
- AR Air Rotary Cuttings
- CB Core Barrel (2.5' or 5')
- CT Auger Cuttings
- NR No recovery

| Depth in Feet | Samples | Sample Type | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION | Lab No. |
|---|---|---|---|---|---|---|---|
| 0 | | | | | | 0-15 ft. Borehole installed in excavation trench, approximately 15 ft. deep. Measurements approximate from original ground surface. | |
| 15 | | | | MH/CA | | 15-15.6 ft CLAYEY, SANDY SILT, with CALICHE, light brown, H/C odor | |
| | | | | CA/CL | | 15.6-17 ft. CALICHE with CLAY, caliche rocks to 3 in., clay interstitial, zones of black-grey weathering at 17 ft. | |
| | | CB | 3.6 | | | 17-18.6 ft. CLAY with frequent caliche, soft at 18 ft. Gray-black mottling 18-18.5 ft. H/C odor through out. | |
| 20 | | | | CL | | 20-20.8 ft. CLAY, silty, frequent caliche rock, H/C saturated | |
| | | CB | 3.9 | | | 20.8-23.6 ft. CLAY, with caliche and occasional sand, becoming sandy at 23.6 ft. | |
| | | | | SC | | 23.6-23.9 ft. CLAYEY SAND, fine grained | |
| 25 | | | | | | 25-26 ft. SANDY CLAY, H/C saturated | |
| | | CB | 3.9 | CL | | 26-28.9 ft. CLAY, with caliche gravel, mottled, H/C saturated in places | |
| 30 | | | | | | | |

BH-61

16
20
30

Notes:
Completed as 2-in. temporary recovery well with 10 ft. 20-slot screen, sand pack to 1 ft. below excavation base, bentonite to excavation bottom
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc.**

# LOG OF BORING BH-80

(Page 1 of 1)

Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line

Navajo Refining Company
Artesia, New Mexico

Date, Time Started: : 11/23/02, 1345
Date, Time Completed : 11/23/02, 1700
Hole Diameter: : 8-1/4 In.
Drilling Method: : Hollow-stem auger, CME-75
Sampling Method: : Cuttings, core barrel

Drilled By: : Eco Drilling
Logged By: : D.G. Boyer

Sample Condition: Remoulded; Undisturbed; Lost; Rock Core

Sample Type: AR Air Rotary Cuttings; CB Core Barrel (2.5' or 5'); CT Auger Cuttings; NR No recovery

| Depth In Feet | Sample Type | Recovery (ft.) | USCS | DESCRIPTION | Lab No. |
|---|---|---|---|---|---|
| 0 | | | | Surface soil | |
| | CB | 2.0 | | coarse grained-2 CALICHE with SILTY SAND, light brown, sand very fine to fine grained, no H/C odor | |
| 5 | | | CA/SM | | |
| | CB | 4.4 | | CALICHE with SILTY SAND, sand very fine to fine grained, chalk color, possible slight H/C odor | H7250-7 |
| 10 | | | | 10-12.4 ft. CALICHE with SILTY SAND, sand very fine to fine grained, light brown, clayey at 12 ft. | |
| | CB | 2.4 | | 12-12.4 ft. CALICHE, light brown, caliche soft to hard, fragments and gravels, very strong H/C odor | |
| | | | CA | 15-15.6 ft. CALICHE, rock, thick, massive, hard, laminations | H7250-8 |
| 15 | | | CA/ML | CALICHE, with SANDY SILT, light brown, fragments and chips, dry H/C odor, increasing clay, 17-17.7 ft. | |
| | CB | 4.0 | | 17.7-19 ft. SILTY CLAY, stiff, dry, with caliche fragments and chips, very strong H/C odor | |
| 20 | | | CL | 19-21.7 ft. SILTY CLAY, with occasional caliche gravels, mottled chalk and brown color, damp, soft, plastic, H/C odor throughout | H7250-9 |
| | CB | 4.0 | | 21.7-22.3 ft. GRAVELLY CLAY, H/C saturated<br>22.3-22.8 ft. SILTY CLAY, H/C saturated | |
| | | | | 22.8-23.6 ft. SANDY CLAY, H/C saturated | |
| | | | SC | 23.6-25 ft. CLAYEY SAND, brown, fine grained, H/C saturated | |
| 25 | | | | Slough only, core ran out of tube due to oil. | |
| | CB | 1.0 | Slough | | |
| 30 | | | | | |

BH-80

11

26

27.5

Notes:
Completed as temporary recovery well with 15 ft. screen, 11 bags sand.
Oil came to the surface as driller was cleaning out hole with auger.
H/C - Petroleum hydrocarbon
Laboratory analyses by Cardinal Laboratories

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## APPENDIX B-7

**Monitoring Well Logs**
**(MWs 1, 2, 3,4,5,6 and 7)**

**Safety & Environmental Solutions, Inc.**

# LOG OF MONITOR WELL MW-1

(Page 1 of 1)

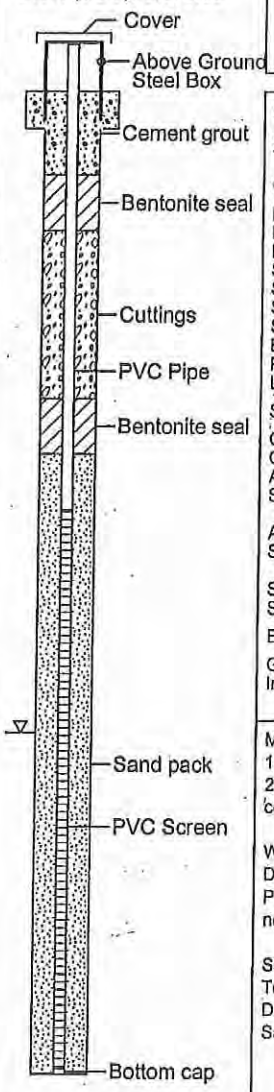
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.631441°, W103.299043°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 10/11/02, 1445 | Drilled By: | : Eco Drilling |
| Date, Time Completed | : 10/11/02, 1700 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 in. | Northing Coordinate | : 595024.03 |
| Drilling Method: | : Hollow-stem auger, CME-75 | Easting Coordinate | : 859738.59 |
| Sampling Method: | : Cuttings, core barrel | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth in Feet | Sample Type | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|---|
| 0 | | | | | Cuttings |
| 10 | CT | | CA/SM | | CALICHE, with SILTY SAND, light brown, no H/C odor |
| 20 | CT | | CL | | SANDY CLAY, light brown, no H/C odor,moist, very plastic |
| 25 | CB | 4.2 | CL/CA | | SANDY CLAY/CLAYEY SAND, light brown, CALICHE 0.2-0.3 ft. thick every foot, no H/C odor |
| 30 | | | SC | | CLAYEY SAND |
| | CB | 4.8 | CL | | CLAY, light brown, hard, some sand |
| | | | SC/CA | | |
| 35 | | | CA | | CLAYEY SAND with CALICHE |
| | | | SC/CA | | CALICHE rock |
| | | | | | CLAYEY SAND with CALICHE |
| 40 | | | | | |




