

**Source Emissions Test Report
Cimarron Energy, Inc.**

**Flare Stack
Inlet and Outlet NMOC Emissions**

Parshall, North Dakota

Report prepared for:
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1. Introduction

Air Pollution Testing, Inc. (APT) was contracted by Cimarron Energy, Inc. to conduct source emission testing services at a facility near Parshall, North Dakota.

The purpose of the test program was to determine the concentrations and mass emission rates of oxygen (O₂), carbon dioxide (CO₂), carbon monoxide (CO), methane (CH₄) and non-methane organic compounds (NMOC) at both the inlet and outlet sampling locations of an enclosed flare stack. The unit is fed with off gas from various facility processes. Concurrent inlet gas velocity measurements, as well as pilot light data, were collected for the determination of total inlet emissions. All of the above data were combined to determine the overall destruction removal efficiency (DRE) of the unit. The emissions testing was conducted under three different operating conditions; 1 oz., 4 oz. and 10 oz. inlet feed pressures.

Table 1.1 provides contact information for key personnel involved in the test program.

Cimarron Energy, Inc.: Parshall Flare Testing Program Contact Personnel		
<i>Name, Title</i>	<i>Company Address</i>	<i>Phone, FAX, email</i>
Mr. Michael John, Process Engineer	Cimarron Energy, Inc. 1012 24 th Ave NW, Suite 100 Norman, Oklahoma 73069	405-928-7373 ext. 111, 405-928-7379 mjohn@cimarron.com
Mr. Dave Maiers, Operations Director	Air Pollution Testing, Inc. 5530 Marshall Street Arvada, Colorado 80003	303-420-5949, 303-420-5920, dmaiers@airtest.net

Table 1.1: Testing Program Contact Personnel

2. Methods

All testing was conducted in accordance with the following source emissions test methods referenced in 40 CFR Part 60, Appendix A.

Method 1 – Sample and Velocity Traverses for Stationary Sources

Method 2 – Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)

Method 3A – Gas Analysis for the Determination of Emission Rate Correction Factor or Excess Air

Method 4 – Determination of Moisture Content in Stack Gases

Method 10 – Determination of Carbon Monoxide Emissions from Stationary Sources

Method 18 – Measurement of Gaseous Organic Compound Emissions by Gas Chromatography

Method 25A – Determination of Total Gaseous Organic Concentration Using a Flame Ionization Analyzer

3. Test Program Summary

APT provided all necessary equipment and labor for the determination of all emission parameters detailed in Table 3.1 on the following page.

Three, 1-hour sampling runs were conducted at 1 oz., 4 oz. and 10 oz. inlet feed pressure from the flare exhaust to determine pollutant concentrations. Concentration data were combined with concurrently collected oxygen (O₂), carbon dioxide (CO₂), moisture (H₂O) and gas velocity data to determine pollutant mass emission rates. Integrated samples were collected from both the pilot light and the waste gas inlet, concurrent with each sample run, for off-site analysis to determine the total hydrocarbon and NMOC content of the two streams for comparison with the exhaust stack levels.

Cimarron Energy, Inc. – Parshall Flare Sampling and Analytical Methods			
Gas Parameter	EPA Method	Analytical Method	Laboratory
Enclosed Flare Exhaust Measurements			
gas flow	Methods 1, 2	draft gauge, thermocouple, pitot tube	APT, on-site
O ₂ , CO ₂	Method 3A	paramagnetic and non-dispersive infrared analyzers	
H ₂ O	Method 4	gravimetric	
CO	Method 10	gas filter correlation, infrared analyzer	
NMOC	Method 25A	flame ionization detector with methane separation – Thermo Model 55	
C ₂ H ₆	Method 18	gas chromatography	APT, Arvada, CO
Condensate Tank Waste Gas Measurements (Flare Inlet)			
gas flow	Methods 1, 2	draft gauge, thermocouple, pitot tube	APT, on-site
VOC, NMOC	ASTM D-1945/1946	gas chromatography / flame ionization detector / thermal conductivity detector	Empact Analytical, Brighton, CO
Flare Pilot / Assist Gas Measurements (Flare Inlet)			
gas flow	Orifice	Manufacturer provided constant value	APT, on-site
VOC, NMOC	ASTM D-1945/1946	gas chromatography / flame ionization detector / thermal conductivity detector	Empact Analytical, Brighton, CO

Table 3.1: Sampling and Analytical Methods

4. Test Method Details

4.1. Stack Gas Velocity, Volumetric Flow Rate and Moisture

Stack gas velocity, volumetric flow rate and moisture (H₂O) content were measured in accordance with EPA Methods 1, 2 and 4.

Each sampling period consisted of conducting a temperature and differential pressure traverse of the stack using a K-type thermocouple and an S-type pitot tube. Concurrent with each traverse, a sample of gas for moisture determination was extracted from the stack at a constant flow rate of no more than 0.75 cubic feet per minute (cfm). The gas sample passed through a stainless steel probe, through a series of four (4) chilled glass impingers, and through a calibrated dry gas meter. See *Appendix 4 – Schematics* for a diagram of the EPA Methods 1, 2 and 4 sampling train.

Prior to sampling, the first two impingers were each seeded with 100 milliliters of water. The third impinger was empty. The fourth impinger was seeded with 250 grams of dried silica gel. Following sampling, the moisture gain in the impingers was measured gravimetrically to determine the moisture content of the gas.

All of the above data were combined with concurrently collected diluent (O₂ and CO₂) data to calculate the stack gas velocity and volumetric flow rate in units of feet per second (ft/sec), actual cubic feet per minute (acfm), dry standard (1 atmosphere and 68 °F) cubic feet per minute (dscfm), and pounds per hour (lb/hr).

4.2. Diluent, Carbon Monoxide and Non-methane Hydrocarbons – Flare Exhaust

O₂, CO₂, CO and NMOC emission concentrations were measured in accordance with EPA Methods 3A (O₂ and CO₂), 10 (CO) and 25A (NMOC).

Each sampling period consisted of extracting a gas sample from the stack at a constant flow rate of approximately three liters per minute (lpm). The sample passed through a refrigeration-type gas conditioner to remove moisture and into the sampling port of a TECO Model 48H gas filter correlation infrared CO analyzer, a Servomex Series 1400 paramagnetic O₂ / non-dispersive infrared CO₂ analyzer and a Thermo Model 55 flame ionization analyzer equipped with a methane separator. The gas conditioner was bypassed for the NMOC analyzer. The gas concentrations were displayed on the analyzer front panels in units of either parts per million, dry volume basis (ppmvd – CO), percent, dry volume basis (%vd – O₂ and CO₂), or parts per million, wet volume basis as propane (ppmvw as C₃H₈ – NMOC) and logged to a computerized data acquisition system (CDAS). Please see *Appendix 4 – Schematics* for a diagram of the EPA Methods 3A, 10 and 25A sampling train.

Before and after each sampling period, the analyzers were challenged with calibration gases to calibrate the instruments, to verify linearity of response, and to quantify zero

and span drift for the previous sampling period. The calibration gases were prepared and certified in accordance with EPA Protocol 1. To ensure no system bias, the analyzer calibrations were conducted by introducing all gases to the analyzers at the sampling probe tip at stack pressure.

Following sampling, the CDAS data were averaged in one-minute increments, corrected for instrumental drift, and reported as average emission concentrations for each sampling period.

4.3. Total Hydrocarbon / NMOC – Flare Inlets

Methane and NMOC concentrations were measured in accordance with ASTM D-1945 and 1946, which are industry standard analytical methods for analysis of fuel gas type samples. Samples were collected from each inlet in Tedlar bags for off-site GC/FID/TCD analysis for C1 – C6+ hydrocarbons, oxygen, carbon dioxide and nitrogen. The concentration data were combined with the pitot traverse data (condensate waste gas) or manufacturer data (pilot light) to calculate flare inlet NMOC mass flow to determine the control efficiency for NMOC.

Laboratory analysis of the waste gas sample indicated high oxygen and nitrogen from likely sample leakage. The hydrocarbon and carbon dioxide concentrations were normalized to remove the leakage. DRE was calculated on both a mass flow in/out basis and by carbon balance.

5. Test Results Summary

The results of the testing are summarized in Tables 5.1 – 5.3. Any emission parameters not found in the tables may be found in *Appendix 1 – Test Parameters*. The following terms are used in the tables:

- %vd – diluent concentration, dry volume percent
- %vw – moisture content, wet volume percent
- dscfm – stack gas flow rate, dry standard (one atmosphere, 68°F) cubic feet per minute
- °F – temperature, in degrees Fahrenheit
- lb/hr – pollutant mass emission rate, pounds per hour
- ppmvd – parts per million, dry volume basis
- as C₃H₈ – as propane
- DRE – destruction removal efficiency

Cimarron Energy, Inc. – Parshall Flare Flare Test Results Summary (06/15/2011) – 1 oz. Inlet Pressure				
	<u>Run #1</u>	<u>Run #2</u>	<u>Run #3</u>	
Start Time	12:34	14:12	15:30	Average
Stop Time	13:34	15:12	16:30	
Stack Temp (°F)	936	811	889	879
Stack Flow (MDSCFD)	2,105.3	3,924.0	4,059.4	3,362.4
O ₂ (%vd)	18.5	18.3	18.2	18.3
CO ₂ (%vd)	1.5	1.7	1.8	1.6
H ₂ O (%vw)	4.6	3.9	4.1	4.2
Emission Data				
CO (lb/hr)	0.7	1.1	1.0	0.9
CO (tons/year)	3.0	4.6	4.4	4.0
NMOC (ppmvd as C ₃ H ₈)	46.0	69.8	46.0	53.9
NMOC (lb/hr as C ₃ H ₈)	0.46	1.30	0.89	0.89

Table 5.1: Test Results Summary, Flare Outlet, 1 oz. Flow

Cimarron Energy, Inc. – Parshall Flare Flare Test Results Summary (06/14/2011) – 4 oz. Inlet Pressure				
	<u>Run #1</u>	<u>Run #2</u>	<u>Run #3</u>	
Start Time	10:48	12:55	14:14	Average
Stop Time	11:48	13:55	15:14	
Stack Temp (°F)	1,320	1,321	1,327	1,323
Stack Flow (MDSCFD)	3,840.5	3,762.7	3,703.7	3,768.5
O ₂ (%vd)	16.5	16.6	16.6	16.6
CO ₂ (%vd)	2.9	2.8	2.8	2.8
H ₂ O (%vw)	4.4	6.2	4.9	5.2
Emission Data				
CO (lb/hr)	0.6	0.6	0.6	0.6
CO (tons/year)	2.7	2.7	2.5	2.6
NMOC (ppmvd as C ₃ H ₈)	0.0	2.0	0.4	0.8
NMOC (lb/hr as C ₃ H ₈)	0.00	0.04	0.01	0.01

Table 5.2: Test Results Summary, Flare Outlet, 4 oz. Flow

Cimarron Energy, Inc. – Parshall Flare Flare Test Results Summary (06/14-15/2011) – 10 oz. Inlet Pressure				
	<i>Run #1</i>	<i>Run #2</i>	<i>Run #3</i>	
Start Time	15:31	16:48	08:45	Average
Stop Time	16:31	17:48	09:45	
Stack Temp (°F)	1,973	1,992	1,992	1,986
Stack Flow (MDSCFD)	3,386.9	3,373.9	3,607.2	3,456.0
O ₂ (%vd)	14.8	14.9	15.1	14.9
CO ₂ (%vd)	3.9	3.8	3.8	3.8
H ₂ O (%vw)	8.4	5.9	6.8	7.0
Emission Data				
CO (lb/hr)	0.2	0.2	0.2	0.2
CO (tons/year)	0.7	0.9	0.7	0.8
NMOC (ppmvd as C ₃ H ₈)	0.3	0.7	0.1	0.4
NMOC (lb/hr as C ₃ H ₈)	0.01	0.01	0.00	0.01

