Golder Associates

August 10, 2015

Project Number: 140-4221

Celestine Ngam
New Mexico Environment Department
Petroleum Storage Tank Bureau
2905 Rodeo Park Drive E., Bldg. 1
Santa Fe, NM 87505

RE: NOTICE OF COMPLETION OF DELIVERABLE ID 17138-3; COMPLETION OF DPE WELL PILOT TEST, LOVINGTON 66, LOVINGTON, NEW MEXICO

FACILITY #: 1489 RELEASE ID#: 1182 WPID#: 17138

Dear Mr. Ngam:

I am transmitting this letter to advise you that Golder has completed the task associated with Deliverable Identification number 17138-3, which included pilot testing a DPE well (DPE-1) at the above referenced site. Proposed equipment and tasks were set forth in our May 7, 2014 workplan.

The pilot well test was completed by AcuVac Remediation, LLC (AcuVac) out of Houston, Texas on July 12 and July 13, 2015. Figure 1 is a map showing the locations of the tested wells and summary results of testing. Attachment A includes photos detailing the specific equipment used and the overall layout of the test. Attachment B includes copies of the raw data and interpretations of the multiphase pilot testing prepared by AcuVac. The tests included an extended (8.6 hour) variable flow rate test of the MPE pilot test well (A-1), an extended constant flow rate test of Well A-1 (6 hours) and short-duration (1 hour) tests of wells W-1 and W-2. Gasoline recovered as LNAPL and vapor mass during the combined testing (16.6 hours, total combined test time) was approximately 229.5 gallons.

The NMED-PSTB agency workplan approval sets forth an approved budget of $26,069.48 for this task; we anticipate that we will issue a claim for the full amount upon receipt of your acceptance of deliverable for deliverable identification number 17138-3. If you have any questions regarding this transmittal, please do not hesitate to contact us.

Sincerely,

GOLDER ASSOCIATES INC.

Clay Kilmer
Senior Hydrogeologist

Phillip D. Carrillo
EIT, Civil Engineer

Attachments: Figure 1: Site map showing locations of tested wells and summary MPE test results
Attachment A: Photographic Log
Attachment B: AcuVac Remediation, LLC Report

CK/rj

p:\abq projects\2014 projects\140-4221 walstad pilot testing\deliverables\task 3 - completion and oversight of dpe pilot test and letter report\text\notice of completion - deliverable 17138-3_rev_1.docx

Golder Associates Inc.
5200 Pasadena Avenue N.E., Suite C
Albuquerque, NM 87113 USA
Tel: (505) 821-3043 Fax: (505) 821-5273 www.golder.com

Golder Associates

RECEIVED
AUG 12 2015
NMED
PETROLEUM STORAGE TANK BUREAU

TRANSMITTAL

Date: August 11, 2015

Project No.: 140-4221.3

To: Mr. Celestine Ngam

Company: NMED-PSTB

From: Clay Kilmer, Sr Hydrogeologist

Address: 2905 Rodeo Park Drive E, Bldg. 1
Santa Fe, NM 87505

cc: Mr. Robert C. Murrell
2317 Tuttington Circle,
Oklahoma, OK 73170
(one copy)

Email: CKilmer@golder.com

RE: **LOVINGTON 66 STATION, PSTB FACILITY #1489, DELIVERABLE ID 17138-3**

☒ Federal Express (priority, standard, **2-day**, 3-day)
☐ UPS
☐ DHL
☐ Email _____

☐ U.S. Mail
☐ Courier
☐ Hand Delivery
☐ Other _____

Quantity	Item	Description
1	Notice of Completion of DPE Well Pilot Test	Deliverable ID 17138-3, dated August 10, 2015

Notes:
Please call me if you have any questions or concerns at 505-821-3043.

Thank you,

Clay Kilmer

Please advise us if enclosures are not as described.

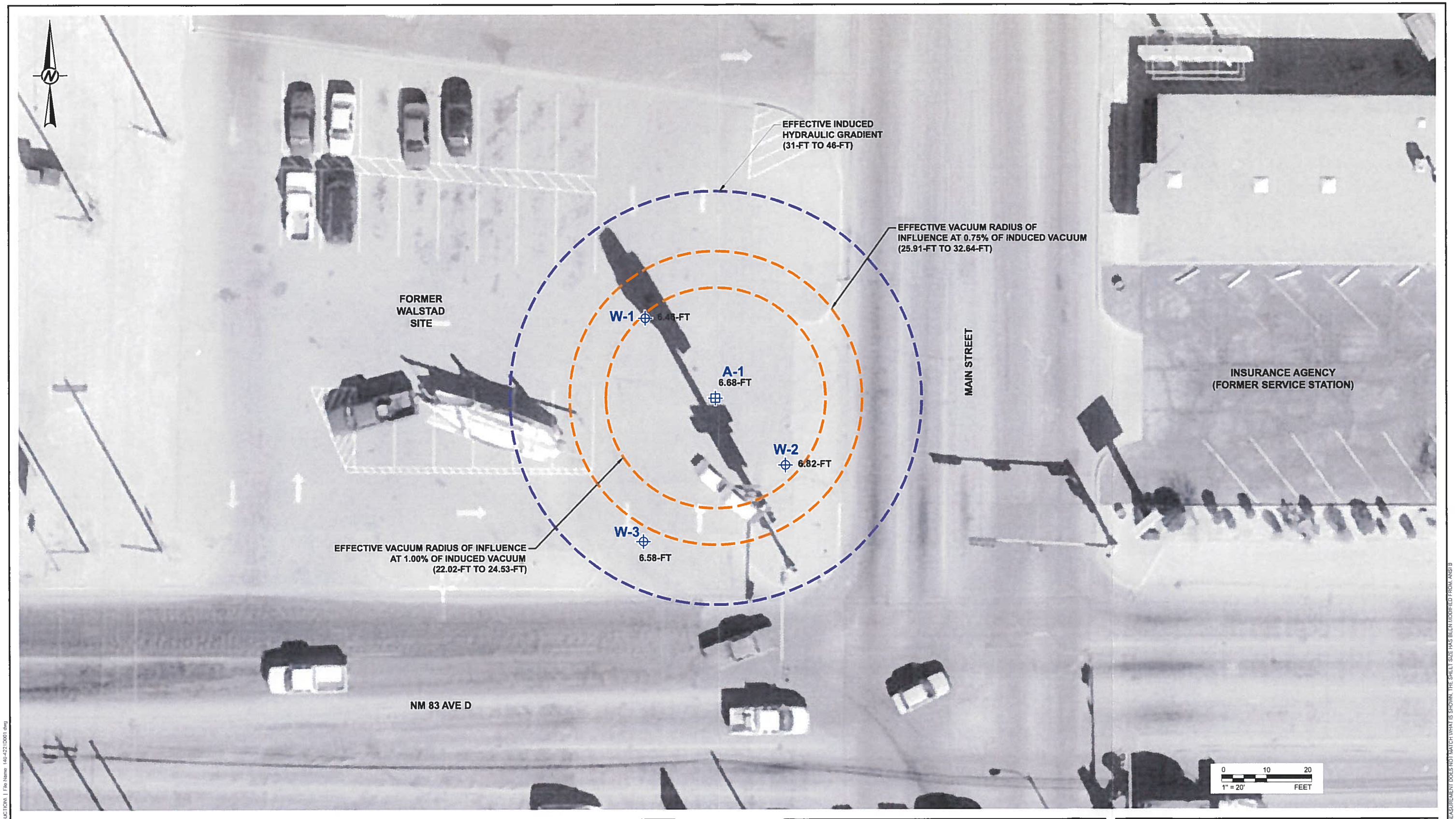
ACKNOWLEDGEMENT REQUIRED:

☐ Yes ☒ No

p:\abq projects\2014 projects\140-4221 walstad pilot testing\deliverables\task 3 - completion and oversight of dpe pilot test and letter report\submittal\transmittal letter nmed.docx

Golder Associates Inc.
5200 Pasadena Avenue N.E., Suite C
Albuquerque, NM 87113 USA
Tel: (505) 821-3043 Fax: (505) 821-5273 www.golder.com

FIGURE



LEGEND

- W-2 / 6.82-FT — EXISTING MONITORING WELL WITH NAPL THICKNESS (FT)
- A-1 / 6.68-FT — DUAL PHASE EXTRACTION WELL WITH NAPL THICKNESS (FT)
- EFFECTIVE INDUCED HYDRAULIC GRADIENT
- EFFECTIVE VACUUM RADIUS OF INFLUENCE

CLIENT
NEW MEXICO ENVIRONMENT DEPARTMENT
PETROLEUM STORAGE TANK BUREAU
SANTA FE, NEW MEXICO

CONSULTANT
Golder Associates

YYYY.MM.DD	2015-07-22
DESIGNED	PDC
PREPARED	PDC
REVIEWED	CLK
APPROVED	BN

PROJECT
WALSTAD OIL COMPANY
LOVINGTON 66
LOVINGTON, NEW MEXICO

TITLE
DPE-1 PILOT TEST

PROJECT NO	TASK	REV	FIGURE
140-4221	4	0	1

IF THIS MEASUREMENT DOES NOT MATCH WHAT IS SHOWN, THE SHEET SIZE HAS BEEN MODIFIED FROM: ANSI B

Path: \\albuquerque\Cad\2014 Projects\140422110PRODUCTION\ | File Name: 140-42210001.dwg

Attachment A: Photographic Log

PHOTO 1 AcuVac Inc. arrives on set with their rig setup. 2015-07-12	
PHOTO 2 The rig from AcuVac for producing the vacuum and oxidizing vapor contamination during the test. 2015-07-12	

PHOTO 3 The pilot test was focused on DPE-1. 2015-07-13	
PHOTO 4 W-1, W-2, & W-3 were used for monitoring during the test. Pictured is W-1. 2015-07-12	

PHOTO 5 W-2 is shown. 2015-07-12	
PHOTO 6 W-3 is shown. 2015-07-12	

PHOTO 7 AcuVac Inc. installing the apparatus for testing. 2015-07-12	
PHOTO 8 The testing setup is shown with the vacuum hose and flowmeter attached to DPE-1. 2015-07-12	

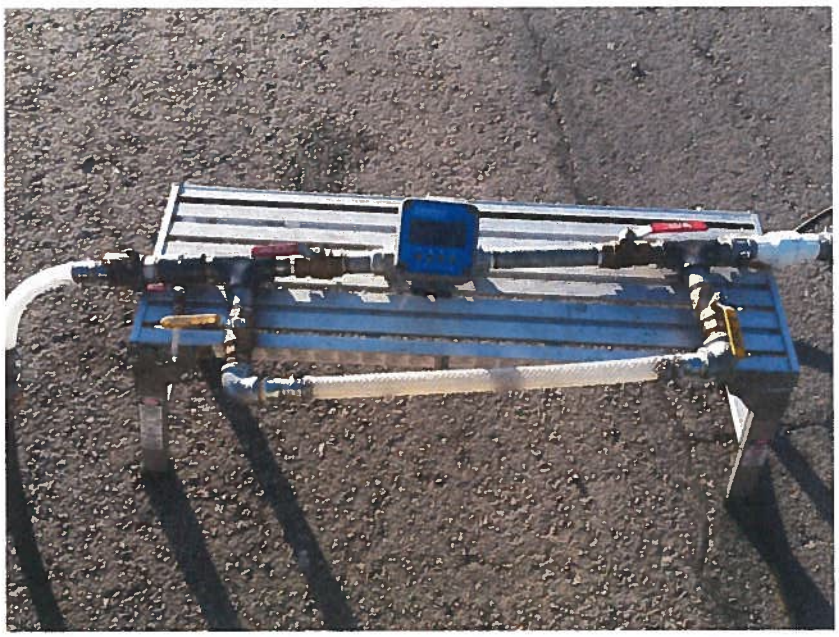
PHOTO 9 The rig was used to create the vacuum for the test and oxidize vapor contamination. 2015-07-12	
PHOTO 10 The pump test apparatus provided sight on water quality and a sampling port for collecting lab specimens. 2015-07-13	

PHOTO 11 The flow meter read flow rate and total gallons pumped. 2015-07-13	
PHOTO 12 A clear portion of the outlet hose shows the condition of water being pumped. 2015-07-13	

PHOTO 13 AcuVac periodically collected water samples to gauge NAPL content. 2015-07-13	
PHOTO 14 Bio-fouling material was observed during the pilot test on day two. 2015-07-13	

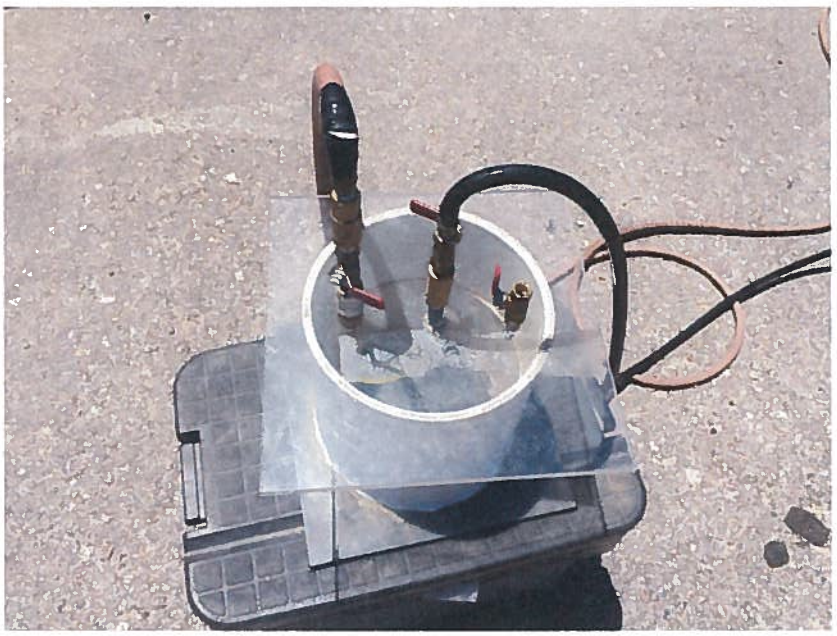
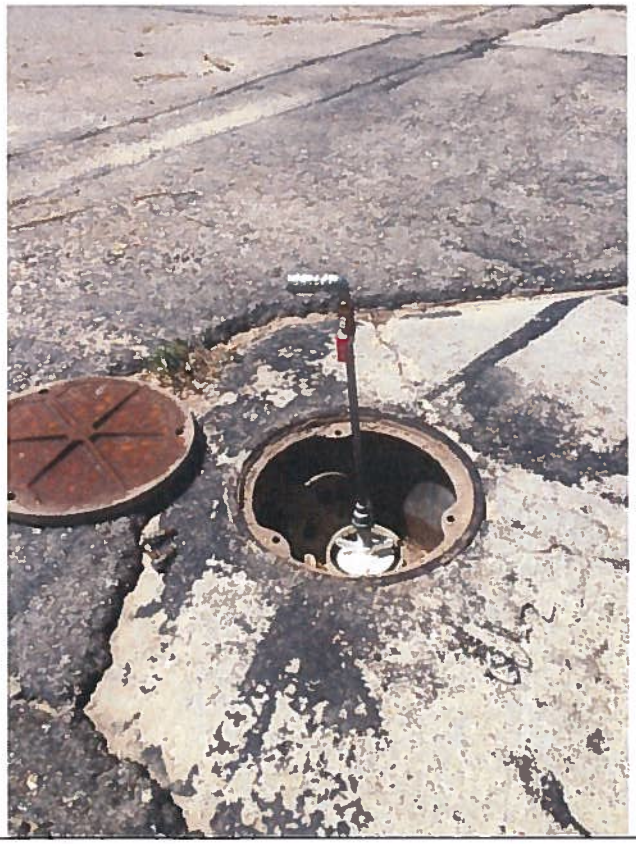
PHOTO 15 The testing apparatus for collecting air monitoring samples as well as the sample submitted for lab testing. 2015-07-12	
PHOTO 16 AcuVac checked the vacuum induced in the surrounding wells with a digital manometer. W-1 shown. 2015-07-12	

PHOTO 17 AcuVac checked the vacuum induced in the surrounding wells with a digital manometer. W-2 shown. 2015-07-12	
PHOTO 18 All produced water was containerized by Gandy in a tanker truck and sent off-site for proper disposal. 2015-07-12	

ATTACHMENT B

ACUVAC REMEDIATION, LLC REPORT

AcuVac Remediation, LLC

1656-H Townhurst, Houston, Texas 77043
713.468.6688 • www.acuvac.com

July 15, 2015

Mr. Clay Kilmer:
Senior Hydrogeologist
Golder Associates, Inc.
5200 Pasadena Avenue N.E. Suite C
Albuquerque, NM 87113

Dear Clay:

Re: Walstadd 66, Lovington, NM

At your request, we performed one Mobile Dual Phase (MDP) Pilot Test on July 12, 2015 at the above referenced sites. An Engineer and an Environmental Specialist, with over 14,500 hours of on-site testing, conducted the Pilot Test. The total MDP test time, including static data time, was 8.6 hours. The contaminant was weathered gasoline.