## Well Construction Information

COMPLETION DATA

| | |
|---|---|
| Hole Depth | : 35 ft. Below LS |
| TD Inside casing | : 38.01 ft. Below TOC |

CASING, SCREEN & CAP

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 In. ID |
| Manufacturer | : National Well Supplies |
| Screen type | : Slotted |
| Screen length | : 20 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 15-35 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

SEALS & SAND PACK

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0 - 3 ft. BLS |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 3-5 ft. BLS, : hydrated |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 11-13 ft. BLS, : hydrated |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 13-35 ft. BLS |

ELEVATIONS

| | |
|---|---|
| Ground elevation | : 3667.48 ft. above MSL |
| Inner casing, top | : 3670.05 ft. above MSL |

MATERIAL USED:
12 bags sand
2 bags bentonite chips
cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with air bailer on 10/20/02.
Purged 100 gallons of water, 1 gallon of sand, no hydrocarbon product

Sampled on 10/21/02 at 1345
Total depth 38.01 ft.
Depth to water 25.44 ft.
Sampled 24 hours following development.

Notes:
Well drilled using CME 75 by Eco Drilling Co.
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc.**

# LOG OF MONITOR WELL MW-2

(Page 1 of 1)

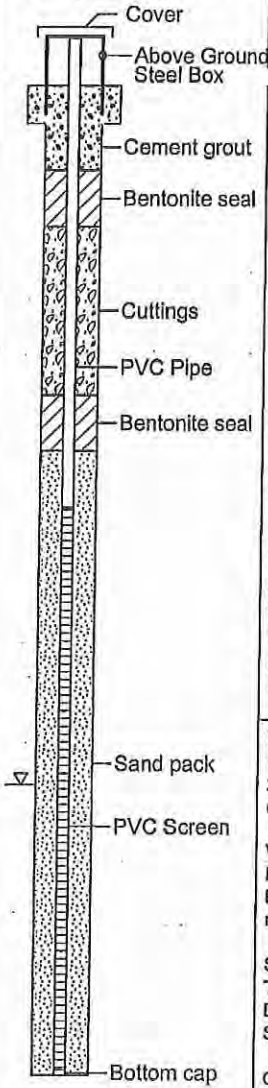
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.630182°, W103.299019°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 10/12/02, 0820 | Drilled By: | : Eco Drilling |
| Date, Time Completed | : 10/12/02, 1120 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 in. | Northing Coordinate | : 594569.02 |
| Drilling Method: | : Hollow-stem auger, CME-75 | Easting Coordinate | : 859750.07 |
| Sampling Method: | : Cuttings, core barrel | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth in Feet | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0 | | | | Auger cuttings to 20 feet, then 5 ft. core barrel. |
| 10 | | CA/SM | | CALICHE, with SILTY SAND, light brown, no petroleum H/C |
| 15 | | | | 15-20 ft. Increasing clay |
| 20 | | CA | | 20-20.9 ft. CALICHE rock and fragments |
| | | CA/SM | | 20.9-21.3 ft. CALICHE & SILTY SAND, light brown, very fine grained |
| | 2.0 | SM/CL | | 21.3-22 ft. SILTY SAND with increasing CLAY, occasional caliche rock in core, light brown, becoming moist at base, no H/C staining or odor |
| 25 | | SP/CA | | |
| | | SP/GP | | 25.3-26.4 ft. SAND & CALICHE rock, sand well sorted, fine to coarse grained w/small pebbles, saturated, no H/C odor |
| | 3.7 | CL | | 26.4-27.6 ft. GRAVELLY SAND, sand fine to medium grained, gravels caliche fragments, very coarse gr. to pea sized. |
| 30 | | GP | | |
| | | SP/GP | | |
| | | SC | | 27.6-28.7 ft. SANDY CLAY, light brown, plastic, slightly damp |
| | 2.9 | CL | | 30.3-30.7 ft. Caliche frags and gravels, well sorted, saturated, gravels to 1 in. |
| 35 | | | | 30.7-31.4 ft. GRAVELLY SAND, light brn, med-coarse gr. sand, caliche gravels. |
| | | | | 31.4-32.3 ft. CLAYEY SAND, light brown, 3" caliche rock at 32 ft. |
| 40 | | | | 32.3-32.9 ft. SANDY CLAY, light brown, plastic, no H/C staining or odor |




## Well Construction Information

COMPLETION DATA

| | |
|---|---|
| Hole Depth | : 35 ft. Below LS |
| TD Inside casing | : 37.65 ft. Below TOC |

CASING, SCREEN & CAP

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 in. ID |
| Manufacturer | : National Well Supplies |
| Screen type | : Slotted |
| Screen length | : 20 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 15-35 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

SEALS & SAND PACK

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0.- 3 ft. BLS |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 3-5 ft. BLS, hydrated |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 11-13 ft. BLS, hydrated |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 13-35 ft. BLS |

ELEVATIONS

| | |
|---|---|
| Ground elevation | : 3668.82 ft. above MSL |
| Inner casing, top | : 3671.40 ft. above MSL |

MATERIAL USED:
12 bags sand
2 bags bentonite chips
cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with air bailer on 10/20/02.
Purged 60 gallons of water, 1 gallon of sand, no hydrocarbon product

Sampled on 10/21/02 at 1420
Total depth 37.37 ft.
Depth to water 27.35 ft.
Sampled 24 hours following development.

Oil detected 11/18/02. Plugged 1/23/03 with 4 bags Portland cement to 1 ft. BLS and 1 bag Quikrete to surface.

Notes:
Well drilled using CME 75 by Eco Drilling Co.
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc.**

# LOG OF MONITOR WELL MW-3

(Page 1 of 1)

