



July 31, 2017

Randy Bayliss  
New Mexico Oil Conservation Division  
1220 S. St. Francis Drive  
Santa Fe, New Mexico 87505

*Sent electronically to: [Randolph.bayliss@state.nm.us](mailto:Randolph.bayliss@state.nm.us)*

**Re: Remediation Plan Update  
Benson-Montin-Greer  
Highway 537 Llaves Pipeline 2008 Release  
Rio Arriba County, New Mexico  
NMOCD #: 3RP-447; Order #860429**

Dear Mr. Bayliss:

On behalf of Benson-Montin-Greer Drilling Corporation (BMG), Animas Environmental Services, LLC (AES) has prepared this Remediation Plan Updated, which provides details of proposed remedial activities at the BMG Llaves Pipeline 2008 Release location. Semi-annual monitoring and sampling have been ongoing at the site, in conjunction with interim hand-bailing of free product. The remediation plan update was requested in a meeting with New Mexico Oil Conservation Division (NMOCD) with AES, on behalf of BMG, on June 29, 2017.

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## 1.0 Site Information

The 2008 release was discovered on December 31, 2007, and originated on the Schmitz Ranch, on the south side of Highway 537. The pipeline release reportedly flowed south and southwest through a small unnamed arroyo for a distance of approximately 920 linear feet. This arroyo drains to the Los Ojitos Arroyo, which eventually drains to Largo Canyon.

### 1.1 Site Location

The release location is described legally as being located within the NW $\frac{1}{4}$  NE $\frac{1}{4}$  Section 18, T25N, R3W in Rio Arriba County, New Mexico. Latitude and longitude were recorded as being N36.40357 and W107.18422, respectively. A topographic site location map, based on an excerpt from the U.S. Geological Survey (USGS) 7.5-minute Schmitz Ranch, Rio Arriba County, New Mexico topographic quadrangle (USGS 1963), is included as Figure 1, and a general site plan is presented as Figure 2.

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Farmington, NM 87401  
505-564-2281

1911 Main, Ste 206  
Durango, CO  
970-403-3084

## 1.2 Release History

**December 31, 2007** - A Western Refining truck driver discovered the Llaves pipeline leak and immediately contacted BMG. BMG personnel confirmed the release and shut down the Llaves pipeline pumps and block valve located about one mile upstream. BMG contracted with TNT Excavating to remove the oil that had pooled along the surface of the small arroyo. Approximately 40 barrels (bbls) of oil were recovered and placed in storage tanks at the BMG Hwy 537 Transfer Station. A total of 3,932 cubic yards of contaminated soils were excavated and transported to the TNT Landfarm facility for disposal.

**January 9, 2008** - Llaves pipeline was repaired. BMG notified the National Response Center of the spill on January 23, 2008, and the release was given identification number 860429.

**April and May 2008** - AES conducted a site investigation, which included the installation of nine groundwater monitoring wells (MW-1 through MW-9). Details of the investigation were presented in the AES Site Investigation Report submitted to NMOCD and dated June 23, 2008. The locations of the monitoring wells are presented on Figure 2.

**March 21 and 22, 2011** - AES installed five remediation wells, MPE-1 through MPE-5, in and around the area of the release, primarily in the area of MW-9.

**April 14, 2011** - AES installed two additional MPE wells, MPE-6 and MPE-7, at the site. The locations of the remediation wells are presented on Figure 2. Installation details were presented in the Periodic Progress Report submitted to NMOCD and dated August 10, 2011.

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## 2.0 NAPL Recovery Efforts

### 2.1 Petroleum Hydrocarbon Recovery 2011

The MPE unit was installed in May 2011 and operated until October 2011, when it was removed for the winter season. An estimated **26,250 lbs** of petroleum hydrocarbons were removed via the RSI mobile MPE system.

### 2.2 Petroleum Hydrocarbon Recovery 2014

In the summer and fall of 2014, it is estimated that approximately **7,172 lbs** of petroleum hydrocarbons were removed through total fluids/free product removal (i.e. multiphase extraction) and stored in an onsite tank, along with petroleum hydrocarbons utilized as a supplemental fuel to operate the RSI unit. Note that mass removal calculations do not include petroleum hydrocarbon reductions resulting from natural attenuation or biodegradation.

### 2.3 Petroleum Hydrocarbon Recovery 2015

In May 2015, AES re-installed a RSI mobile MPE system to remove residual contaminants. The unit operated from May 8 to August 6, 2015. It is estimated that approximately **7,052 lbs** (1,137 gallons) of petroleum hydrocarbons were removed through total fluids/free product removal (i.e. multiphase extraction) and stored in an onsite tank. This figure includes an estimated 466 lbs (roughly 75 gallons) of petroleum hydrocarbons which were mechanically removed from the subsurface and utilized as supplemental fuel in the RSI Unit.