OBJECTIVES

The Objectives of an MDP Pilot Test are to:

- Evaluate the potential for removing liquid and vapor LNAPL and contaminated groundwater (GW) from soils in the subsurface formations.
- Expose the capillary fringe area and below to induced soil vacuum extraction (SVE) in the extraction well (EW).
- With induced vacuums, increase the GW specific yields. Stress the GW System and monitor its response.
- Maintain a near constant GW depression in the EW.
- Create an induced hydraulic gradient (IHG) to gain hydraulic control of the area.
- Record GW depression and pump rates to accomplish the above objectives.

The purpose of the EW induced vacuum variable rate test is to define the pressure/flow characteristics of sub-surface soils around the EW and to estimate potential conditions for an operational Dual Phase System. Starting a test with lower variable rates of vacuum and flow allows the EW and outer wells sufficient time to adjust and stabilize and minimizes the risk of developing preferential paths. This will also assist the development of newly installed extraction wells.

METHODS AND EQUIPMENT

The tests were conducted using AcuVac's I-6 System, with Roots RAI-33 and RAI-22 blowers, various instrumentation, including the HORIBA® Analyzer, Solinst Interface Probes, Lumidor O_2 Meter, vapor flow gauges, liquid volume/flow meter, a sensitive instrument to determine barometric pressure, V-1 vacuum box to capture non-diluted vapor samples, Redi-Flo 2 total fluids (TF) pump and other special equipment. The vacuum extraction portion of the AcuVac System consists of a vacuum pump driven by an internal combustion (IC) engine. The vacuum pump is connected to the extraction well and the vacuum created on the extraction well causes light hydrocarbons in the soil and on the GW to volatilize and flow through a moisture knockout tank, to the vacuum pump and the IC engine where they are burned as part of the normal combustion process. Propane is used as auxiliary fuel to help power the engine if the well vapors do not provide the required BTU.

The GW Extraction is provided by an in-well, Redi-Flo 2 total fluids pump that has the discharge line connected to a total volume meter. The discharge line from the volume meter is then connected to the stand-by tank truck. The electrical power for the GW pump was supplied from a 120v Honda generator. The GW flow rate can be adjusted to maintain a target level. Interface meters are used to measure Depth to Groundwater (DTGW)/Depth to Light Non-Aqueous Petroleum Liquids (DTLNAPL).

The AcuVac IC engine is fully loaded for maximum power that is necessary to achieve and maintain high induced vacuums and/or high well vapor flows required to maximize the vacuum SVE Radius of Influence (ROI) for Pilot Tests and short term Event remediation. The lower part of the IC engine is encased with a liquid collection pan designed to catch any oil drips or liquid leaks if it should occur.

Emissions from the engine are passed through three catalytic converters to ensure maximum destruction of removed hydrocarbon vapors. The engine's fuel to air ratio can be adjusted to maintain efficient combustion. Because the engine is the power source for all IC engine driven equipment, all systems stop when the engine stops. This eliminates any uncontrolled release of hydrocarbons. Since the AcuVac System is held entirely under vacuum, any leaks in the seals or connections are leaked into the System and not emitted into the atmosphere. The engine is automatically shut down by vacuum loss, low oil pressure or overheating.

The design of the AcuVac System enables complete independent control of both the Induced Well Vacuum and the GW pumping functions such that the AcuVac System operator can control the IHG to expose the maximum amount of the formation to SVE. The ability to separate the induced vacuum and liquid flows within the EW improves the LNAPL recovery rates, and enables the test data to be recorded independently. All the systems are properly grounded to eliminate any static electrical charge.

PROJECT SCOPE AND PROCEDURES

- Gauge the DTGW and DTLNAPL in the EW.
- Calculate the Hydro-equivalent in the EW.
- Determine the appropriate placement for the GW pump inlet.

- Calculate the GW depression necessary to gain hydraulic control of the area.
- Record the distances from the selected EW to the outer wells.
- Install the GW pump into the EW (A-1).
- Connect the ground wires for the AcuVac System and Honda generator.
- Set pump and data probe at the selected depth from TOC.
- Connect discharge hoses to liquid volume meter and then connect to the on-site tank truck.
- Connect the AcuVac System to the selected EW manifold and seal the selected outer observation wells with plugs designed to accept magnehelic gauges or digital manometers.
- Record the static well data, DTGW/DTLNAPL, well size, TD, screen intervals and then apply EW induced vacuum. Record the vacuum and well flow, all System data (including fuel flow of propane), temperature and barometric pressure.
- The test procedures are to provide variable rates of induced vacuum and GW pumping rates over the test period.
- Start the GW pump and set at proper flow rate to achieve the selected GW drawdown.
- Monitor the GW pump and adjust the flow to maintain the selected GW drawdown.
- Record pump flow rate and total liquid volume.
- Collect GW/LNAPL samples in a 2,000 ml beaker to determine the percentage of LNAPL in the recovered liquid volume.
- Install and observe the digital manometer on the outer observation wells to determine if the selected EW induced vacuum is in vacuum communication with the outer observation wells.
- Gauge the outer wells to determine the GW drawdown.
- Record the data at a selected interval of time.
- Operate the AcuVac System in such a manner that all well vapors are passed through the engine and catalytic converters, to destruct the contaminants and exhausted, to meet air emission standards. Comply with all security and safety regulations.
- Complete the tests by providing a report consisting of operating and analytical data, projection of SVE radius of influence (ROI), the IHG ROI and the collected volumes of GW and LNAPL.

CONDITIONS AFFECTING PILOT TESTS

- Generally, a decreasing barometric pressure results in increased well pressures (decreased vacuums) on those wells plugged and sealed at the TOC, while an increasing barometric pressure results in increased well vacuums. This is the function of GW levels increasing and decreasing. **There are many variables that can affect Pilot Test data, but barometric pressure fluctuations have the most immediate and profound effect.** This assumes that SVE short-circuiting is not a factor.
- To offset the induced vacuum/pressure as a result of GW depression or upwelling in the outer monitoring wells, the wells are vented periodically to atmosphere and then re-plugged prior to recording data at select intervals. The potential for increased vacuum or pressure as a result of in/decreasing GW levels will be minimized. GW depression surrounding an outer observation well will result in an induced vacuum not associated with the induced vacuum created in the EW. Likewise, GW mounding will create the opposite effect creating well pressures.

TEST #MDP-1
WALSTADD 66
LOVINGTON, NM
JULY 12, 2015

PRE-TEST FUNCTIONS - PILOT TEST #MDP-1

Prior to starting the MDP test with GW Extraction, all systems were checked for normal and safe operation. The DTGW/DTLNAPL, barometric and absolute pressure and ambient air temperature were recorded. The hydro equivalent (HE) was calculated. Based upon the HE, the GW pump inlet was set at 65 ft below the top of the well casing. The pump hose was then connected to the total volume meter. The discharge hose was connected to the on-site 3,000 gal liquid collection tank truck. Each magnehelic gauge was checked and calibrated to zero. The outer monitoring wells were plugged with expandable well plugs designed to accept a digital manometer. Static well data and the atmospheric effect on the outer wells were recorded prior to engaging the AcuVac System. The propane tank fuel level was recorded so that accurate fuel consumption could be estimated for the total test period. All safety checks were performed on the Systems. (See list of Attached Schedules and Figures, Page 11.)

DISCUSSION OF DATA - TEST #MDP-1

Test #MDP-1, with vacuum and GW/LNAPL extraction, was an 8.6 hour MDP test including static well data, conducted from well A-1 as the EW. Immediately prior to starting the test, the selected outer monitoring wells were recording zero vacuums. The general weather conditions were clear and cool. At the start of the MDP test, the EW induced vacuum was set at 40"H_2O, with an initial well vapor flow of 12.19 scfm. The data probe static reading was 7.5 ft, immediately decreasing to 2.0 ft when the GW pump was engaged. Based upon the data probe, it was determined that a constant drawdown creating a GW depression (GWD) of approximately 5.5 ft below HE static level would be appropriate for this test (see Table #1A). The initial GW pump rate was set at 3.5 gpm to achieve the selected GWD and then remained constant for 2.0 hours. The GWD and related GW pump rate are monitored constantly throughout the test and recorded every 30 minutes. Table #1A summarizes the GWD, GW pump rate and the drawdown in the EW and Table #1B summarizes the GWD in the outer observation wells.

During the first 2.0 hours of the test, the EW induced vacuum remained constant at 40"H_2O with a well vapor flow of 12.19 scfm. Outer well W-2, which is located 16.2 ft from the EW, immediately recorded a well vacuum increasing from 0 to 0.07"H_2O and continued on an increasing trend during the test period to 0.88"H_2O. Outer wells W-1 and W-3 which are located 25.8 and 38.3 ft from the EW, recorded a slight increasing vacuum level and then continued on a slight increasing vacuum trend to 0.36 and 0.17"H_2O. The ambient air temperature increased from 72.4 to 79.6°F and the barometric pressure was mostly steady at 30.10"Hg. The GW depression averaged 5.5 ft below static level. The total collected liquid volume was 420 gals and **38.9 gals of liquid LNAPL were observed on the collected GW**.

EXTRACTION WELL A-1
OPERATING DATA TEST #MDP-1
Table #1A

Location: Walstadd 66, Lovington, NM						
Project Date 07/12/2015			**A-1 DTGW ft**	**GWD ft**	**EW GWR gpm**	**Total Volume gal**	**EW Vacuum "H_2O**
Well Data							
TD			75.0	-	-	-	-
Screen			45.0-75.0	-	-	-	-
Well Size			4.0	-	-	-	-
DTGW	0715	hrs	64.08	-	-	-	-
DTGW Hydro Equivalent			59.14	-	-	-	-
DTLNAPL	0715	hrs	57.40	-	-	-	-
LNAPL	0715	hrs	6.68	-	-	-	-
Drawdown Data							
Data Probe	0730	hrs	Start	7.50	-	-	-	-
Data Probe	0800	hrs		2.00	-5.50	3.50	105	40
Data Probe	0830	hrs		2.00	-5.50	3.50	210	40
Data Probe	0900	hrs		2.00	-5.50	3.50	315	40
Data Probe	0930	hrs		2.00	-5.50	3.50	420	40
Data Probe	1000	hrs		2.00	-5.50	4.30	549	60
Data Probe	1030	hrs		2.00	-5.50	4.30	678	60
Data Probe	1100	hrs		2.00	-5.50	4.30	807	60
Data Probe	1130	hrs		2.00	-5.50	4.30	936	60
Data Probe	1200	hrs		2.00	-5.50	4.30	1065	60
Data Probe	1230	hrs		2.00	-5.50	4.30	1194	60
Data Probe	1300	hrs		2.00	-5.50	4.30	1323	60
Data Probe	1330	hrs		2.00	-5.50	4.60	1460	75
Data Probe	1400	hrs		2.00	-5.50	4.60	1598	75
Data Probe	1430	hrs		2.00	-5.50	4.60	1736	75
Data Probe	1500	hrs		2.00	-5.50	5.20	1892	90
Data Probe	1530	hrs	Stop	2.00	-5.50	5.20	2048	90
Data Probe	1600	hrs	Static	7.46	-0.04	0.00	-	-
DTGW	1600	hrs		61.65	-	-	-	-
DTGW Hydro Equivalent				61.64	-	-	-	-
DTLNAPL	1600	hrs		61.61	-	-	-	-
LNAPL	1600	hrs		0.04	-	-	-	-
Average GW Depression				-	-5.50	-	-	-

OBSERVATION WELLS
INDUCED HYDRAULIC GRADIENT DATA
TEST #MDP-1
TABLE #1B

Location: Walstadd 66, Lovington, NM							
Project Date 07/12/2015	**W-2**		**W-1**		**W-3**		
Well Data							
TD ft	75.0		80.0		75.0		
Screen ft	50.0 - 70.0		50.0 - 70.0		50.0 - 70.0		
Well Size in	4.0		4.0		4.0		
	DTGW ft	**Change in GWD ft**	**DTGW ft**	**Change in GWD ft**	**DTGW ft**	**Change in GWD ft**	**GW Pump Rate gpm**
Static/Start Data							
DTGW 0730 hrs ft	63.92		64.62		63.81		3.50
DTGW Hydro Equivalent ft	58.87	0	59.84	0	58.94	0	
DTLNAPL 0730 hrs ft	57.10		58.16		57.23		
LNAPL 0730 hrs ft	6.82		6.46		6.58		
Drawdown Data							
DTGW 1030 hrs ft	64.13		64.82		63.87		4.30
DTGW Hydro Equivalent ft	58.99	-0.11	59.91	-0.07	58.97	-0.03	
DTLNAPL 1030 hrs ft	57.18		58.19		57.25		
LNAPL 1030 hrs ft	6.95		6.63		6.62		
Drawdown Data							
DTGW 1330 hrs ft	64.81		65.28		64.08		4.60
DTGW Hydro Equivalent ft	59.46	-0.59	60.16	-0.32	59.14	-0.20	
DTLNAPL 1330 hrs ft	57.58		58.36		57.41		
LNAPL 1330 hrs ft	7.23		6.92		6.67		
Drawdown Data							
DTGW 1530 hrs ft	64.91		65.38		64.21		5.20
DTGW Hydro Equivalent ft	59.53	-0.66	60.21	-0.37	59.18	-0.24	
DTLNAPL 1530 hrs ft	57.64		58.39		57.41		
LNAPL 1530 hrs ft	7.27		6.99		6.80		
Maximum Drawdown ft		-0.66		-0.37		-0.24	
Distance From EW	16.2		25.8		38.3		

Specific Gravity .74

HORIBA® analytical data indicated the two influent vapor samples taken from the EW had HC concentrations of 76,990 and 74,020 ppmv, with CO_2 at 4.72 and 5.12%, CO at 3.82 and 3.09%, O_2 at 6.8 and 6.1% and H_2S at 0 ppm. The propane flow to the IC engine averaged 0 cfh, with a well flow of 12.19 scfm. The influent vapors were supplying 100% of the IC engine required fuel. The HC levels were within the mid to high range normally found in soil gas samples collected from an area contaminated with weathered gasoline.

At test hour 2.0, the test continued with the induced vacuum increased to 60"H_2O and a well flow of 19.88 scfm. The test period was 3.5 hours with the EW induced vacuum and well flow remaining steady. Outer well W-2 continued on an increasing vacuum trend to 1.14"H_2O in response to the EW vacuum increase and then developed a slight decreasing trend when the barometric pressure decreased. Outer wells W-1 and W-3 recorded an increased vacuum trend to 0.43 and 0.15"H_2O and then decreased to 0.38 and 0.12"H_2O. The GW pump rate increased to 4.30 gpm and remained steady during this test period. The collected volume was 903 gals which brings the total to 1,323 gals, with a GW depression average of 5.5 ft. The ambient air temperature increased to 91.8°F and the barometric pressure decreased from 30.10 to 30.07"Hg. The influent vapor temperature increased to 71°F. **A total LNAPL volume of 14.4 gals was observed on the collected GW.**

Additional HORIBA® analytical data indicated the influent vapor samples recorded HC levels of 71,750, 68,490 and 61,890 ppmv, with CO_2 at 4.60, 5.24 and 5.12%, CO at 2.37, 2.55 and 1.88%, O_2 at 5.8, 6.4 and 8.3% and H_2S at 0 ppm. The influent vapors continued to supply 100% of the IC engine's fuel and the TPH levels continued to be within the range of weathered gasoline vapors.

At test hour 5.5, the test continued with the induced vacuum increased to 75"H_2O, and a vapor well flow of 21.34 scfm. The test period was 1.5 hours with the EW vacuum and well flow remaining steady. The outer observation wells, W-2, W-1 and W-3, immediately recorded increased vacuum levels for 1.0 hour, and then developed a decreasing trend as the barometric pressure continued to decrease. This is an excellent example of the effect of barometric pressure oscillations on the vacuum/pressures observed on the outer observation wells. The average GW drawdown in the EW was 5.5 ft. A drawdown of 0.59 ft was recorded in W-2, 0.32 ft in W-1 and 0.2 ft in W-3. The GW pump rate averaged 4.60 gpm with a collected volume 413 gals. The total collected volume increased to 1,736 gals and **7.6 gals of liquid LNAPL was observed on the GW.** The ambient air temperature increased from 91.8 to 93.3°F and the barometric pressure decreased from 30.07 to 30.04"Hg.

Additional HORIBA® analytical data indicated the influent vapor samples recorded a HC level of 61,720 ppmv, with CO_2 at 5.20%, CO at 1.75%, O_2 at 8.7% and H_2S at 0 ppmv. The influent vapors continued to supply 100% of the IC engine's fuel. Although the HORIBA® Analyzer has been proven to be reasonably accurate compared to laboratory analysis of influent vapors, projections should be based on analytical results from a Certified Testing Laboratory qualified to conduct tests on air emission samples.