Table 5.3: Test Results Summary, Flare Outlet, 10 oz. Flow

Cimarron Energy, Inc. – Parshall Flare Flare Test Results Summary (06/14-15/2011) – DRE Summary			
	<i>1 oz. Flow</i>	<i>4 oz. Flow</i>	<i>10 oz. Flow</i>
Waste Gas Inlet			
Waste Gas Specific Gravity	1.46	1.44	1.45
Waste Gas Heat Content (BTU)	2,273	2,252	2,308
Waste Gas Flow (MCFD)	41.8	70.6	131.0
Waste Gas Flow (MDSCFD)	37.4	64.8	119.5
NMOC (lb/hr as C ₃ H ₈)	150.6	260.0	489.2
Pilot Inlet			
Pilot Light Flow (MCFD)	0.3	0.3	0.3
Pilot Light NMOC (lb/hr as C ₃ H ₈)	0.5	0.5	0.5
Total Inlet NMOC (lb/hr as C₃H₈)	151.0	260.5	489.7
Total Outlet NMOC (lb/hr as C₃H₈)			
0.9	0.01	0.01	
% DRE(mass flow in/out basis)	99.41	99.99	100.00
% DRE(carbon balance)	98.94	99.99	100.00

Table 5.4: Test Results Summary, DRE Calculations



Appendix One: Test Parameters

1 oz. Inlet Pressure

Cimarron Energy
 Liberty Oil Well
 Parshall, ND
 Flare
 6/15/2011

1 oz.

Field Reference Method Data					
Run #		7	8	9	Average
Start Time		12:42	14:20	15:41	
Stop Time		13:08	14:40	16:06	
hrs	Hours of Operation / Year	8760	8760	8760	8760
D _S	Inlet Duct Diameter (inches)	4.0	4.0	4.0	4.0
$\sqrt{\Delta P_{AVG}}$	Inlet Average (Delta P) ^{1/2} (" H ₂ O) ^{1/2}	0.1150	0.0940	0.1026	0.1039
C _P	Inlet Pitot Tube Constant (unitless)	0.84	0.84	0.84	0.84
T _S	Inlet Stack Temperature (°F)	73	74	73	73
P _{bar}	Barometric Pressure (mbar)	936	936	936	936
P _{bar}	Barometric Pressure (" Hg)	27.64	27.64	27.64	27.64
P _S	Inlet Stack Pressure (" H ₂ O)	1.0	1.0	1.0	1.0

Waste Gas Data				
	Carbon Dioxide (%vd)	0.3	0.3	0.3
	Methane (%vd)	16.1	14.0	14.8
	Ethane (%vd)	20.4	19.2	19.8
	Propane (%vd)	33.0	32.1	32.9
	Butanes (%vd)	18.9	18.7	19.1
	Pentanes (%vd)	5.3	5.2	5.3
	Hexanes+ (%vd)	2.7	2.5	2.7
	Heat Content (Btu/scf)	2,304	2,224	2,290

Pilot Light Data				
	Carbon Dioxide (%vd)	0.5	0.5	0.5
	Methane (%vd)	47.5	47.5	47.5
	Ethane (%vd)	19.2	19.2	19.2
	Propane (%vd)	15.4	15.4	15.4
	Butanes (%vd)	6.1	6.1	6.1
	Pentanes (%vd)	1.5	1.5	1.5
	Hexanes+ (%vd)	0.8	0.8	0.8
	Heat Content (Btu/scf)	1,479	1,479	1,479
F _{ACFM}	Pilot Light Flow (acfm)	0.18	0.18	0.18
F _{DSCFM}	Pilot Light Flow (dscfm)	0.17	0.17	0.17
dry	Pilot Light NMOC (ppmvd as C ₃ H ₈)	402,167	402,167	402,167
lb/hr	Pilot Light NMOC (lb/hr as C ₃ H ₈)	0.47	0.47	0.47

Reference Method Calculations					
Run #		7	8	9	Average
B _{ws}	Inlet Moisture Content (%/100) - saturated	0.029	0.030	0.029	0.030
M _D	Inlet Molecular Weight Dry (lb/lb-mole)	35.54	35.54	35.54	35.54
M _A	Inlet Molecular Weight Wet (lb/lb-mole)	35.03	35.01	35.03	35.02
V _S	Inlet Gas Velocity (ft/sec)	6.1	5.0	5.5	5.5
F _{ACFM}	Inlet Gas Flow (acfm)	32	26	29	29
F _{DSCFM}	Inlet Gas Flow (dscfm)	29	23	25	26
dry	NMOC (ppmvd as C ₃ H ₈)	858,433	835,967	858,533	850,978
lb/hr	NMOC (lb/hr as C ₃ H ₈)	168	134	150	151
tpy	NMOC (tons/year as C ₃ H ₈)	739	587	659	661

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 Liberty Oil Well
 Parshall, ND
 Flare
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1 oz.

Field Reference Method Data					
Run #		1	2	3	Average
Start Time		12:34	14:12	15:30	
Stop Time		13:34	15:12	16:30	
Sample Duration (minutes)		60	60	60	
hrs	Hours of Operation / Year	8760	8760	8760	8760
D _S	Stack Diameter (inches)	42.6	42.6	42.6	42.6
√ΔP _{AVG}	Average (Delta P) ^{1/2} (" H ₂ O) ^{1/2}	0.0780	0.1380	0.1475	0.1212
C _P	Pitot Tube Constant (unitless)	0.83	0.83	0.83	0.83
T _S	Stack Temperature (°F)	936	811	889	879
P _{bar}	Barometric Pressure (mbar)	936	936	936	936
P _{bar}	Barometric Pressure (" Hg)	27.64	27.64	27.64	27.64
P _S	Stack Pressure (" H ₂ O)	0.00	0.00	0.00	0.00
Y _d	Meter Y Factor (unitless)	0.9780	0.9780	0.9780	0.9780
T _m	Meter Temperature (°F)	74	78	79	77
V _m	Sample Volume (ft ³)	37.560	38.015	37.022	37.532
ΔH	Orifice Pressure Delta H (" H ₂ O)	1.0	1.0	1.0	1.0
V _{lc}	Moisture (g)	34.0	28.7	30.1	30.9
O ₂ %vd	O ₂ (%vd)	18.5	18.3	18.2	18.3
CO ₂ %vd	CO ₂ (%vd)	1.5	1.7	1.8	1.6
N ₂ %vd	N ₂ (%vd)	80.0	80.0	80.0	80.0
dry	CO (ppmvd)	107.2	89.1	81.4	92.6
wet	CH ₄ (ppmvw)	18.3	18.0	9.6	15.3
wet	NMOC (ppmvw as C ₃ H ₈)	43.9	67.1	44.1	51.7

Reference Method Calculations					
Run #		1	2	3	Average
V _{mstd}	Sample Volume (dscf)	33.629	33.763	32.850	33.414
V _{wstd}	Moisture Volume (scf)	1.60	1.35	1.42	1.46
B _{ws}	Moisture Content (%/100)	0.046	0.039	0.041	0.042
M _D	Molecular Weight Dry (lb/lb-mole)	28.98	29.00	29.02	29.00
M _A	Molecular Weight Wet (lb/lb-mole)	28.48	28.58	28.56	28.54
V _S	Gas Velocity (ft/sec)	7.4	12.4	13.7	11.2
F _{ACFM}	Gas Flow (acfm)	4,382	7,386	8,135	6,635
F _{DSCFM}	Gas Flow (dscfm)	1,462	2,725	2,819	2,335
lb/hr	Gas Flow (lb/hr)	6,791	12,611	13,080	10,827
F _o	F _o (unitless)	1.640	1.551	1.499	1.564
lb/hr	CO (lb/hr)	0.7	1.1	1.0	0.9
tpy	CO (tons/year)	3.0	4.6	4.4	4.0
dry	CH ₄ (ppmvd)	19.2	17.4	9.2	15.3
lb/hr	CH ₄ (lb/hr)	0.1	0.1	0.1	0.1
tpy	CH ₄ (tons/year)	0.3	79.0	42.3	40.5
dry	NMOC (ppmvd as C ₃ H ₈)	46.0	69.8	46.0	53.9
lb/hr	NMOC (lb/hr as C ₃ H ₈)	0.461	1.3042	0.8903	0.885
tpy	NMOC (tons/year as C ₃ H ₈)	2.019	5.712	3.900	3.877
DRE	TVOC DRE (%) - carbon balance	98.96%	98.67%	99.19%	98.94%

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Linearity Information					
Gas	O ₂	CO ₂	CO	CH ₄	NMHC
Span Gas Value/Range	21.1	5.0	182.0	1490.0	100.0
Bias Gas Value	10.00	2.48	79.1	300.0	30.2
Bias Check (Zero)	0.0	0.0	1.2	0.0	0.0
Bias Check (Span)	10.1	2.5	77.9	305.1	30.2
Linearity Bias (Zero)	0.0	0.0	-0.2	1.9	0.0
Linearity Bias (Span)	10.0	2.5	77.0	295.4	31.1
Gas Concentration	%	%	(ppm)	(ppm)	(ppm)
1	0.00	0.00	0.0	0.0	0.0
2	10.00	2.48	79.1	300.0	30.2
3	21.10	5.00	182.0	750.0	50.1
4				1490.0	85.5
Response					
1	0.0	0.0	-0.2	1.9	0.0
2	10.0	2.5	77.0	295.4	31.1
3	21.1	5.0	179.0	749.6	50.5
4				1500.0	85.2
Difference					
1	0.0	0.0	0.2	1.9	0.0
2	0.0	0.0	2.1	4.6	0.9
3	0.0	0.0	3.0	0.4	0.4
4	0.0	0.0	0.0	10.0	0.3
Results					
Zero Bias	0.00%	0.00%	0.77%	0.13%	1.00%
Span Bias	0.47%	0.40%	0.49%	0.65%	0.30%
Max Calibration Error	0.00%	0.20%	1.65%	0.67%	0.90%

