

1R - 398

## REPORTS

DATE:

6-20-13



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**MOBILE DUAL PHASE EXTRACTION REPORT**  
**LIVINGSTON RIDGE TO HUGH-P.SIMS PIPELINE RELEASE**  
**LEA COUNTY, NEW MEXICO**

**SRS # 2001-1005**  
**NMOCD# 1R-0398**

**PREPARED FOR:**

**PLAINS MARKETING, L.P.**  
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**SUITE 1600**  
**HOUSTON, TEXAS 77002**

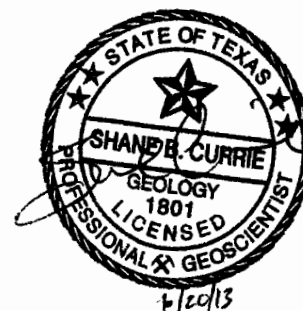
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**TALON/LPE**  
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**JUNE 20, 2013**



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## **I. MDPE SUMMARY REPORT AND WASTE DISPOSITION**

### **A. MDPE Results**

The following report summarizes data collected during the 12-hour High Vacuum Multi-Phase Extraction (MDPE) event conducted on April 9, 2013 at the Livingston Ridge to Hugh-P.Sims Pipeline release site, located in Lea County, New Mexico. The objective of the MDPE treatment was to remove both vapor and liquid phase separated hydrocarbons (PSH) from onsite groundwater wells. Talon/LPE utilized an MDPE unit which consisted of an SVE extraction pump capable of generating vacuum up to 25" hg. Off gas vapors extracted from the extraction wells were destroyed using a propane-fired 1000-SCFM thermal oxidizer capable of processing 172.96 lbs/hr of gasoline.

A total of 12 hours (0.5 days) of PSH recovery was performed on TMW1 for 12 hours.

Prior to and immediately following the event, the groundwater wells were gauged for groundwater elevation and PSH. Depth to groundwater ranges were measured in feet below the top of casing. Refer to Attachment 1 for a summary of data collected during the MDPE event.

The volume of PSH removed during the MDPE event is shown to reflect the portions of PSH in the liquid phase and as off-gas vapor. Air removal rates were calculated from velocity measurements recorded at the influent manifold prior to entry into the MDPE unit. PSH recovery and air flow data has been detailed and is contained in Table 1. Two influent air samples were collected over the course of the event. These samples were submitted for laboratory testing in order to compare the predicted vapor concentrations (based on field-screening or calculated based on fuel consumption) to the actual vapor concentrations. Both influent samples were tested for Total-Gas Analysis (Hydrocarbon Composition) by GPA 2261-C6+. Laboratory analytical results can be found in Attachment 2.

Based on a combination of field vapor screening and collected laboratory samples, a combined estimated total of **10.79 equivalent gallons of hydrocarbons (Total)** were removed during the event. The combined volume of hydrocarbons were comprised of approximately **3 gallons of PSH (liquid phase)** and approximately **7.79 gallons as off-gas vapor**. The calculations used to estimate the off-gas vapor mass recovered reflect the mass of total hydrocarbons recovered and does not necessarily equate to an equal mass of the product released. The mass recovery calculations may be affected by variations in the type of product released, age of release, activity of aerobic and/or anaerobic processes, and site specific geochemical factors.

The cumulative air flow measurements for the MDPE event were calculated using a combination of field data measurements and Preso® B+ manufacturer provided formulas. **Air flow rates extracted from the recovery wells averaged 54.95 SCFM** during the event.

A portion of the extracted air flow rates measured is attributable to compressed air, which was "injected" into the extraction wells. This "injected" air is introduced into the extraction wells for the purpose of enhancing liquid recovery rates.

**B. Air Quality**

Two influent air samples were collected during the event. These samples were submitted for laboratory testing in order to compare the predicted vapor concentrations (based on field-screening or calculated based on fuel consumption) to the actual vapor concentrations. The maximum concentration in air influent was recorded as 30,800 ppmv for Hydrocarbon Composition. Laboratory analytical results can be found in Attachment 2.

**C. Waste Management and Disposition**

A cumulative total of 682 gallons of fluid were generated during this event. The fluids were temporarily transferred to an on-site storage tank prior to being transported to an authorized disposal facility. A copy of the waste ticket can be found in Attachment 4.