At test hour 7.0, the test continued with the induced vacuum increased to 90"H_2O and a vapor well flow of 27.95 scfm. The test period was 1.0 hour with the EW vacuum and well flow remaining steady. Outer observation well W-2 recorded an increased vacuum level from 1.10 to 1.23"H_2O and continued to increase to 1.54"H_2O during the test period. Outer well W-1 recorded an increasing vacuum ranging from 0.37 to a maximum of 0.60"H_2O and well W-3 recorded an increase from 0.09 to 0.20"H_2O. The average GW drawdown in the EW was 5.5 ft. A maximum drawdown of 0.66 ft was recorded in W-2, 0.37 ft in W-1 and 0.24 ft in W-3. This was the maximum recorded drawdown before any required well vacuum adjustments resulting from the decreasing barometric pressure. The GW pump rate averaged 5.2 gpm with a collected volume of 312 gals. The total collected volume increased to 2,048 gals and **6.2 gals of liquid LNAPL was observed on the GW.** The ambient air temperature increased from 95.3 to 96.1°F and the barometric pressure decreased from 30.04 to 30.02"Hg.

Immediately before the conclusion of this test period, the outer observation wells were gauged. The gauging data is included on Table #1B.

RADIUS OF INFLUENCE & INDUCED HYDRAULIC GRADIENT

Figure #1A indicates that the effective vacuum radius of influence from Test #MDP-1 with groundwater extraction (GWE) would be from 25.91 to 32.64 ft, with extraction well flow of 22.0 to 24.0 scfm and extraction well vacuum in the 80 to 85"H_2O range. An approximation of the radius of influence may be obtained by determining the point at which the measured vacuum is **0.50 to 0.70"H_2O.** It is assumed that beyond the lower point, the pressure gradient (driving force) is negligible to effectively transport vaporized contaminants to the extraction well. **Under continuous operation, vacuum and radius of influence will most likely continue to increase horizontally and vertically.**

Figure #1B indicates that the effective vacuum radius of influence from Test #MDP-1 with groundwater extraction (GWE) would be from 22.02 to 24.53 ft, with extraction well flow of 22.0 to 24.0 scfm and extraction well vacuum in the 80 to 85"H_2O range. An approximation of the radius of influence may be obtained by determining the point at which the measured vacuum is **0.75 to 0.85"H_2O or approximately 1.0% of the EW induced vacuum.** It is assumed that beyond the lower point, the pressure gradient (driving force) is negligible to effectively transport vaporized contaminants to the extraction well. **Under continuous operation, vacuum and radius of influence will most likely continue to increase horizontally and vertically.**

Figure #2 indicates that the effective induced hydraulic gradient from Test #MDP-1 with vacuum and groundwater extraction would be greater than approximately 31.0 ft, with a pump rate of 4.0 to 4.3 gpm. An approximation of the radius of influence may be obtained by determining the point at which the measured GW level effect on the outer wells is greater than 0.30 ft. At the point at which the measured GW level effect on the outer wells is greater than 0.20 ft, **the effective induced hydraulic gradient with vacuum would be greater than approximately 46 ft. Under continuous operation, the gradient effect of the GW pump rate and depression may cover a larger area.**

The effective vacuum radius of influence is based on calculations and equations using a software program of which data was provided from an extensive database collected by AcuVac over a period of years. Each projection is based on the test data and site parameters, and takes into consideration such variables as barometric pressure oscillations and gauge error. Although we cannot provide total assurance of accuracy, past experience and results have proven these projections to be well within the acceptable range of accuracy.

PRODUCT RECOVERY

A total liquid volume of 2,048 gals were recovered during the test of which 3.11% or 63.64 gals was liquid gasoline. A calculated volume of 22.63 gals of gasoline contaminant were removed as part of the influent vapors and were burned as IC engine fuel bringing the total gasoline recovery to 86.27 gals or an average of 10.78 gals/hr.

GROUNDWATER RECOVERY

GW recovery was monitored in well A-1 for 30 minutes after the vacuum had ceased. The GW recovery was recorded with the interface meter. In 30 minutes, the recovery for A-1 was equal to 54.5% based on the hydro equivalent.

EMISSION DATA

During this Pilot Test, HORIBA® data indicated that the influent vapors had an average hydrocarbon level (TPH) of 69,142 ppmv. Laboratory analysis of influent vapor samples from previous pilot tests indicated that those vapor samples had a benzene level of approximately 2.0% of the 69,142 ppmv. Using an average well flow of 18.83 scfm from this extended test, **the calculated emissions from <u>one</u> extraction well without vapor treatment were as follows:**

HC	=	42.5 lbs/day	=	17.7 lbs/hr
Benzene	=	8.5 lbs/day	=	0.35 lbs/hr

ADDITIONAL INFORMATION

The HORIBA® analytical instrument is calibrated with Hexane and CO_2. One sample was collected for laboratory analysis.

The formula used to calculate the emission rate is:

$$ER = HC\ (ppmv) \times MW\ (Hexane) \times Flow\ Rate\ (scfm) \times 1.58E^{-7} \frac{(min)(lb\ mole)}{(hr)(ppmv)(ft^3)} = lbs/hr$$

To calculate MDP well placement, the equation we use is as follows:

$L = 2\ ROI\ Cos\ 30°$ (L = distance between wells; ROI = radius of influence)

All other data, including the groundwater depth, well placement, extraction well screened intervals, induced vacuum and vapor well flow and liquid recovery rate, must be considered in the final design for a Corrective Action Plan (CAP).

Static (baseline) data, recorded 0.5 hours after the conclusion of the test, indicates that W-1 was recording a pressure of 0.19"H_2O, W-1 was recording a well pressure of 0.15"H_2O and W-3 was recording a well pressure of 0.17"H_2O. The well pressure was the result of the decreasing barometric pressure.

The test provided excellent data to use in the calculation and projection of an SVE vacuum radius of influence and excellent data to project an induced hydraulic gradient.

CONCLUSION

Pilot Tests are conducted to provide information on short term tests that can be projected into long term remedial plans. These feasibility tests indicated that Mobile Dual Phase Extraction (MDP) with groundwater depression should provide an excellent method of remediation for this facility. Although the observed vacuum of the most distant outer monitoring well was moderately low, the duration of the pilot tests was short compared to continuous operation. **However, the tests results provided excellent data to project that wells W-2, W-1 and W-3 were in vacuum communication with the selected extraction well.** The vacuum radius of influence defines the region within which the vapor in the vadose zone flows to the extraction well under the influence of a vacuum. The radius of influence depends on the soil properties of the vented zone, properties of surrounding soil layers, the depth at which the well is screened, well installation and the presence of any impermeable boundaries such as the water table, clay layers, surface seal, building basements and the presence of such areas as tank pits with backfill and underground utilities. **The induced hydraulic gradient (IHG) defines the region within which a selected GW depression is recorded in the outer monitoring wells.** The IHG depends on the hydraulic properties of the underlying sub-surface, aquifer characteristics and the effect of the induced vacuum on specific yields.

SUMMARY AND OBSERVATIONS - TEST #MDP-1

- Based on the recorded test data, the sub-surface medium is most likely isotropic.
- Due to the age of the contaminant, the recovered gasoline may contain tetraethyl lead.
- An average induced vacuum of 60.3"H_2O was required to produce an average well vapor flow of 18.83 scfm. The ratio of the average EW induced vacuum to the EW well flow was 3.21:1.
- The average well flow per foot of EW well screen was 0.96 scfm with a maximum of 1.42 scfm.
- The GW pump rate was increased to provide a sufficient GW depression when the EW induced vacuum was increased. The average GW pump rate was 4.22 gpm with a maximum of 5.20 gpm.
- During each increase of the induced vacuum, outer observation wells W-2, W-1 and W-3 recorded increased vacuum levels. Additionally, GW drawdown in the observation wells continued to decrease during the test period.

- The average maximum percent of induced vacuum observed in outer observation wells W-2 at 16.2 ft was 1.74-2.30%, W-1 at 25.8 ft was 0.66-0.95% and W-3 was 0.25-0.50%.
- The HC levels recorded during the test period were **within** the range normally associated with soil gas samples taken from an area that is highly saturated with weathered gasoline.
- **The test provided excellent data for the calculation and projection of a vacuum radius of influence, excellent data for the projection of an induced hydraulic gradient and excellent data to support the collection and removal of liquid and vapor phase gasoline with Dual Phase Recovery.**
- **SVE without GW extraction would not be an effective remediation option at this site. The higher vacuums would result in GW upwelling in the EW which may cover the well screen and render the SVE ineffective.**

ATTACHED SCHEDULES AND FIGURES

Schedule A: Summary of Data
Schedule B: Graphic Summary of Data
Figure #1A: Plot of Observed Vacuum vs Distance at the Facility (ROI) at 0.75% of Induced Vacuum
Figure #1B: Plot of Observed Vacuum vs Distance at the Facility (ROI) at 1.00% of Induced Vacuum
Figure #2: Plot of Recorded GW Induced Hydraulic Gradient vs Distance at the Facility (ROI)

Additional Information (this should be read as part of the report):

- Field Operating Data and Notes – Test #MDP-1
- Site Photographs

Once you have reviewed the report, please call me if you have any questions.

Sincerely,
ACUVAC REMEDIATION, LLC

James E. Sadler,
VP Engineering/Environmental

cc: Paul Faucher

Attachment A

Acronyms and Definitions

A	Annulus - the space between the pipes and lines in the extraction well and the outer casing
ACFM	Actual Cubic Feet Per Minute
AI (AS)	Air Injection (Sparging) the mass transfer of O_2 from air to groundwater
BGL	Below Ground Level
BGS	Below Ground Surface
BP	Barometric Pressure (Atmospheric Pressure)
BTOC	Below Top of Casing
CFH	Cubic Feet Per Hour
DNAPL	Dense Non-Aqueous Petroleum Liquid
DPVE	Dual Phase Vacuum Extraction
DTGW	Depth to Groundwater
DTPSH	Depth to Phase Separated Hydrocarbons/NAPL
DT	Drop Tube
EVR	Enhanced Vacuum Recovery, also referred to as SVE/GWD
EW	Extraction Well
GW	Groundwater
GWD	Groundwater Depression
GWE	Groundwater Extraction
GWUP	Groundwater Upwelling
HC	Hydrocarbon Concentration (Petroleum-TPH)
"H_2O	Inches of Water
"Hg	Inches of Mercury
IHG	Induced Hydraulic Gradient
IV	Induced Vacuum, normally from a vacuum pump connected to the extraction well or vapor recovery well
LNAPL	Light Non-Aqueous Petroleum Liquids
MDP	Mobile Dual Phase
NAPL	Non-Aqueous Petroleum Liquids
P	Pressure, the existence of above atmospheric pressure
ROI	Radius of Influence
RPM	Revolutions Per Minute
SCFM	Standard Cubic Feet Per Minute
SVE	Soil Vacuum Extraction
TD	Total Depth
QT	Quick Test, a short duration SVE Test
V	Vacuum, the existence of below atmospheric pressure
VEGE	Vacuum Enhanced Groundwater Extraction
VER	Vacuum Enhanced Recovery
VEW	Vapor Extraction Well
VWF	Vapor Well Flow
WVF	Well Vapor Flow

SCHEDULE A
Test # MDP-1

Walstadd 66
Lovington, NM
July 12, 2015

7/12/2015	DATA ELEMENT						
	Static 7:25	Start 7:30	8:00	8:30	9:00	9:30	10:00
Influent Vapor Data							
Horiba HC ppmv	ND	ND	76,990	ND	74,020	ND	71,750
Horiba CO_2%	ND	ND	4.72	ND	5.12	ND	4.60
Horiba CO%	ND	ND	3.82	ND	3.09	ND	2.37
Lumidor O_2%	ND	ND	6.8	ND	6.1	ND	5.8
Lumidor H_2S ppm	ND	ND	0	ND	0	ND	0
Influent Vapor Temp °F	OFF	69.0	69.0	69.0	69.0	70.0	70.0
Atmospheric Conditions							
Barometric Pressure "Hg	30.10	30.10	30.10	30.09	30.09	30.10	30.09
Absolute Pressure "Hg	26.09	26.09	26.09	26.08	26.08	26.09	26.08
Groundwater Data							
Groundwater Pump Rate (gpm)	OFF	3.50	3.50	3.50	3.50	3.50	4.30
Total Liquid Vol (gal)	0	0	105	210	315	420	549
Extraction Well Data - Well A-1							
Flow SCFM	OFF	12.19	12.19	12.19	12.19	12.19	19.88
Vacuum "H_2O	OFF	40.0	40.0	40.0	40.0	40.0	60.0
Well Vapor Flow SCFM / "H_2O	OFF	0.30	0.30	0.30	0.30	0.30	0.33
Well Vapor Flow SCFM / ft Well Screen	OFF	0.621	0.621	0.621	0.621	0.621	1.013
Observation Well Data - Vacuum "H_2O							
Well W-2 Dist. 16.2 ft	0.00	0.07	0.86	0.88	0.92	0.88	1.07
Well W-1 Dist. 25.8 ft	0.00	0.05	0.31	0.37	0.38	0.36	0.38
Well W-3 Dist. 38.3 ft	0.00	0.02	0.13	0.17	0.20	0.17	0.14

( ) Indicates Well Pressure
ND - No Recorded Data

SCHEDULE A
Test # MDP-1

Walstadd 66
Lovington, NM
July 12, 2015

7/12/2015	DATA ELEMENT						
	10:30	11:00	11:30	12:00	12:30	13:00	13:30
Influent Vapor Data							
Horiba HC ppmv	ND	68,490	ND	ND	ND	61,880	ND
Horiba CO_2%	ND	5.24	ND	ND	ND	5.12	ND
Horiba CO%	ND	2.55	ND	ND	ND	1.88	ND
Lumidor O_2%	ND	6.4	ND	ND	ND	8.3	ND
Lumidor H_2S ppm	ND	0	ND	ND	ND	0	ND
Influent Vapor Temp °F	70.0	70.0	71.0	71.0	71.0	71.0	71.0
Atmospheric Conditions							
Barometric Pressure "Hg	30.09	30.09	30.09	30.08	30.08	30.07	30.06
Absolute Pressure "Hg	26.08	26.08	26.08	26.07	26.08	26.07	26.06
Groundwater Data							
Groundwater Pump Rate (gpm)	4.30	4.30	4.30	4.30	4.30	4.30	4.60
Total Liquid Vol (gal)	678	807	936	1,065	1,194	1,323	1,460
Extraction Well Data - Well A-1							
Flow SCFM	19.88	19.88	19.88	19.88	19.88	19.88	21.34
Vacuum "H_2O	60.0	60.0	60.0	60.0	60.0	60.0	75.0
Well Vapor Flow SCFM / "H_2O	0.33	0.33	0.33	0.33	0.33	0.33	0.28
Well Vapor Flow SCFM / ft Well Screen	1.013	1.013	1.013	1.013	1.013	1.013	1.087
Observation Well Data - Vacuum "H_2O							
Well W-2 Dist. 16.2 ft	1.09	1.14	1.13	1.12	1.13	1.10	1.14
Well W-1 Dist. 25.8 ft	0.42	0.42	0.41	0.42	0.43	0.38	0.43
Well W-3 Dist. 38.3 ft	0.16	0.16	0.15	0.14	0.15	0.12	0.14