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Run 1

Start Time	12:34
Run Length	60
Stop Time	13:34

Calibration Information						
Gas		O ₂	CO ₂	CO	CH ₄	NMHC
Instrument Range		21.1	5.0	182	1490	100
Span Gas Value		10.00	2.48	79.1	300.0	30.2
Calibration						
Pretest Calibration						
Zero%		0.0	0.0	1.2	0.0	0.0
Span%		10.1	2.5	77.9	305.1	30.2
Post Test Calibration						
Zero%		0.0	0.0	1.2	0.0	0.0
Span%		10.1	2.5	77.9	305.1	30.2
Results						
Absolute Bias (Zero)		0.0%	0.0%	0.8%	0.1%	0.0%
Absolute Bias (Span)		0.5%	0.4%	0.5%	0.7%	0.9%
Absolute Drift (Zero)		0.0%	0.0%	0.0%	0.0%	0.0%
Absolute Drift (Span)		0.0%	0.0%	0.0%	0.0%	0.0%
		Corrected O ₂	Corrected CO ₂ %	Corrected CO ppm	Corrected CH ₄ ppmvw	Corrected TVOC ppm
		18.5	1.5	107.2	18.3	43.9
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH ₄ ppmvw	Uncorrected TVOC ppm
		18.7	1.5	105.1	18.6	43.9
1	12:34	18.7	1.5	100.1	18.5	41.3
2	12:35	18.1	1.9	78.6	12.0	54.6
3	12:36	18.7	1.5	71.9	7.4	29.7
4	12:37	19.0	1.2	115.5	5.8	18.0
5	12:38	19.1	1.2	113.1	8.1	12.3
6	12:39	19.2	1.1	160.0	13.4	20.2
7	12:40	18.9	1.3	144.9	16.0	29.8
8	12:41	18.5	1.6	76.2	33.4	37.7
9	12:42	18.6	1.6	73.5	17.6	87.1
10	12:43	18.4	1.7	73.2	5.3	28.6
11	12:44	18.3	1.7	70.4	4.2	12.0
12	12:45	18.5	1.7	72.2	4.9	10.4
13	12:46	18.4	1.7	73.0	5.0	11.1
14	12:47	18.7	1.5	85.3	5.6	12.1
15	12:48	18.8	1.3	110.1	7.5	12.0
16	12:49	19.1	1.2	150.5	11.3	16.0
17	12:50	19.0	1.2	150.8	17.0	22.7
18	12:51	19.1	1.1	154.8	22.6	31.0
19	12:52	19.2	1.1	171.1	23.5	46.9
20	12:53	19.3	1.0	199.4	25.8	47.9
21	12:54	19.3	1.1	199.3	34.3	58.4
22	12:55	18.9	1.3	162.4	111.0	108.2
23	12:56	18.9	1.3	117.2	44.3	261.1
24	12:57	19.2	1.1	171.9	19.1	72.6
25	12:58	19.4	1.0	220.1	19.6	38.0
26	12:59	19.3	1.0	201.5	38.1	53.9
27	13:00	19.2	1.1	209.7	121.7	125.6
28	13:01	18.8	1.4	190.0	75.8	303.3
29	13:02	18.3	1.7	80.8	82.3	160.9
30	13:03	18.3	1.7	73.6	90.3	234.2
31	13:04	18.3	1.7	71.3	6.9	180.2
32	13:05	18.4	1.6	75.3	4.9	15.6
33	13:06	18.4	1.7	72.8	5.7	12.1
34	13:07	18.4	1.7	70.5	5.6	13.9
35	13:08	18.5	1.6	71.4	5.0	13.0
36	13:09	18.4	1.6	70.9	5.0	11.7
37	13:10	18.4	1.7	71.9	5.0	11.2
38	13:11	18.5	1.6	71.8	4.3	12.1
39	13:12	18.4	1.6	72.5	4.4	10.5
40	13:13	18.4	1.6	73.0	5.0	10.7
41	13:14	18.4	1.7	71.8	5.0	11.4
42	13:15	18.3	1.7	71.9	5.0	12.1
43	13:16	18.5	1.6	73.3	5.0	11.1
44	13:17	18.5	1.5	78.6	5.1	11.1
45	13:18	18.6	1.5	80.8	5.0	12.3
46	13:19	18.6	1.5	81.2	6.0	13.8
47	13:20	18.6	1.5	88.5	5.1	16.0
48	13:21	18.2	1.8	80.2	6.0	14.1
49	13:22	18.6	1.5	82.5	6.3	17.0
50	13:23	18.8	1.4	97.8	5.2	15.1
51	13:24	18.6	1.6	78.1	11.0	14.4
52	13:25	18.9	1.4	96.5	7.0	22.1
53	13:26	18.3	1.7	95.2	22.5	13.4
54	13:27	18.7	1.5	76.0	28.4	46.8
55	13:28	18.7	1.5	104.3	5.0	37.1
56	13:29	18.8	1.4	101.9	11.0	11.9
57	13:30	18.3	1.8	86.8	8.8	23.0
58	13:31	18.6	1.6	76.3	5.6	19.3
59	13:32	18.7	1.5	111.1	3.8	11.6
60	13:33	18.4	1.7	81.2	6.0	11.0

Cimarron Energy
 Liberty Oil Well
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Run 2

Start Time	14:12
Run Length	60
Stop Time	15:12

		Calibration Information				
Gas		O ₂	CO ₂	CO	CH ₄	NMHC
Instrument Range		21.1	5.0	182	1490	100
Span Gas Value		10.00	2.48	79.1	300.0	30.2
Calibration						
Pretest Calibration						
Zero%		0.0	0.0	1.2	0.0	0.0
Span%		10.1	2.5	77.9	305.1	30.2
Post Test Calibration						
Zero%		0.0	0.0	1.2		0.2
Span%		10.0	2.5	77.7	284.0	30.0
Results						
Absolute Bias (Zero)		0.0%	0.0%	0.8%	0.1%	0.2%
Absolute Bias (Span)		0.0%	0.2%	0.4%	0.8%	1.1%
Absolute Drift (Zero)		0.0%	0.0%	0.0%	0.0%	0.2%
Absolute Drift (Span)		0.5%	0.6%	0.1%	1.4%	0.2%
		Corrected O ₂ %	Corrected CO ₂ %	Corrected CO ppm	Corrected CH ₄ ppmvw	Corrected TVOC ppm
		18.3	1.7	89.1	18.0	67.1
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH ₄ ppmvw	Uncorrected TVOC ppm
		18.4	1.7	87.5	17.7	66.7
1	14:12	18.6	1.6	84.2	12.7	43.4
2	14:13	18.9	1.3	123.5	8.9	40.7
3	14:14	18.7	1.5	138.5	17.7	36.4
4	14:15	18.5	1.6	91.7	20.9	63.2
5	14:16	18.3	1.8	83.7	16.3	84.1
6	14:17	18.5	1.7	80.0	9.4	56.2
7	14:18	18.9	1.3	114.7	7.0	34.2
8	14:19	18.4	1.7	114.6	12.7	28.3
9	14:20	18.7	1.4	97.9	17.9	47.1
10	14:21	18.6	1.5	109.6	19.1	68.7
11	14:22	18.5	1.6	85.7	16.6	70.9
12	14:23	18.2	1.8	77.6	10.0	59.5
13	14:24	18.2	1.8	73.7	9.0	39.8
14	14:25	18.3	1.8	75.1	7.0	36.1
15	14:26	17.7	2.1	71.6	6.7	25.2
16	14:27	17.8	2.1	67.5	7.5	27.0
17	14:28	18.1	1.9	72.2	5.0	24.7
18	14:29	18.2	1.9	73.3	7.6	13.6
19	14:30	18.3	1.8	74.1	8.0	24.1
20	14:31	18.5	1.6	76.4	7.6	25.6
21	14:32	18.4	1.7	78.6	7.1	25.6
22	14:33	18.4	1.7	77.2	8.0	26.6
23	14:34	17.9	2.0	73.9	8.0	30.2
24	14:35	18.2	1.8	71.5	6.8	29.1
25	14:36	18.4	1.7	76.7	6.9	23.1
26	14:37	18.3	1.7	78.4	9.0	25.5
27	14:38	18.1	1.9	72.6	9.0	30.2
28	14:39	18.3	1.8	71.1	7.4	30.1
29	14:40	18.3	1.8	72.5	6.9	25.2
30	14:41	18.7	1.5	83.7	6.6	25.1
31	14:42	18.9	1.3	135.2	6.1	23.6
32	14:43	18.1	1.8	101.1	18.0	30.8
33	14:44	17.9	2.0	70.7	12.0	66.1
34	14:45	18.5	1.6	76.0	6.9	41.4
35	14:46	18.4	1.7	83.8	6.2	23.6
36	14:47	18.4	1.7	74.4	12.9	27.3
37	14:48	17.9	2.0	71.0	10.1	41.6
38	14:49	18.4	1.7	76.3	7.1	34.0
39	14:50	18.2	1.8	81.1	7.9	20.5
40	14:51	18.1	2.0	72.3	9.6	28.8
41	14:52	18.7	1.5	88.5	7.9	31.0
42	14:53	18.5	1.6	100.7	8.1	26.2
43	14:54	18.5	1.6	79.7	12.0	27.0
44	14:55	18.1	1.9	81.6	12.7	45.3
45	14:56	18.4	1.6	75.9	10.2	40.3
46	14:57	18.4	1.7	82.8	6.0	30.0
47	14:58	18.2	1.8	76.4	13.2	23.5
48	14:59	18.3	1.7	74.6	11.4	50.2
49	15:00	18.6	1.5	84.0	9.3	37.5
50	15:01	18.7	1.5	98.9	8.7	31.2
51	15:02	18.9	1.3	126.9	13.1	32.9
52	15:03	18.6	1.5	108.9	164.8	80.1
53	15:04	18.5	1.6	88.7	180.2	782.4
54	15:05	18.6	1.5	92.0	118.2	720.1
55	15:06	18.7	1.5	109.6	12.3	349.6
56	15:07	18.5	1.6	97.7	16.1	43.4
57	15:08	18.5	1.6	92.2	12.6	54.8
58	15:09	18.6	1.6	105.8	13.1	41.1
59	15:10	18.5	1.6	102.9	15.2	45.7
60	15:11	18.4	1.7	97.0	17.7	55.6