**II. SYSTEM OPERATION DATA AND MASS RECOVERY CALCULATIONS**

**Formulae:**

$$\text{Concentration (C\_mg/l)} = \frac{\text{C\_ppmv} \times \text{Mol. wt. in mg(estimated)} \times 1000 \times 0.000001}{0.0821 \times \text{Temp (K)}}$$

$$\text{Recovery Rate (lbs/hr)} = \frac{(\text{C\_mg/l}) \times 2.2 \times (\text{Flowrate}) \times 60 \times 28.32}{1,000,000}$$

$$\text{Recovery (lbs)} = (\text{lbs/hr}) \times (\text{hrs})$$

$$\text{Correction Factor (CF)} = \frac{\text{PID Reading(ppm)}}{\text{PID Reading at Time of Laboratory Analysis}}$$

$$\frac{8.34 \text{ lbs}}{\text{gallon water}} \times 0.66 \text{ average specific gravity of light crude (estimated)} = \frac{5.5 \text{ lbs light crude}}{\text{gallon}}$$

**Table 1**  
**System Operation Data and Mass Recovery Calculations**

Time	Period (hours)	Influent Temp. (°F)	Vacuum (In. hg)	Vacuum (In. h2O)	Differential pressure (In. h2O)	Flow (SCFM)	FID Readings (ppm)	Lab Result (ppmv)	Assigned Lab Result (ppmv)	Correction Factor (CF)	Adjusted Lab Result (ppmv)	Adjusted Lab Result (mg/L)	Recovery (lbs/hr)	Recovery in Period (lbs)	Total Recovery (lbs)
11:15	0.5	80	22.5	306.20	10.2	55.19	12300	-	30800.00	0.25	7577	8.78	1.81	0.91	0.91
11:45	0.5	80	22.5	306.20	10	54.84	50000	30800.00	30800.00	1.00	30800	35.69	7.29	3.65	4.55
12:45	1	82	22.5	306.20	10.5	55.89	50000	-	30800.00	1.00	30800	35.56	7.43	7.43	11.98
13:45	1	82	22	299.40	10.1	56.62	50000	-	30800.00	1.00	30800	35.56	7.53	7.53	19.51
14:45	1	83	22.5	306.20	10.6	56.10	50000	-	30800.00	1.00	30800	35.50	7.44	7.44	26.95
15:45	1	79	23	313.01	11.3	56.16	50000	-	30800.00	1.00	30800	35.76	7.51	7.51	34.46
16:45	1	78	19	258.57	5	46.92	38726	-	30800.00	0.77	23855	27.75	4.87	4.87	39.33
17:45	1	78	19	258.57	5.1	47.39	50000	-	12520.00	1.00	12520	14.57	2.58	2.58	41.91
18:45	1	76	19	258.57	7.3	56.80	24556	-	12520.00	0.49	6149	7.18	1.52	1.52	43.43
19:45	1	72	19	258.57	7	55.83	21341	-	12520.00	0.43	5344	6.29	1.31	1.31	44.75
20:45	1	66	19	258.57	7.5	58.12	32294	-	12520.00	0.65	8086	9.63	2.09	2.09	46.84
21:45	1	62	18	244.96	6.8	58.03	50000	12520.00	12520.00	1.00	12520	15.02	3.26	3.26	50.09
22:45	1	62	18	244.96	6.5	56.73	50000	-	12520.00	1.00	12520	15.02	3.18	3.18	53.28
Averages:		75.38	20.46	278.46	8.30	54.95	40709.00						Total	53.28	

PSH Mass Recovered in Vapor Phase = **7.79** gallons

FID maximum Concentration = 50,000 PPM

Ex: Conversion from ppmv to mg/L (Influent 1)

Measured Conc.	Molecular Wt.	Pressure	Gas Constant	Temp.	Temp.	Conc.
(ppmv)	(Grams)	(atm)	(atm.liter/K.mole)	(F)	(K)	( C_mg/l)
7577	28.5118	1	0.0821	80	299.66667	8.78068925

Inputs are the green values.

Calculated values are yellow.

Constants are purple values.

Output are the blue values.

