

AP - 37

**STAGE 2  
REPORT**  
(Event 6)

**Date**

6-5-13



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**MOBILE DUAL PHASE EXTRACTION REPORT**  
**LOVINGTON DEEP 6 PIPELINE RELEASE**  
**LEA COUNTY, NEW MEXICO**

**SRS # 2002-10312**  
**NMOCD# AP-037**

RECEIVED OCD

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**PREPARED FOR:**

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

**PREPARED BY:**

**TALON/LPE**  
**921 N. BIVINS**  
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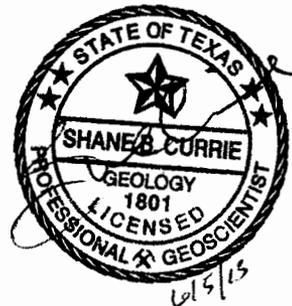
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JUNE 5, 2013



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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 24, 2013, at the Lovington Deep 6 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. MW2, MW13, MW-14, MW16 & MW17 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. 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 **195.09 equivalent gallons of hydrocarbons (Total)** were removed during the event. The combined volume of hydrocarbons were comprised of approximately **172 gallons of PSH (liquid phase)** and approximately **23.09 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 specific gravity of hydrocarbon 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 201.39 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 influent concentration was recorded as 13,830 ppmv for Hydrocarbon Composition. Laboratory analytical results can be found in Attachment 2.

**C. Waste Management and Disposition**

A cumulative total of 1,668 gallons of fluid were generated during this event. The fluids were temporarily transferred to an on-site storage tank prior to being transferred 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:**

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

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

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

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

$$\frac{8.34 \text{ lbs}}{\text{gallon water}} \times 0.82 \text{ average specific gravity of light crude} = \frac{6.84 \text{ lbs light crude}}{\text{gallon}} \text{ (estimated)}$$

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

Time	Period (hours)	Influent Temp. (°f)	Vacuum (in. hg)	Vacuum (in. h20)	Differential pressure (in. h20)	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)
11:45	0.5	62	15	204.14	60.5	193.58	18721	-	13020.00	0.75	9773	11.77	8.51	4.26	4.26
12:15	0.5	62	15.5	210.94	63.2	194.52	24942	13020.00	13020.00	1.00	13020	15.68	11.40	5.70	9.96
13:15	1	66	16	217.74	74.8	207.14	27894	-	13020.00	1.12	14561	17.40	13.47	13.47	23.43
14:15	1	68	17	231.35	83.4	210.34	29710	-	13020.00	1.19	15509	18.46	14.51	14.51	37.94
15:15	1	70	17	231.35	80.2	205.88	44106	-	13020.00	1.77	23024	27.30	21.01	21.01	58.95
16:15	1	70	17.5	238.16	81.3	203.25	42714	-	13020.00	1.71	22297	26.44	20.09	20.09	79.04
17:15	1	70	16	244.96	82.7	200.83	46314	-	13020.00	1.66	24176	28.67	21.52	21.52	100.56
18:15	1	70	17.5	238.16	83.6	206.10	32854	-	13830.00	0.91	12635	15.09	11.63	11.63	112.19
19:15	1	68	17.5	238.16	82.7	205.38	20461	-	13830.00	0.57	7869	9.43	7.24	7.24	119.43
20:15	1	62	16	217.74	38.7	149.58	9534	-	13830.00	0.27	3697	4.45	2.49	2.49	121.92
21:15	1	60	17	231.35	82.5	210.81	27852	-	13830.00	0.77	10712	13.04	10.28	10.28	132.19
22:15	1	60	16.5	224.55	83.1	215.61	35960	13830.00	13830.00	1.00	13830	16.84	13.57	13.57	145.76
23:15	1	60	16.5	224.55	82.7	215.09	32421	-	13830.00	0.90	12469	15.16	12.20	12.20	157.97
Average:		65.23	16.69	227.17	75.34	201.39	30267.92						Total	157.97	

PSH Mass Recovered in Vapor Phase = 23.09 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)
9773	28.6319	1	0.0821	62	289.666667	11.766667

Inputs are the green values.