Cimarron Energy
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Run 3

Start Time	15:30
Run Length	60
Stop Time	16:30

Calibration Information						
Gas		O ₂	CO ₂	CO	CH ₄	NMHC
Instrument Range		21.1	5.0	182	1490	100
Span Gas Value		10.00	2.48	79.1	300.0	30.2
Calibration						
Pretest Calibration						
Zero%		0.0	0.0	1.2	0.0	0.2
Span%		10.0	2.5	77.7	284.0	30.0
Post Test Calibration						
Zero%		0.0	0.0	0.0	0.0	0.0
Span%		10.0	2.5	76.6	305.8	28.1
Results						
Absolute Bias (Zero)		0.0%	0.0%	0.1%	0.1%	0.0%
Absolute Bias (Span)		0.0%	0.6%	0.2%	0.7%	3.0%
Absolute Drift (Zero)		0.0%	0.0%	0.7%	0.0%	0.2%
Absolute Drift (Span)		0.0%	0.8%	0.6%	1.5%	1.9%
		Corrected O ₂	Corrected CO ₂	Corrected CO	Corrected CH ₄	Corrected TVOC
		%	%	ppm	ppmvw	ppm
		18.2	1.8	81.4	9.6	44.1
Run Length (Minutes)	Time	Uncorrected O ₂	Uncorrected CO ₂	Uncorrected CO	Uncorrected CH ₄	Uncorrected TVOC
		O ₂ %	CO ₂ %	ppm	ppmvw	ppm
		18.2	1.8	79.4	9.5	42.4
1	15:30	18.6	1.5	129.2	23.8	94.5
2	15:31	18.2	1.8	103.9	23.8	110.9
3	15:32	18.2	1.8	80.8	15.9	104.4
4	15:33	18.0	1.9	79.3	9.2	74.6
5	15:34	18.0	2.0	72.1	7.7	40.1
6	15:35	17.9	2.0	72.9	6.9	32.1
7	15:36	18.1	1.9	74.4	6.5	28.5
8	15:37	18.0	2.0	74.2	8.4	28.6
9	15:38	18.2	1.8	75.3	7.5	32.0
10	15:39	18.1	1.9	80.5	7.9	28.9
11	15:40	18.3	1.8	74.2	8.7	33.7
12	15:41	18.2	1.8	76.3	9.3	37.2
13	15:42	18.1	1.9	76.1	7.3	37.5
14	15:43	18.1	1.9	75.1	9.9	32.9
15	15:44	18.4	1.7	84.5	9.3	44.9
16	15:45	18.2	1.8	81.5	9.4	37.8
17	15:46	18.0	1.9	89.0	11.3	43.1
18	15:47	18.3	1.8	82.3	6.3	47.1
19	15:48	18.3	1.7	86.2	7.9	29.2
20	15:49	17.9	2.0	76.7	12.2	36.7
21	15:50	18.4	1.7	80.6	13.4	63.7
22	15:51	18.3	1.7	89.4	6.3	54.8
23	15:52	18.1	1.9	76.6	15.8	35.4
24	15:53	18.2	1.8	77.0	9.5	72.2
25	15:54	18.2	1.8	80.6	8.2	36.5
26	15:55	18.1	1.9	78.4	9.9	39.5
27	15:56	18.3	1.8	75.0	11.5	45.9
28	15:57	18.3	1.7	79.2	8.5	47.7
29	15:58	18.2	1.8	85.1	7.7	33.1
30	15:59	17.9	2.0	72.2	7.7	31.4
31	16:00	18.4	1.7	73.7	7.7	34.1
32	16:01	18.3	1.7	86.2	5.3	31.2
33	16:02	18.3	1.7	76.2	13.0	25.5
34	16:03	18.4	1.7	78.4	9.5	56.1
35	16:04	18.0	1.9	75.0	8.3	35.3
36	16:05	18.4	1.7	73.2	8.8	37.0
37	16:06	18.5	1.6	86.6	4.1	34.1
38	16:07	18.3	1.7	81.1	12.6	21.6
39	16:08	18.3	1.8	80.2	11.7	58.1
40	16:09	18.2	1.8	89.3	11.6	50.1
41	16:10	18.1	1.9	76.0	13.1	56.1
42	16:11	17.9	2.0	71.1	8.5	55.8
43	16:12	18.1	1.9	71.8	7.5	37.1
44	16:13	18.4	1.6	83.6	7.3	33.2
45	16:14	18.2	1.8	84.9	9.1	30.1
46	16:15	18.4	1.7	76.5	12.2	41.6
47	16:16	18.4	1.7	80.8	6.3	47.3
48	16:17	18.3	1.7	75.5	9.6	27.1
49	16:18	18.4	1.7	79.6	9.4	47.8
50	16:19	18.3	1.7	78.9	8.7	38.8
51	16:20	18.1	1.9	72.8	9.4	38.4
52	16:21	17.9	2.0	69.9	7.4	40.4
53	16:22	18.1	1.9	70.6	6.6	33.1
54	16:23	18.0	1.9	73.8	6.3	24.6
55	16:24	18.2	1.7	75.2	6.7	25.4
56	16:25	18.2	1.7	77.9	8.3	28.2
57	16:26	18.2	1.8	73.7	10.4	33.2
58	16:27	18.4	1.6	77.6	7.4	44.2
59	16:28	18.2	1.8	80.5	7.3	30.5
60	16:29	18.4	1.7	76.2	7.9	33.6

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%DRE Calculations	
Outlet NMOC (lb/hr as C ₃ H ₈)	0.89
Waste Gas Inlet NMOC (lb/hr as C ₃ H ₈)	150.6
Pilot Inlet NMOC (lb/hr as C ₃ H ₈)	0.5
Sum of Inlets NMOC (lb/hr as C ₃ H ₈)	151.0
% DRE (mass flow in/out basis)	99.4%
% DRE (carbon balance)	98.9%



Cimarron Energy
 Liberty Oil Well
 Parshall ND
 Flare
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4 oz.

Field Reference Method Data					
Run #		4	5	6	Average
Start Time		10:56	13:15	14:28	
Stop Time		11:02	13:21	14:36	
hrs	Hours of Operation / Year	8760	8760	8760	8760
D _S	Inlet Duct Diameter (inches)	4.0	4.0	4.0	4.0
$\sqrt{\Delta P_{AVG}}$	Inlet Average (Delta P) ^{1/2} (" H ₂ O) ^{1/2}	0.1793	0.1769	0.1798	0.1787
C _P	Inlet Pitot Tube Constant (unitless)	0.84	0.84	0.84	0.84
T _S	Inlet Stack Temperature (°F)	61	63	67	64
P _{bar}	Barometric Pressure (mbar)	938	938	938	938
P _{bar}	Barometric Pressure (" Hg)	27.70	27.70	27.70	27.70
P _S	Inlet Stack Pressure (" H ₂ O)	6.2	6.2	6.2	6.2

Waste Gas Data				
Carbon Dioxide (%vd)	0.4	0.3	0.3	0.4
Methane (%vd)	15.4	16.7	17.5	16.5
Ethane (%vd)	20.2	20.5	20.4	20.4
Propane (%vd)	31.5	32.2	32.1	31.9
Butanes (%vd)	18.1	17.9	18.6	18.2
Pentanes (%vd)	5.1	4.9	5.2	5.0
Hexanes+ (%vd)	2.8	2.4	3.0	2.7
Heat Content (Btu/scf)	2,227	2,229	2,299	2,252

Pilot Light Data					
	Carbon Dioxide (%vd)	0.5	0.5	0.5	0.5
	Methane (%vd)	46.3	46.3	46.3	46.3
	Ethane (%vd)	19.9	19.9	19.9	19.9
	Propane (%vd)	15.8	15.8	15.8	15.8
	Butanes (%vd)	6.3	6.3	6.3	6.3
	Pentanes (%vd)	1.5	1.5	1.5	1.5
	Hexanes+ (%vd)	0.7	0.7	0.7	0.7
	Heat Content (Btu/scf)	1,496	1,496	1,496	1,496
F _{ACFM}	Pilot Light Flow (acfm)	0.18	0.18	0.18	0.18
F _{DSCFM}	Pilot Light Flow (dscfm)	0.17	0.17	0.17	0.17
dry	Pilot Light NMOC (ppmvd as C ₃ H ₈)	413,300	413,300	413,300	413,300
lb/hr	Pilot Light NMOC (lb/hr as C ₃ H ₈)	0.49	0.49	0.49	0.49

Reference Method Calculations					
Run #		4	5	6	Average
B _{ws}	Inlet Moisture Content (%/100) - saturated	0.019	0.021	0.024	0.021
M _D	Inlet Molecular Weight Dry (lb/lb-mole)	35.54	35.54	35.54	35.54
M _A	Inlet Molecular Weight Wet (lb/lb-mole)	35.20	35.18	35.12	35.17
V _S	Inlet Gas Velocity (ft/sec)	9.3	9.2	9.4	9.3
F _{ACFM}	Inlet Gas Flow (acfm)	49	48	49	49
F _{DSCFM}	Inlet Gas Flow (dscfm)	46	45	45	45
dry	NMOC (ppmvd as C ₃ H ₈)	830,533	826,400	850,367	835,767
lb/hr	NMOC (lb/hr as C ₃ H ₈)	260	255	265	260
tpy	NMOC (tons/year as C ₃ H ₈)	1142	1119	1162	1141

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4 oz.

Field Reference Method Data					
Run #		4	5	6	Average
Start Time		10:48	12:55	14:14	
Stop Time		11:48	13:55	15:14	
Sample Duration (minutes)		60	60	60	
hrs	Hours of Operation / Year	8760	8760	8760	8760
D _S	Stack Diameter (inches)	42.6	42.6	42.6	42.6
√ΔP _{AVG}	Average (Delta P) ^{1/2} (" H ₂ O) ^{1/2}	0.1607	0.1599	0.1560	0.1589
C _P	Pitot Tube Constant (unitless)	0.83	0.83	0.83	0.83
T _S	Stack Temperature (°F)	1320	1321	1327	1323
P _{bar}	Barometric Pressure (mbar)	938	938	938	938
P _{bar}	Barometric Pressure (" Hg)	27.70	27.70	27.70	27.70
P _S	Stack Pressure (" H ₂ O)	0.00	0.00	0.00	0.00
Y _d	Meter Y Factor (unitless)	0.9780	0.9780	0.9780	0.9780
T _m	Meter Temperature (°F)	57	65	69	64
V _m	Sample Volume (ft ³)	36.340	36.409	37.287	36.679
ΔH	Orifice Pressure Delta H (" H ₂ O)	1.0	1.0	1.0	1.0
V _{ic}	Moisture (g)	32.7	46.2	37.2	38.7
O ₂ %vd	O ₂ (%vd)	16.5	16.6	16.6	16.6
CO ₂ %vd	CO ₂ (%vd)	2.9	2.8	2.8	2.8
N ₂ %vd	N ₂ (%vd)	80.6	80.6	80.6	80.6
dry	CO (ppmvd)	52.6	54.0	51.5	52.7
wet	CH ₄ (ppmvw)	0.0	0.7	0.0	0.2
wet	NMOC (ppmvw as C ₃ H ₈)	0.0	1.9	0.4	0.7

Reference Method Calculations					
Run #		4	5	6	Average
V _{mstd}	Sample Volume (dscf)	33.662	33.213	33.775	33.550
V _{wstd}	Moisture Volume (scf)	1.54	2.18	1.75	1.82
B _{ws}	Moisture Content (%/100)	0.044	0.062	0.049	0.052
M _D	Molecular Weight Dry (lb/lb-mole)	29.12	29.11	29.10	29.11
M _A	Molecular Weight Wet (lb/lb-mole)	28.63	28.43	28.56	28.54
V _S	Gas Velocity (ft/sec)	17.1	17.1	16.6	16.9
F _{ACFM}	Gas Flow (acfm)	10,158	10,145	9,894	10,065
F _{DSCFM}	Gas Flow (dscfm)	2,667	2,613	2,572	2,617
lb/hr	Gas Flow (lb/hr)	12,435	12,327	12,031	12,265
F _o	F _o (unitless)	1.523	1.547	1.562	1.544
lb/hr	CO (lb/hr)	0.6	0.6	0.6	0.6
tpy	CO (tons/year)	2.7	2.7	2.5	2.6
dry	CH ₄ (ppmvd)	0.0	0.7	0.0	0.2
lb/hr	CH ₄ (lb/hr)	0.0	0.0	0.0	0.0
tpy	CH ₄ (tons/year)	0.0	3.1	0.1	1.0
dry	NMOC (ppmvd as C ₃ H ₈)	0.0	2.0	0.4	0.8
lb/hr	NMOC (lb/hr as C ₃ H ₈)	0.000	0.0354	0.0068	0.014
tpy	NMOC (tons/year as C ₃ H ₈)	0.000	0.155	0.030	0.062
DRE	TVOC DRE (%) - carbon balance	100.00%	99.98%	100.00%	99.99%

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Linearity Information					
Gas	O ₂	CO ₂	CO	CH ₄	NMHC
Span Gas Value/Range	21.1	5.0	182.0	1490.0	10.0
Bias Gas Value	10.00	2.48	79.1	300.0	3.0
Bias Check (Zero)	0.0	0.0	1.2	1.0	0.1
Bias Check (Span)	10.0	2.5	79.5	300.9	3.0
Linearity Bias (Zero)	0.0	0.0	1.2	1.0	0.1
Linearity Bias (Span)	10.0	2.5	78.8	309.1	2.9
Gas Concentration	%	%	(ppm)	(ppm)	(ppm)
1	0.00	0.00	0.0	0.0	0.0
2	10.00	2.48	79.1	300.0	3.0
3	21.10	5.00	182.0	750.0	5.0
4				1490.0	8.5
Response					
1	0.0	0.0	1.2	1.0	0.1
2	10.0	2.5	78.8	309.1	2.9
3	21.1	5.0	180.1	758.9	5.0
4				1505.2	8.4
Difference					
1	0.0	0.0	1.2	1.0	0.1
2	0.0	0.0	0.3	9.1	0.1
3	0.0	0.0	1.9	8.9	0.0
4	0.0	0.0	0.0	15.2	0.0
Results					
Zero Bias	0.00%	0.00%	0.00%	0.00%	0.00%
Span Bias	0.14%	0.00%	0.38%	0.55%	0.50%
Max Calibration Error	0.14%	0.60%	1.04%	1.02%	1.00%

