APPROVED
By Olivia Yu at 7:49 am, Jul 27, 2018

July 3, 2018

Reference No. 11135241

NMOCD approves of the proposed remediation plan for 1RP-4643. Provide a schematic of the SVE system as built in the subsequent report.

Mr. Bradford Billings
Energy Minerals and Natural Resources Division
New Mexico Oil Conservation Division
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

Mr. Ryan Mann
New Mexico State Land Office
2827 N.Dal Paso, Suite 117
Hobbs, New Mexico 88240

Dear Mr. Billings and Mr. Mann:

Re: 0-6-1 Four Inch Line Release
1RP-4643
Work Plan to Perform Site Remediation
S20, T20S, R 37E
Lea County, New Mexico

GHD Services Inc. (GHD) appreciates the opportunity to submit this work plan on behalf of ETC Field Services LLC (ETC) for the remediation of the 0-6-1 Four Inch Pipeline release. The release location (Site) is located approximately 4.6 miles south of Monument, New Mexico in Section 20, Township 20 south, Range 37 east in Lea County, New Mexico (Figure 1). The site is regulated by the New Mexico Oil Conservation Division (NMOCD). The surface is owned by the New Mexico State Land Office (NMSLO).

Assessment activities that included the drilling of six soil borings and the installation of one groundwater monitoring well were performed at the Site on August 29 and 30, 2017 by GHD. Vertical and horizontal assessment was performed by collecting soil samples from the six soil borings (BE-1, BE-2, BS, BW, BN-1, BN-2) that were advanced in the four cardinal directions of the release point and one (MW-1) that was advanced near the release point (Figure 2). Either two or three soil samples per soil boring were submitted to Hall Environmental Analysis Laboratory (HEAL) located in Albuquerque, New Mexico. The samples were analyzed for benzene, toluene, ethylbenzene, xylenes (BTEX) by EPA Method 8021B, total petroleum hydrocarbons (TPH) by EPA Method 8015B, and chloride by EPA Method 300.0.

The soil sample collected from MW-1 from 15 to 17 ft. bgs contained a benzene concentration of 0.032 milligrams per kilogram (mg/kg). None of the rest of the submitted samples contained BTEX or TPH constituents above the laboratory reporting limits. Chloride concentrations ranged from 54 to 1,100 mg/kg. The highest chloride concentration, and the only one exceeding the Recommended Remedial Action Limit (RRAL), was contained in the sample collected from MW-1 at 15 to 17 ft. bgs.

A groundwater sample was collected from MW-1 on September 20, 2017 and submitted to HEAL for BTEX analysis by EPA Method 8021B, TPH by EPA Method 8015D, chloride by EPA Method 300.0, and total dissolved solids (TDS) by EPA Method SM2540C Mod analysis. Benzene was detected at a

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concentration of 200 micrograms per liter (ug/L) that exceeds the New Mexico Water Quality Control Commission (NMWQCC) standard of 10 ug/L. Chloride was detected above the NMWQCC standard of 250 milligrams per liter (mg/L) at a concentration of 580 mg/L (Figure 2). The sample also exceeded the NMWQCC standard for TDS (1,000 mg/L), with a concentration of 2,010 mg/L. A second groundwater sample was collected from MW-1 on October 17, 2017 to confirm the original sample results. Benzene was detected at a concentration of 150 ug/L, chloride at a concentration of 560 mg/L, and TDS at a concentration of 1,620 mg/L (Figure 2).

As a result, GHD installed four additional monitoring wells and two air sparge wells at the site. Monitoring well MW-2 was installed to the north, MW-3 to the southeast, MW-4 to the south, and MW-5 to the west of MW-1. The air sparge wells were installed north and south of the 0-6-1 line to the west of MW-1. See Figure 3 for the monitor and air sparge well locations.

A soil vapor extraction (SVE) pilot study was performed at the site on January 30, 2018. A probe response of 0.5 to 1.0 percent of the applied SVE wellhead vacuum is generally considered significant in radius of influence (ROI) estimation. The applied wellhead vacuum ranged from 35 to 43 scfm during the test. The vacuum response of 0.44 in. of water at MW-5 is over 1% of the wellhead vacuum, indicating a ROI of 41.5 feet or more.

An air sparge (AS) pilot study was performed at the site on January 31, 2018. To assess the air sparge ROI, the pressure induced at nearby monitoring wells was measured. During the AS-1 test, significant pressure was induced in MW-2, at a distance of 34 feet, but not in MW-4 at a distance of 50.5 feet. Noticeable response was observed at all monitoring wells (MW-1, MW-2, MW-4, and MW-5) during the combined AS-1/AS-2 test, indicating that a ROI of 35-40 feet is achievable.