Calculated values are yellow.

Constants are purple values.

Outputs are the blue values.

Liquid-phase Hydrocarbon Recovery

$\square \cdot r^2 \cdot h = \text{volume}$

Total Hydrocarbon Recovery	
PSH Mass Recovered in Vapor Phase =	<span style="border: 1px solid black; padding: 2px;">157.97</span> lbs
	<span style="border: 1px solid black; padding: 2px;">23.09</span> gallons
PSH Mass Recovered in Liquid Phase =	<span style="border: 1px solid black; padding: 2px;">1176.48</span> lbs
	<span style="border: 1px solid black; padding: 2px;">172.00</span> gallons
<b>TOTAL =</b>	<b><span style="border: 1px solid black; padding: 2px;">1334.45</span> lbs</b>
	<b><span style="border: 1px solid black; padding: 2px;">195.09</span> gallons</b>

Gallons removed determined at time of pick up	
PSH Volume in Gallons=	<span style="border: 1px solid black; padding: 2px;">172</span>
PSH Mass in Pounds=	<span style="border: 1px solid black; padding: 2px;">1176.48</span>

% Vol. Hydrocarbon to ppmv - Influent 1				
Compound	Molecular Weight (g/mol)	% Vol	=	ppmv
Methane (CH4)	16.04	0		0.00
Ethane (C2H6)	30.07	0		0.00
Propane (C3H8)	44.10	0		0.00
iso-Butane (C4H10)	58.12	0		0.00
n-Butane (C4H10)	58.12	0.016		160.00
iso-Pentane (C4H12)	72.15	0.048		480.00
n-Pentane (C5H12)	72.15	0.101		1010.00
Hexane+ (C6H14)	97.40	1.137		11370.00
<b>Total</b>				<b>13020.00</b>

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

Molecular Weight Calculations		
component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.016	97.4250
Methane (CH4)	16.0425	0.0000
Carbon Dioxide (CO2)	44.011	2.1590
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0956	0.0000
iso-Butane (C4H10)	58.1222	0.0000
n-Butane (C4H10)	58.1222	0.0080
iso-Pentane (C4H12)	72.1488	0.0190
n-Pentane (C5H12)	72.1488	0.0400
Hexane+	97.3966	0.3490
<b>Total</b>		<b>100</b>
<b>Calculated MW</b>		<b>28.6319</b>

% Vol. Hydrocarbon to ppmv - Influent 2				
Compound	Molecular Weight (g/mol)	% Vol	=	ppmv
Methane (CH4)	16.04	0		0
Ethane (C2H6)	30.07	0		0.00
Propane (C3H8)	44.10	0		0.00
iso-Butane (C4H10)	58.12	0		0.00
n-Butane (C4H10)	58.12	0.014		140.00
iso-Pentane (C4H12)	72.15	0.053		530.00
n-Pentane (C5H12)	72.15	0.113		1130.00
Hexane+ (C6H14)	97.40	1.203		12030.00
<b>Total</b>				<b>13830.00</b>

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

Molecular Weight Calculations		
component	Molecular Weight (g/mol)	mol%
Nitrogen (N2)	28.016	96.2240
Methane (CH4)	16.0425	0.0000
Carbon Dioxide (CO2)	44.011	3.3310
Ethane (C2H6)	30.069	0.0000
Propane (C3H8)	44.0956	0.0000
iso-Butane (C4H10)	58.1222	0.0000
n-Butane (C4H10)	58.1222	0.0070
iso-Pentane (C4H12)	72.1488	0.0210
n-Pentane (C5H12)	72.1488	0.0450
Hexane+	97.3966	0.3720
<b>Total</b>		<b>100</b>
<b>Calculated MW</b>		<b>28.8381</b>