Liquid-phase Hydrocarbon Recovery

$[V] \times 12 \times h = \text{volume}$

### Total Hydrocarbon Recovery

PSH Mass Recovered in Vapor Phase =	<b>53.28</b> lbs
	<b>7.79</b> gallons
PSH Mass Recovered in Liquid Phase =	<b>20.52</b> lbs
	<b>3.00</b> gallons
<b>TOTAL =</b>	<b>73.80</b> lbs
	<b>10.79</b> gallons

Gallons removed determined at time of pick up

PSH Volume in Gallons=	<b>3</b>
PSH Mass in Pounds=	<b>20.52</b>

#### % Vol. Hydrocarbon to ppmv - Influent 1

Compound	Molecular Weight (g/mol)	% Vol	=	ppmv
Methane (CH4)	16.04	2.05		20500.00
Ethane (C2H6)	30.07	0		0.00
Propane (C3H8)	44.10	0.002		20.00
Iso-Butane (C4H10)	58.12	0.005		50.00
N-Butane (C4H10)	58.12	0.001		10.00
Iso-Pentane (C4H12)	72.15	0.033		330.00
N-Pentane (C5H12)	72.15	0.034		340.00
Hexane+ (C6H14)	97.40	0.955		9550.00
Total				30800.00

\*Hexane+ is treated as 60% hexanes, 30 % heptanes, and 10 % octanes, as such its  
 $(0.6 \times 93.1887) + (0.3 \times 100.2019) + (0.1 \times 114.2285) = 97.3966$

#### Molecular Weight Calculations

component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.016	91.8480
Methane (CH4)	16.0425	3.6410
Carbon Dioxide (CO2)	44.011	4.0120
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0956	0.0060
Iso-Butane (C4H10)	58.1222	0.0140
N-Butane (C4H10)	58.1222	0.0020
Iso-Pentane (C4H12)	72.1488	0.0910
N-Pentane (C5H12)	72.1488	0.0940
Hexane+	97.3966	0.2920
Total		100
Calculated MW		28.5118

#### % Vol. Hydrocarbon to ppmv - Influent 2

Compound	Molecular Weight (g/mol)	% Vol	=	ppmv
Methane (CH4)	16.04	0.451		4510
Ethane (C2H6)	30.07	0		0.00
Propane (C3H8)	44.10	0.003		30.00
Iso-Butane (C4H10)	58.12	0.016		160.00
N-Butane (C4H10)	58.12	0.084		840.00
Iso-Pentane (C4H12)	72.15	0.152		1520.00
N-Pentane (C5H12)	72.15	0.164		1640.00
Hexane+ (C6H14)	97.40	0.833		8330.00
Total				12520.00

\*Hexane+ is treated as 60% hexanes, 30 % heptanes, and 10 % octanes, as such its  
 $(0.6 \times 93.1887) + (0.3 \times 100.2019) + (0.1 \times 114.2285) = 97.3966$

#### Molecular Weight Calculations

component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.016	96.5320
Methane (CH4)	16.0425	0.8020
Carbon Dioxide (CO2)	44.011	2.2350
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0956	0.0020
Iso-Butane (C4H10)	58.1222	0.0080
N-Butane (C4H10)	58.1222	0.0410
Iso-Pentane (C4H12)	72.1488	0.0600
N-Pentane (C5H12)	72.1488	0.0650
Hexane+	97.3966	0.2550
Total		100
Calculated MW		28.5246

Calculated MW=  $\frac{\text{sum (individual component MW x their reported mol\%)}}{100}$

ppmv= % Vol x 10,000

*Livingston Ridge to Hugh-P.Sims – 700376.100.04 - SRS# 2001-1005 – Event 4 – 12 Hour*

**ATTACHMENT 1**  
MDPE Field Logs





Start Date: 4/9/2013

## MDPE FIELD DATA

		Well Flow						Well Data				
TIME	SAMPLE TAKEN	Influent temp. (°f)	Diff. Pressure (INH2O) 2" Preso	Vac (In.Hg)	PID Composite (PPM)	Propane Tank (%-size) 500 Gal.	EXHAUST TEMP F	COMMENTS:				
								TMW1				
								VAC (INH2O)	VAC (INH2O)	VAC (INH2O)	VAC (INH2O)	VAC (INH2O)
11:15		80	10.2	22.5	12300	59	1409	62.3				
11:45	*	80	10	22.5	>50000	56	1410	64.7				
12:45		82	10.5	22.5	>50000	54	1411	64.1				
13:45		82	10.1	22	>50000	52	1411	63.2				
14:45		83	10.6	22.5	>50000	50	1410	64.7				
15:45		79	11.3	23	>50000	49	1409	40.3				
16:45		78	5	19	38726	47	1416	48.1				
17:45		78	5.1	19	>50000	45	1411	47.4				
18:45		76	7.3	19	24556	43	1408	52.8				
19:45		72	7	19	21341	41	1405	53.4				
20:45		66	7.5	19	32294	39	1412	54.2				
21:45	*	62	6.8	18	>50000	37	1405	56.4				
22:45		62	6.5	18	>50000	35	1409	56.8				