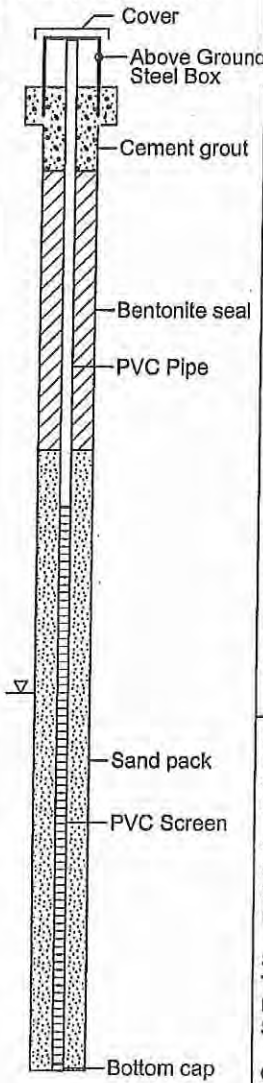
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.631481°, W103.297474°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 10/12/02, 1130 | Drilled By: | : Eco Drilling |
| Date, Time Completed | : 10/12/02, 1445 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 In. | Northing Coordinate | : 594677.68 |
| Drilling Method: | : Hollow-stem auger, CME-75 | Easting Coordinate | : 860219.27 |
| Sampling Method: | : Cuttings, core barrel | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth In Feet | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0 | | | | Auger cuttings to 20 feet, then 5 ft. core barrel. |
| 10 | | CA/SM | | CALICHE and SILTY SAND, light brown, becoming more silty with depth. |
| 20 | | | | Clayey at 20 ft., brown, plastic. |
| | 2.5 | CL | | 20-25 ft. SANDY CLAY, reddish-brown, sand very fine grained, plastic, slightly moist, no H/C odor |
| 25 | | CA | | 25-25.5 ft. CALICHE rock |
| | 3.4 | CL | | 25.5-28.4 ft. SANDY GRAVELLY CLAY, sand brown, fine grained, H2O saturated where gravels predominate, no H/C staining or odor |
| 30 | | CL | | 30-31.7 ft. SANDY CLAY, light brown, soft, dry |
| | 2.8 | CA/CL | | 31.7-32.8 ft. CALICHE rock with SANDY CLAY, brown, rock hard, well cemented. |
| 35 | | | | |
| 40 | | | | |




## Well Construction Information

COMPLETION DATA

| | |
|---|---|
| Hole Depth | : 35 ft. Below LS |
| TD Inside casing | : 37.80 ft. Below TOC |

CASING, SCREEN & CAP

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 in. ID |
| Manufacturer | : National Well Supplies |
| Screen type | : Slotted |
| Screen length | : 20 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 15-35 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

SEALS & SAND PACK

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0 - 3 ft. BLS |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 3-5 ft. BLS, hydrated |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 11-13 ft. BLS, hydrated |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 13-35 ft. BLS |

ELEVATIONS

| | |
|---|---|
| Ground elevation | : 3663.64 ft. above MSL |
| Inner casing, top | : 3666.41 ft. above MSL |

MATERIAL USED:
12 bags sand
2 bags bentonite chips
cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with air bailer on 10/20/02.
Purged 60 gallons of water, 1 gallon of sand, no hydrocarbon product

Sampled on 10/21/02 at 1420
Total depth 37.37 ft.
Depth to water 27.35 ft.
Sampled 24 hours following development.

Oil detected 11/18/02. Plugged 1/23/03 with 4 bags Portland cement to 1 ft. BLS and 1 bag Quikrete to surface.

Notes:
Well drilled using CME 75 by Eco Drilling Co.
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc.**

# LOG OF MONITOR WELL MW-4

(Page 1 of 1)

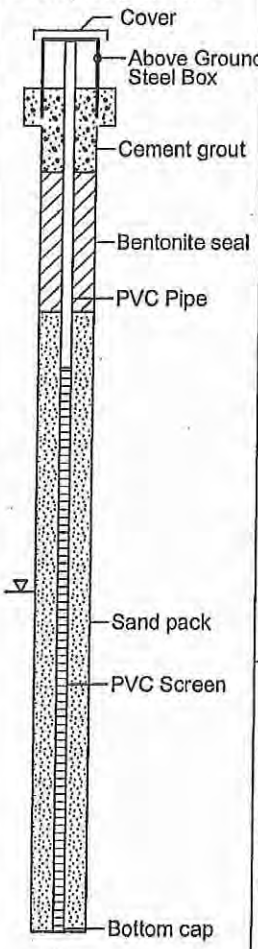
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.630833°, W103.296889°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 11/16/02, 0905 | Drilled By: | : Eco Drilling |
| Date, Time Completed | : 11/16/02, 1300 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 In. | Northing Coordinate | : 594809.38 |
| Drilling Method: | : Hollow-stem auger, CME-75 | Easting Coordinate | : 860401.08 |
| Sampling Method: | : Cuttings, core barrel | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth In Feet | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0 | | | | Auger cuttings to 5 feet, then 5 ft. core barrel. |
| | | SM | | 0-1 ft. Topsoil |
| | | | | 1-4 ft. SILTY SAND with caliche fragments and small (pea-sized) gravels, chalk color |
| 5 | | SM | | 5-6.8 ft. SILTY SAND with caliche fragments and increasing clay, light brown, |
| | 2.6 | CL/CA | | 6.8-7.6 ft. SILTY CLAY with CALICHE. Clay silty, light brown, dry, caliche rocks and fragments, no H/C odor |
| 10 | | | | 10-11.5 ft. SILTY CLAY with CALICHE. Clay silty, light brown, dry, caliche rocks and fragments, no H/C odor |
| | 3.3 | CA/CL | | 11.5-13.1 ft. CALICHE with CLAY, soft caliche rock and fragments, clay light brown, no H/C odor |
| | | SS | | |
| 15 | | CA | | 13.1-13.3 ft. SANDSTONE, rock in tip |
| | 1.2 | CL/CA | | ~13.5-14 ft, barrel is wet from 14-15 ft. |
| | | | | 15.5-15.7 ft. Large CALICHE fragment |
| | | | | 15.7-16.2 ft. SILTY CLAY with CALICHE rock fragments. Rock in barrel, no further sample, returns are soft, brown, sticky clay, no H/C odor. Caliche zones at 16 and 18.5 ft. |
| 20 | | | | |
| | 4.1 | CL/CA | | 20-25 ft. CLAY with occasional caliche gravel and/or fragments. Zones of caliche rock and fragments 21 and 23.5 ft. No H/C odor |
| 25 | | CL | | 25-26.2 ft. Slough, saturated |
| | | CA | | 26.2-27 ft. CLAY, mottled, brown and chalky, very stiff |
| | 4.2 | CL | | 27-27.3 ft. CALICHE rock, chalk color, clay surrounding |
| 30 | | | | 27.3-29.2 ft. CLAY, pale-yellow (chalk color), very stiff, very cohesive and tight, no H/C staining or odor |
| 35 | | | | |
| 40 | | | | |




## Well Construction Information

COMPLETION DATA

| | |
|---|---|
| Hole Depth | : 35 ft. Below LS |
| TD Inside casing | : 37.80 ft. Below TOC |

CASING, SCREEN & CAP

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 in. ID |
| Manufacturer | : National Well Supplies |
| Screen type | : Slotted |
| Screen length | : 20 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 15-35 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

SEALS & SAND PACK.