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

ppmv = % Vol x 10,000

*Lovington Deep 6 – 700376.051.07 - SRS# 2002-10312 – Event 6 – 12 Hour*

**ATTACHMENT 1**  
MDPE Field Logs



Start Date: 24-Apr-13

MDPE FIELD DATA

TIME	SAMPLE TAKEN	Well Flow			FID Composite (PPM)	Propane Tank (%-size) 1000 Gal.	EXHAUST TEMP F	Well Data				
		Influent temp. (°f)	Diff. Pressure (INH2O) 2" Preso	Vac (In.Hg)				COMMENTS:				
								MW-2	MW-13	MW-14	MW-16	MW-17
								VAC (INH2O)				
11:45		62	60.5	15	18721	68	1909	14.1	16	8.1	17.9	18.3
12:15	*	62	63.2	15.5	24942	67	1413	14.4	16.5	8.2	18.8	18
13:15		66	74.8	16	27894	66	1410	14.1	15.8	7.7	20.1	18.3
14:15		68	83.4	17	29710	65	1409	14.6	12.6	7.3	22.2	17.9
15:15		70	80.2	17	44106	63	1408	14.2	14.6	7.4	21.8	18.5
16:15		70	81.3	17.5	42714	62	1407	14.3	13.8	7.5	16.8	17.8
17:15		70	82.7	18	46314	61	1410	13.7	14	7.8	15.7	18
18:15		70	83.6	17.5	32854	61	1409	12	17.7	6.9	20.9	10.3
19:15		68	82.7	17.5	20461	60	1414	12.6	18.3	7.2	21.2	10.1
20:15		62	38.7	16	9534	60	1409	10.6	15.7	4.2	19.1	15.5
21:15		60	82.5	17	27852	59	1405	9.3	16.9	8.9	22.2	16.7
22:15	*	60	83.1	16.5	35960	57	1405	10.1	15.8	7.9	21.6	12.1
23:15		60	82.7	16.5	32421	56	1409	9.8	15.2	7.3	22.1	13.5

Soil Vacuum Influence

Observation Well	MW-15
Extraction Well (EW)	MW-2
Time:	In.H2O
12:15	0
22:15	0.07

*Lovington Deep 6 – 700376.051.07 - SRS# 2002-10312 – Event 6 – 12 Hour*

**ATTACHMENT 2**  
Laboratory Analytical Results



HOUSTON LABORATORIES  
 2500 WESTHOPE BOULEVARD  
 HOUSTON, TEXAS 77058  
 PHONE: 281.281.8100

## Certificate of Analysis

Number: 1030-2013040735-001A

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

May 03, 2013

Sample ID:		Sampled By:	LB
Station Name :	Influent #1	Sample Of:	Gas Spot
Station Number :	700376.051.07	Sample Date:	04/24/2013 12:15
Station Location :	Hobbs, NM.	Sample Conditions:	N.G. Pres. , N.G. Temp.
Sample Point:		PO / Ref. No:	

### ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
				GPA-2261 M	JD	5/2/2013 9:17:56 AM
Nitrogen	97.425	95.377				
Carbon Dioxide	2.159	3.321				
n-Butane	0.008	0.016	0.003			
Iso Pentane	0.019	0.048	0.007			
n-Pentane	0.040	0.101	0.014			
Hexanes Plus	0.349	1.137	0.151			
	<u>100.000</u>	<u>100.000</u>	<u>0.175</u>			
	<b>C2 +</b>	<b>C3 +</b>	<b>iC5 +</b>			
GPM TOTAL :	0.175	0.175	0.172			
Relative Density	Real Gas			0.9880		
Calculated Molecular Weight				28.61		
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:		20			
	Water Sat. Gas_Base BTU:		20			
<b>Comments :</b>	H2O Mol% - 1.75_Wt% - 1.109					

*Simon I. Walshe*

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 LABORATORY  
 2800 WEST 17TH STREET  
 HOUSTON, TEXAS 77056  
 PHONE 281-551-1187

# Certificate of Analysis

Number: 1030-2013040735-002A

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

May 03, 2013

Sample ID:		Sampled By:	LB
Station Name :	Influent #2	Sample Of:	Gas Spot
Station Number :		Sample Date:	04/24/2013 22:15
Station Location :	Hobbs, NM.	Sample Conditions:	N.G. Pres. , N.G. Temp.
Sample Point:	Lovington to Deep 6	PO / Ref. No:	