Vapor samples collected during the test indicated TPH gasoline range organic (GRO) concentrations in the extracted vapor at 4,400 ug/l. By the end of the test, the TPH GRO concentration had dropped to 3,600 ug/l. The extracted vapor concentrations correlate to an initial TPH GRO removal rate of approximately 25 lbs. per day, which will likely steadily decrease to less than 1 lb. per day within the first year of operation.

The data and observations mentioned above indicate that AS/SVE is capable of removing petroleum hydrocarbons from the impacted subsurface. Based on vapor concentrations extracted during the pilot test and using conservative operating parameters, it is estimated that 75-90% of the mass currently present would be removed in less than a year of operation. Based on this, GHD is recommending the installation of a full scale remediation system.

The most recent quarterly groundwater sampling data collected in April 2018 indicates significant decreases of benzene in monitor wells MW-1, MW-4, and MW-5 (Figure 2). The observed decrease are most likely the stimulation of aerobic heterotrophic bacteria in the groundwater. The data provides further evidence that air sparging will degrade the petroleum hydrocarbons found in the groundwater.

Given the excellent permeability that was observed in the vadose and saturated zones, GHD recommends the installation and operation of an AS/SVE system using the existing AS/SVE wells. GHD believes that

by addressing the source area, the remainder of the benzene plume will reduce in size over time. In the event that residual benzene concentrations need to be addressed with additional wells, they will be installed at a later date. This work plan addresses the installation, operation and monitoring of the proposed AS/SVE system.

1. Proposed Scope of Work

GHD proposes to install, operate and monitor an AS/SVE system at the site. Given the concentrations, GHD does not anticipate that the system will require operation for more than two years. The AS/SVE system will require the installation of single phase, 110 volt and 230 volt electrical service. Following installation of the electrical service, a skid mounted SVE/AS system will be placed at the site. The AS/SVE system will be connected to existing wells and the system will be operated.

1.1 Project Preparation

This task includes preparing this work plan and other project preparation activities that occur after approval, but before fieldwork mobilization.

- Submission of this work plan (without the costs) to the NMOCD and NMSLO for their approval.
- Revision of the project health and safety plan.
- Check with the NMSLO to assess if a permit is required for this scope of work.

An air quality permit or vapor abatement is not required because the anticipated emissions will be less than 10 pounds per hour or 25 tons per year. Initial emissions are anticipated on the order of 25 pounds per day. These emissions will eventually decrease to 1 pound per day.

1.2 AS/SVE System Installation

Electrical service is available at the site. However, it will require the installation of a step-down transformer and wiring to the system. The cost for the electrical service installation will be paid by ETC. GHD has included an estimated cost for the monthly electrical service.

The SVE system will consist of a skid mounted Rotron 454 vacuum blower with a particulate filter and moisture separator and will be connected to existing MW-1. The AS system will consist of a rotary vain compressor. Both pieces of equipment will be placed in the vicinity of MW-1 as indicated on Figure 3.

Vacuum and air pressure will be provided to the wells using HDPE tubing. Due to the relatively short anticipated operating time of the system, the tubing will be placed on the ground and not buried. Vapors from the SVE system will be discharged through a 15-foot tall stack.

1.3 AS/SVE System Operations and Monitoring

System monitoring will be performed weekly for the first two months, then biweekly after that. Data collected from system operations will include the following:

- AS/SVE system flow, pressure, and vacuum
- Well head vacuums
- SVE Inlet hydrocarbon concentrations to be measured with a calibrated photoionization detector

The following data will be collected on a monthly basis:

- Down-hole water quality parameters from the monitor wells. The down-hole water quality parameters will be collected using a calibrated In-Situ SmarTroll MP with a 100 foot long cable. The SmarTroll will be used to collect parameters of temperature, rugged dissolved oxygen, oxidation reduction potential (ORP), pH, and conductivity.
- An air sample will be collected from the exhaust of the system. The air sample will be analyzed for BTEX by EPA Method 8260 and TPH GRO by EPA Method 8015.

In addition, the existing groundwater monitoring wells will be sampled every two months. Monitoring of the groundwater will provide an assessment of the effectiveness of the remediation system. The groundwater samples will be analyzed for concentrations of BTEX by EPA Method 8021 and chlorides by EPA Method 300.

1.4 AS/SVE Reporting

GHD will include data collected from the AS/SVE system during the 2018 calendar year in the annual report. The annual report will include tabulated analytical and gauging data, and maps showing the groundwater concentrations.

GHD appreciates the opportunity to submit this proposal on behalf of ETC. Please feel free to contact me at 505-884-0672 if you have questions or comments.