( ) Indicates Well Pressure
ND - No Recorded Data

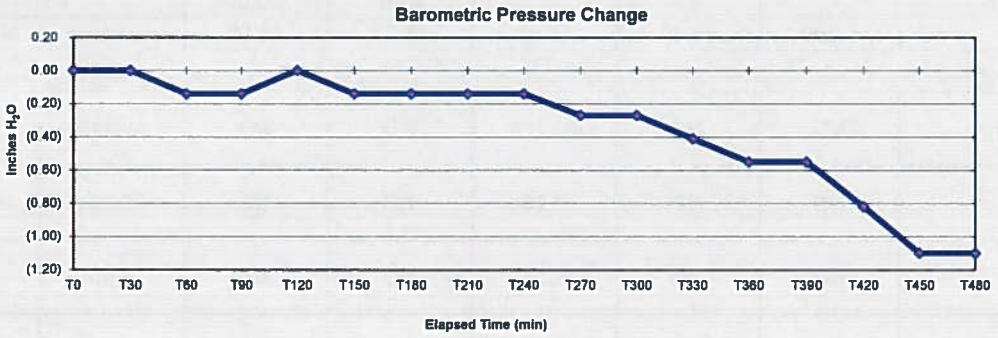
SCHEDULE A
Test # MDP-1

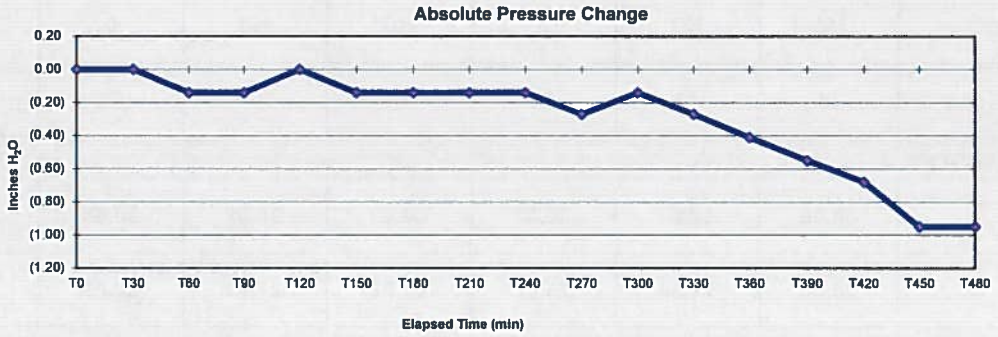
Walstadd 66
Lovington, NM
July 12, 2015

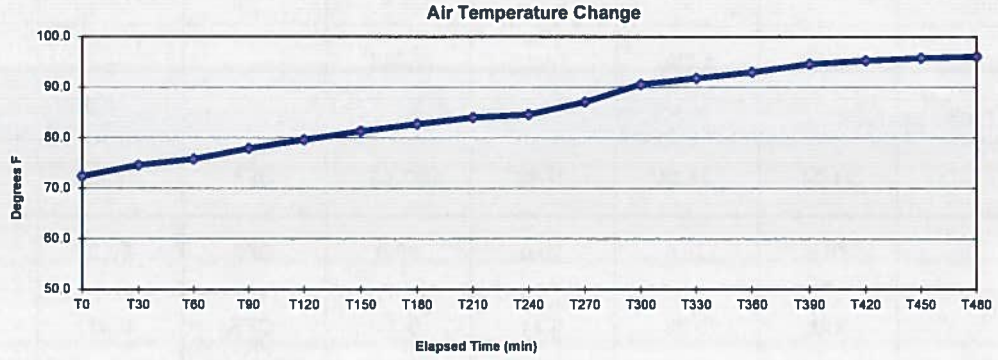
7/12/2015	DATA ELEMENT						
				End	Static	8 Hrs	
	14:00	14:30	15:00	15:30	16:00	Average	Maximum
Influent Vapor Data							
Horiba HC ppmv	ND	ND	61,720	ND	ND	69,142	76,990
Horiba CO_2%	ND	ND	5.20	ND	ND	5.00	5.24
Horiba CO%	ND	ND	1.75	ND	ND	2.58	3.82
Lumidor O_2%	ND	ND	8.7	ND	ND	7.0	8.7
Lumidor H_2S ppm	ND	ND	0	ND	ND	0	0
Influent Vapor Temp °F	71	71	71	72	OFF	70	72
Atmospheric Conditions							
Barometric Pressure "Hg	30.06	30.04	30.02	30.02	30.02	30.08	30.10
Absolute Pressure "Hg	26.05	26.04	26.02	26.02	26.02	26.07	26.09
Groundwater Data							
Groundwater Pump Rate (gpm)	4.60	4.60	5.20	5.20	OFF	4.22	5.20
Total Liquid Vol (gal)	1,598	1,736	1,892	2,048	-	-	-
Extraction Well Data - Well A-1							
Flow SCFM	21.34	21.34	27.95	27.95	OFF	18.83	27.95
Vacuum "H_2O	75.0	75.0	90.0	90.0	OFF	60.3	90.0
Well Vapor Flow SCFM / "H_2O	0.28	0.28	0.31	0.31	OFF	0.31	0.33
Well Vapor Flow SCFM / ft Well Screen	1.087	1.087	1.423	1.423	OFF	0.960	1.420
Observation Well Data - Vacuum "H_2O							
Well W-2 Dist. 16.2 ft	1.14	1.10	1.23	1.54	(0.19)	0.97	1.54
Well W-1 Dist. 25.8 ft	0.43	0.37	0.43	0.60	(0.15)	0.37	0.60
Well W-3 Dist. 38.3 ft	0.14	0.09	0.15	0.20	(0.17)	0.14	0.20

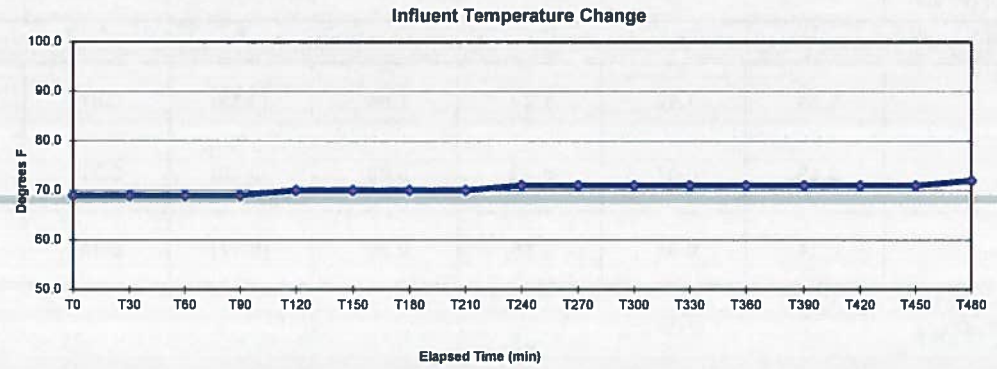
( ) Indicates Well Pressure
ND - No Recorded Data

SCHEDULE B
Summary of TEST # MDP-1
Atmospheric Conditions

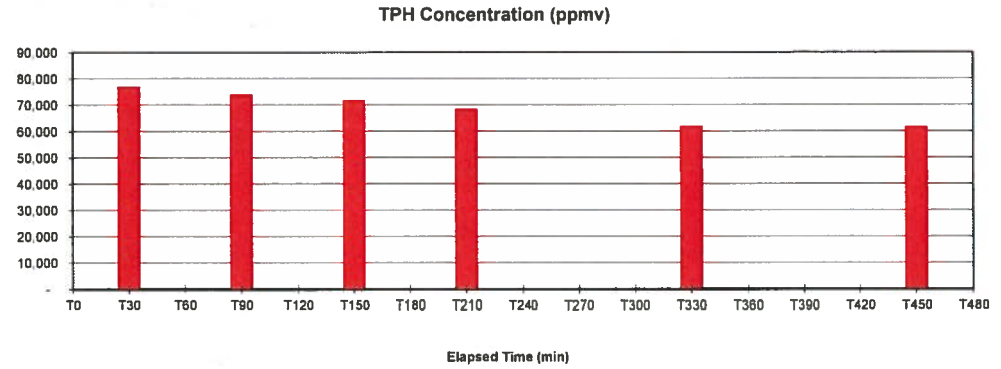


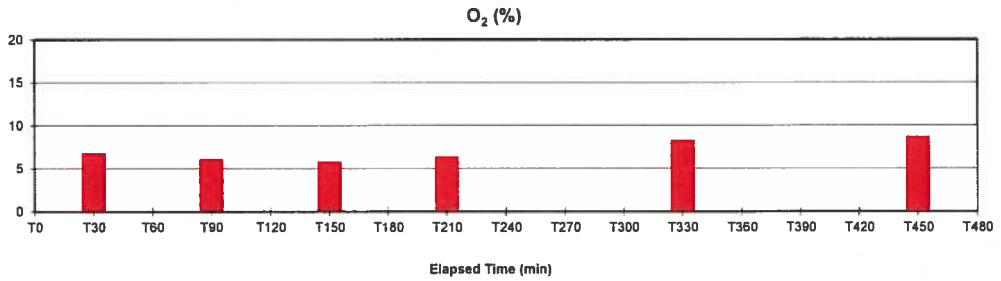


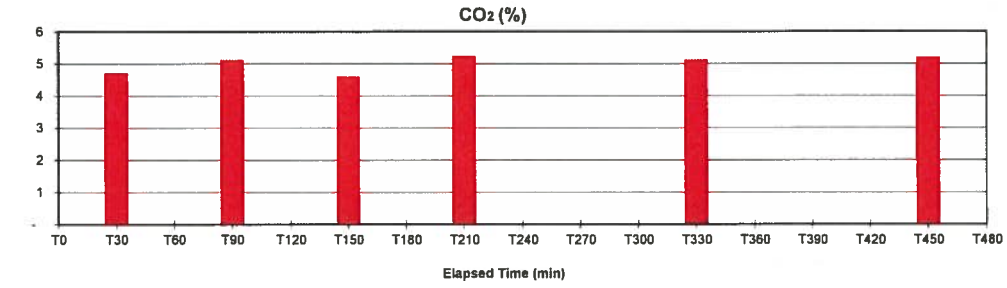


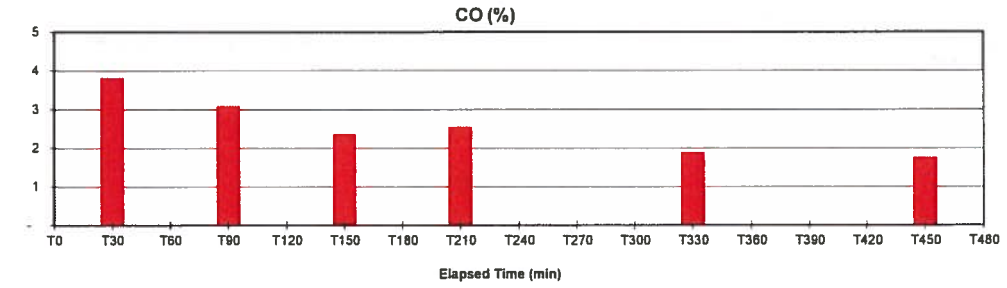


SCHEDULE B
Summary of TEST # MDP-1
Atmospheric Conditions



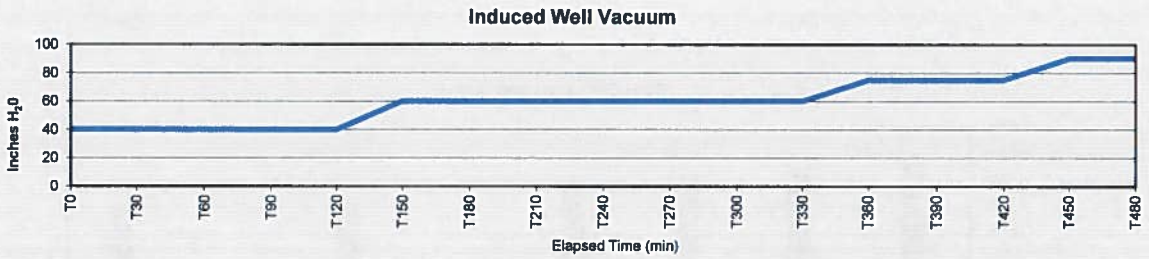


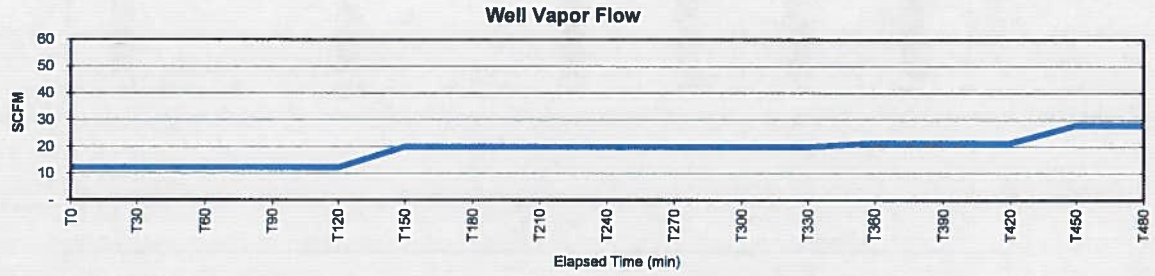


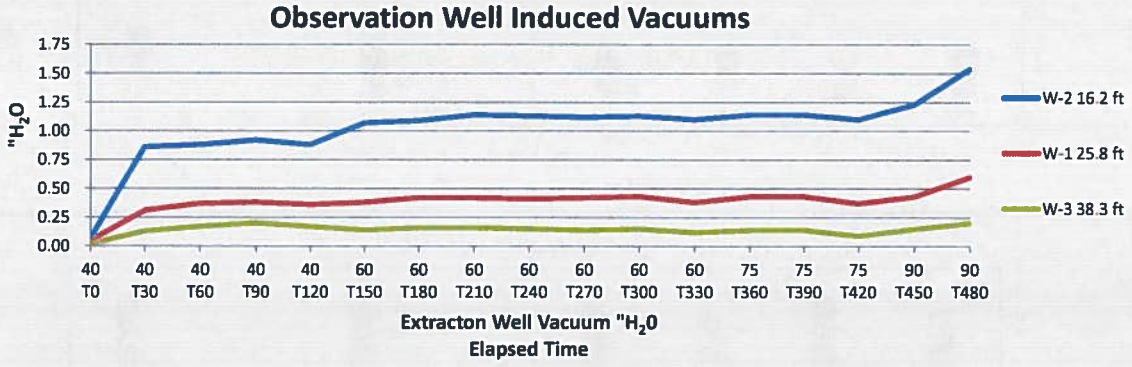


SCHEDULE B
Summary of ACUVAC TEST # MDP-1
Recorded Well Vacuums and/or (Pressures)

Walstadd 66
Lovington, NM
July 12, 2015







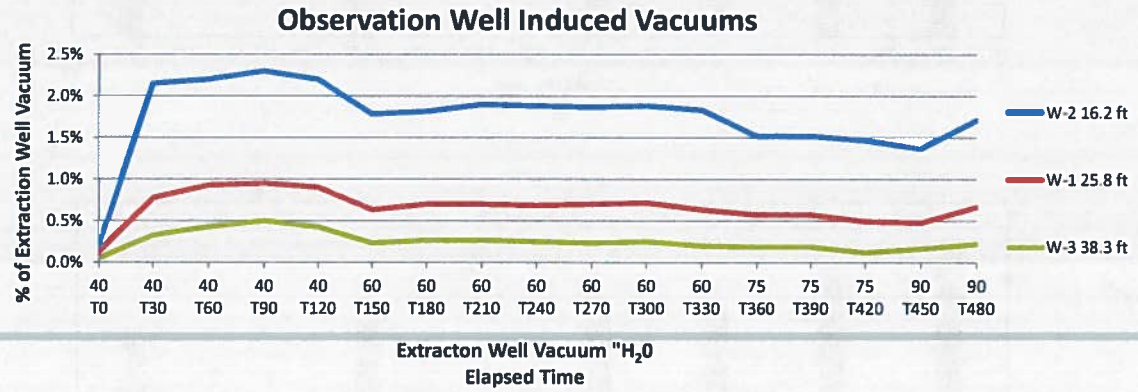
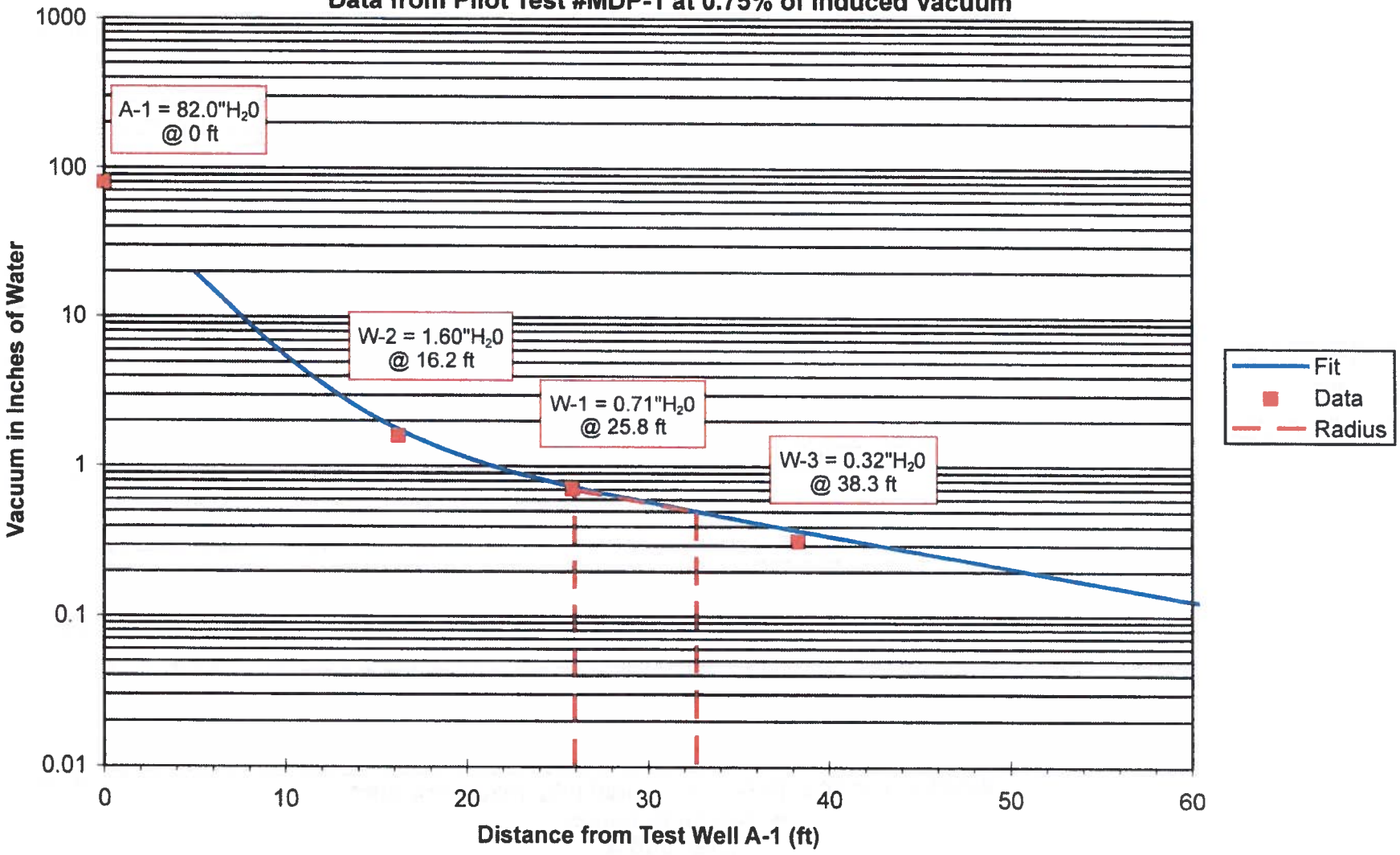