## ANALYTICAL DATA

Components	Mol %	Wt %	GPM at 14.650 psia	Method	Lab Tech.	Date Analyzed
				GPA-2261 M	JD	5/2/2013 9:38:31 AM
Nitrogen	96.224	93.530				
Carbon Dioxide	3.331	5.087				
n-Butane	0.007	0.014	0.002			
Iso Pentane	0.021	0.053	0.008			
n-Pentane	0.045	0.113	0.016			
Hexanes Plus	0.372	1.203	0.161			
	100.000	100.000	0.187			
	<b>C2 +</b>	<b>C3 +</b>	<b>iC5 +</b>			
GPM TOTAL :	0.187	0.187	0.185			
Relative Density	Real Gas			0.9950		
Calculated Molecular Weight				28.82		
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:		22			
	Water Sat. Gas_Base BTU:		22			
<b>Comments :</b>	H2O Mol% - 1.75_Wt% - 1.101					

*Chris Staley*

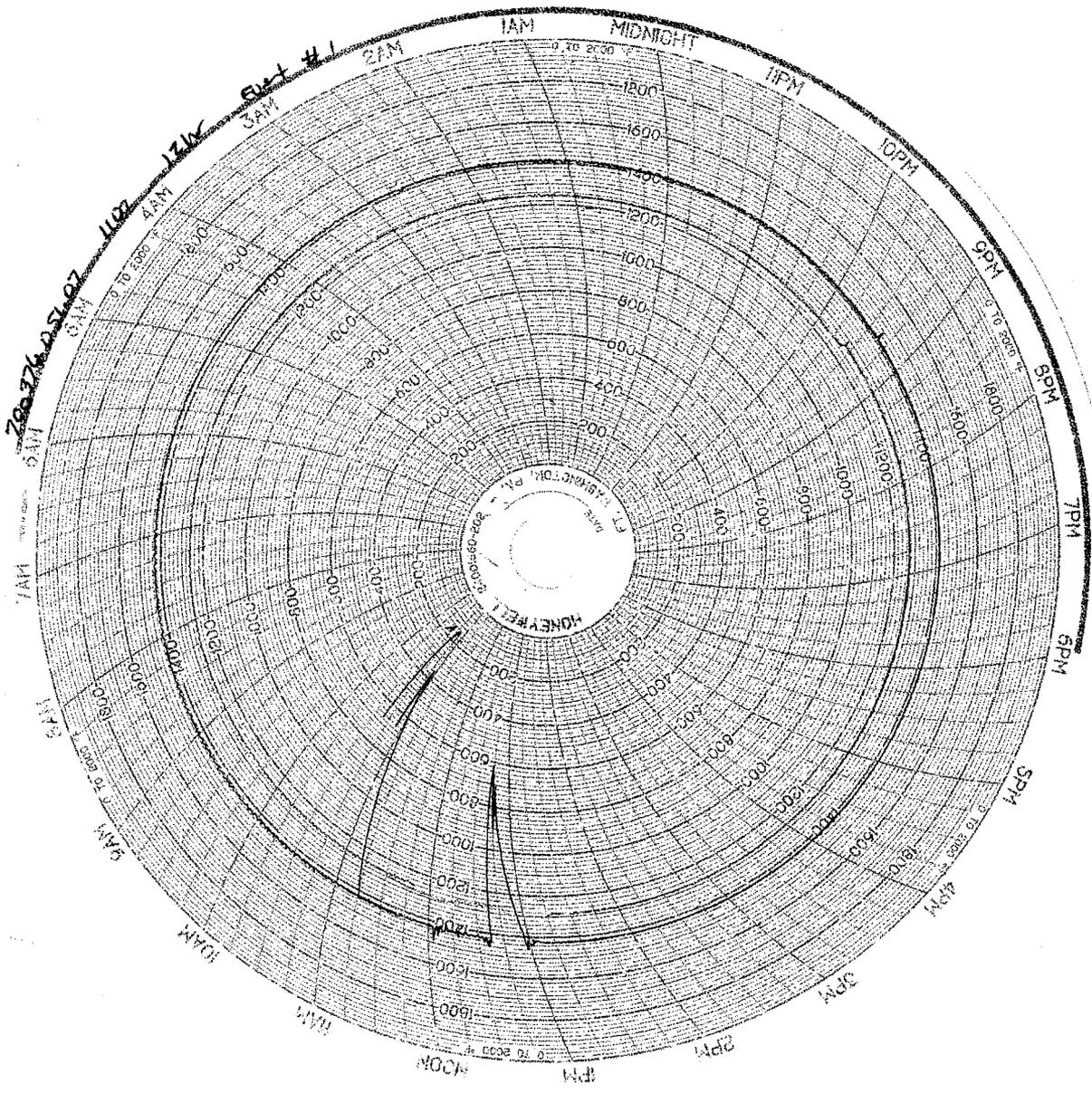
Hydrocarbon Laboratory Manager

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

SPL, Inc.  
Analysis Request Chain of Custody Record

<b>SPL</b>			SPL Work Order No.:			Acct. Mate Code:			Dept. Code			SPL												
						NEEDS CLIENT CODE						Page <u>1</u> of <u>1</u>												
Report To: (Company Name): Talon/LPE, Ltd.			Project/Station Name:			Project/Station Number:			Project/Station Location:			Requested TAT												
Address: 921 N. Bivins St.			<del>Influent Soil Vapor</del>			700376.051.07			Hubbs, NM			10 business days												
City/State/Zip: Amarillo TX 79107			Special Instructions: Low instants to Deep 6																					
Contact: Simon I. Walshe, CAPM swalshe@talonlpe.com			Indicate Billing Type: (Place "X", where appropriate)			Net 30 day Acct.			Check #			Surcharges May Apply (See quote for details)												
Phone: 806-350-8872 Fax: 806-467-0622			Credit Card			<<<Contact SPL, Inc for CC payment arrangements.																		