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Run 4

Start Time 10:48:13
 Run Length 60
 Stop Time 11:48

Calibration Information						
Gas	O ₂	CO ₂	CO	CH ₄	NMHC	
Instrument Range	21.1	5.0	182	1490	10	
Span Gas Value	10.00	2.48	79.1	300.0	3.0	
Calibration						
Pretest Calibration						
Zero%	0.0	0.0	1.2	1.0	0.1	
Span%	10.0	2.5	79.5	300.9	3.0	
Post Test Calibration						
Zero%	-0.1	0.0	5.2	0.0	0.1	
Span%	10.0	2.5	81.1	305.9	3.0	
Results						
Absolute Bias (Zero)	0.5%	0.0%	2.2%	0.1%	0.0%	
Absolute Bias (Span)	0.1%	0.2%	1.3%	0.2%	1.0%	
Absolute Drift (Zero)	0.5%	0.0%	2.2%	0.1%	0.0%	
Absolute Drift (Span)	0.0%	0.2%	0.9%	0.3%	0.5%	
		Corrected O ₂	Corrected CO ₂	Corrected CO	Corrected CH ₄ ppmvw	Corrected TVOC ppm
		%	CO ₂ %	ppm	CH ₄ ppmvw	TVOC ppm
		16.5	2.9	52.6	-0.5	-0.1
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH ₄ ppmvw	Uncorrected TVOC ppm
		16.6	2.9	54.5	0.0	0.0
1	10:48	16.5	2.9	56.2	0.3	0.0
2	10:49	16.4	2.9	55.1	0.0	0.0
3	10:50	16.4	2.9	55.8	0.7	0.0
4	10:51	16.3	3.0	54.4	-0.2	0.0
5	10:52	16.8	2.7	57.5	0.1	0.0
6	10:53	16.8	2.7	59.0	-0.4	0.0
7	10:54	16.6	2.8	57.3	1.4	0.0
8	10:55	16.3	3.0	55.0	0.5	0.0
9	10:56	16.6	2.9	56.1	0.7	0.0
10	10:57	16.7	2.8	59.5	0.3	0.0
11	10:58	16.4	3.0	56.3	0.1	0.0
12	10:59	16.5	2.9	56.3	1.3	0.0
13	11:00	16.5	2.9	56.3	0.2	0.0
14	11:01	16.4	3.0	54.0	-0.1	0.0
15	11:02	16.3	3.0	53.5	-0.6	0.0
16	11:03	16.4	2.9	52.8	0.2	0.0
17	11:04	16.5	2.9	54.3	-0.5	0.0
18	11:05	16.4	3.0	53.0	-0.6	0.0
19	11:06	16.7	2.8	54.7	0.1	0.0
20	11:07	16.6	2.8	55.4	-0.2	0.0
21	11:08	16.4	3.0	53.1	-0.3	0.0
22	11:09	16.5	2.9	54.4	0.2	0.0
23	11:10	16.5	2.9	54.3	-0.4	0.0
24	11:11	16.4	3.0	53.5	-0.4	0.0
25	11:12	16.6	2.8	54.5	-0.5	0.0
26	11:13	16.5	3.0	54.2	0.3	0.0
27	11:14	16.8	2.8	56.0	-0.2	0.0
28	11:15	16.7	2.8	56.8	0.0	0.0
29	11:16	16.4	3.0	52.5	0.4	0.0
30	11:17	16.6	2.9	52.0	1.1	0.0
31	11:18	16.6	2.9	55.2	0.5	0.0
32	11:19	16.5	2.9	53.1	0.1	0.0
33	11:20	16.6	2.9	55.5	-0.2	0.0
34	11:21	16.4	2.9	53.4	0.0	0.0
35	11:22	16.5	3.0	52.1	0.1	0.0
36	11:23	16.7	2.9	54.6	-0.4	0.0
37	11:24	16.7	2.8	55.2	-0.2	0.0
38	11:25	16.8	2.8	57.3	-0.4	0.0
39	11:26	16.7	2.9	55.4	-0.3	0.0
40	11:27	16.8	2.8	55.3	0.8	0.0
41	11:28	16.5	2.9	53.1	-0.2	0.0
42	11:29	16.8	2.8	52.4	-0.3	0.0
43	11:30	16.9	2.7	55.3	0.0	0.0
44	11:31	16.8	2.8	54.7	0.1	0.0
45	11:32	16.7	2.8	54.8	0.2	0.0
46	11:33	16.9	2.7	55.3	-0.2	0.0
47	11:34	16.7	2.8	55.5	0.0	0.0
48	11:35	16.6	2.9	53.4	-0.1	0.0
49	11:36	16.6	2.9	52.8	0.6	0.0
50	11:37	16.7	2.8	54.6	-0.2	0.0
51	11:38	16.7	2.8	53.1	-0.8	0.0
52	11:39	16.7	2.8	54.1	0.4	0.0
53	11:40	16.7	2.8	52.4	-0.7	0.0
54	11:41	16.4	3.0	52.7	-0.4	0.0
55	11:42	16.3	3.0	50.3	0.2	0.0
56	11:43	16.7	2.8	51.5	-0.4	0.0
57	11:44	16.6	2.9	53.6	-0.1	0.0
58	11:45	16.7	2.8	51.7	-0.2	0.0
59	11:46	16.7	2.8	54.3	0.0	0.0
60	11:47	16.5	2.9	52.2	-0.1	0.0

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Run 5

Start Time 12:55:23
 Run Length 60
 Stop Time 13:55

		Calibration Information				
Gas		O ₂	CO ₂	CO	CH ₄	NMHC
Instrument Range		21.1	5.0	182	1490	10
Span Gas Value		10.00	2.48	79.1	300.0	3.0
Calibration						
Pretest Calibration						
Zero%		-0.1	0.0	5.2	0.0	0.1
Span%		10.0	2.5	81.1	305.9	3.0
Post Test Calibration						
Zero%		0.0	0.0	0.6	0.0	0.1
Span%		10.0	2.5	79.7	301.9	3.0
Results						
Absolute Bias (Zero)		0.0%	0.0%	0.3%	0.1%	0.0%
Absolute Bias (Span)		0.1%	0.2%	0.5%	0.5%	0.1%
Absolute Drift (Zero)		0.5%	0.0%	2.5%	0.0%	0.0%
Absolute Drift (Span)		0.0%	0.4%	0.8%	0.3%	0.9%
		Corrected O ₂	Corrected	Corrected CO	Corrected	Corrected
		%	CO ₂ %	ppm	CH ₄ ppmvw	TVOC ppm
		16.6	2.8	54.0	0.7	1.9
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH ₄ ppmvw	Uncorrected TVOC ppm
1	12:55:23	16.4	2.9	61.7	1.0	0.2
2	12:56:23	16.6	2.8	53.9	0.9	0.2
3	12:57:23	16.6	2.8	57.9	0.1	0.1
4	12:58:23	16.5	2.9	58.3	0.7	0.9
5	12:59:23	16.4	2.9	52.1	0.4	1.0
6	13:00:23	16.6	2.8	56.6	0.0	0.4
7	13:01:23	16.5	2.8	54.9	0.0	0.0
8	13:02:23	16.5	2.9	54.2	0.0	-0.1
9	13:03:23	16.7	2.7	58.5	-0.1	0.3
10	13:04:23	16.7	2.8	57.3	0.4	0.0
11	13:05:23	16.4	2.9	56.8	0.9	1.1
12	13:06:23	16.6	2.8	53.6	1.0	1.7
13	13:07:23	16.4	2.9	54.9	0.1	1.0
14	13:08:23	16.7	2.7	56.2	0.0	-0.1
15	13:09:23	17.2	2.5	60.2	0.4	0.1
16	13:10:23	17.0	2.6	82.1	2.1	0.6
17	13:11:23	16.7	2.7	63.6	15.1	15.1
18	13:12:23	16.8	2.7	61.6	4.1	53.2
19	13:13:23	16.8	2.7	61.1	1.4	5.1
20	13:14:23	16.6	2.8	55.5	1.0	3.1
21	13:15:23	16.6	2.9	54.8	0.8	2.3
22	13:16:23	16.8	2.7	55.8	0.0	1.8
23	13:17:23	16.7	2.7	56.5	-0.1	0.8
24	13:18:23	16.9	2.7	58.2	0.4	0.7
25	13:19:23	17.0	2.6	56.9	1.1	1.6
26	13:20:23	16.8	2.7	57.5	1.0	1.9
27	13:21:23	16.7	2.7	54.8	1.0	1.8
28	13:22:23	16.7	2.7	53.6	1.1	2.3
29	13:23:23	16.9	2.6	58.9	0.9	1.7
30	13:24:23	16.9	2.6	60.0	1.2	1.4
31	13:25:23	17.0	2.6	63.2	2.0	2.0
32	13:26:23	16.5	2.9	58.3	1.9	3.4
33	13:27:23	16.6	2.8	51.9	1.3	5.5
34	13:28:23	16.6	2.8	56.2	0.5	1.8
35	13:29:23	16.3	3.0	52.5	0.0	0.4
36	13:30:23	16.5	2.9	50.6	-0.1	0.0
37	13:31:23	16.5	2.9	56.4	0.0	0.2
38	13:32:23	16.4	2.9	51.7	0.0	-0.4
39	13:33:23	16.4	2.9	53.2	0.0	0.4
40	13:34:23	16.5	2.9	54.2	-0.1	0.0
41	13:35:23	16.4	2.9	52.6	0.0	-0.2
42	13:36:23	16.4	2.9	52.7	0.0	-0.1
43	13:37:23	16.5	2.9	51.8	0.0	0.1
44	13:38:23	16.4	2.9	52.5	0.0	-0.3
45	13:39:23	16.3	3.0	51.6	0.0	-0.3
46	13:40:23	16.6	2.8	53.2	0.1	0.0
47	13:41:23	16.4	2.9	53.4	0.1	0.8
48	13:42:23	16.6	2.8	53.6	0.0	-0.3
49	13:43:23	16.5	2.9	51.3	-0.1	-0.3
50	13:44:23	16.3	3.0	52.9	0.0	-0.2
51	13:45:23	16.4	2.9	51.1	0.0	-0.1
52	13:46:23	16.6	2.8	52.2	0.0	0.0
53	13:47:23	16.6	2.8	57.2	-0.1	0.7
54	13:48:23	16.7	2.8	53.7	0.1	0.0
55	13:49:23	16.4	2.9	55.3	0.0	0.0
56	13:50:23	16.4	3.0	53.7	0.0	0.4
57	13:51:23	16.6	2.8	53.2	0.0	0.7
58	13:52:23	16.5	2.8	55.9	0.0	-0.3
59	13:53:23	16.4	2.9	53.4	0.1	-0.1
60	13:54:23	16.6	2.8	52.7	0.0	-0.1