## Soil Vacuum Influence

Observation Well	MW5
Extraction Well (EW)	TMW1
Time:	In. H2O
11:45	0
21:45	0.05

*Livingston Ridge to Hugh-P.Sims – 700376.100.04 - SRS# 2001-1005 – Event 4 – 12 Hour*

**ATTACHMENT 2**  
Laboratory Analytical Results



HOUSTON LABORATORIES  
6520 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
PHONE (713) 660-0901

## Certificate of Analysis

Number: 1030-2013040312-001A

April 15, 2013

Simon I. Walshe, CAPM  
Talon/LPE  
921 N. Bivins St.  
Amarillo Texas 79107

Sample ID:  
Station Name : Influent #1  
Station Number :  
Station Location : Eunice, NM.  
Sample Point:

Sampled By:  
Sample Of: Gas Spot  
Sample Date: 04/09/2013 11:45  
Sample Conditions: N.G. Pres. , N.G. Temp.  
PO / Ref. No:

### ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
				GPA-2261 M	DK	4/15/2013 3:18:44 AM
Nitrogen	91.848	90.289				
Carbon Dioxide	4.012	6.196				
Methane	3.641	2.050				
Propane	0.006	0.009	0.002			
Iso Butane	0.014	0.029	0.005			
n-Butane	0.002	0.004	0.001			
Iso Pentane	0.091	0.230	0.033			
n-Pentane	0.094	0.238	0.034			
Hexanes Plus	0.292	0.955	0.127			
	100.000	100.000	0.202			
	C2 +	C3 +	iC5 +			
GPM TOTAL :	0.202	0.202	0.194			
Relative Density	Real Gas			0.9840		
Calculated Molecular Weight				28.50		
Compressibility Factor				0.9995		
GPA 2172-09 Calculation :						
Calculated Gross BTU per ft <sup>3</sup> @14.650 psia & 60°F						
Real Gas:	Dry BTU:		60			
	Water Sat. Gas_Base BTU:		59			
Comments : H2O Mol% - 1.75_Wt% - 1.113						

Hydrocarbon Laboratory Manager

Quality Assurance:

The above analyses are performed in accordance with ASTM, UOP or GPA guidelines for quality assurance, unless otherwise stated



HOUSTON LABORATORIES  
3826 INTERCHANGE DRIVE  
HOUSTON, TEXAS 77054  
PHONE (713) 660-0901

## Certificate of Analysis

Number: 1030-2013040312-002A

Simon I. Walshe, CAPM  
Talon/LPE  
921 N. Bivins St.  
Amarillo Texas 79107

April 15, 2013

Sample ID:  
Station Name : Influent #2  
Station Number :  
Station Location : Eunice, NM.  
Sample Point:

Sampled By:  
Sample Of: Gas Spot  
Sample Date: 04/09/2013 21:45  
Sample Conditions: N.G. Pres. , N.G. Temp.  
PO / Ref. No:

### ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
				GPA-2261 M	DK	4/15/2013 3:34:49 AM
Nitrogen	96.532	94.847				
Carbon Dioxide	2.235	3.450				
Methane	0.802	0.451				
Propane	0.002	0.003	0.001			
Iso Butane	0.008	0.016	0.003			
n-Butane	0.041	0.084	0.013			
Iso Pentane	0.060	0.152	0.022			
n-Pentane	0.065	0.164	0.023			
Hexanes Plus	0.255	0.833	0.111			
	100.000	100.000	0.173			
	<b>C2 +</b>	<b>C3 +</b>	<b>iC5 +</b>			
GPM TOTAL :	0.173	0.173	0.156			
Relative Density	Real Gas			0.9844		
Calculated Molecular Weight				28.51		
Compressibility Factor				0.9996		
<b>GPA 2172-09 Calculation :</b>						
<b>Calculated Gross BTU per ft<sup>3</sup> @14.650 psia &amp; 60°F</b>						
Real Gas:	Dry BTU:		28			
	Water Sat. Gas_Base BTU:		27			
<b>Comments :</b> H2O Mol% - 1.75_Wt% - 1.113						