#### Petroleum Hydrocarbon Mass Removal to Date BMG Hwy 537 2008 Release

<i>Time Period</i>	<i>Mass Petroleum Hydrocarbons Removed (lbs)</i>
May to October 2011	26,250
July to September 2014	7,172
May to August 2015	7,052
<b>Cumulative</b>	<b>40,474</b>

### 2.4 Residual NAPL

Residual NAPL in MPE wells has been measured and recovered quarterly via hand-bailing in 2016 and 2017. The most recent gauging and hand-bailing event was conducted on June 21, 2017, and measured well NAPL thickness and recovered volumes are summarized below.

#### Measured NAPL Thicknesses in MPE Wells (June 2017) BMG Hwy 537 2008 Release

<i>MPE Well</i>	<i>Initial Measured NAPL Thickness in Well (ft)</i>	<i>Volume Removed (gallons)</i>	<i>Mass Petroleum Hydrocarbons Removed (lbs)</i>
MPE-1	1.91	0.625	4.5
MPE-2	0.26	0.5	3.6
MPE-3	1.35	0.875	6.3
MPE-4	2.32	0.625	4.5
MPE-5	2.07	0.375	2.7
MPE-6	2.15	1.125	8.1
<b>Cumulative</b>	<b>4.125</b>	<b>4.125</b>	<b>29.7</b>

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### 3.0 Proposed Remedial Actions

Although high vacuum MPE operations were successful for removing the initial portion of petroleum hydrocarbon mass, it has proven less effective at addressing the residual mass. In order to identify additional mitigation methods for removing residual hydrocarbon mass, several technologies were evaluated for technical feasibility, cost, and labor requirements. Based on current site conditions along with technology factors, it is proposed to perform pilot studies for both:

- An active skimming system (utilizing skimmers with hydrophobic filters and pneumatic pump to transfer product to a storage tank); and
- A low vacuum enhanced skimming system, using a low vacuum (5 to 20 in Hg), which will assist in drawing free product to the recovery wells, while minimizing upwelling of groundwater.

AES has coordinated with Xitech Instruments ([www.xitechinc.com](http://www.xitechinc.com)) to assist in performing pilot studies for both options. If successful, then a regular system can be implemented and started up. Note that high altitude (over 7,000 feet) precludes operation of any mechanical system over the winter months because of freezing lines and limited site accessibility. Additionally, the site is located on private land, and the land owner wants no further earth disturbance at the site. Therefore, any mechanical system installed will be taken out of service over the winter months and then started up again in the spring.

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### 4.0 Scheduled Site Activities

The following site activities have been scheduled for August 2017:

- **Week of August 7, 2017** – Conduct both active skimming and enhanced low vacuum skimming system pilot studies at the site. Evaluate most cost effective power option/availability (electric or propane) at the site.
- **Week of August 7, 2017** - Plug and abandon six monitor wells (MW-1, MW-3, MW-4, MW-5, MW-6, and MW-8), per approval from NMOCD. Note that two wells, MW-7 (upgradient) and MW-2 (downgradient), will be left open to measure depth to groundwater and to assist in calculating hydraulic gradient. MW-9 still shows presence of NAPL and will be incorporated into next phase of remedial activities.

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## 5.0 Deliverables

A progress report will be prepared and submitted to NMOCD by September 1, 2017. The report will include the results of the pilot study, proposed implementation plan and schedule, and P&A reports for plugged and abandoned monitor wells.

If you have any questions regarding this workplan, proposed schedule, or site conditions, please do not hesitate to contact me or Elizabeth McNally at (505) 564-2281.

Respectfully Submitted,



Robert "Bob" Flegal, P.E.  
Sr. Project Manager



Elizabeth McNally, P.E.  
Principal

### Attachments:

Figure 1. Topographic Site Location Map

Figure 2. Site Plan with Groundwater Elevation Contours, January 2017  
Remediation Evaluation Matrix