Sincerely,

GHD

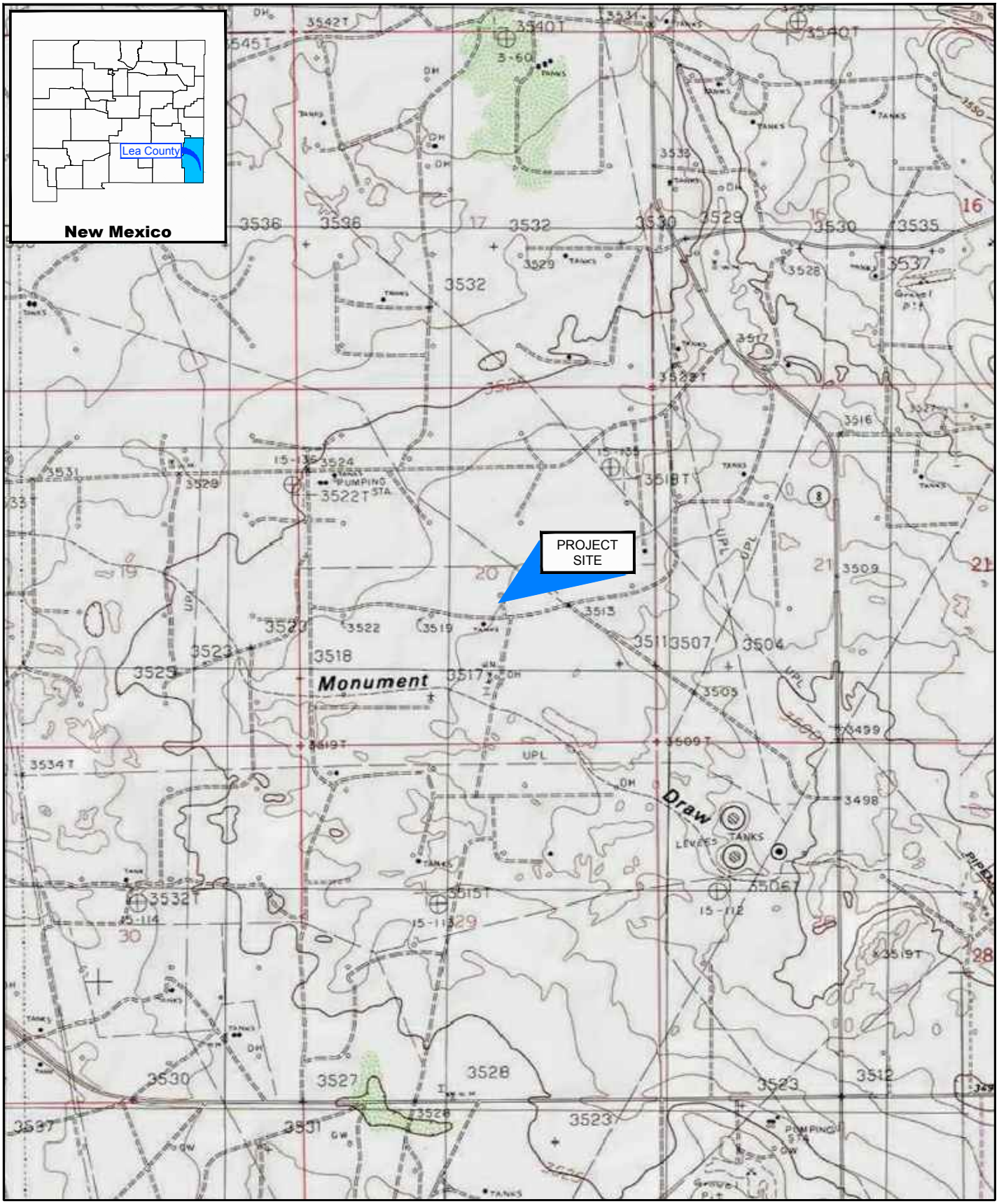
Alan Brandon
Senior Project Manager

Brian Kramer
Engineer

AB/ji/1

Encl.