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0 - 3 ft. BLS |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 3-13 ft. BLS, : hydrated |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 13-35 ft. BLS |

ELEVATIONS

| | |
|---|---|
| Ground elevation | : 3663.64 ft. above MSL |
| Inner casing, top | : 3666.41 ft. above MSL |

MATERIAL USED:
7 bags sand
2 bags bentonite chips
cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with pump on 12/27/02.
DTW 20.52 ft. Purged 25 gallons of water, some sand and turbidity, no hydrocarbon product

Notes:
Well drilled using CME 75 by Eco Drilling Co.
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc.**

# LOG OF MONITOR WELL MW-5

(Page 1 of 1)

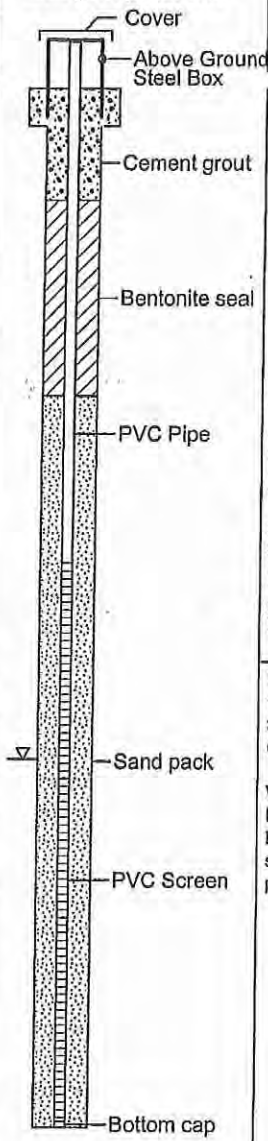
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.630481°, W103.297474°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 11/22/02, 0845 | Drilled By: | : Eco Drilling |
| Date, Time Completed | : 11/22/02, 1230 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 In. | Northing Coordinate | : 594559.61 |
| Drilling Method: | : Hollow-stem auger, CME-75 | Easting Coordinate | : 859895.14 |
| Sampling Method: | : Cuttings, core barrel | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth in Feet | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0 | | | | Auger cuttings to 15 feet, then 5 ft. core barrel. |
| | | | | 0-5 ft. SILTY SAND and CALICHE, hard drilling |
| 5 | | SM/CA | | 5-10 ft. SILTY SAND, light brown, with caliche chips/rock fragments |
| 10 | | | | 10-15 ft. SILTY SAND as above with increasing clay, dry, no H/C staining or odor |
| 15 | 1.9 | CA/SC | | 15-20 ft. CALICHE and CLAYEY SILTY SAND, sand very fine to fine grained, caliche planar and fragmented, some sandstone, no H/C odor |
| | | | | 20-20.9 ft. GRAVELLY SAND, sand light brown, very fine to fine grained |
| 20 | | SW | | 20.9-21.8 ft. CALICHE and CLAY, clay sandy/silty, some sandstone pieces |
| | | CA/CL | | |
| | 3.4 | CA/CL | | 21.8-22.5 ft. CALICHE with some CLAY |
| | | CA/CL | | 22.5-23.4 ft. CALICHE and SILTY CLAY, very tight, slightly damp at base. |
| 25 | | CA | | 25-25.4 ft. CALICHE, rocks and fragments, saturated, very hard drilling |
| | | CA/CL | | 25.4-28.4 ft. CALICHE with some CLAY, very tight, slightly damp |
| | 3.8 | SS/SC | | |
| | | CA | | 28.4-28.6 ft. SANDSTONE with CLAYEY SAND, saturated, no H/C odor |
| 30 | | CA | | 28.6-28.8 ft. CALICHE |
| | | CA/CL | | 30-31.5 ft. CALICHE, white, planar |
| | 3.0 | SP | | 31.5-32.5 ft. CALICHE & CLAY, clay mottled becoming sandy and saturated at 32.5 ft. |
| 35 | | | | 32.5-33 ft. SAND, dark brown, fine grained, some clay |
| | 4.3 | CL | | 35-35.5 ft. Slough, sand |
| | | | | 35.5-39.3 ft. Redbed CLAY, reddish-purple, dry, hard. |
| 40 | | | | |




## Well Construction Information

COMPLETION DATA

| | |
|---|---|
| Hole Depth | : 39 ft. Below LS |
| TD Inside casing | : 39.32 ft. Below TOC |

CASING, SCREEN & CAP

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 in. ID |
| Manufacturer | : National Well Supplies |
| Screen type | : Slotted |
| Screen length | : 20 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 17-37 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

SEALS & SAND PACK

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0 - 4 ft. BLS |
| Annular seal type | : Texas Sodium Bentonite |
| Seal placement | : 1/4" chips, 4-11 ft. BLS, hydrated |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 11-37 ft. BLS |

ELEVATIONS

| | |
|---|---|
| Ground elevation | : 3668.35 ft. above MSL |
| Inner casing, top | : 3670.43 ft. above MSL |

MATERIAL USED:
12 bags sand
3 bags bentonite chips
Cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with pump on 12/27/02.
DTW 26.53 ft. Purged 90 gallons of water, some sand and turbidity, no hydrocarbon product

Notes:
Well drilled using CME 75 by Eco Drilling Co.
H/C - Petroleum hydrocarbon

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**Safety & Environmental Solutions, Inc**

# LOG OF MONITOR WELL MW-6

(Page 1 of 1)

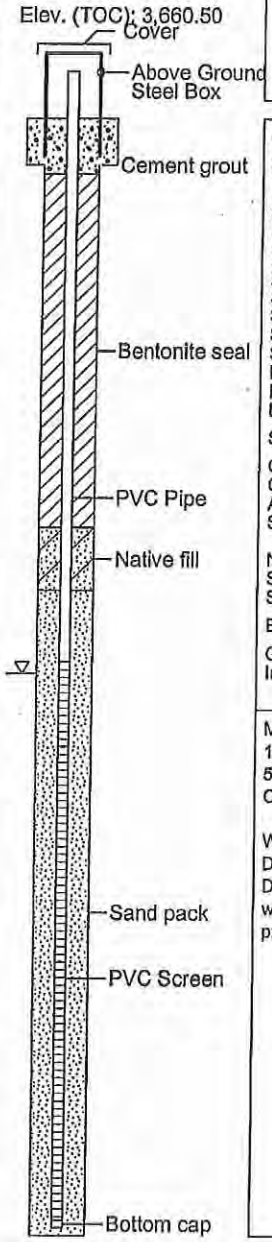
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.630884°, W103.296376°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 05/07/08, 0830 | Drilled By: | : Eco/Enviro Drilling |
| Date, Time Completed | : 05/07/08, 1115 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 in. | Northing Coordinate | : 594830.44 |
| Drilling Method: | : Hollow-stem auger | Easting Coordinate | : 860561.08 |
| Drilling Equipment: | : Foremost-Mobile B-57 | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth in Feet | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0 | | | | Sampling method 5 ft. core barrel. |
| | 0.5 | TS/CA | | 0-5 ft. Top soil and CALICHE. Rock in tip, no sample, no H/C staining or odor |
| 5 | | | | Cuttings are fine grained, light brown, gravelly sand, gravels 1/4-1/2 in. |
| | 1.0 | SC/CA | | 5-10 ft. CLAYEY SAND/SANDY CLAY, with CALICHE, very light brown, damp, no H/C staining or odor |
| 10 | | | | |
| | 0 | SC/CA | | 10-15 ft. Very little recovery, rock in tip, cuttings as above |
| 15 | | SM | | 15-15.3 ft. SILTY SAND, creme color |
| | | CL/CA | | 15.3-16.0 ft. CLAY, very light brown, some caliche |
| | | CA | | |
| | | CL | | 16.0-16.2 ft. CALICHE, fractured, H2O saturated, H/C odor |
| | 3.9 | CA | | |
| | | CL | | 16.2-17.4 ft. SILTY CLAY, brown, soft, plastic, little odor |
| | | CA/SP | | 17.4-17.6 ft. CALICHE, fractured, H2O saturated, H/C odor |
| 20 | | SP | | 17.6-18.4 ft. CLAY |
| | | | | 18.4-18.9 ft. CALICHE, fractured and SAND, fine grained, H2O saturated, H/C odor |
| | 1.8 | CL/CA | | 20-20.4 ft. SAND, H2O sat., no H/C odor |
| | | | | 20.4-21.8 ft. CLAY with fractured CALICHE, clay light brown, very plastic, soft |
| 25 | | CA/SP | | 25-26 ft. CALICHE and SAND, fine grained, H2O saturated, no H/C odor |
| | | CI | | 26-28 ft. CLAY. |
| | 3.0 | | | |
| 30 | | | | |