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Run 6

Start Time	14:14:23
Run Length	60
Stop Time	15:14

Calibration Information						
Gas	O ₂	CO ₂	CO	CH4	NMHC	
Instrument Range	21.1	5.0	182	1490	10	
Span Gas Value	10.00	2.48	79.1	300.0	3.0	
Calibration						
Pretest Calibration						
Zero%	0.0	0.0	0.6	0.0	0.1	
Span%	10.0	2.5	79.7	301.9	3.0	
Post Test Calibration						
Zero%	-0.1	0.0	0.2	0.0	0.1	
Span%	10.0	2.5	81.8	307.4	3.0	
Results						
Absolute Bias (Zero)	0.5%	0.0%	0.5%	0.1%	0.0%	
Absolute Bias (Span)	0.1%	0.6%	1.6%	0.1%	0.4%	
Absolute Drift (Zero)	0.5%	0.0%	0.2%	0.0%	0.0%	
Absolute Drift (Span)	0.0%	0.8%	1.2%	0.4%	0.3%	
	Corrected O ₂	Corrected CO ₂	Corrected CO	Corrected CH4 ppmvw	Corrected TVOC ppm	
	%	CO ₂ %	ppm			
	16.6	2.8	51.5	0.0	0.4	
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH4 ppmvw	Uncorrected TVOC ppm
		16.6	2.8	52.7	0.0	0.4
1	14:14	16.6	2.8	52.0	0.0	1.5
2	14:15	16.6	2.8	52.1	0.0	-0.1
3	14:16	16.7	2.7	50.0	0.0	-0.1
4	14:17	16.7	2.7	52.5	0.0	-0.1
5	14:18	16.7	2.7	51.7	-0.1	-0.2
6	14:19	16.6	2.8	52.5	-0.1	-0.2
7	14:20	16.7	2.8	53.9	-0.1	-0.1
8	14:21	16.7	2.7	53.9	-0.1	0.1
9	14:22	16.6	2.8	52.8	0.0	0.3
10	14:23	16.6	2.8	51.2	-0.1	0.3
11	14:24	16.6	2.8	52.7	-0.1	0.5
12	14:25	16.6	2.8	53.3	-0.1	1.6
13	14:26	16.5	2.9	51.4	-0.1	0.1
14	14:27	16.8	2.7	54.6	0.1	0.1
15	14:28	16.7	2.7	53.9	0.0	0.1
16	14:29	16.6	2.8	51.1	-0.1	-0.2
17	14:30	16.7	2.8	52.8	-0.1	0.5
18	14:31	16.8	2.7	52.7	-0.1	-0.1
19	14:32	16.6	2.8	56.0	0.0	0.1
20	14:33	16.7	2.8	49.2	-0.1	0.5
21	14:34	16.8	2.7	53.1	0.0	0.6
22	14:35	16.8	2.7	54.2	0.0	-0.4
23	14:36	16.6	2.8	50.1	0.0	0.6
24	14:37	16.5	2.9	52.0	0.0	0.7
25	14:38	16.8	2.7	48.7	-0.1	0.8
26	14:39	16.8	2.7	50.3	0.0	1.3
27	14:40	16.7	2.7	50.6	-0.1	1.2
28	14:41	16.8	2.7	52.4	-0.1	0.2
29	14:42	16.6	2.8	52.1	0.0	-0.2
30	14:43	16.7	2.7	51.1	0.0	-0.1
31	14:44	16.7	2.7	52.5	0.0	0.5
32	14:45	16.6	2.8	53.0	0.0	1.3
33	14:46	16.5	2.8	50.6	0.0	0.7
34	14:47	16.7	2.8	49.4	-0.1	0.1
35	14:48	16.8	2.7	56.2	0.0	-0.1
36	14:49	16.6	2.8	52.3	0.0	1.2
37	14:50	16.6	2.7	53.1	0.0	0.8
38	14:51	16.7	2.7	55.3	0.0	0.6
39	14:52	16.5	2.8	51.6	0.0	0.6
40	14:53	16.5	2.8	51.1	0.0	0.7
41	14:54	16.5	2.8	53.7	0.1	0.7
42	14:55	16.6	2.8	52.5	0.0	-0.1
43	14:56	16.5	2.8	54.7	0.1	0.2
44	14:57	16.6	2.8	53.2	0.1	0.6
45	14:58	16.7	2.7	53.5	-0.1	0.7
46	14:59	16.6	2.8	54.8	0.0	0.2
47	15:00	16.7	2.7	52.1	0.0	0.4
48	15:01	16.7	2.7	56.6	0.1	0.5
49	15:02	16.6	2.8	54.8	0.9	0.8
50	15:03	16.7	2.8	52.8	0.1	1.7
51	15:04	16.5	2.9	54.3	0.0	0.5
52	15:05	16.6	2.8	51.8	-0.1	0.7
53	15:06	16.8	2.7	52.9	-0.1	0.7
54	15:07	16.6	2.8	55.6	0.0	0.5
55	15:08	16.5	2.8	52.2	0.8	0.3
56	15:09	16.6	2.8	52.8	0.3	1.9
57	15:10	16.7	2.7	55.6	0.1	0.6
58	15:11	16.6	2.7	51.9	-0.1	0.2
59	15:12	16.6	2.8	51.5	0.0	0.3
60	15:13	16.6	2.7	54.6	0.0	0.7

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%DRE Calculations	
	4 oz.
Outlet NMOC (lb/hr as C ₃ H ₈)	0.01
Waste Gas Inlet NMOC (lb/hr as C ₃ H ₈)	260.0
Pilot Inlet NMOC (lb/hr as C ₃ H ₈)	0.5
Sum of Inlets NMOC (lb/hr as C ₃ H ₈)	260.5
% DRE (mass flow in/out basis)	99.99%
% DRE (carbon balance)	99.99%

10 oz. Inlet Pressure

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10 oz.

Field Reference Method Data					
Run #		7	8	9	Average
Start Time		15:37	16:56	8:56	
Stop Time		15:44	17:08	9:03	
hrs	Hours of Operation / Year	8760	8760	8760	8760
D _S	Inlet Duct Diameter (inches)	4.0	4.0	4.0	4.0
$\sqrt{\Delta P_{AVG}}$	Inlet Average (Delta P) ^{1/2} (" H ₂ O) ^{1/2}	0.3290	0.3314	0.3338	0.3314
C _P	Inlet Pitot Tube Constant (unitless)	0.84	0.84	0.84	0.84
T _S	Inlet Stack Temperature (°F)	68	73	74	72
P _{bar}	Barometric Pressure (mbar)	938	938	936	937
P _{bar}	Barometric Pressure (" Hg)	27.70	27.70	27.64	27.68
P _S	Inlet Stack Pressure (" H ₂ O)	9.5	9.5	9.5	9.5

Waste Gas Lab Data				
	Carbon Dioxide (%vd)	0.3	0.3	0.3
	Methane (%vd)	16.5	17.9	17.6
	Ethane (%vd)	20.5	20.5	21.3
	Propane (%vd)	33.0	32.0	32.9
	Butanes (%vd)	19.0	18.5	18.1
	Pentanes (%vd)	5.3	5.2	5.0
	Hexanes+ (%vd)	2.8	3.0	2.6
	Heat Content (Btu/scf)	2,325	2,305	2,295

Pilot Light Data				
	Carbon Dioxide (%vd)	0.5	0.5	0.5
	Methane (%vd)	46.1	46.1	46.1
	Ethane (%vd)	19.9	19.9	19.9
	Propane (%vd)	15.9	15.9	15.9
	Butanes (%vd)	6.4	6.4	6.4
	Pentanes (%vd)	1.6	1.6	1.6
	Hexanes+ (%vd)	0.9	0.9	0.9
	Heat Content (Btu/scf)	1,514	1,514	1,514
F _{ACFM}	Pilot Light Flow (acfm)	0.18	0.18	0.18
F _{DSCFM}	Pilot Light Flow (dscfm)	0.17	0.17	0.17
dry	Pilot Light NMOC (ppmvd as C ₃ H ₈)	421,267	421,267	421,267
lb/hr	Pilot Light NMOC (lb/hr as C ₃ H ₈)	0.50	0.50	0.50

Reference Method Calculations					
Run #		7	8	9	Average
B _{ws}	Inlet Moisture Content (%/100) - saturated	0.024	0.029	0.029	0.028
M _D	Inlet Molecular Weight Dry (lb/lb-mole)	35.54	35.54	35.54	35.54
M _A	Inlet Molecular Weight Wet (lb/lb-mole)	35.11	35.03	35.02	35.06
V _S	Inlet Gas Velocity (ft/sec)	17.2	17.4	17.6	17.4
F _{ACFM}	Inlet Gas Flow (acfm)	90	91	92	91
F _{DSCFM}	Inlet Gas Flow (dscfm)	83	83	84	83
dry	NMOC (ppmvd as C ₃ H ₈)	864,867	851,467	848,100	854,811
lb/hr	NMOC (lb/hr as C ₃ H ₈)	494	486	487	489
tpy	NMOC (tons/year as C ₃ H ₈)	2168	2131	2135	2145

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10 oz.

Field Reference Method Data					
Run #		7	8	9	Average
Start Time		15:31	16:48	8:45	
Stop Time		16:31	17:48	9:45	
Sample Duration (minutes)		60	60	60	
hrs	Hours of Operation / Year	8760	8760	8760	8760
D _S	Stack Diameter (inches)	42.6	42.6	42.6	42.6
$\sqrt{\Delta P_{AVG}}$	Average (Delta P) ^{1/2} (" H ₂ O) ^{1/2}	0.1719	0.1681	0.1813	0.1738
C _P	Pitot Tube Constant (unitless)	0.83	0.83	0.83	0.83
T _S	Stack Temperature (°F)	1973	1992	1992	1986
P _{bar}	Barometric Pressure (mbar)	938	938	936	937
P _{bar}	Barometric Pressure (" Hg)	27.70	27.70	27.64	27.68
P _S	Stack Pressure (" H ₂ O)	0.00	0.00	0.00	0.00
Y _d	Meter Y Factor (unitless)	0.9780	0.9780	0.9780	0.9780
T _m	Meter Temperature (°F)	74	79	62	72
V _m	Sample Volume (ft ³)	37.385	37.148	37.088	37.207
ΔH	Orifice Pressure Delta H (" H ₂ O)	1.0	1.0	1.0	1.0
V _{ic}	Moisture (g)	65.2	43.7	52.2	53.7
O ₂ %vd	O ₂ (%vd)	14.8	14.9	15.1	14.9
CO ₂ %vd	CO ₂ (%vd)	3.9	3.8	3.8	3.8
N ₂ %vd	N ₂ (%vd)	81.3	81.3	81.1	81.2
dry	CO (ppmvd)	15.5	21.0	15.4	17.3
wet	CH ₄ (ppmvw)	0.0	0.0	0.0	0.0
wet	NMOC (ppmvw as C ₃ H ₈)	0.3	0.6	0.1	0.3