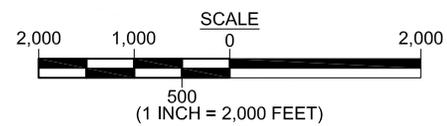
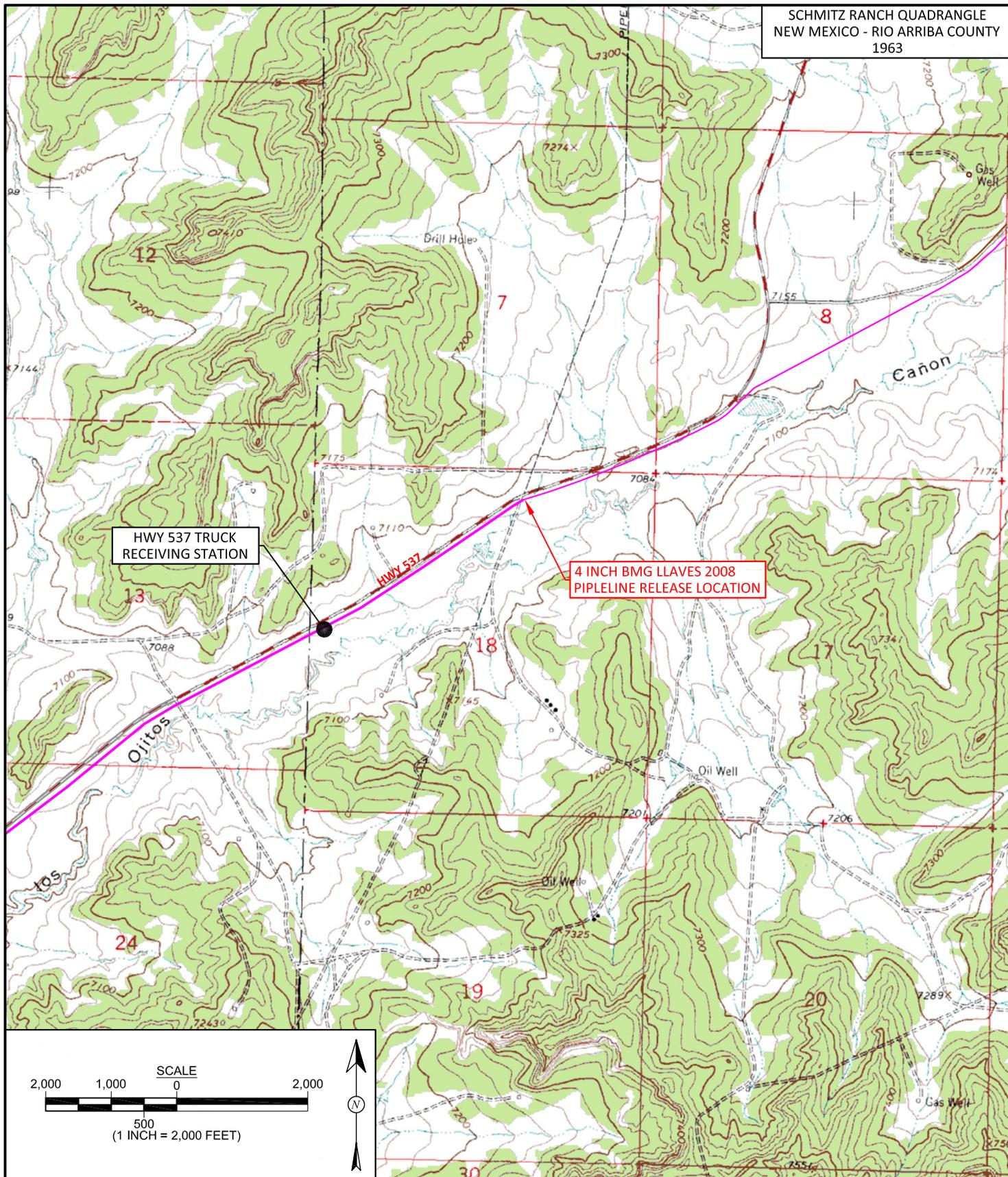
Cc: Matt Dimond  
Zach Stradling ([zstradling@bmqdrilling.com](mailto:zstradling@bmqdrilling.com))  
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Dropbox\2017 Client Projects\BMG\HWY 537 2008\Workplans and Reports\2016 Report\BMG Hwy 537 2008  
Release Remediation Plan 073117.docx