Hydrocarbon Laboratory Manager

#### Quality Assurance:

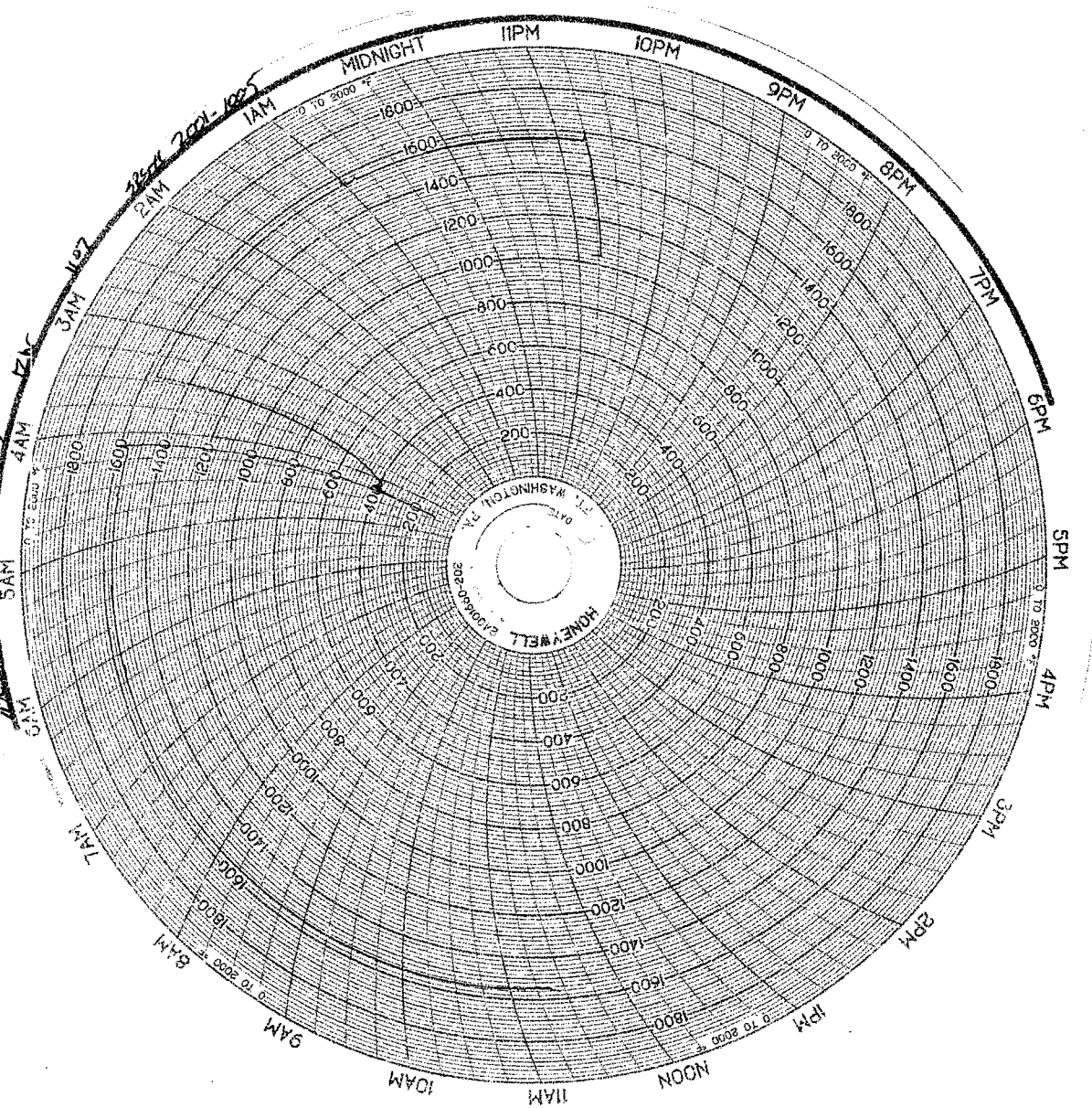
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SPL, Inc.



*Livingston Ridge to Hugh-P.Sims – 700376.100.04 - SRS# 2001-1005 – Event 4 – 12 Hour*

**ATTACHMENT 3**  
Oxidizer Charts



*Livingston Ridge to Hugh-P.Sims – 700376.100.04 - SRS# 2001-1005 – Event 4 – 12 Hour*

## **ATTACHMENT 4**

Waste Ticket