## Well Construction Information

**COMPLETION DATA**

| | |
|---|---|
| Hole Depth | : 30 ft. Below LS |
| TD Inside casing | : 32.70 ft. Below TOC |

**CASING, SCREEN & CAP**

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 in. ID |
| Manufacturer | : Monoflex |
| Screen type | : Slotted |
| Screen length | : 15 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 15-30 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

**SEALS & SAND PACK**

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0 - 1.5 ft. BLS |
| Annular seal type | : Holeplug bentonite |
| Seal placement | : 3/8" chips, 1.5-11 ft. BLS, : hydrated |
| Native backfill | : 11-12.7 ft. BLS |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 12.7-30 ft. BLS |

**ELEVATIONS**

| | |
|---|---|
| Ground elevation | : 3657.65 ft. above MSL |
| Inner casing, top | : 3660.50 ft. above MSL |

MATERIAL USED:
13 bags sand
5 bags bentonite chips
Cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with pump on 05/7-8/2008.
DTW 17.77 ft. Total purged 340 gallons of water, sand and turbidity, no hydrocarbon product

Notes:
H/C - Petroleum hydrocarbon

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Safety & Environmental Solutions, Inc.

# LOG OF MONITOR WELL MW-7

(Page 1 of 1)

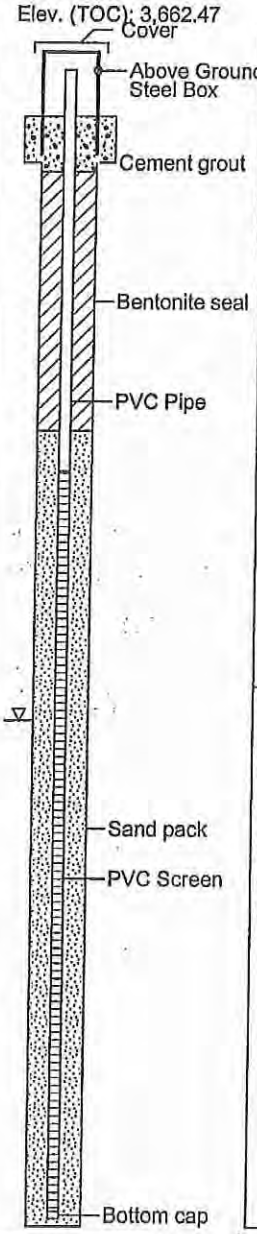
Hydrocarbon Site Investigation
Monument 6" Crude Gathering Line
Navajo Refining Company
Artesia, New Mexico
N32.631203°, W103.296896°

| | | | |
|---|---|---|---|
| Date, Time Started: | : 05/07/08, 1150 | Drilled By: | : Eco/Enviro Drilling |
| Date, Time Completed | : 05/07/08, 1530 | Logged By: | : D.G. Boyer, PG |
| Hole Diameter: | : 8-1/4 in. | Northing Coordinate | : 594947.43 |
| Drilling Method: | : Hollow-stem auger | Easting Coordinate | : 860395.96 |
| Drilling Equipment: | : Foremost-Mobile B-57 | Survey By | : Pettigrew & Associates |

Water Levels
▼ H/C Product
▽ Water Level

Sample Type:
SS Split Spoon (24")
CB Core Barrel (5 ft.)
CT Auger Cuttings
NR No recovery

| Depth in Feet | Recovery (ft.) | USCS | GRAPHIC | DESCRIPTION |
|---|---|---|---|---|
| 0 | | | | Sampling method 5 ft. core barrel. |
| | 0.5 | TS/CA | | 0-5 ft. Top soil and CALICHE. Rock in tip, no sample, no H/C staining or odor |
| 5 | | | | |
| | 0.7 | CA/GP | | 5-10 ft. CALICHE rock in barrel, cuttings gravelly sand with caliche fragments and gravels 1/4-1/2 in. |
| 10 | | | | 10-11.2 ft. CLAYEY SILTY SAND with CALICHE, sand light brown, very fine grained, dry, no H/C staining or odor |
| | 1.2 | SM/CA | | |
| 15 | | | | 15-16.3 ft. CALICHE and SANDY SILTY CLAY, soft, damp at 16-17 ft., H/C odor in clay |
| | 1.3 | CA/CL | | |
| 20 | | | | |
| | 0.5 | CA/CL | | 20-25 ft. CALICHE and SANDY SILTY CLAY, no H/C odor |
| 25 | | | | |
| | 3.3 | CL/ML | | 25-28.3 ft. SANDY CLAY/CLAYEY SILT, light brown, H2O saturated |
| 30 | | | | |




## Well Construction Information

COMPLETION DATA

| | |
|---|---|
| Hole Depth | : 30 ft. Below LS |
| TD Inside casing | : 32.68 ft. Below TOC |

CASING, SCREEN & CAP

| | |
|---|---|
| Material, joints | : PVC, threaded |
| Diameter | : 2 in. ID |
| Manufacturer | : Monoflex |
| Screen type | : Slotted |
| Screen length | : 20 ft. |
| Screen opening | : 0.020 slot |
| Scrn. placement | : 10-30 ft. BLS |
| Bottom Cap | : 0.2 ft PVC |
| Protector Casing | : Above-ground steel |
| Lock Key # | : 2001 |

SEALS & SAND PACK

| | |
|---|---|
| Cement seal type | : Concrete mix |
| Cem't placement | : 0 - 1.5 ft. BLS |
| Annular seal type | : Holeplug bentonite |
| Seal placement | : 3/8" chips, 1.5-8.5 ft. BLS, hydrated |
| Sand pack type | : 8-16 OglebayNorton silica |
| Sand placement | : 8.5-30 ft. BLS |