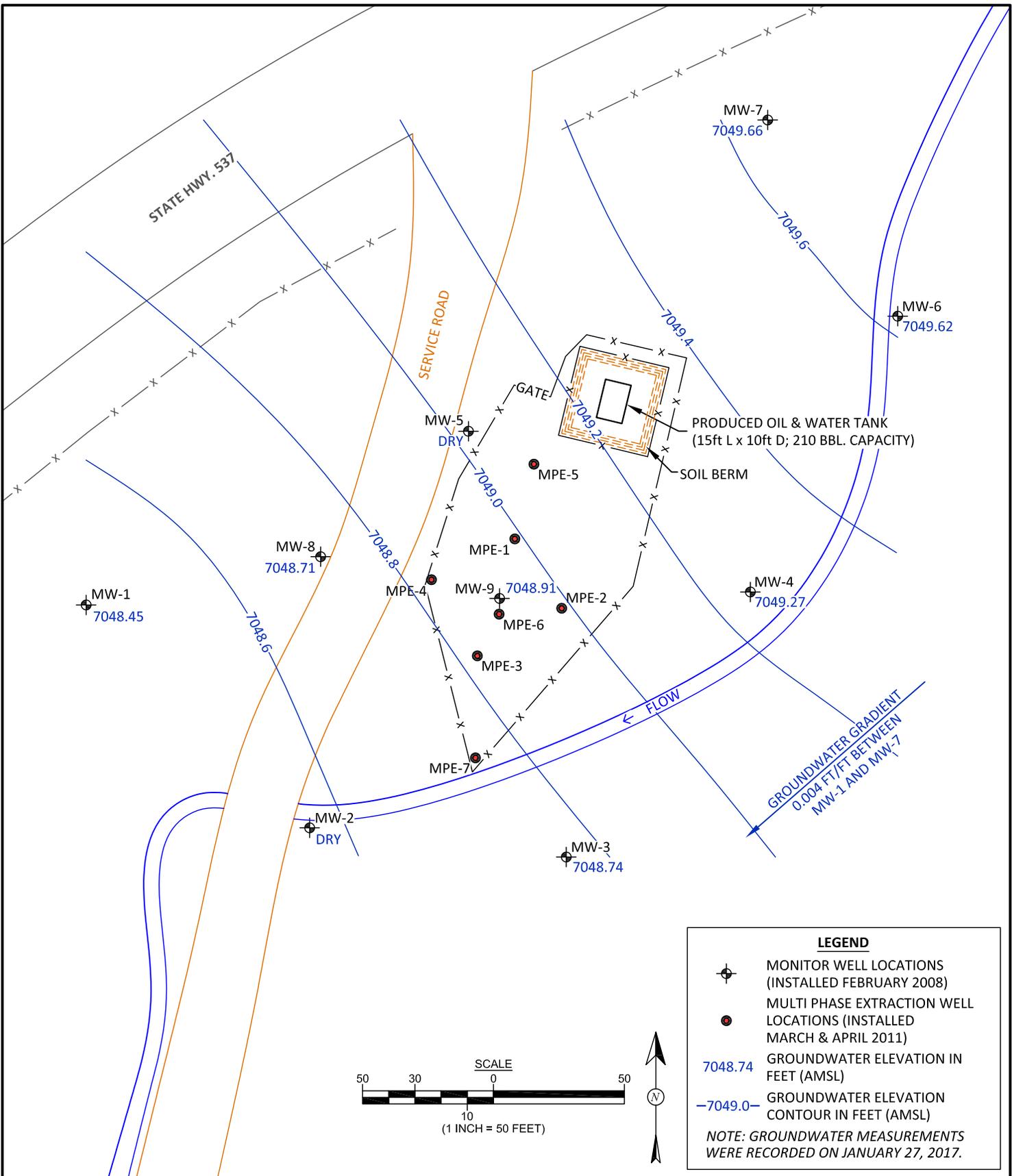
<b>DRAWN BY:</b> S. Glasses	<b>DATE DRAWN:</b> March 3, 2017
<b>REVISIONS BY:</b> S. Glasses	<b>DATE REVISED:</b> March 6, 2017
<b>CHECKED BY:</b> E. McNally	<b>DATE CHECKED:</b> March 6, 2017
<b>APPROVED BY:</b> E. McNally	<b>DATE APPROVED:</b> March 6, 2017

**FIGURE 1**

**TOPOGRAPHIC SITE LOCATION MAP**  
 BMG HIGHWAY 537  
 LLAVES 2008 PIPELINE OIL RELEASE  
 NW¼ NE¼, SECTION 18, T25N, R3W  
 RIO ARRIBA COUNTY, NEW MEXICO  
 N36.40357, W107.18422