Figure #1A
Radius of Influence
Data from Pilot Test #MDP-1 at 0.75% of Induced Vacuum



AcuVac Remediation, LLC
July 12, 2015

Walstadd 66
Lovington, NM

Figure #1B
Radius of Influence
Data from Pilot Test #MDP-1 at 1% of Induced Vacuum

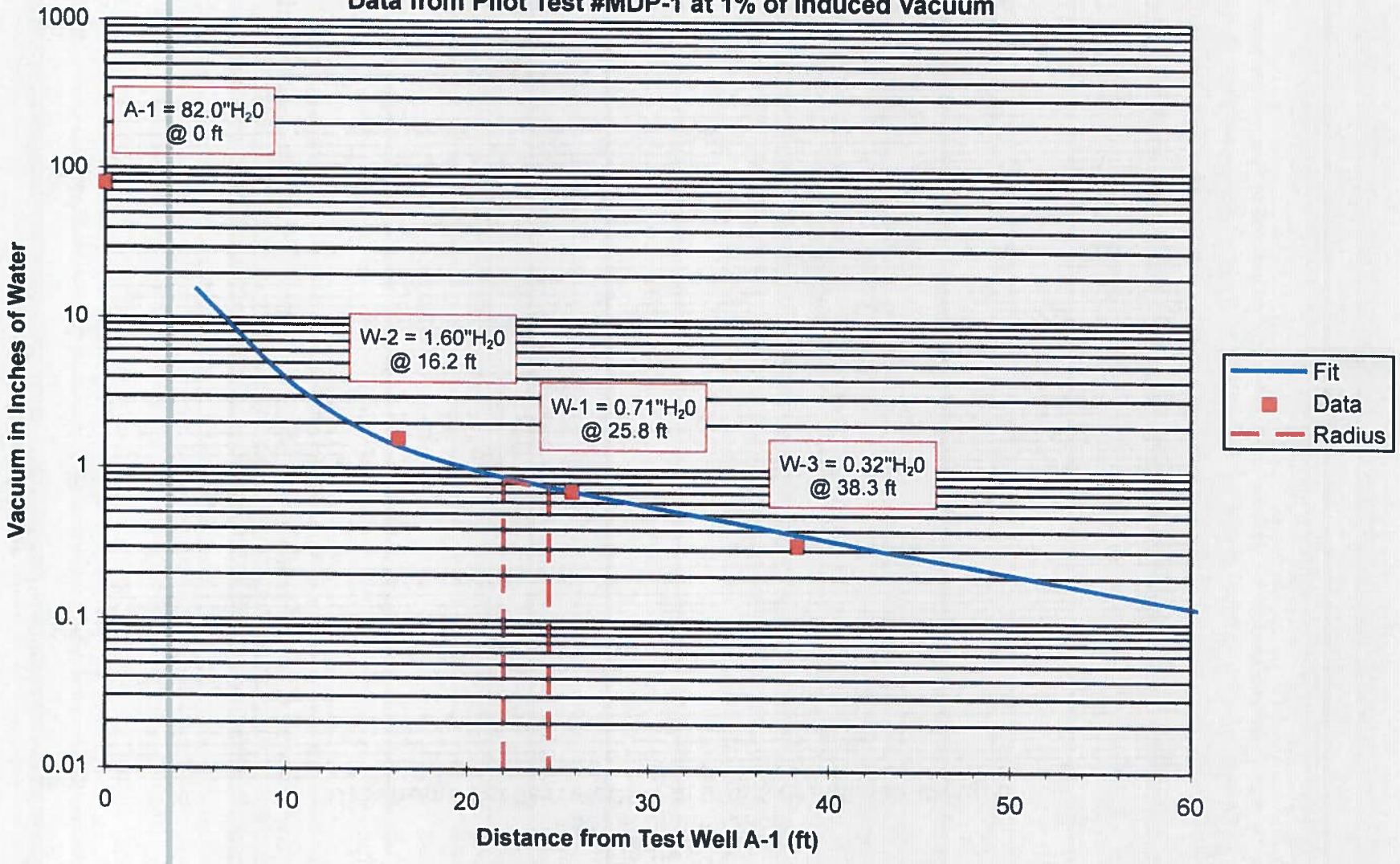
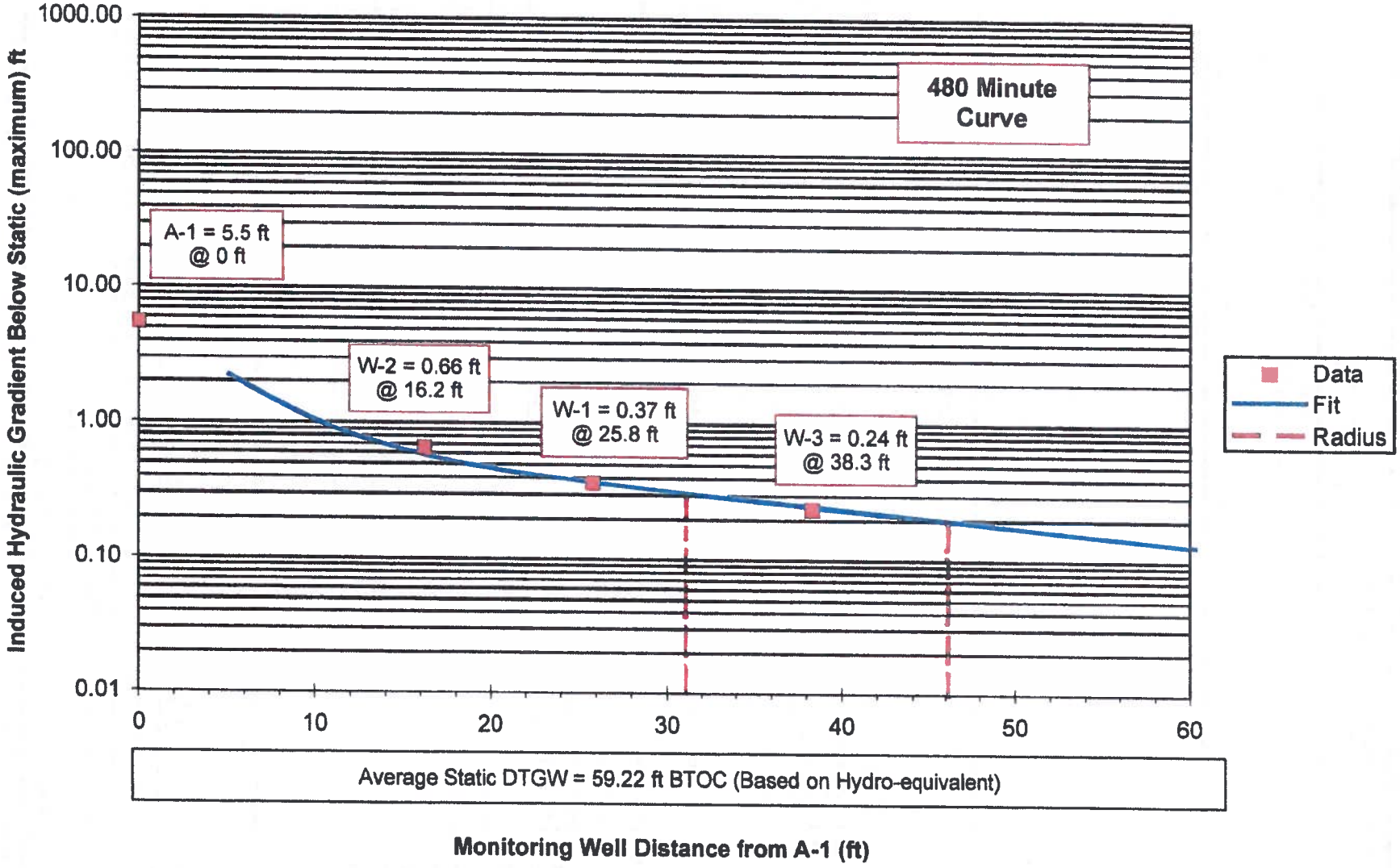


Figure #2
Drawdown at 480 Minutes vs Monitoring Well Distance



AVR

OPERATING DATA - PILOT TEST # 1 **PAGE # 1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

		Date:	7-12-15	-	-	-	-	
Parameters			Time 0725	Time 0730	Time 0800	Time 0830	Time 0900	Time 0930
	Well # A-1		Hr Meter 7279.9	Hr Meter 7280.0	Hr Meter 7280.5	Hr Meter 7281.0	Hr Meter 7281.5	Hr Meter 7282.0
ENGINE/BLOWER	R.P.M.		1000	2200	2200	2200	2200	2200
	Oil Pressure	psi	50	50	50	50	50	50
	Water Temp	°F	155	160	160	160	160	160
	Volts		13.5	14.0	14.0	14.0	14.0	14.0
	Intake Vacuum	"Hg	19	18	18	18	18	18
	Gas Flow Fuel/Propane	cfh	100	0	0	0	0	0
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	OFF	ON	ON	ON	ON	ON
	Extraction Well Flow	scfm	OFF	12.19	12.19	12.19	12.19	12.19
	Extraction Well Vac.	"H_2O	OFF	40	40	40	40	40
	Pump Rate	gals/min	N/A	3.50	3.50	3.50	3.50	3.50
	Total Volume	gals	-	-	105	210	315	420
	Influent Vapor Temp.	°F	-	69	69	69	69	70
	Air Temp	°F	72.3	72.4	74.6	75.8	77.9	79.6
	Barometric Pressure	Hg	30.10	30.10	30.10	30.09	30.09	30.10
	Absolute Pressure	"Hg	26.09	26.09	26.09	26.08	26.08	26.09
MONITOR WELL VACUUM	(16.2) W-2	"H_2O	0	.07	.86	.88	.92	.88
	(25.8) W-1	"H_2O	0	.05	.31	.37	.38	.36
	(38.3) W-3	"H_2O	0	.02	.13	.17	.20	.17
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
MANIFOLD	NAPL %	Vol Gals	—	—	180/189	9.5/10	5.5/5.8	4.0/4.2
	Data Logger / Probe	ft	7.5	2.0	2.0	2.0	2.0	2.0
	Depth of GW Depression	ft	0	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well	DTNAPL	57.40					
	Extraction Well	DTGW	64.08					

STATIC

( ) Indicates Well Pressure

6.68

SG = .74 HE = 59.14

7FORMS/TestForms/1210010

OPERATING DATA - MDP PILOT TEST # 1 PAGE # 1 ACUVAC MOBILE DUAL PHASE SYSTEM

Location: Walstadd 66 Lovington, NM							Project Managers: Sadler/Faucher
Date 7-12-15	-	-					
Time	0800	0900					
TEST Instrument	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	
TEST Well No.	A-1	A-1					
VAPOR/INFLUENT HC ppmv	76,990	74,020					
VAPOR/INFLUENT CO_2 %	4.72	5.12					
VAPOR/INFLUENT CO %	3.82	3.09					
VAPOR/INFLUENT O_2 %	6.8	6.1					
VAPOR/INFLUENT H_2S %	0	0					

0600	Arrived @ location - Positioned MDP System near well A-1 as the extraction well. Mobilized equipment - Opened selected wells - recorded distances gauged wells - Install total fluid pump and probe in EW. Plugged outer observation wells - Connected LNAPL/GW discharge line to volume meter and standby tank truck - Safety checks - all ok - calibrated instruments
0725	Recorded static (baseline) data - all outer wells @ 0" H_2O - Pump inlet @ 65.0' BTOC
0730	START MDP-1 - Initial EW induced vacuum = 40" H_2O, WVF = 12.19 scfm GW pump rate = 3.5 gpm - All outer wells recorded slight increased vacuum levels
0800	Recorded data: BP - All outer wells on increasing vacuum trend - GWR = 3.5 gpm - GWD = -5.5 ft - (Heavy LNAPL recovery) Propane @ 0 cfh HORIBA DATA: TOH = HC = 76,990 ppmv, CO_2 = 4.72%, CO = 3.82%, O_2 = 6.8%
0830	Recorded data: BP ↓ Outer wells continue on a slight increasing trend GWR = 3.5 gpm LNAPL recovery (liquid) @ 5.5% = 5.8 gals
0900	HORIBA DATA: HC = 74,020 ppmv ↓ CO_2 = 5.12% ↑, CO = 3.09% ↓, O_2 = 6.1% ↓ Recorded data: BP - All outer wells continue on an increasing vacuum trend - GWR = 3.5 gpm - GWD = -5.5 ft - Liquid LNAPL @ 4%
0930	Recorded data: BP ↑ Outer wells recording a slight decreasing vacuum trend - LNAPL @ 3% - GWR = 3.5 gpm - Well vacuum and WVF steady INCREASED EW induced = 60" H_2O, WVF = 19.88 scfm. GWR = 4.3 gpm - Pump rate increase necessary to maintain GWD @ 5.5 ft

OPERATING DATA - PILOT TEST # 1 PAGE # 2

ACUVAC
MOBILE DUAL PHASE SYSTEM

Location: Walstadd 66, Lovington, NM

Project Managers: Sadler/Faucher

		Date:	7-12-15	-	-	-	-	-
Parameters			Time	Time	Time	Time	Time	Time
			1000	1030	1100	1130	1200	1230
		Well # A-1	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter
			7282.5	7283.0	7283.5	7284.0	7284.5	7285.0
ENGINE/BLOWER	R.P.M.		2300	2300	2300	2300	2300	2300
	Oil Pressure	psi	50	50	50	50	50	50
	Water Temp	°F	165	165	170	170	170	170
	Volts		14.0	14.0	14.0	14.0	14.6	14.0
	Intake Vacuum	"Hg	17	17	17	17	17	17
	Gas Flow Fuel/Propane	cfh	0	0	0	0	0	0
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	ON	ON	ON	ON	ON	ON
	Extraction Well Flow	scfm	19.88	19.88	19.88	19.88	19.88	19.88
	Extraction Well Vac.	"H_2O	60	60	60	60	60	60
	Pump Rate	gals/min	4.30	4.30	4.30	4.30	4.30	4.30
	Total Volume	gals	549	678	807	936	1065	1194
	Influent Vapor Temp.	°F	70	70	70	71	71	71
	Air Temp	°F	81.3	82.7	84.0	84.6	87.7	90.6
	Barometric Pressure	Hg	30.09	30.09	30.09	30.09	30.08	30.08
	Absolute Pressure	"Hg	26.08	26.08	26.08	26.08	26.07	26.08
MONITOR WELL VACUUM	W-2	"H_2O	1.07	1.09	1.14	1.13	1.12	1.13
	W-1	"H_2O	.38	.42	.42	.41	.42	.43
	W-3	"H_2O	.14	.16	.16	.15	.14	.15
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
MANIFOLD	NAPL %	Vol Gals	3.0/3.2	1.5/2.0	1.0/1.3	1.5/2.0	1.5/2.0	1.5/1.9
	Data Logger / Probe	ft	2.0	2.0	2.0	2.0	2.0	2.0
	Depth of GW Depression	ft	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well	DTNAPL						
	Extraction Well	DTGW						

( ) Indicates Well Pressure

OPERATING DATA - MDP PILOT TEST # 1 PAGE #2 **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66 Lovington, NM							Project Managers: Sadler/Faucher
Date 7-12-15	-	-					
Time	1000	1100					
TEST Instrument	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	
TEST Well No.	A-1	A-1					
VAPOR/INFLUENT HC ppmv	71,750	68,490					
VAPOR/INFLUENT CO_2 %	4.60	5.24					
VAPOR/INFLUENT CO %	2.37	2.55					
VAPOR/INFLUENT O_2 %	5.8	6.4					
VAPOR/INFLUENT H_2S %	0	0					