ELEVATIONS

| | |
|---|---|
| Ground elevation | : 3662.47 ft. above MSL |
| Inner casing, top | : 3659.60 ft. above MSL |

MATERIAL USED:
12 bags sand
3 bags bentonite chips
Cement (to secure outer protective casing)

WELL DEVELOPMENT:
Developed with pump on 05/08/2008.
DTW 19.19 ft. Total purged 410 gallons of water, sand and turbidity, no hydrocarbon product

Notes:
H/C - Petroleum hydrocarbon

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# APPENDIX C

## Site Photographs


07/31/2012


07/31/2012


07/31/2012


07/31/2012

# APPENDIX D

## Well Evaluations

Monument Well Evaluations - Holly Energy Partners

| Well ID | Date | PID | Casing Dia (in) | DTP (ft-bmp) | DTW (ft-bmp) | Thickness (ft) | TD (ft-bmp) | Saturated (ft) | Stick up (ft) Y/N | Well Marked Y/N | Surface Condition | Well Log Y/N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| WBH-7 | 7/26/2012 | 0 | 2 | | 25.40 | | 26.15 | 0.75 | 2.07 | Y | No concrete collar | N |
| WBH-7A | 7/26/2012 | 0.03 | 2 | | 24.78 | | 33.25 | 8.47 | 1.21 | Y | No concrete collar | N |
| WBH-20 | 7/26/2012 | 1.02 | 2 | 23.71 | 24.79 | 1.08 | 30.31 | 6.60 | 1.00 | Y | No concrete collar | N |
| WBH-27 | 7/26/2012 | 8.02 | 2 | 24.72 | 24.74 | 0.02 | 33.68 | 8.96 | 1.45 | Y | No concrete collar | N |
| WBH-5A | 7/26/2012 | 0 | 2 | 24.35 | 24.44 | 0.09 | 30.25 | 5.90 | 1.70 | Y | cracked pipe | N |
| WBH-3A | 7/26/2012 | 5.09 | 2 | 26.36 | 26.55 | 0.19 | 31.55 | 5.19 | 2.16 | Y | No concrete collar | N |
| WBH-2A | 7/26/2012 | 0.01 | 2 | 24.50 | 24.89 | 0.39 | 30.34 | 5.84 | 1.30 | Y | No concrete collar | N |
| WBH-8 | 7/26/2012 | 0.07 | 2 | 24.99 | 25.05 | 0.06 | 30.32 | 5.33 | 1.71 | Y | cracked pipe | N |
| WBH-20A | 7/26/2012 | 0.05 | 2 | | 24.65 | | 32.30 | 7.65 | 1.66 | Y | No concrete collar | N |
| WBH-15 | 7/26/2012 | 109 | 2 | 24.87 | 25.05 | 0.18 | 30.23 | 5.36 | 1.37 | Y | No concrete collar | N |
| WBH-17 | 7/26/2012 | 83 | 2 | 24.33 | 24.45 | 0.12 | 30.22 | 5.89 | 1.01 | Y | No concrete collar | N |
| WBH-16 | 7/26/2012 | 22 | 2 | 24.45 | 24.73 | 0.28 | 30.31 | 5.86 | 1.68 | Y | No concrete collar | N |
| WBH-14 | 7/26/2012 | 0 | 2 | | | | 9.02 | | 2.62 | Y | No concrete collar | N |
| WBH-18 | 7/26/2012 | 1 | 2 | | 24.24 | | 30.20 | 5.96 | 1.48 | Y | No concrete collar | N |
| WBH-11 | 7/26/2012 | 1 | 2 | 24.41 | 25.03 | 0.62 | 30.28 | 5.87 | 1.87 | Y | No concrete collar | N |
| WBH-19 | 7/26/2012 | 0.04 | 2 | 24.24 | 24.99 | 0.75 | 30.17 | 5.93 | 1.68 | Y | No concrete collar | N |
| BH-98 | 7/27/2012 | 0 | 2 | 20.17 | 20.31 | 0.14 | 26.99 | 6.82 | 2.13 | Y | No concrete collar | N |
| BH-88 | 7/31/2012 | 24 | 2 | 24.56 | 24.93 | 0.37 | 31.49 | 6.93 | 1.48 | Y | No concrete collar | N |
| BH-16 | 7/31/2012 | 104 | 2 | 22.85 | 23.20 | 0.35 | 29.50 | 6.65 | 0.62 | Y | No concrete collar | N |
| BH-82 | 7/31/2012 | 11 | 2 | 25.25 | 25.35 | 0.10 | 31.80 | 6.55 | 1.77 | Y | No concrete collar | N |
| BH-83 | 7/31/2012 | 27 | 2 | 24.93 | 25.09 | 0.16 | 30.91 | 5.98 | 1.85 | Y | No concrete collar | N |
| BH-90 | 7/31/2012 | 3 | 2 | 24.87 | 24.99 | 0.12 | 29.73 | 4.86 | 2.06 | Y | No concrete collar | N |
| BH-84 | 7/31/2012 | 6 | 2 | 24.34 | 24.62 | 0.28 | 30.22 | 5.88 | 1.37 | Y | No concrete collar | N |
| BH-89 | 7/31/2012 | 2 | 2 | 24.51 | 24.54 | 0.03 | 31.07 | 6.56 | 2.14 | Y | No concrete collar | N |
| BH-81 | 7/31/2012 | 28 | 2 | 24.22 | 24.50 | 0.28 | 30.38 | 6.16 | 1.42 | Y | No concrete collar | N |
| BH-36 | 7/31/2012 | 0.7 | 2 | 21.23 | 21.29 | 0.06 | 31.46 | 10.23 | 1.57 | Y | No concrete collar | N |
| BH-101 | 7/26/2012 | 0 | 2 | 21.07 | 21.21 | 0.14 | 27.22 | 6.15 | 1.78 | Y | No concrete collar | N |
| BH-100 | 7/26/2012 | 0 | 2 | | 20.79 | | 28.39 | 7.60 | 1.90 | Y | No concrete collar | N |
| BH-99 | 7/26/2012 | 25 | 2 | | 20.83 | | 26.10 | 5.27 | 2.11 | Y | No concrete collar | N |
| BH-30 | 7/31/2012 | | 2 | 19.30 | 19.60 | 0.30 | 28.92 | 9.62 | 1.41 | Y | No concrete collar | N |