Figures



Source: USGS 7.5 Minute Quad "Monument South and Hobbs SW, New Mexico"

Lat/Long: 32.557054° North, 103.27255° West

0 1000 2000ft

Coordinate System:
NAD 1983 (2011) StatePlane-
New Mexico East (US Feet)

ETC FIELD SERVICES LLC
LEA COUNTY, NEW MEXICO
0-6-1 4" LINE RELEASE

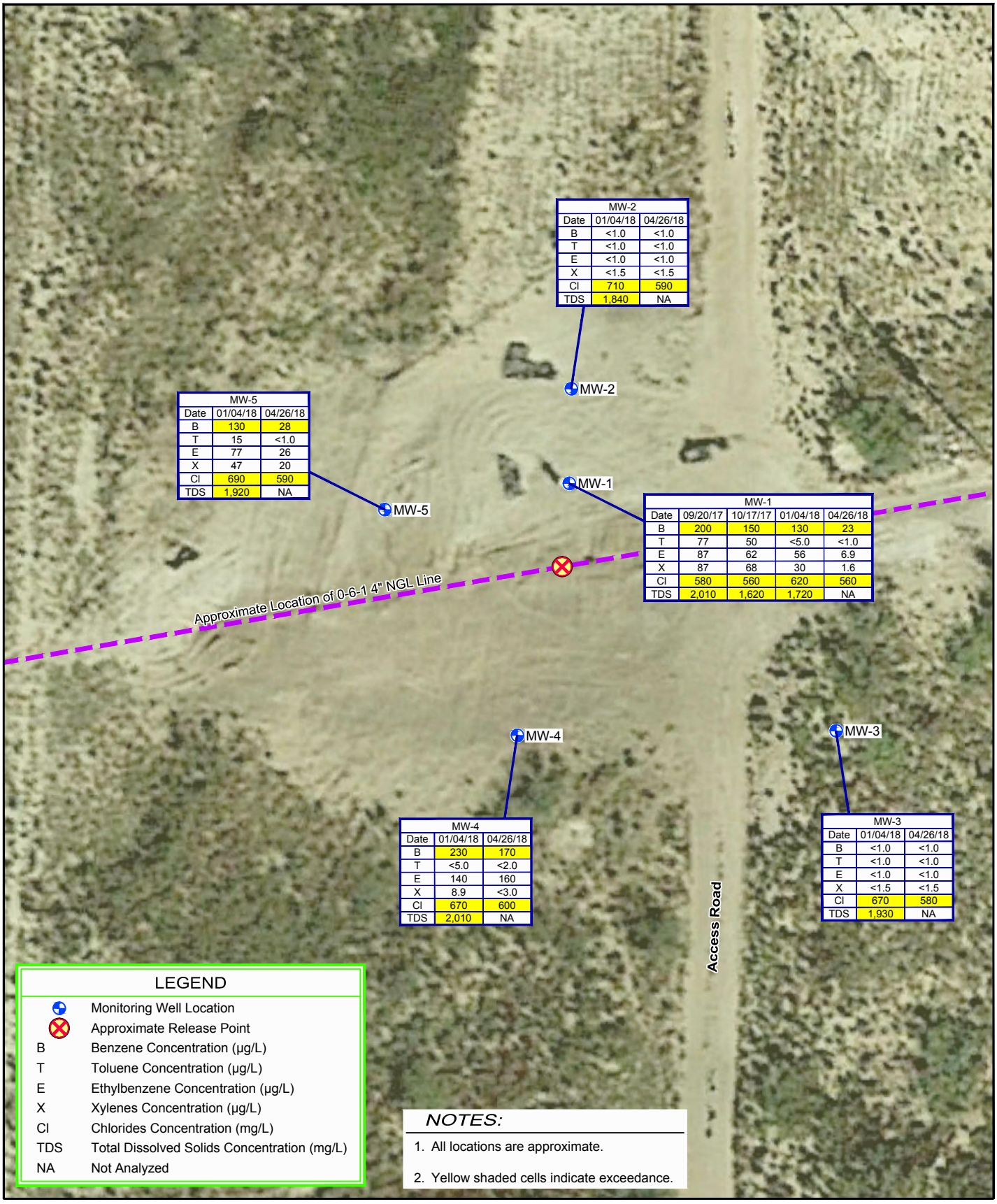
11135241-98

Apr 10, 2017

SITE LOCATION MAP

FIGURE 1

CAD File: I:\CAD\Files\Eight Digit Job Numbers\1113----\11135241-ETC-S-U-6 Six Inch Line Release\11135241-98\11135241-98(000)GN-DL001.dwg



Source: Image © 2016 Google - Imagery Date: February 1, 2017

Lat/Long: 32.557054° North, 103.27255° West

0 10 30ft

Coordinate System:
NAD 1983 (2011) StatePlane-
New Mexico East (US Feet)

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GROUNDWATER CONCENTRATION MAP

11135241-2018

Jun 5, 2018

FIGURE 2

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Source: Image © 2016 Google - Imagery Date: November 2, 2017

Lat/Long: 32.557054° North, 103.27255° West

0 10 30ft

Coordinate System:
NAD 1983 (2011) StatePlane-
New Mexico East (US Feet)

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PROPOSED SVE/AS EQUIPMENT LOCATION

11135241-2018

Jun 5, 2018

FIGURE 3

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