Reference Method Calculations					
Run #		7	8	9	Average
V _{mstd}	Sample Volume (dscf)	33.536	33.037	33.984	33.519
V _{wstd}	Moisture Volume (scf)	3.07	2.06	2.46	2.53
B _{ws}	Moisture Content (%/100)	0.084	0.059	0.068	0.070
M _D	Molecular Weight Dry (lb/lb-mole)	29.22	29.21	29.21	29.21
M _A	Molecular Weight Wet (lb/lb-mole)	28.28	28.55	28.45	28.43
V _S	Gas Velocity (ft/sec)	21.5	21.0	22.7	21.7
F _{ACFM}	Gas Flow (acfm)	12,780	12,486	13,507	12,925
F _{DSCFM}	Gas Flow (dscfm)	2,352	2,343	2,505	2,400
lb/hr	Gas Flow (lb/hr)	11,304	11,069	11,903	11,425
F _o	F _o (unitless)	1.562	1.565	1.537	1.555
lb/hr	CO (lb/hr)	0.2	0.2	0.2	0.2
tpy	CO (tons/year)	0.7	0.9	0.7	0.8
dry	CH ₄ (ppmvd)	0.0	0.0	0.0	0.0
lb/hr	CH ₄ (lb/hr)	0.0	0.0	0.0	0.0
tpy	CH ₄ (tons/year)	0.0	0.0	0.0	0.0
dry	NMOC (ppmvd as C ₃ H ₈)	0.3	0.7	0.1	0.4
lb/hr	NMOC (lb/hr as C ₃ H ₈)	0.005	0.0107	0.0013	0.006
tpy	NMOC (tons/year as C ₃ H ₈)	0.022	0.047	0.006	0.025
DRE	TVOC DRE (%) - carbon balance	100.00%	99.99%	100.00%	100.00%

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Linearity Information					
Gas	O ₂	CO ₂	CO	CH ₄	NMHC
Span Gas Value/Range	21.1	5.0	182.0	1490.0	10.0
Bias Gas Value	10.00	2.48	79.1	300.0	3.0
Bias Check (Zero)	-0.1	0.0	1.1	0.0	0.1
Bias Check (Span)	10.0	2.5	78.0	294.2	3.0
Linearity Bias (Zero)	0.0	0.0	-0.2	1.9	0.0
Linearity Bias (Span)	10.0	2.5	77.0	295.4	3.0
Gas Concentration	%	%	(ppm)	(ppm)	(ppm)
1	0.00	0.00	0.0	0.0	0.0
2	10.00	2.48	79.1	300.0	3.0
3	21.10	5.00	182.0	750.0	5.0
4				1490.0	8.5
Response					
1	0.0	0.0	-0.2	1.9	0.0
2	10.0	2.5	77.0	295.4	3.0
3	21.1	5.0	179.0	749.6	5.0
4				1500.0	8.4
Difference					
1	0.0	0.0	0.2	1.9	0.0
2	0.0	0.0	2.1	4.6	0.0
3	0.0	0.0	3.0	0.4	0.0
4	0.0	0.0	0.0	10.0	0.0
Results					
Zero Bias	0.47%	0.00%	0.71%	0.13%	1.00%
Span Bias	0.00%	0.00%	0.55%	0.08%	0.20%
Max Calibration Error	0.00%	0.20%	1.65%	0.67%	0.40%

Run 7

Start Time	15:31:23
Run Length	60
Stop Time	16:31

Calibration Information						
Gas		O ₂	CO ₂	CO	CH ₄	NMHC
Instrument Range		21.1	5.0	182	1490	10
Span Gas Value		10.00	2.48	79.1	300.0	3.0
Calibration						
Pretest Calibration						
Zero%		-0.1	0.0	0.2	0.0	0.1
Span%		10.0	2.5	81.8	307.4	3.0
Post Test Calibration						
Zero%		0.0	0.0	1.4	0.0	0.1
Span%		10.0	2.5	80.2	305.0	3.0
Results						
Absolute Bias (Zero)		0.0%	0.0%	0.1%	0.1%	0.0%
Absolute Bias (Span)		0.1%	0.2%	0.8%	0.3%	0.6%
Absolute Drift (Zero)		0.5%	0.0%	0.7%	0.0%	0.0%
Absolute Drift (Span)		0.0%	0.4%	0.9%	0.2%	0.2%
		Corrected O ₂ %	Corrected CO ₂ %	Corrected CO ppm	Corrected CH ₄ ppmvw	Corrected TVOC ppm
		14.8	3.9	15.5	0.0	0.3
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH ₄ ppmvw	Uncorrected TVOC ppm
		14.8	3.9	16.5	0.0	0.4
1	15:31	14.7	4.0	17.1	0.1	0.9
2	15:32	14.9	3.9	17.2	0.0	0.8
3	15:33	14.9	3.9	15.5	0.1	0.8
4	15:34	14.8	3.9	18.4	0.0	0.8
5	15:35	14.9	3.9	14.5	-0.1	0.8
6	15:36	14.8	4.0	14.0	0.0	0.8
7	15:37	14.9	3.9	15.2	-0.1	0.8
8	15:38	14.8	4.0	15.8	0.0	0.8
9	15:39	14.7	4.0	13.9	0.0	0.8
10	15:40	15.0	3.9	15.8	0.0	0.2
11	15:41	14.8	3.9	13.6	0.0	-0.3
12	15:42	15.0	3.8	22.7	-0.1	0.5
13	15:43	15.1	3.8	17.4	0.0	0.6
14	15:44	14.9	3.9	17.4	-0.1	0.5
15	15:45	14.8	4.0	14.1	0.0	0.3
16	15:46	14.9	3.9	15.4	0.0	0.0
17	15:47	14.8	4.0	30.7	-0.1	0.5
18	15:48	14.8	4.0	15.9	0.0	0.2
19	15:49	15.2	3.7	23.0	0.0	0.4
20	15:50	14.5	4.1	21.8	-0.1	0.4
21	15:51	14.9	3.9	11.6	0.0	0.2
22	15:52	14.7	4.0	16.3	-0.1	0.5
23	15:53	14.8	4.0	13.1	-0.1	0.5
24	15:54	15.1	3.8	16.2	0.0	0.5
25	15:55	14.9	3.8	16.6	0.0	0.5
26	15:56	14.9	3.9	15.8	0.0	0.5
27	15:57	15.2	3.7	20.7	0.0	0.9
28	15:58	15.0	3.8	22.7	-0.1	0.6
29	15:59	15.0	3.8	21.9	0.0	0.2
30	16:00	14.9	3.9	23.2	0.0	0.1
31	16:01	14.8	4.0	14.1	0.0	0.5
32	16:02	14.9	3.9	17.5	0.0	0.6
33	16:03	14.8	4.0	13.2	0.0	0.1
34	16:04	14.9	3.9	18.2	0.1	0.2
35	16:05	14.8	4.0	15.4	0.0	0.3
36	16:06	14.8	4.0	14.0	-0.1	-0.5
37	16:07	14.8	4.0	14.6	-0.1	0.4
38	16:08	14.8	4.0	13.9	-0.1	0.6
39	16:09	14.4	4.2	16.7	0.0	0.6
40	16:10	15.0	3.8	12.0	-0.1	0.5
41	16:11	15.0	3.8	24.2	0.0	0.6
42	16:12	15.1	3.8	30.0	-0.1	0.8
43	16:13	14.9	3.9	14.9	0.0	0.7
44	16:14	14.9	3.9	19.4	-0.1	0.6
45	16:15	14.7	4.0	12.9	-0.1	0.4
46	16:16	14.7	4.0	17.8	-0.1	-0.2
47	16:17	14.6	4.1	19.6	0.0	0.4
48	16:18	15.0	3.9	15.7	0.0	0.2
49	16:19	14.8	4.0	17.2	0.0	0.2
50	16:20	15.1	3.8	15.9	0.0	0.6
51	16:21	14.7	4.0	17.6	0.1	1.0
52	16:22	14.4	4.2	10.5	0.0	0.6
53	16:23	14.6	4.1	11.3	0.0	-0.2
54	16:24	14.6	4.0	13.7	0.0	-0.5
55	16:25	14.6	4.1	11.3	0.0	-0.1
56	16:26	14.8	3.9	13.9	-0.1	-0.8
57	16:27	14.6	4.1	11.1	0.1	-0.3
58	16:28	14.5	4.2	11.8	0.0	0.1
59	16:29	14.6	4.1	14.5	0.0	0.4
60	16:30	14.7	4.0	11.0	-0.1	0.6

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Run 8

Start Time 16:48:23
 Run Length 60
 Stop Time 17:48

Gas		Calibration Information				
		O ₂	CO ₂	CO	CH ₄	NMHC
		Instrument Range	21.1	5.0	182	1490
Span Gas Value		10.00	2.48	79.1	300.0	3.0
Calibration						
Pretest Calibration						
Zero%		0.0	0.0	1.4	0.0	0.1
Span%		10.0	2.5	80.2	305.0	3.0
Post Test Calibration						
Zero%		-0.1	0.0	0.2	0.0	0.1
Span%		10.0	2.5	81.3	299.1	3.1
Results						
Absolute Bias (Zero)		0.3%	0.0%	0.5%	0.1%	0.0%
Absolute Bias (Span)		0.1%	0.2%	1.4%	0.7%	1.2%
Absolute Drift (Zero)		0.3%	0.0%	0.7%	0.0%	0.0%
Absolute Drift (Span)		0.0%	0.0%	0.6%	0.4%	0.6%
		Corrected O ₂ %	Corrected CO ₂ %	Corrected CO ppm	Corrected CH ₄ ppmvw	Corrected TVOC ppm
		14.9	3.8	21.0	0.0	0.6
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH ₄ ppmvw	Uncorrected TVOC ppm
		14.9	3.8	22.0	0.0	0.7
1	16:48	14.7	4.0	17.2	-0.1	2.4
2	16:49	15.2	3.6	22.6	0.0	1.4
3	16:50	14.9	3.8	24.1	-0.1	1.4
4	16:51	14.6	4.1	19.9	-0.1	1.2
5	16:52	14.7	4.0	14.8	0.0	1.3
6	16:53	14.6	4.0	13.2	0.0	1.3
7	16:54	14.5	4.2	14.0	-0.1	1.2
8	16:55	14.7	4.0	13.0	0.0	1.4
9	16:56	15.1	3.8	15.6	0.1	1.4
10	16:57	15.1	3.7	22.6	0.1	1.4
11	16:58	14.8	3.9	20.1	0.0	1.4
12	16:59	14.8	3.9	16.4	0.1	1.4
13	17:00	14.6	4.1	13.2	0.0	1.2
14	17:01	14.7	4.0	13.7	-0.1	1.2
15	17:02	14.9	3.9	14.1	0.0	1.2
16	17:03	14.7	4.0	13.0	-0.2	1.2
17	17:04	14.6	4.0	17.6	0.0	1.2
18	17:05	14.8	3.9	11.7	0.1	0.2
19	17:06	14.8	3.9	14.5	-0.1	-0.5
20	17:07	14.6	4.0	13.4	0.0	-0.4
21	17:08	14.6	4.1	14.8	-0.1	0.3
22	17:09	14.8	4.0	14.8	-0.1	0.3
23	17:10	15.0	3.8	20.3	0.0	0.9
24	17:11	14.8	4.0	18.5	0.0	1.0
25	17:12	15.1	3.7	21.2	-0.1	1.0
26	17:13	15.0	3.8	20.2	-0.1	1.0
27	17:14	15.1	3.7	20.0	0.1	0.5
28	17:15	15.0	3.8	18.7	0.1	-0.6
29	17:16	15.2	3.7	19.3	-0.1	-0.2
30	17:17	15.3	3.6	31.2	-0.1	0.5
31	17:18	15.1	3.7	24.2	-0.1	1.0
32	17:19	15.1	3.8	21.0	-0.1	1.2
33	17:20	15.0	3.9	19.8	-0.1	0.8
34	17:21	15.1	3.7	20.4	-0.1	0.8
35	17:22	15.0	3.7	22.1	0.0	1.1
36	17:23	15.0	3.8	18.9	0.0	1.2
37	17:24	15.2	3.7	22.7	0.0	-0.4
38	17:25	15.1	3.7	23.3	-0.1	-0.1
39	17:26	14.9	3.8	18.2	-0.2	0.5
40	17:27	15.0	3.8	19.8	0.0	0.7
41	17:28	15.1	3.7	22.9	-0.1	-0.4
42	17:29	15.3	3.6	138.2	-0.1	0.9
43	17:30	15.3	3.7	90.9	0.0	0.4
44	17:31	15.0	3.8	32.2	-0.1	-0.2
45	17:32	15.1	3.7	47.7	-0.1	-0.5
46	17:33	15.0	3.9	18.3	-0.1	0.3
47	17:34	14.9	3.8	14.7	-0.1	1.1
48	17:35	14.9	3.8	18.0	0.0	1.2
49	17:36	14.9	3.8	15.8	0.1	0.6
50	17:37	15.2	3.7	20.5	0.0	-0.3
51	17:38	15.0	3.8	20.9	-0.1	1.0
52	17:39	14.9	3.9	13.3	0.0	1.2
53	17:40	15.3	3.6	24.7	-0.1	1.2
54	17:41	14.8	3.9	18.7	0.0	1.0
55	17:42	14.7	4.0	14.4	-0.1	0.5
56	17:43	14.7	4.0	15.9	-0.1	0.3
57	17:44	14.8	3.9	12.4	0.0	0.2
58	17:45	14.9	3.8	18.2	-0.1	0.1
59	17:46	14.9	3.9	14.6	-0.1	0.2
60	17:47	14.8	3.9	14.8	0.1	0.3