1000	HORIBA DATA HC = 71,750 ppmv ↓, CO_2 = 4.60% ↑, CO = 2.37% ↓ - O_2 = 5.8% ↓
	Recorded data: BP ↓ Outer well W-2, recording an increased vacuum
	level in response to the EW ↑, other wells, most steady - GWR = 4.3
	gpm - EW vacuum @ 60 "H_2O, WVF = 19.88 scfm - LNAPL @ 1.5%
1030	Gauged all wells - IHC on slight decreasing trend
	Recorded data: BP — Outer wells continue on an increasing
	vacuum trend. GWR steady @ 4.3 gpm - LNAPL @ 1.0%
1100	Recorded data: BP — Outer well W-2, slight increase, the two
	wells, steady - NOTE - LNAPL @ 1.5% of volume
	HORIBA DATA: HC = 68,490 ppmv ↓, CO_2 = 5.24% ↑, CO = 2.55% ↑, O_2 = 6.48 ↑
1130	Recorded data: BP ↓ Outer wells mostly steady, but developing a
	slight decreasing vacuum trend. GWR - 4.3 gpm. LNAPL @ 1.6%
1200	Recorded data: BP ↓ - Outer wells mostly steady, slight increase/
	decreases. GWR steady @ 4.3 gpm. LNPL steady @ 1.5% - GWD = -5.5'
1230	Recorded data: BP — Outer wells mostly steady with slight
	increases - GWR = 4.3 gpm LNAPL = 1.5% GWD = 5.5 ft

OPERATING DATA - PILOT TEST # 1 PAGE # 3 **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

		Date:	7-12-15	-	-	-	-	-
Parameters			Time 1300	Time 1330	Time 1400	Time 1430	Time 1500	Time 1530
	Well # A-1		Hr Meter 7285.5	Hr Meter 7286.0	Hr Meter 7286.5	Hr Meter 7287.0	Hr Meter 7287.5	Hr Meter 7288.0
ENGINE/BLOWER	R.P.M.		2300	2400	2400	2400	2400	2400
	Oil Pressure	psi	50	50	50	50	50	50
	Water Temp	°F	175	175	175	175	175	175
	Volts		14.0	14.0	14.0	14.0	14.0	14.0
	Intake Vacuum	"Hg	17	17	17	17	17	16
	Gas Flow Fuel/Propane	cfh	0	0	0	0	0	0
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	ON	ON	ON	ON	ON	ON
	Extraction Well Flow	scfm	19.88	21.34	21.34	21.34	27.95	27.95
	Extraction Well Vac.	"H_2O	60	75	75	75	90	90
	Pump Rate	gals/min	4.30	4.60	4.60	4.60	5.20	5.20
	Total Volume	gals	1323	1460	1598	1736	1892	2048
	Influent Vapor Temp.	°F	71	71	71	71	71	72
	Air Temp	°F	91.8	93.0	94.6	95.3	95.8	96.1
	Barometric Pressure	Hg	30.07	30.06	30.06	30.04	30.02	30.02
	Absolute Pressure	"Hg	26.07	26.06	26.05	26.04	26.02	26.02
MONITOR WELL VACUUM	W-2	"H_2O	1.10	1.14	1.14	1.10	1.23	1.54
	W-1	"H_2O	.38	.43	.43	.37	.43	.60
	W-3	"H_2O	.12	.14	.14	.09	.15	.20
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O						
MANIFOLD	NAPL %	Vol Gals	1.5/2.0	1.5/2.1	2.0/2.7	2.0/2.8	2.0/3.1	2.0/3.1
	Data Logger	ft	2.0	2.0	2.0	2.0	2.0	2.0
	Depth of GW Depression	ft	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well	DTNAPL						61.61
	Extraction Well	DTGW						61.65

( ) Indicates Well Pressure

7FORMS/TestForms/1210010

LNAPL = 0.04'

HE = 61.64'

Location: Walstadd 66 Lovington, NM							Project Managers: Sadler/Faucher
Date 7-12-15	-	-					
Time	1300	1500					
TEST Instrument	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	
TEST Well No.	A-1	A-1					
VAPOR/INFLUENT HC ppmv	61,880	61,720					
VAPOR/INFLUENT CO_2 %	5.12	5.20					
VAPOR/INFLUENT CO %	1.88	1.75					
VAPOR/INFLUENT O_2 %	8.3	8.7					
VAPOR/INFLUENT H_2S %	0	0					

1300	HORIBA DATA: HC = 61,880 ppmv ↓, CO_2 = 5.12% ↓ CO = 1.88% ↓ O_2 = 8.3% ↑
	Recorded data: BP ↓ All outer wells recording a decreasing vacuum trend due to BP ↓ - LNAPL = 1.5% - GWD = -5.5 ft
	INCREASED EW induced vacuum = 75" H_2O, WVF = 21.34 scfm
	GWR = 4.6 gpm - LNAPL = 1.5%
1330	Recorded data: BP ↓ Outer well recording increased vacuum levels
	in response to the EW increase. GWR = 4.6 gpm - LNAPL = 2%
	Gauged outer wells - Note increase in the IHC
1400	Recorded data; BP ↓ Outer well steady - No change
	GWR = 4.6 gpm - LNAPL steady @ 2% - GWD = 5.5 ft
1430	Recorded data: BP ↓↓ - Outer wells recording a decreasing
	vacuum trend due to BP ↓ - GWR = 4.6 gpm - LNAPL = 2%
1430	INCREASED EW induced vacuum = 90" H_2O, WVF = 27.9 scfm
	GWR = 5.2 gpm LNAPL = 2.0 %
1500	HORIBA DATA: HC = 61,720 ppmv ↓, CO_2 = 5.20% ↑, CO = 1.75% ↓, O_2 = 8.7% ↑
1500	Recorded data: BP ↓↓ - Outer wells recorded increasing vacuum trend
	in response to EW vacuum increase - GWR = 5.2 gpm - LNAPL = 2%
1530	Recorded data! BP - All wells recorded increased vacuum levels
	in response to A-1 @ 90" H_2O - GWR = 5.2 gpm LNAPL = 2.0%
	Gauged wells -
1535	Discontinued GW pumping and induced vacuum to allow time
	for outer wells to adjust to atmospheric changes

OPERATING DATA - PILOT TEST # 1 PAGE # 4 **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers: Sadler/Faucher**

		Date:	7-12-15					
Parameters			Time 1600	Time	Time	Time	Time	Time
	Well #		Hr Meter 7288.3	Hr Meter	Hr Meter	Hr Meter	Hr Meter	Hr Meter
ENGINE/BLOWER	R.P.M.		1000					
	Oil Pressure	psi	50					
	Water Temp	°F	165					
	Volts		14.0					
	Intake Vacuum	"Hg	19					
	Gas Flow Fuel/Propane	cfh	90					
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	OFF					
	Extraction Well Flow	scfm	OFF					
	Extraction Well Vac.	"H_2O	OFF					
	Pump Rate	gals/min	OFF					
	Total Volume	gals	2048					
	Influent Vapor Temp.	°F	N/A					
	Air Temp	°F	95.1					
	Barometric Pressure	Hg	30.02					
	Absolute Pressure	"Hg	26.02					
MONITOR WELL VACUUM	MW-2	"H_2O	(.19)					
	MW-1	"H_2O	(.15)					
	MW-3	"H_2O	(.17)					
		"H_2O						
		"H_2O						
		"H_2O						
		"H_2O	STATIC					
		"H_2O						
		"H_2O						
		"H_2O						
MANIFOLD	NAPL %	Vol	—					
		Gals	—					
	Data Logger	ft	—					
	Depth of GW Depression	ft	—					
	Extraction Well	DTNAPL	—					
	Extraction Well	DTGW	—					

( ) Indicates Well Pressure

OPERATING DATA - MDP PILOT TEST # 1 PAGE # 4

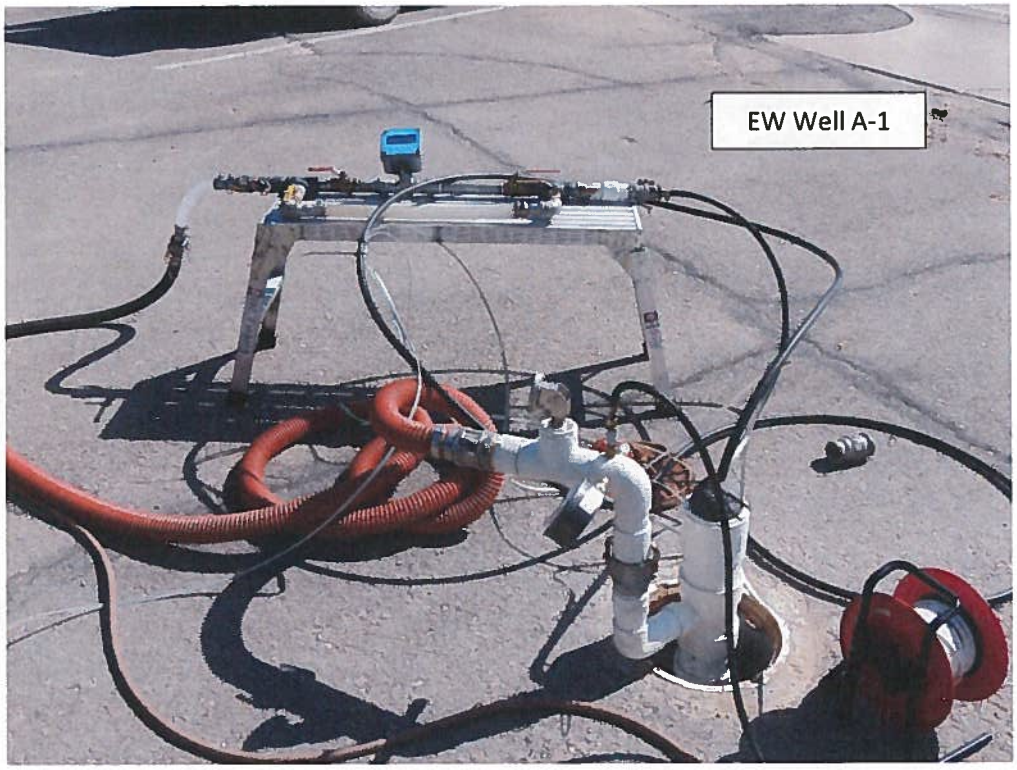
ACUVAC
MOBILE DUAL PHASE SYSTEM

Location: Walstadd 66 Lovington, NM						Project Managers: Sadler/Faucher	
Date	7-11-15						
Time							
TEST Instrument	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	HORIBA	
TEST Well No.							
VAPOR/INFLUENT HC ppmv							
VAPOR/INFLUENT CO_2 %							
VAPOR/INFLUENT CO %							
VAPOR/INFLUENT O_2 %							
VAPOR/INFLUENT H_2S %							

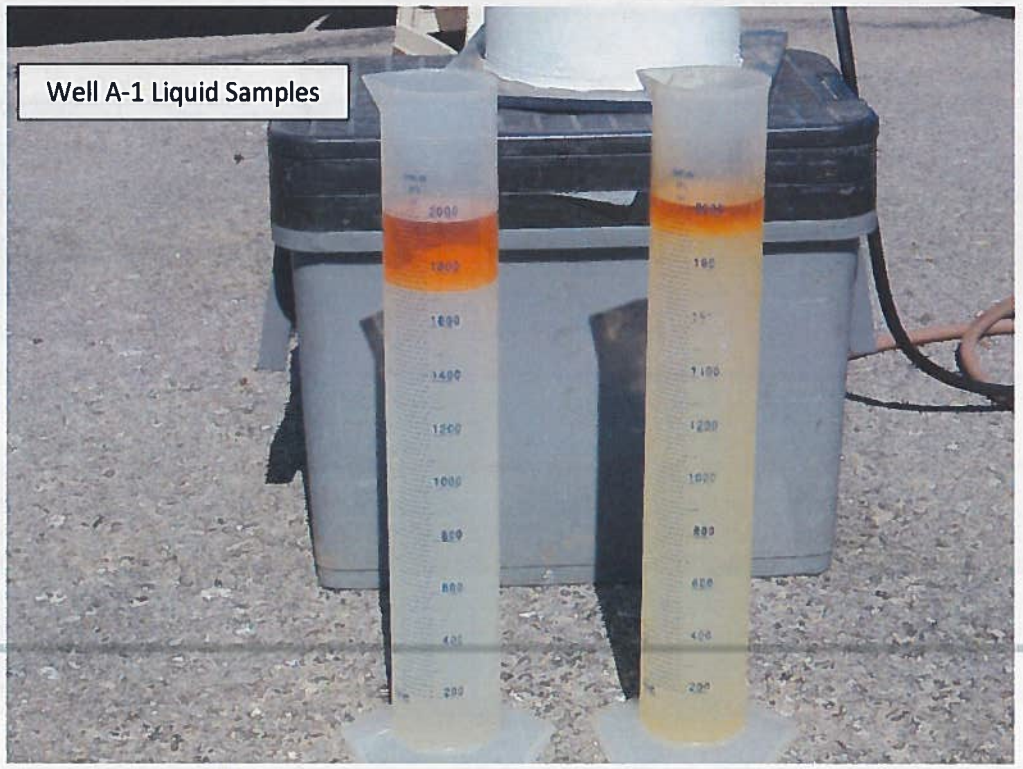
1600	Recorded static data: DP steady - All wells recording well pressure due to decreased barometric pressure on the GW
	TEST MDP-1 completed - NOTE - Total Liquid Volume = 2048 gals
1635	Secured all wells - departed site

WALSTADD 66
LOVINGTON, NM

WALSTADD 66
LOVINGTON, NM



WALSTADD 66
LOVINGTON, NM



AcuVac Remediation, LLC

1656-H Townhurst · Houston, Texas 77043
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July 15, 2015

Mr. Clay Kilmer
Senior Hydrogeologist
Golder Associates, Inc.
5200 Pasadena Avenue, N.E. Suite C
Albuquerque, NM 87113

Dear Clay:

Re: Walstadd 66, Lovington, NM

At your request, we performed two 1-hour (Wells W-1 and W-2), and one 6.0-hour (Well A-1) Mobile Dual Phase (MDP) Events at the above referenced location on July 13, 2015. Following is the Report and a copy of the Operating Data collected during Event #1 at the above referenced location. Table #1A is the Well Summary Information and Table #1B is the Recovery Summary Information on wells W-2 (Event #1A), W-1 (Event #1B), and Well A-1 (Event #1C). PSH is referred to as LNAPL in this report. GW samples are taken in a 2,000 ml beaker to determine the average LNAPL percentage and volume.

OBJECTIVES

The Objectives of an MDP Event are to:

- Evaluate the potential for removing liquid and vapor phase LNAPL (PSH) from the groundwater (GW) and soils in the subsurface formations.
- Expose the capillary fringe area and below to the Extraction Well (EW) induced vacuums.
- Increase the GW and contaminant specific yields with high induced vacuums.
- Provide an induced hydraulic gradient (IHG) to gain hydraulic control of the area during the Event period.
- Select the GW depression and pump rates to accomplish the above objectives.

METHODS AND EQUIPMENT

The tests were conducted using AcuVac's I-6 System, with Roots RAI-33 and RAI-22 blowers, various instrumentation, including the HORIBA® Analyzer, Solinst Interface Probes, Lumidor O_2 Meter, flow gauges, a sensitive instrument to determine barometric pressure, V-1 vacuum box to capture non-diluted vapor samples, Redi-Flo 2 total fluids pump and other special equipment.

The vacuum extraction portion of the AcuVac System consists of a vacuum pump driven by an internal combustion (IC) engine. The vacuum pump is connected to the extraction well and the vacuum created on the extraction well causes light hydrocarbons in the soil and on the GW to volatilize and flow through a moisture knockout tank to the vacuum pump and the IC Engine where they are burned as part of the normal combustion process. Propane is used as auxiliary fuel to help power the engine if the well vapors do not provide the required BTU.

The AcuVac IC Engine is fully loaded for the maximum power necessary to achieve and maintain high induced vacuums and/or high well vapor flows required to maximize the vacuum Radius of Influence (ROI) for Pilot Tests and short term Event remediation.

Emissions from the engine are passed through three catalytic converters to ensure maximum destruction of removed hydrocarbon vapors. The engine's fuel to air ratio can be adjusted to maintain efficient combustion. Because the engine is the power source for all equipment, all systems stop when the engine stops. This eliminates any uncontrolled release of hydrocarbons. Since the AcuVac System is held entirely under vacuum, any leaks in the seals or connections are leaked into the System and not emitted into the atmosphere. The engine is automatically shut down by vacuum loss, low oil pressure or overheating.

The GW Extraction is provided by an in-well, Redi-Flo 2 total fluids pump that has the discharge line connected to a total volume meter. The discharge line from the volume meter is then connected to the stand-by tank truck. The electrical power for the GW pump was supplied from a 120v Honda generator. The GW flow rate can be adjusted to maintain a target level. Interface meters are used to measure all DTGW/DTLNAPL.

The design of the AcuVac System enables complete independent control of both the Induced Well Vacuum and the GW pumping functions such that the AcuVac team can control the IHG to expose the maximum amount of the formation to SVE. The ability to separate the vacuum and liquid flows within the Extraction Well improves the LNAPL recovery rates, and enables the AcuVac team to record data specific to each.