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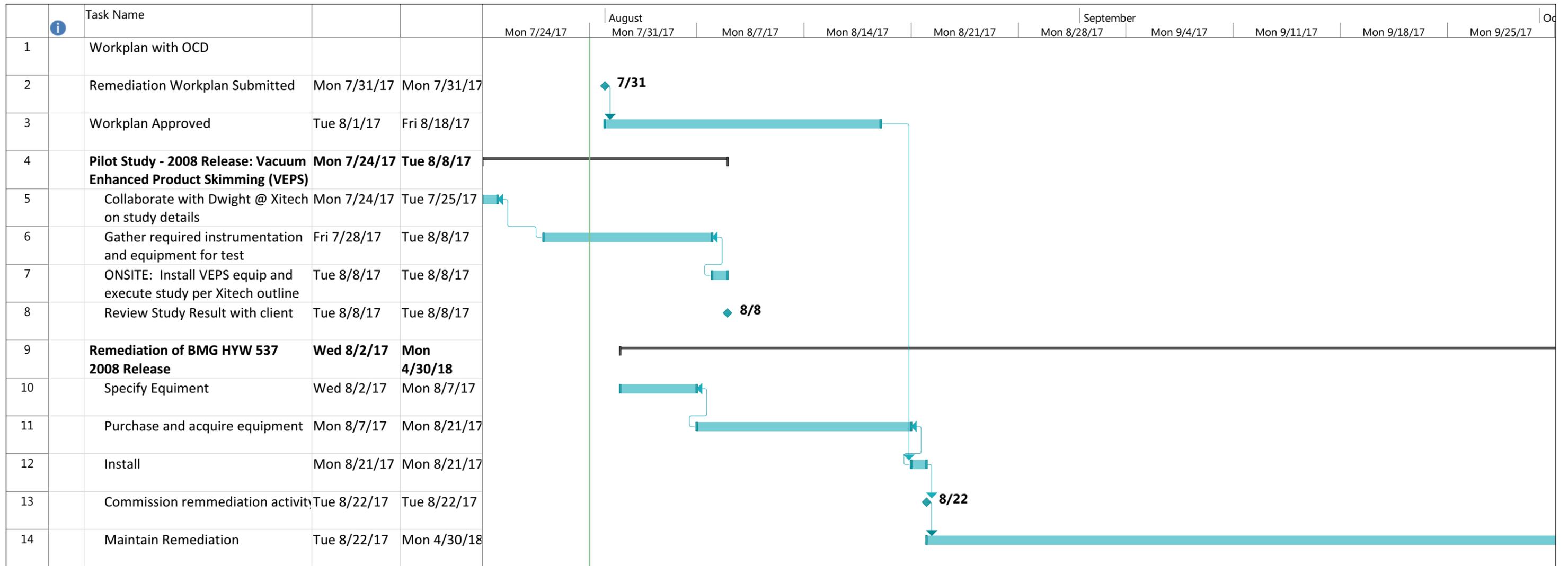
## FIGURE 2C

### GROUNDWATER ELEVATION CONTOURS, JANUARY 2017

BMG HIGHWAY 537  
LLAVES 2008 PIPELINE OIL RELEASE  
NW¼ NE¼, SECTION 18, T25N, R3W  
RIO ARriba COUNTY, NEW MEXICO  
N36.40357, W107.18422

BMG Hwy 537 2008 Release - Remediation Evaluation Matrix, July 31, 2017

	<i>Hand Bailing Recovery</i>	<i>Passive Skimmers</i>	<i>Active Skimmer</i>	<i>Vacuum Enhanced Active Skimmer</i>	<i>High Vacuum RSI MPE</i>
Status	Present Remediation	Available	Available	Available pending pilot study	Available
Period	Quarterly	As scheduled	No Winter	No Winter	No Winter
Readily Available	Yes	Yes	Yes	TBD	Yes
Recovery Effectiveness	Product/Water	Product Only	Product Only	Product Only	Product/Water
Vacuum Assist	No	No	No	Yes, typically 5 to 20 in Hg	Yes, typically >20 in Hg
Manpower Requirement	Completely manual, infrequent	Labor Intensive	Low	Low	Labor Intensive
Complexity	Basic	Basic	Automated, avg. to high	Automated, avg. to high	Tends to be high
Utilities Needed	None	None	Propane or Electric	Propane or Electric	Propane or Natl Gas
Installation Cost	--	Low	Low to Mod	Low to Mod	Mod to High
Maintenance Cost	--	Low	Low to Mod	Low to Mod	High



Project: BMG HWY 537 2008 Re Date: Mon 7/31/17	Task		Project Summary		Manual Task		Start-only		Deadline	
	Split		Inactive Task		Duration-only		Finish-only		Progress	
	Milestone		Inactive Milestone		Manual Summary Rollup		External Tasks		Manual Progress	
	Summary		Inactive Summary		Manual Summary		External Milestone			