Invoice To: (Company Name): Talon/LPE, Ltd.			Terms: Cylinders will be rented for \$10/cyl. All cylinders checked out are to be returned within 21 days, whether they contain sample or not. Cylinders not returned after 30 days will be considered lost and will be billed at current replacement cost.			Requested Analysis (Place an "X" next to Sample ID below)																		
Address: 921 N. Bivins St.						GPA-2261-C6+																		
City/State/Zip: Amarillo TX 79107																								
Contact: Talon - Accounts Payable acct.payables@talonlpe.com Phone: 806-467-0607 Fax: 806-372-6603																								
Client PO# or Ref. No.: N/A			Contract/Proposal #: SPLQ5270 (i.e. SPLQ###)																					
Sample ID (used to log/track sample)			Sample Date	Sample Time	Sample Type (Gas/Liq./Solid)	Duplicate	Composite	Spot	Cylinder Tracking Info			Comments												
								Cylinder #	Date Out	Date In														
Influent #1			4-24-13	0825	GAS																			
Influent #2			4-24-13	2245	'																			
Sampled By-Print Name: <u>L. Bridger</u>			Received By-Company:																					
Signature: <u>[Signature]</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
Relinquished By-Print Name: <u>L. Bridger</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
Signature: <u>[Signature]</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
Relinquished By-Print Name: <u>L. Bridger</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
Signature: <u>[Signature]</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
Relinquished By-Print Name: <u>L. Bridger</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
Signature: <u>[Signature]</u>			Received By-Print Name: <u>[Signature]</u>			Date: <u>4-25-13</u>			Time: <u>4:17</u>			Date: <u>4/26/13</u>			Time: <u></u>									
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**ATTACHMENT 3**  
Oxidizer Charts



*Lovington Deep 6 – 700376.051.07 - SRS# 2002-10312 – Event 6 – 12 Hour*

**ATTACHMENT 4**  
Waste Ticket