**Monument Well Evaluations - Holly Energy Partners**

| Well ID | Date | PID | Casing Dia (in) | DTP (ft-bmp) | DTW (ft-bmp) | Thickness (ft) | TD (ft-bmp) | Saturated (ft) | Stick up (ft) Y/N | Well Marked Y/N | Surface Condition | Well Log Y/N |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| BH-97 | 7/27/2012 | 1 | 2 | 19.70 | 20.02 | 0.32 | 26.90 | 7.20 | 2.02 | Y | No concrete collar | N |
| BH-29 | 7/27/2012 | 0.05 | 2 | 18.60 | 18.66 | 0.06 | 26.31 | 7.71 | 1.81 | Y | No concrete collar | N |
| BH-9A | 7/27/2012 | 0 | 2 | 17.96 | 18.04 | 0.08 | 25.52 | 7.56 | 1.57 | Y | No concrete collar | N |
| BH-77 | 7/26/2012 | 71 | 2 | | 17.94 | | 26.47 | 8.53 | 1.38 | Y | No concrete collar | N |
| BH-13 | 7/27/2012 | 80 | 2 | 18.27 | 18.36 | 0.09 | 24.23 | 5.96 | 2.02 | Y | No concrete collar | N |
| BH-95 | 7/27/2012 | 0 | 2 | 18.96 | 19.24 | 0.28 | 27.02 | 8.06 | 1.85 | Y | No concrete collar | N |
| BH-96 | 7/27/2012 | 71 | 2 | 19.15 | 19.38 | 0.23 | 27.00 | 7.85 | 1.08 | Y | No concrete collar | N |
| BH-54 | 7/27/2012 | 24 | 2 | 17.50 | 17.58 | 0.08 | 27.11 | 9.61 | 1.31 | Y | No concrete collar | N |
| BH-53 | 7/27/2012 | 11 | 2 | 17.59 | 17.60 | 0.01 | 19.43 | 1.84 | 1.73 | Y | No concrete collar | N |
| BH-55 | 7/27/2012 | 11 | 2 | | 17.34 | | 17.75 | 0.41 | 1.50 | Y | No concrete collar | N |
| BH-56 | 7/27/2012 | 0 | 2 | | 16.88 | | 25.01 | 8.13 | 1.01 | Y | No concrete collar | N |
| BH-12 | 7/27/2012 | 0 | 2 | | 18.55 | | 24.91 | 6.36 | 1.74 | Y | cracked pipe | N |
| BH-11 | 7/27/2012 | 0 | 2 | | 17.18 | | 24.28 | 7.10 | 1.95 | Y | cracked pipe | N |
| BH-45 | 7/27/2012 | 0.03 | 2 | 16.17 | 17.70 | 1.53 | 26.01 | 9.84 | 1.87 | Y | No concrete collar | N |
| BH-7 | 7/30/2012 | | 2 | 18.15 | 18.69 | 0.54 | 24.60 | 6.45 | 1.60 | Y | No concrete collar | N |
| BH-21 | 7/30/2012 | | 2 | 18.03 | 18.12 | 0.09 | 25.01 | 6.98 | 2.60 | Y | No concrete collar | N |
| BH-22 | 7/30/2012 | | 2 | 18.81 | 18.91 | 0.10 | 26.99 | 8.18 | 2.10 | Y | No concrete collar | N |
| BH-57 | 7/30/2012 | | 2 | 18.87 | 18.99 | 0.12 | 25.70 | 6.83 | 2.56 | Y | No concrete collar | Y |
| BH-58 | 7/30/2012 | | 2 | 19.25 | 19.52 | 0.27 | 28.17 | 8.92 | 2.58 | Y | No concrete collar | Y |
| BH-60 ??? | 7/30/2012 | | 2 | 19.05 | 19.54 | 0.49 | 27.18 | 8.13 | 1.92 | Y | No concrete collar | N |
| BH-59 | 7/30/2012 | | 2 | 19.01 | 19.15 | 0.14 | 28.18 | 9.17 | 2.47 | Y | No concrete collar | N |
| BH-23 | 7/30/2012 | | 2 | 18.72 | 19.02 | 0.30 | 27.25 | 8.53 | 2.65 | Y | No concrete collar | N |
| BH-19 | 7/30/2012 | | 2 | 19.79 | 19.81 | 0.02 | 25.94 | 6.15 | 1.61 | Y | No concrete collar | N |
| BH-14 | 7/27/2012 | | 2 | 18.25 | 18.37 | 0.12 | 25.16 | 6.91 | 2.26 | Y | No concrete collar | N |
| BH-61 | 7/30/2012 | | 2 | 19.46 | 19.97 | 0.51 | 29.23 | 9.77 | 2.56 | Y | No concrete collar | N |
| BH-62 | 7/30/2012 | | 2 | 18.88 | 19.67 | 0.79 | 27.92 | 9.04 | 2.46 | Y | No concrete collar | N |
| BH-24 | 7/30/2012 | | 2 | 18.59 | 18.81 | 0.22 | 26.35 | 7.76 | 2.41 | Y | No concrete collar | N |
| BH-8A | 7/30/2012 | 25 | 2 | 18.27 | 18.71 | 0.44 | 24.54 | 6.27 | 2.35 | Y | No concrete collar | N |
| BH-25 | 7/30/2012 | | 2 | 19.42 | 19.72 | 0.30 | 25.85 | 6.43 | 2.54 | Y | No concrete collar | N |
| BH-67 | 7/30/2012 | | 2 | 20.11 | 20.85 | 0.74 | 26.50 | 6.39 | 2.57 | Y | No concrete collar | N |
| BH-76 | 7/30/2012 | | 2 | 19.63 | 19.78 | 0.15 | 29.01 | 9.38 | 1.78 | Y | No concrete collar | N |
| BH-75 | 7/30/2012 | | 2 | 21.10 | 21.30 | 0.20 | 29.47 | 8.37 | 2.70 | Y | No concreta collar | N |
| BH-47 | 7/30/2012 | 0 | 2 | ???? | 17.46 | | 24.88 | 7.42 | 2.47 | Y | No concrete collar | N |
| BH-72 | 7/30/2012 | 176 | 2 | 17.19 | 17.21 | 0.02 | 23.44 | 6.25 | 1.90 | Y | No concrete collar | N |
| BH-52 | 7/30/2012 | 50 | 2 | | 18.39 | | 25.36 | 6.97 | 1.84 | Y | No concrete collar | N |
| BH-116-4 | 7/30/2012 | 0 | 2 | | 19.49 | | 25.21 | 5.72 | 2.57 | Y | No concrete collar | N |
| BH-68 | 7/30/2012 | 0 | 2 | 18.37 | 18.64 | 0.27 | 26.01 | 7.64 | 2.35 | Y | No concrete collar | N |
| BH-71 | 7/30/2012 | 46 | 2 | ???? | 16.86 | | 23.35 | 6.49 | 1.82 | Y | No concrete collar | N |