SUMMARY OF MDP EVENT #1A- WELL W-2

- The total Event time was 1.0 hour. The Event was conducted on July 13, 2015. There is no comparative data.
- The total liquid volume recovered was 192 gals, of which 13.50% or 25.92 gals were liquid LNAPL.
- Total vapor LNAPL burned as IC engine fuel was 1.97 gals, **for a total liquid and vapor LNAPL recovery of 27.89 gals.**
- Average HORIBA® Analytical Data from the influent vapor samples was: HC = 95,790 ppmv, CO_2 = 3.46%, CO = 7.46%, O_2 = 8.6% and H_2S = 0 ppm.
- The maximum HORIBA® Analytical Data from the influent vapor samples for TPH was 95,790 ppmv.
- The Average Induced Vacuum was 60"H_2O with a maximum vacuum of 60.00"H_2O.
- The average EW well vapor flow was 9.51 scfm with a maximum well vapor flow of 9.51 scfm.
- The GW pump inlet was set at 65.0 ft BTOC. The average GW pump rate was 3.20 gpm, and the maximum GW pump rate was 3.20 gpm.
- The average GW depression, based on the positioning of the GW pump, was 5.50 ft below static level.
- An LNAPL thickness of 6.54 ft was recorded prior to the start of Event #1A and no LNAPL thickness was recorded at the conclusion of the Event.

The total LNAPL removed, including liquid and vapor, during the 1.0 hour Event #1A, Well W-2, was 27.89 gals.

ADDITIONAL INFORMATION

- The higher percentage of the LNAPL volume, 25.92 gals or 92.94%, was recovered as liquid due to the high level of free phase LNAPL at the start of the Event.
- A minimal percentage of the LNAPL, 1.97 gals or 7.06%, was burned as IC engine fuel as a result of the short duration of the Event period.
- The high HC (TPH) levels indicate contaminant in the gasoline range.
- The relatively low O_2 levels in the influent vapors indicate SVE short circuiting from the ground surface most likely did not occur.
- Well W-2 was gauged at the conclusion of Event #1C (1445 hrs) and an LNAPL thickness of 4.40 ft was recorded indicating a rebound of 67.28%.

SUMMARY OF MDP EVENT #1B- WELL W-1

- The total Event time was 1.0 hour. The Event was conducted on July 13, 2015. There is no comparative data.
- The total liquid volume recovered was 201 gals, of which 23.69% or 47.61 gals were liquid LNAPL.
- Total vapor LNAPL burned as IC engine fuel was 1.84 gals, **for a total liquid and vapor LNAPL recovery of 49.45 gals.**
- Average HORIBA® Analytical Data from the influent vapor samples was: HC = 89,750 ppmv, CO_2 = 3.52%, CO = 5.74%, O_2 = 8.6% and H_2S = 0 ppm.
- The maximum HORIBA® Analytical Data from the influent vapor samples for TPH was 89,750 ppmv.
- The Average Induced Vacuum was 60"H_2O with a maximum vacuum of 60.00"H_2O.
- The average EW well vapor flow was 9.51 scfm with a maximum well vapor flow of 9.51 scfm.
- The GW pump inlet was set at 65.0 ft BTOC. The average GW pump rate was 3.47 gpm, and the maximum GW pump rate was 3.70 gpm.
- The average GW depression, based on the positioning of the GW pump, was 5.50 ft below static level.
- An LNAPL thickness of 6.84 ft was recorded prior to the start of Event #1B and an LNAPL thickness of 0.04 ft was recorded at the conclusion of the Event.

The total LNAPL removed, including liquid and vapor, during the 1.0 hour Event #1B, Well W-1, was 49.45 gals.

ADDITIONAL INFORMATION

- The higher percentage of the LNAPL volume of 47.61 gals or 96.27%, was recovered as liquid.
- A minimal amount of LNAPL, 1.84 gals or 3.73%, was burned as IC engine fuel as a result of the short duration of the Event period.

- The high HC (TPH) levels indicate contaminant in the gasoline range.
- The relatively low O_2 levels in the influent vapors indicate SVE short circuiting from the ground surface most likely did not occur.
- Well W-1 was gauged at the conclusion of Event #1C (1445 hrs) and an LNAPL thickness of 1.01 ft of was recorded indicating a rebound of 14.77%.
- A thickness of biomass was initially observed on the collected GW/LNAPL sample.

SUMMARY OF MDP EVENT #1C- WELL A-1

- The total Event time was 6.0 hours. The Event was conducted on July 13, 2015. The data is compared to Pilot Test #1 conducted on July 12, 2015 which had a total Test time of 8.0 hours.
- The total liquid volume recovered was 1,553 gals, of which 2.35% or 36.53 gals were liquid LNAPL.
- Total vapor LNAPL burned as IC engine fuel was 29.36 gals, **for a total liquid and vapor LNAPL recovery of 65.88 gals. This equates to an average of 10.98 gals/hr.**
- Average HORIBA® Analytical Data from the influent vapor samples was: HC = 59,027 ppmv, CO_2 = 5.61%, CO = 1.73%, O_2 = 7.1% and H_2S = 0 ppm.
- Compared with MDP Pilot Test #1 data, the average TPH levels decreased 10,115 ppmv, CO_2 increased 0.61%, CO decreased 0.85%, O_2 increased 0.1% and H_2S was steady at 0 ppm.
- The maximum HORIBA® Analytical Data from the influent vapor samples for TPH was 64,480 ppmv. Compared with MDP Pilot Test #1 data, the maximum TPH levels decreased 12,510 ppmv.
- The Average Induced Vacuum was 68.46"H_2O with a maximum vacuum of 70.00"H_2O. Compared with Pilot Test #1 data, the average induced vacuum increased 8.17"H_2O and the maximum induced vacuum decreased 20.00"H_2O.
- The average EW well vapor flow was 23.01 scfm with a maximum well vapor flow of 23.34 scfm. Compared with MDP Pilot Test #1 data, the average EW well vapor flow increased 4.18 scfm, and the maximum well flow decreased 4.61 scfm.
- The GW pump inlet was set at 65.0 ft BTOC. The average GW pump rate was 4.35 gpm, and the maximum GW pump rate was 4.50 gpm.
- The average GW depression, based on the positioning of the GW pump, was 5.50 ft below static level.
- An LNAPL thickness of 5.52 ft was recorded prior to the start of Event #1C and a LNAPL thickness of 0.13 ft was recorded at the conclusion of the Event.

The total LNAPL removed, including liquid and vapor, during the 6.0 hour Event #1C, Well A-1, was 65.88 gals.

ADDITIONAL INFORMATION

- The higher percentage of the LNAPL volume, 36.53 gals or 55.44%, was recovered as liquid.
- Of the total LNAPL volume recovered, 29.36 gals or 44.56%, was burned as IC engine fuel during the Event period as a result of the high TPH and Well Vapor Flow.
- The high HC (TPH) levels indicate contaminant in the gasoline range.
- The HC (TPH) recorded a decreasing trend throughout the Event period.
- The relatively low O_2 levels in the influent vapors indicate SVE short circuiting from the ground surface most likely did not occur.

TOTAL RECOVERY EVENT #1

The total LNAPL removed, including liquid and vapor, during the 8.0 hour Event #1, Wells W-1, W-2, and A-1, was 143.22 gals. This equates to 17.90 gal/hr.

RECOMMENDATION

The Events proved to be an extremely effective method of decreasing the liquid LNAPL thickness in these wells. An Event program should be considered to quickly reduce the LNAPL thickness before considering a CAP which includes an on-site recovery system. In many cases the Event program has initially been more cost effective.

METHOD OF CALIBRATION AND CALCULATIONS

The HORIBA® Analytical instrument is calibrated with Hexane, CO and CO_2.

The formula used to calculate the emission rate is:

$$ER = HC\ (ppmv) \times MW\ (Hexane) \times Flow\ Rate\ (scfm) \times 1.58E^{-7} \frac{(min)(lb\ mole)}{(hr)(ppmv)(ft^3)} = lbs/hr$$

INFORMATION INCLUDED WITH REPORT

- Table #1A Summary Well Data
- Table #1B Summary Recovery Data
- Recorded Data
- Photographs of the MDP System and Wells A-1, W-1 and W-2.

After you have reviewed the report and if you have any questions, please contact me. We appreciate you selecting AcuVac to provide this service.

Sincerely,
ACUVAC REMEDIATION, LLC

Paul D. Faucher
Vice President, Operations

Summary Well Data
Table #1A

Event		1A	1B	1C
WELL NO.		W-2	W-1	A-1
Total Event Hours		1.0	1.0	6.0
TD	ft	75.0	80.0	75.0
Well Screen	ft	45.0 to 75.0	50 to 70	50 to 70
Well Size	in	4.0	4.0	4.0
Well Data				
DTGW - Static - Start Event	ft	64.67	63.96	63.55
DTLNAPL - Static - Start Event	ft	58.13	57.12	58.03
LNAPL	ft	6.54	6.84	5.52
Hydro-Equivalent- Beginning	ft	59.83	58.90	59.47
DTGW - End Event	ft	57.76	59.21	60.01
DTLNAPL - End Event	ft	0	59.17	59.88
LNAPL	ft	0	0.04	0.13
Hydro-Equivalent - Ending	ft	57.76	59.18	59.91
Extraction Data				
Maximum Extraction Well Vacuum	"H_2O	60.00	60.00	70.00
Average Extraction Well Vacuum	"H_2O	60.00	60.00	68.46
Maximum Extraction Well Vapor Flow	scfm	9.51	9.51	23.34
Average Extraction Well Vapor Flow	scfm	9.51	9.51	23.01
Maximum GW/ LNAPL Pump Rate	gpm	3.20	3.70	4.50
Average GW/ LNAPL Pump Rate	gpm	3.20	3.47	4.35
Influent Data				
Maximum TPH	ppmv	95,790	89,750	64,480
Average TPH	ppmv	95,790	89,750	59,027
Average CO_2	%	3.46	3.52	5.61
Average CO	%	7.46	5.74	1.73
Average O_2	%	8.6	8.6	7.1
Average H_2S	ppm	0	0	0

Summary Recovery Data
Table #1B

Event		1A	1B	1C
WELL NO.		W-2	W-1	A-1
Recovery Data- Current Event				
Total Liquid Volume Recovered	gals	192	201	1,553
Total Liquid LNAPL Recovered	gals	25.92	47.61	36.53
Total Liquid LNAPL Recovered / Total Liquid	%	13.50	23.69	2.35
Total Liquid LNAPL Recovered / Total LNAPL	%	92.94	96.27	55.44
Total Vapor LNAPL Recovered	gals	1.97	1.84	29.36
Total Vapor LNAPL Recovered / Total LNAPL	%	7.06	3.73	44.56
Total Vapor and Liquid LNAPL Recovered	gals	27.89	49.45	65.88
Average LNAPL Recovery	gals/hr	27.89	49.45	10.98
Total LNAPL Recovered	lbs	195	346	461
Total Volume of Well Vapors	cu. ft	571	571	8,284
Recovery Data- Cumulative				
Total Liquid Volume Recovered	gals	192	201	3,601
Total Liquid LNAPL Recovered	gals	25.92	47.61	100.16
Total Vapor LNAPL Recovered	gals	1.97	1.84	51.87
Total Vapor and Liquid LNAPL Recovered	gals	27.89	49.45	152.03
Average LNAPL Recovery	gals/hr	27.89	49.45	10.86
Total LNAPL Recovered	lbs	195	346	1,064
Total Volume of Well Vapors	cu. ft	571	571	17,322

OPERATING DATA - EVENT #1A **PAGE # 1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

Date: 7/13/15

	Parameters		Time 0615	Time 0645	Time 0715	Time	Time	Time
	WELL # W-1		Hr Meter 7288.5	Hr Meter 7289.0	Hr Meter 7289.5	Hr Meter	Hr Meter	Hr Meter
ENGINE/BLOWER	R.P.M.		2206	2200	2200			
	Oil Pressure	psi	50	50	50			
	Water Temp	°F	130	140	150			
	Volts		14	14	14			
	Intake Vacuum	"Hg	19	19	19			
	Gas Flow Fuel/Propane	cfh	0	0	0			
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	ON	ON	OFF			
	Extraction Well Flow	scfm	9.51	9.51	9.51			
	Extraction Well Vacuum	"H_2O	60	60	60			
	Pump Rate	gals/min	3.2	3.2	3.2			
	Total Volume	gals	–	96	192			
	Influent Vapor Temp.	°F	68	68	68			
	Air Temperature	°F	66.7	69.1	69.8			
	Barometric Pressure	"Hg	30.03	30.02	30.01			
VAPOR /INFLUENT	HC	ppmv	–	95790	–			
	CO_2	%	–	3.42	–			
	CO	%	–	7.46	–			
	O_2	%	–	8.6	–			
	H_2S	ppm	–	0	–			

NOTES

ARRIVED ON SITE AT 0545 HRS. POSITIONED THE ACUVAC SYSTEM NEAR WELL W-1. GAUGED THE WELL AND MOBILIZED ALL EQUIPMENT. PLACED THE IN WELL PUMP AT 67.0 FT BTOC. EVENT STARTED AT 0615 HRS. IN ITIAL WELL VAC SET AT 60 "H_2O RESULTING IN WVF OF 9.50 SCFM. INFLUENT VAPOR SAMPLE INDICATES HIGH CONCENTRATION OF HYDROCARBONS IN THE 95,000 + PPMV RANGE. LIQUID SAMPLE TAKEN AT APPROX 0630 INDICATES 15 % OF LNAPL PRESENT IN THE LIQUID. INDUCED WELL VAC REDUCED AT 0705 HRS GW PUMPING STOPPED AT 0715. EVENT CONCLUDED AT 0715

MANIFOLD								
	LNAPL % Vol / Gals	-/-	15/14.40	12/11.52			
	Depth of GW Depression	ft	-5.5	-5.5	-5.5	1445		
	Extraction Well DTLNAPL	ft	58.13		–	59.00		
	Extraction Well DTGW	ft	64.67		57.76	63.40		

( ) Indicates Well Pressure

LNAPL 6.54 HE 59.83 — Ø — 4.40 HE 60.14

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OPERATING DATA - EVENT #1 B **PAGE #1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

	Date:	7/13/15					
	Parameters	Time 0730	Time 0800	Time 0830	Time	Time	Time
	WELL # W-2	Hr Meter 7289.5	Hr Meter 7290.0	Hr Meter 7290.5	Hr Meter	Hr Meter	Hr Meter
ENGINE/BLOWER	R.P.M.	2200	2200	2200			
	Oil Pressure psi	50	50	50			
	Water Temp °F	150	150	150			
	Volts	14	14	14			
	Intake Vacuum "Hg	19	19	15			
	Gas Flow Fuel/Propane cfh	0	0	0			
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump ON/OFF	ON	ON	OFF			
	Extraction Well Flow scfm	9.51	9.51	9.51			
	Extraction Well Vacuum "H_2O	60	60	60			
	Pump Rate gals/min	3.0	3.70	3.70			
	Total Volume gals	-	90	201			
	Influent Vapor Temp. °F	68	68	68			
	Air Temperature °F	70.4	71.7	72.5			
	Barometric Pressure "Hg	30.01	30.01	30.01			
VAPOR /INFLUENT	HC ppmv	-	89.750	-			
	CO_2 %	-	3.52	-			
	CO %	-	5.74	-			
	O_2 %	-	8.6	-			
	H_2S ppm	-	0	-			
NOTES	RELOCATED THE AQUVAC SYSTEM NEAR WELL W-2. GAUGED THE WELL PLACED THE D-WELL PUMP AT 67.0 FT BTOC. INITIAL WELL VAC SET AT 60 "H_2O RESULTING IN A WVF OF 9.50 SCFM.						
MANIFOLD	LNAPL % Vol / Gals	-/-	27/24.3	21/23.31			
	Depth of GW Depression ft	-5.5	-5.5	-5.5		1445	
	Extraction Well DTLNAPL ft	59.12		59.17		59.12	
	Extraction Well DTGW ft	63.96		59.21		60.13	

( ) Indicates Well Pressure

LNAPL 6.84 HE 58.80 .04 HE 59.18 1.01 HE 59.38

7FORMS/TestForms/1210017B

OPERATING DATA - EVENT #1 C **PAGE # 1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

	Date:	7/13/15					
	Parameters	Time 0845	Time 0915	Time 0945	Time 1015	Time 1045	Time 1115
	WELL # A-1	Hr Meter 7290.5	Hr Meter 7291.0	Hr Meter 7291.5	Hr Meter 7292.0	Hr Meter 7292.5	Hr Meter 7293.0
ENGINE/BLOWER	R.P.M.	2200	2200	2300	2300	2300	2300
	Oil Pressure psi	50	50	50	50	50	50
	Water Temp °F	150	150	150	150	155	160
	Volts	14	14	14	14	14	14
	Intake Vacuum "Hg	16	16	16	16	16	16
	Gas Flow Fuel/Propane cfh	0	0	50	50	50	50
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump ON/OFF	ON	ON	ON	ON	ON	ON
	Extraction Well Flow scfm	23.34	23.34	22.95	22.95	22.95	22.95
	Extraction Well Vacuum "H_2O	60	60	70	70	70	70
	Pump Rate gals/min	4.2	4.2	4.4	4.5	4.5	4.5
	Total Volume gals	-	126	252	384	519	654
	Influent Vapor Temp °F	71	71	71	72	72	72
	Air Temperature °F	74.3	77.8	84.3	86.7	88.5	89.4
	Barometric Pressure "Hg	30.01	30.01	30.00	30.00	30.00	29.99
VAPOR/INFLUENT	HC ppmv	-	-	64480	-	-	-
	CO_2 %	-	-	5.14	-	-	-
	CO %	-	-	2.09	-	-	-
	O_2 %	-	-	7.1	-	-	-
	H_2S ppm	-	-	0	-	-	-

NOTES

AT 0830 MOBILIZED THE ACUVAC EQUIPMENT ON WELL A-1. SET IN-WELL PUMP AT 67 FT BTOC. INITIAL WELL VAC SET AT 60"H_2O RESULTING IN A WVF OF 23.34 SCFM. INITIAL GW PUMP RATE SET AT 4.2 GPM.