Monument Well Evaluations - Holly Energy Partners

| Well ID | Date | PID | Casing Dia | DTP | DTW | Thickness | TD | Saturated | Stick up | Well Marked | Surface Condition | Well Log |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | (in) | (ft-bmp) | (ft-bmp) | (ft) | (ft-bmp) | (ft) | (ft) Y/N | Y/N | | Y/N |
| BH-117 | 7/30/2012 | 0 | 4 | | 19.15 | | 27.72 | 8.57 | 2.55 | Y | No concrete collar | N |
| BH-119-4 | 7/30/2012 | 0 | 4 | | 19.31 | | 27.85 | 8.54 | 2.52 | Y | No concrete collar | N |
| BH-118 | 7/30/2012 | 28 | 4 | | 18.50 | | 27.68 | 9.18 | 2.54 | Y | No concrete collar | N |
| BH-122-4 | 7/30/2012 | 0 | 4 | 17.34 | 17.39 | 0.05 | 27.64 | 10.30 | 2.48 | Y | No concrete collar | N |
| BH-120-4 | 7/30/2012 | 31 | 4 | | 18.42 | | 30.12 | 11.70 | 1.35 | Y | No concrete collar | N |
| BH-121-4 | 7/30/2012 | 0 | 4 | | 17.58 | | 27.48 | 9.90 | 2.31 | Y | No concrete collar | N |
| BH-65 | 7/30/2012 | | 2 | 19.85 | 21.02 | 1.17 | 28.24 | 8.39 | 2.76 | Y | No concrete collar | N |
| BH-64 | 7/30/2012 | | 2 | 20.00 | 21.64 | 1.64 | 28.77 | 8.77 | 2.61 | Y | No concrete collar | N |
| BH-63 | 7/30/2012 | | 2 | 19.71 | 20.05 | 0.34 | 28.45 | 8.74 | 2.43 | Y | No concrete collar | N |
| BH-91 | 7/30/2012 | 5 | 2 | 24.01 | 25.01 | 1.00 | 30.28 | 6.27 | 1.01 | Y | No concrete collar | N |
| BH-18 | 7/30/2012 | 3 | 2 | 24.53 | 25.01 | 0.48 | 30.41 | 5.88 | 1.52 | Y | No concrete collar | N |
| BH-66 | 7/30/2012 | | 2 | 20.84 | 21.38 | 0.54 | 30.37 | 9.53 | 2.78 | Y | No concrete collar | N |
| BH-39 | 7/30/2012 | | 2 | 20.10 | 20.31 | 0.21 | 29.01 | 8.91 | 1.50 | Y | No concrete collar | N |
| BH-40 | 7/30/2012 | | 2 | 19.48 | 19.68 | 0.20 | 29.10 | 9.62 | 1.70 | Y | No concrete collar | N |
| BH-4-4 | 7/30/2012 | | 4 | 18.88 | 19.05 | 0.17 | 25.36 | 6.48 | 0.54 | Y | No concrete collar | Y |
| BH-80 | 7/30/2012 | | 2 | 18.53 | 19.27 | 0.74 | 27.09 | 8.56 | 1.82 | Y | No concrete collar | N |
| BH-41 | 7/30/2012 | | 2 | 18.90 | 19.46 | 0.56 | 29.50 | 10.60 | 1.61 | Y | No concrete collar | Y |
| BH-48 | 7/30/2012 | | 2 | 18.90 | 19.22 | 0.32 | 28.80 | 9.90 | 1.86 | Y | No concrete collar | N |
| BH-42 | 7/30/2012 | | 2 | 19.52 | 20.43 | 0.91 | 29.66 | 10.14 | 2.32 | Y | No concrete collar | N |
| BH-106 | 7/30/2012 | | 2 | 19.83 | 19.94 | 0.11 | 27.40 | 7.57 | 2.14 | Y | No concrete collar | N |
| BH-105 | 7/30/2012 | | 2 | 19.73 | 19.89 | 0.16 | 25.85 | 6.12 | 1.53 | Y | No concrete collar | N |
| BH-104 | 7/30/2012 | | 2 | 20.23 | 21.64 | 1.41 | 24.74 | 4.51 | 2.26 | Y | No concrete collar | N |
| BH-17 | 7/30/2012 | | 2 | 21.85 | 22.45 | 0.60 | 27.60 | 5.75 | 2.98 | Y | No concrete collar | N |
| BH-103 | 7/30/2012 | | 2 | 20.48 | 20.72 | 0.24 | 25.60 | 5.12 | 2.06 | Y | No concrete collar | N |
| BH-106 | ??? | Repeated ?? | 2 | | | | | | | | | N |
| BH-33 | | | 2 | | | | | | | | | N |
| BH-110 | 7/30/2012 | | 2 | 19.80 | 19.97 | 0.17 | 26.95 | 7.15 | 2.77 | Y | No concrete collar | N |
| BH-109 | 7/30/2012 | 0 | 2 | | 19.87 | | 26.84 | 6.97 | 2.42 | Y | No concrete collar | N |
| BH-115 | 7/30/2012 | | 2 | 20.98 | 21.54 | 0.56 | 29.56 | 8.58 | 2.66 | Y | No concrete collar | N |
| BH-108 | 7/30/2012 | | 2 | 20.31 | 20.88 | 0.57 | 26.16 | 5.85 | 2.25 | Y | No concrete collar | N |
| BH-114 | 7/26/2012 | 27.8 | 2 | 20.85 | 21.29 | 0.44 | 27.44 | 6.59 | 2.73 | Y | No concrete collar | N |
| BH-107 | 7/30/2012 | | 2 | 21.21 | 21.50 | 0.29 | 26.77 | 5.56 | 2.41 | Y | No concrete collar | N |
| BH-103 ?? | | | 2 | | | | | | | | | N |
| BH-111 | 7/30/2012 | | 2 | 21.36 | 22.90 | 1.54 | 27.14 | 5.78 | 2.56 | Y | No concrete collar | N |
| MW-6 | 7/26/2012 | 0 | 2 | | 16.42 | | 32.62 | 16.20 | 2.41 | Y | Monument, good condition | Y |
| MW-3 | 7/26/2012 | 0 | 2 | | 21.72 | | 37.52 | 15.80 | 2.41 | Y | Monument, good condition | Y |
| MW-5 | 7/26/2012 | 0 | 2 | | 24.00 | | 39.36 | 15.36 | 2.32 | Y | Monument, good condition | Y |
| MW-1 | 7/26/2012 | 0 | 2 | | 22.02 | | 38.77 | 16.75 | 2.51 | Y | Monument, good condition | Y |
| MW-7 | 7/26/2012 | 0 | 2 | | 18.84 | | 32.27 | 13.43 | 2.53 | Y | Monument, good condition | Y |

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# State of New Mexico
# Energy, Minerals and Natural Resources
# Oil Conservation Division
# 1220 S. St Francis Dr.
# Santa Fe, NM 87505

CONDITIONS

Action 340769

## CONDITIONS

| | |
|---|---|
| Operator:<br>HF Sinclair Navajo Refining LLC<br>ATTN: GENERAL COUNSEL<br>Dallas, TX 75201 | OGRID:<br>15694 |
| | Action Number:<br>340769 |
| | Action Type:<br>[UF-GWA] Ground Water Abatement (GROUND WATER ABATEMENT) |

**CONDITIONS**

| Created By | Condition | Condition Date |
|---|---|---|
| michael.buchanan | ST2 AP for the North Monument 6" Gathering Line has been accepted as part of the incident record. The abatement plan is dated for October 2012. App ID: 340769 | 10/21/2024 |