AT 0945 INCREASED WELL VAC TO 70"H_2O RESULTING IN A WVF OF 22.95 SCFM. GW PUMP RATE INCREASED TO 4.4 GPM AND INCREASED AGAIN AT 1015 HRS TO 4.5 GPM TO COMPENSATE FOR HIGHER VACUUM. TPH VAPORS REMAIN HIGH IN THE GASOLINE RANGE

MANIFOLD	LNAPL % Vol / Gals	-/-	8/10.08	4/5.04	2/2.64	2/2.7	1.5/2.03
	Depth of GW Depression ft	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well DTLNAPL ft	0820 58.03	0830 57.76				
	Extraction Well DTGW ft	63.55	63.87				

( ) Indicates Well Pressure

LNAPL 5.52 6.11

HE 57.47 57.35

OPERATING DATA - EVENT #1C **PAGE #2** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

Date: 7/13/15

	Parameters							
			Time 1145	Time 1215	Time 1245	Time 1315	Time 1345	Time 1445
	WELL # A-1		Hr Meter 7293.5	Hr Meter 7294.0	Hr Meter 7294.5	Hr Meter 7295.0	Hr Meter 7295.5	Hr Meter 7296.5
ENGINE/BLOWER	R.P.M.		2300	2300	2300	2300	2300	2300
	Oil Pressure	psi	50	50	50	50	50	50
	Water Temp	°F	160	160	165	165	165	165
	Volts		14	14	14	14	14	14
	Intake Vacuum	"Hg	16	16	16	16	16	16
	Gas Flow Fuel/Propane	cfh	50	50	50	50	50	50
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	ON	ON	ON	ON	ON	OFF
	Extraction Well Flow	scfm	22.95	22.95	22.95	22.95	22.95	22.95
	Extraction Well Vacuum	"H_2O	70	70	70	70	70	70
	Pump Rate	gals/min	4.5	4.5	4.5	4.4	4.4	3.5
	Total Volume	gals	789	924	1059	1194	1326	1553
	Influent Vapor Temp.	°F	71	71	71	71	71	71
	Air Temperature	°F	91.3	95.1	97.6	99.2	99.5	99.8
	Barometric Pressure	"Hg	29.98	29.97	29.96	29.94	29.92	29.92
VAPOR/INFLUENT	HC	ppmv	56,750	-	-	-	55850	-
	CO_2	%	5.74	-	-	-	5.96	-
	CO	%	1.57	-	-	-	1.52	-
	O_2	%	7.0	-	-	-	7.2	-
	H_2S	ppm	0	-	-	-	0	-
NOTES	WELL VAC AND WELL FLOW STEADY DURING PERIOD. TPH VAPORS MOSTLY STEADY DURING THE PERIOD. AT 1445 EVENT CONCLUDED. ALL WELL GAUGED. WELL W-1 AND W-2 WERE GAUGED TO DETERMINE THE EXTENT OF ANY REBOUND. ACUVAC EQUIPMENT AND SYSTEM DEMOBILIZED, SITE SECURED, DEPARTED SITE.							
MANIFOLD	LNAPL % Vol / Gals		1.5/2.03	1.5/2.03	1.5/2.03	1.5/2.03	1.5/1.98	1.5/1.98
	Depth of GW Depression	ft	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well DTLNAPL	ft						55.88
	Extraction Well DTGW	ft						60.01

( ) Indicates Well Pressure

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LNAPL .13

HE 55.91

OPERATING DATA - EVENT #1 A **PAGE # 1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

Date: 7/13/15

	Parameters		Time 0615	Time 0645	Time 0715	Time	Time	Time
	WELL # W-1		Hr Meter 7288.5	Hr Meter 7289.0	Hr Meter 7289.5	Hr Meter	Hr Meter	Hr Meter
ENGINE/BLOWER	R.P.M.		2206	2200	2200			
	Oil Pressure	psi	50	50	50			
	Water Temp	°F	130	140	150			
	Volts		14	14	14			
	Intake Vacuum	"Hg	19	19	19			
	Gas Flow Fuel/Propane	cfh	0	0	0			
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	ON	ON	OFF			
	Extraction Well Flow	scfm	9.51	9.51	9.51			
	Extraction Well Vacuum	"H_2O	60	60	60			
	Pump Rate	gals/min	3.2	3.2	3.2			
	Total Volume	gals	–	96	192			
	Influent Vapor Temp.	°F	68	68	68			
	Air Temperature	°F	66.7	69.1	69.8			
	Barometric Pressure	"Hg	30.03	30.02	30.01			
VAPOR /INFLUENT	HC	ppmv	–	95790	–			
	CO_2	%	–	3.42	–			
	CO	%	–	7.46	–			
	O_2	%	–	8.6	–			
	H_2S	ppm	–	0	–			

NOTES

ARRIVED ON SITE AT 0545 HRS. POSITIONED THE ACUVAC SYSTEM NEAR WELL W-1. GAUGED THE WELL AND MOBILIZED ALL EQUIPMENT. PLACED THE IN WELL PUMP AT 67.0 FT BTOC. EVENT STARTED AT 0615 HRS. INITIAL WELL VAC SET AT 60 "H_2O RESULTING IN WVF OF 9.50 SCFM. INFLUENT VAPOR SAMPLE INDICATES HIGH CONCENTRATION OF HYDROCARBONS IN THE 95,000 + PPMV RANGE. LIQUID SAMPLE TAKEN AT APPROX 0630 INDICATES 15 % OF LNAPL PRESENT IN THE LIQUID. INDUCED WELL VAC REDUCED AT 0705 HRS GW PUMPING STOPPED AT 0715. EVENT CONCLUDED AT 0715

MANIFOLD	LNAPL % Vol / Gals		-/-	15/14.40	12/11.52			
	Depth of GW Depression	ft	-5.5	-5.5	-5.5	1445		
	Extraction Well DTLNAPL	ft	58.13		–	59.00		
	Extraction Well DTGW	ft	64.67		57.76	63.40		

( ) Indicates Well Pressure

LNAPL 6.54 = ∅ = 4.40

HE 59.83 HE 60.14

7FORMS/TestForms/1210017B

OPERATING DATA - EVENT #1 B **PAGE # 1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers: Sadler/Faucher**

	Date:	7/13/15					
	Parameters	Time 0730	Time 0800	Time 0830	Time	Time	Time
	WELL # W-2	Hr Meter 72895	Hr Meter 72900	Hr Meter 72905	Hr Meter	Hr Meter	Hr Meter
ENGINE/BLOWER	R.P.M.	2200	2200	2200			
	Oil Pressure psi	50	50	50			
	Water Temp °F	150	150	150			
	Volts	14	14	14			
	Intake Vacuum "Hg	19	19	19			
	Gas Flow Fuel/Propane cfh	0	0	0			
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump **ON/OFF**	ON	ON	OFF			
	Extraction Well Flow scfm	9.51	9.51	9.51			
	Extraction Well Vacuum "H_2O	60	60	60			
	Pump Rate gals/min	3.0	3.70	3.70			
	Total Volume gals	-	90	201			
	Influent Vapor Temp °F	68	68	68			
	Air Temperature °F	70.4	71.7	72.5			
	Barometric Pressure "Hg	30.01	30.01	30.01			
VAPOR /INFLUENT	HC ppmv	-	89,750	-			
	CO_2 %	-	3.52	-			
	CO %	-	5.74	-			
	O_2 %	-	8.6	-			
	H_2S ppm	-	0	-			
NOTES	RELOCATED THE ACUVAC SYSTEM NEAR WELL W-2. GAUGED THE WELL PLACED THE ID WELL PUMP AT 67.0 FT BTOC. INITIAL WELL VAC SET AT 60 "H_2O RESULTING IN A WVF OF 9.50 SCFM.						
MANIFOLD	LNAPL % Vol Gals	-/-	27/24.3	21/23.31			
	Depth of GW Depression ft	-5.5	-5.5	-5.5		1445	
	Extraction Well DTLNAPL ft	59.12		59.17		59.12	
	Extraction Well DTGW ft	63.96		59.21		60.13	

( ) Indicates Well Pressure

LNAPL 6.84 HE 58.90 .04 HE 59.18 1.01 HE 59.38

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OPERATING DATA - EVENT #1 C **PAGE # 1** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

	Date:	7/13/15					
	Parameters	Time 0845	Time 0915	Time 0945	Time 1015	Time 1045	Time 1115
	WELL # A-1	Hr Meter 7290.5	Hr Meter 7291.0	Hr Meter 7291.5	Hr Meter 7292.0	Hr Meter 7292.5	Hr Meter 7293.0
ENGINE/BLOWER	R.P.M.	2200	2200	2300	2300	2300	2300
	Oil Pressure psi	50	50	50	50	50	50
	Water Temp °F	150	150	150	150	155	160
	Volts	14	14	14	14	14	14
	Intake Vacuum "Hg	16	16	16	16	16	16
	Gas Flow Fuel/Propane cfh	0	0	50	50	50	50
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump ON/OFF	ON	ON	ON	ON	ON	ON
	Extraction Well Flow scfm	23.34	23.34	22.95	22.95	22.95	22.95
	Extraction Well Vacuum "H_2O	60	60	70	70	70	70
	Pump Rate gals/min	4.2	4.2	4.4	4.5	4.5	4.5
	Total Volume gals	-	126	252	384	519	654
	Influent Vapor Temp °F	71	71	71	72	72	72
	Air Temperature °F	74.3	77.8	84.3	86.7	88.5	89.4
	Barometric Pressure "Hg	30.01	30.01	30.00	30.00	30.00	29.99
VAPOR /INFLUENT	HC ppmv	-	-	64480	-	-	-
	CO_2 %	-	-	5.14	-	-	-
	CO %	-	-	2.09	-	-	-
	O_2 %	-	-	7.1	-	-	-
	H_2S ppm	-	-	0	-	-	-

NOTES

AT 0830 MOBILIZED THE ACUVAC EQUIPMENT ON WELL A-1. SET IN-WELL PUMP AT 67 FT BTOC. INITIAL WELL VAC SET AT 60"H_2O RESULTING IN A WVF OF 23.34 SCFM. INITIAL GW PUMP RATE SET AT 4.2 GPM.
AT 0945 INCREASED WELL VAC TO 70"H_2O RESULTING IN A WVF OF 22.95 SCFM. GW PUMP RATE INCREASED TO 4.4 GPM AND INCREASED AGAIN AT 1015 HRS TO 4.5 GPM TO COMPENSATE FOR HIGHER VACUUM. TPH VAPORS REMAIN HIGH IN THE GASOLINE RANGE

MANIFOLD	LNAPL % Vol / Gals	-/-	8/10.08	4/5.04	2/2.64	2/2.7	1.5/2.03
	Depth of GW Depression ft	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well DTLNAPL ft	0820 58.03	0830 57.76				
	Extraction Well DTGW ft	63.55	63.87				

( ) Indicates Well Pressure

LNAPL 5.52 6.11

HE 57.47 57.35

7FORMS/TestForms/1210017B

OPERATING DATA - EVENT #1C **PAGE #2** **ACUVAC MOBILE DUAL PHASE SYSTEM**

Location: Walstadd 66, Lovington, NM **Project Managers:** Sadler/Faucher

Date: 7/13/15

	Parameters							
			Time 1145	Time 1215	Time 1245	Time 1315	Time 1345	Time 1445
	WELL # A-1		Hr Meter 7293.5	Hr Meter 7294.0	Hr Meter 7294.5	Hr Meter 7295.0	Hr Meter 7295.5	Hr Meter 7296.5
ENGINE/BLOWER	R.P.M.		2300	2300	2300	2300	2300	2300
	Oil Pressure	psi	50	50	50	50	50	50
	Water Temp	°F	160	160	165	165	165	165
	Volts		14	14	14	14	14	14
	Intake Vacuum	"Hg	16	16	16	16	16	16
	Gas Flow Fuel/Propane	cfh	50	50	50	50	50	50
ATMOSPHERE/VACUUM/AIR PUMP/VOLUME	GW Pump	ON/OFF	ON	ON	ON	ON	ON	OFF
	Extraction Well Flow	scfm	2295	22.95	22.95	22.95	22.95	2295
	Extraction Well Vacuum	"H_2O	70	70	70	70	70	70
	Pump Rate	gals/min	4.5	4.5	4.5	4.4	4.4	3.5
	Total Volume	gals	789	924	1059	1194	1326	1553
	Influent Vapor Temp.	°F	71	71	71	71	71	71
	Air Temperature	°F	91.3	95.1	97.6	99.2	99.5	99.8
	Barometric Pressure	"Hg	29.98	29.97	29.96	29.94	29.92	2992
VAPOR /INFLUENT	HC	ppmv	56,750	-	-	-	55850	-
	CO_2	%	5.74	-	-	-	5.96	-
	CO	%	1.57	-	-	-	1.52	-
	O_2	%	7.0	-	-	-	7.2	-
	H_2S	ppm	0	-	-	-	0	-
NOTES	WELL VAC AND WELL FLOW STEADY DURING PERIOD. TPH VAPORS MOSTLY STEADY DURING THE PERIOD. AT 1445 EVENT CONCLUDED. ALL WELL GAUGED. WELL W-1 AND W-2 WERE GAUGED TO DETERMINE THE EXTENT OF ANY REBOUND. ACUVAC EQUIPMENT AND SYSTEM DEMOBILIZED, SITE SECURED, DEPARTED SITE.							
MANIFOLD	LNAPL % Vol / Gals		1.5/2.03	1.5/2.03	1.5/2.03	1.5/2.03	1.5/1.98	1.5/1.98
	Depth of GW Depression	ft	-5.5	-5.5	-5.5	-5.5	-5.5	-5.5
	Extraction Well DTLNAPL	ft						55.98
	Extraction Well DTGW	ft						60.01

( ) Indicates Well Pressure

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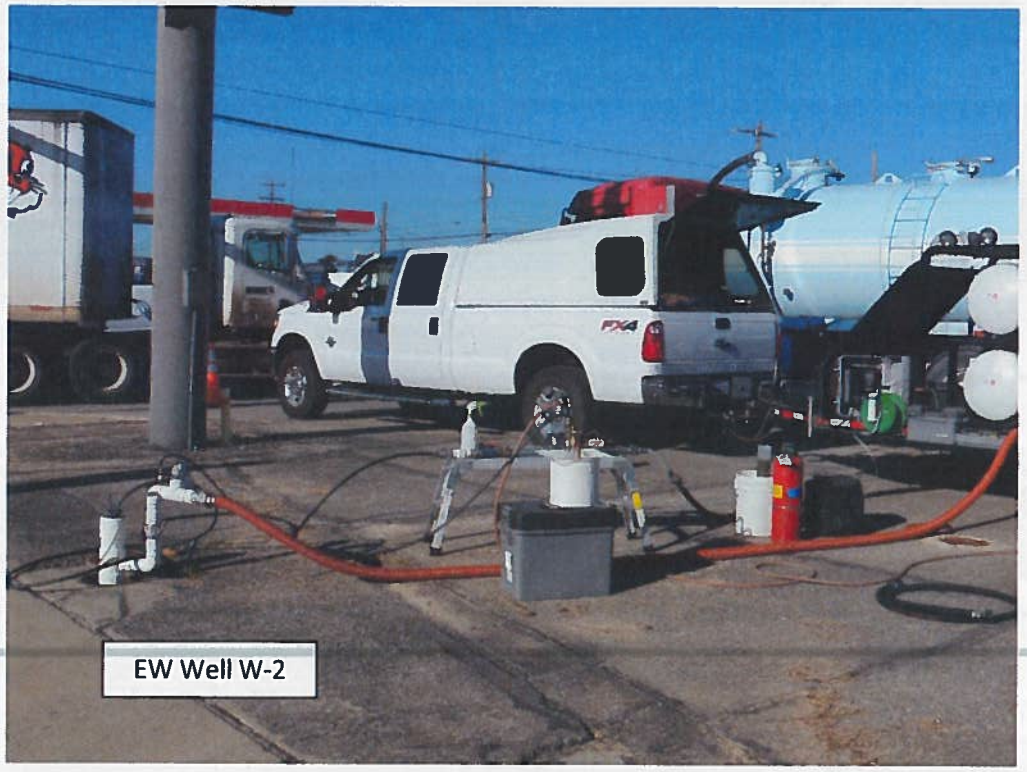
HE 55.91 LNAPL .13

WALSTADD 66
LOVINGTON, NM



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