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Run 9

Start Time 8:45:06
 Run Length 60
 Stop Time 9:45

Calibration Information						
Gas	O ₂	CO ₂	CO	CH ₄	NMHC	
Instrument Range	21.1	5.0	182.0	1490.0	10.0	
Span Gas Value	10.0	2.5	79.1	300.0	3.0	
Calibration						
Pretest Calibration						
Zero%	-0.1	0.0	1.1	0.0	0.1	
Span%	10.0	2.5	78.0	294.2	3.0	
Post Test Calibration						
Zero%	0.0	0.0	1.1	0.1	0.0	
Span%	10.0	2.5	77.1	301.4	3.0	
Results						
Absolute Bias (Zero)	0.0%	0.0%	0.1%	0.1%	1.0%	
Absolute Bias (Span)	0.1%	0.4%	0.9%	0.5%	1.0%	
Absolute Drift (Zero)	0.5%	0.0%	0.0%	0.0%	1.0%	
Absolute Drift (Span)	0.0%	0.2%	0.5%	0.5%	0.4%	
		Corrected O ₂ %	Corrected CO ₂ %	Corrected CO ppm	Corrected CH4 ppmvw	Corrected TVOC ppm
		15.1	3.8	15.4	-0.1	0.1
Run Length (Minutes)	Time	Uncorrected O ₂ %	Uncorrected CO ₂ %	Uncorrected CO ppm	Uncorrected CH4 ppmvw	Uncorrected TVOC ppm
		15.1	3.8	16.0	0.0	0.1
1	6/15/11 8:45	15.2	3.7	16.8	0.0	0.4
2	6/15/11 8:46	15.0	3.8	15.4	0.0	0.3
3	6/15/11 8:47	15.1	3.8	15.0	-0.1	0.3
4	6/15/11 8:48	15.1	3.8	14.2	0.0	0.3
5	6/15/11 8:49	15.1	3.8	13.9	0.0	0.3
6	6/15/11 8:50	15.2	3.7	14.68	-0.1	0.3
7	6/15/11 8:51	14.9	3.9	15.0	0.0	0.3
8	6/15/11 8:52	15.1	3.7	14.9	0.0	0.3
9	6/15/11 8:53	15.1	3.8	14.0	0.0	0.4
10	6/15/11 8:54	15.0	3.8	15.2	0.0	0.3
11	6/15/11 8:55	15.0	3.9	14.4	-0.1	0.0
12	6/15/11 8:56	15.1	3.8	13.8	-0.1	0.4
13	6/15/11 8:57	15.2	3.8	15.0	0.0	0.8
14	6/15/11 8:58	15.0	3.8	16.2	-0.1	0.7
15	6/15/11 8:59	15.0	3.9	13.1	0.0	0.3
16	6/15/11 9:00	15.1	3.8	14.2	-0.1	0.1
17	6/15/11 9:01	15.0	3.9	14.8	-0.1	0.1
18	6/15/11 9:02	15.2	3.8	15.5	0.0	0.2
19	6/15/11 9:03	15.0	3.9	14.8	0.0	0.1
20	6/15/11 9:04	15.0	3.8	14.2	0.0	0.0
21	6/15/11 9:05	14.9	3.9	13.16	0.0	0.1
22	6/15/11 9:06	15.0	3.9	13.9	0.0	0.1
23	6/15/11 9:07	15.0	3.9	13.2	-0.1	0.1
24	6/15/11 9:08	15.0	3.9	13.1	0.0	0.2
25	6/15/11 9:09	15.1	3.8	15.2	0.0	0.3
26	6/15/11 9:10	14.8	4.0	12.0	0.0	0.2
27	6/15/11 9:11	15.2	3.7	16.0	0.0	0.3
28	6/15/11 9:12	15.0	3.8	14.7	-0.1	0.2
29	6/15/11 9:13	15.1	3.8	14.0	0.1	0.0
30	6/15/11 9:14	14.8	4.0	14.0	0.0	-0.4
31	6/15/11 9:15	15.0	3.8	13.1	-0.1	0.1
32	6/15/11 9:16	14.7	4.1	13.4	-0.1	0.0
33	6/15/11 9:17	14.9	4.0	11.8	-0.1	0.0
34	6/15/11 9:18	14.9	4.0	13.7	0.0	0.0
35	6/15/11 9:19	15.1	3.8	13.5	-0.1	0.1
36	6/15/11 9:20	15.5	3.6	17.4	-0.1	0.0
37	6/15/11 9:21	15.2	3.7	23.0	0.1	0.0
38	6/15/11 9:22	14.9	4.0	15.2	0.1	0.1
39	6/15/11 9:23	15.5	3.6	18.2	0.0	0.2
40	6/15/11 9:24	15.5	3.6	22.6	0.0	0.0
41	6/15/11 9:25	15.5	3.5	26.7	0.0	0.0
42	6/15/11 9:26	15.2	3.8	17.7	0.0	0.0
43	6/15/11 9:27	15.5	3.6	17.3	0.1	0.0
44	6/15/11 9:28	15.7	3.5	26.1	0.0	0.0
45	6/15/11 9:29	15.7	3.4	29.9	0.0	0.0
46	6/15/11 9:30	15.3	3.7	23.4	-0.1	0.0
47	6/15/11 9:31	15.0	3.9	15.1	0.0	0.1
48	6/15/11 9:32	15.4	3.7	17.4	0.1	0.1
49	6/15/11 9:33	15.2	3.7	19.0	-0.1	0.0
50	6/15/11 9:34	15.0	3.9	14.0	0.1	-0.1
51	6/15/11 9:35	15.0	3.9	14.0	0.0	0.0
52	6/15/11 9:36	15.3	3.7	15.8	0.0	0.0
53	6/15/11 9:37	15.1	3.8	16.9	0.1	0.0
54	6/15/11 9:38	15.1	3.8	16.3	0.0	0.0
55	6/15/11 9:39	15.1	3.8	15.5	0.0	0.0
56	6/15/11 9:40	15.3	3.8	15.6	0.2	-0.1
57	6/15/11 9:41	15.4	3.8	18.8	0.0	0.0
58	6/15/11 9:42	15.1	3.9	15.2	0.0	0.0
59	6/15/11 9:43	15.2	3.9	14.8	-0.1	-0.1
60	6/15/11 9:44	15.1	4.0	13.8	0.0	-0.1

Cimarron Energy
Liberty Oil Well
Parshall ND
Flare
6/14/2011

%DRE Calculations	
	10 oz.
Outlet NMOC (lb/hr as C ₃ H ₈)	0.01
Waste Gas Inlet NMOC (lb/hr as C ₃ H ₈)	489.2
Pilot Inlet NMOC (lb/hr as C ₃ H ₈)	0.5
Sum of Inlets NMOC (lb/hr as C ₃ H ₈)	489.7
% DRE (mass flow in/out basis)	100.00%
% DRE (carbon balance)	100.00%

Cimarron Energy
 Liberty Oil Well
 Parshall, ND
 Flare
 06/15/11

EPA Methods 1-4: Determination of Stack Gas Velocity and Volumetric Flow Rate

Sample Calculations

$$\begin{aligned}\text{sample volume (scf)} &= \frac{17.64 * V_M * Y_D * \{P_B + \Delta H/13.6\}}{T_M + 460} \\ &= \frac{17.64 * 37.56 * 0.978 * \{27.64 + 1.0 / 13.6\}}{74 + 460} \\ &= 33.629\end{aligned}$$

$$\begin{aligned}\text{moisture volume (scf)} &= 0.04715 * V_{LC} \\ &= 0.04715 * 34 \\ &= 1.603\end{aligned}$$

$$\begin{aligned}\text{moisture content (\% / 100)} &= \frac{V_{W(STD)}}{(V_{M(STD)} + V_{W(STD)})} \\ &= \frac{1.603}{(33.629 + 1.603)} \\ &= 0.046\end{aligned}$$

$$\begin{aligned}\text{molecular weight, dry (grams/mol)} &= (0.440) * (\%CO_2) + (0.320) * (\%O_2) + (0.280) * (\%N_2 + \%CO) \\ &= (0.440) * 1.5 + (0.320) * 18.5 + (0.280) * (80 + 0.0) \\ &= 28.98\end{aligned}$$

$$\begin{aligned}\text{molecular weight, actual (grams/mol)} &= M_D * (1 - B_{WS}) + (18.0) * B_{WS} \\ &= 28.98 * (1 - 0.046) + (18 * 0.046) \\ &= 28.48\end{aligned}$$

Cimarron Energy
 Liberty Oil Well
 Parshall, ND
 Flare
 06/15/11

EPA Methods 1-4: Determination of Stack Gas Velocity and Volumetric Flow Rate

Sample Calculations (continued)

$$\begin{aligned}
 \text{gas velocity (ft/sec)} &= 85.49 * C_p * \sqrt{\Delta P_{AVG} * \frac{T_s + 460}{[P_B + P_s / 13.6] * M_A}} \\
 &= (85.49) * 0.83 * 0.078 * \sqrt{\frac{936 + 460}{27.64 + \frac{0.00}{13.6}}} * 28.48 \\
 &= 7.4 \\
 \text{gas flow (acfm)} &= 60 * \frac{\pi * (D_s / 12)^2}{4} * V_s \\
 &= 60 * \frac{\pi * (42.63 / 12)^2}{4} * 7.4 \\
 &= 4,382 \\
 \text{gas flow (dscfm)} &= 60 * V_s * (1 - B_{ws}) * \frac{\pi * (D_s / 12)^2}{4} * \frac{T_{STD} * [P_B + P_s / 13.6]}{(T_s + 460) * P_{STD}} \\
 &= 60 * 7.4 * (1 - 0.046) * \frac{\pi * (42.6 / 12)^2}{4} * \frac{528 * [27.64 + 0.00 / 13.6]}{(936 + 460) * 29.92} \\
 &= 1,462
 \end{aligned}$$

Cimarron Energy
Liberty Oil Well
Parshall, ND
Flare
06/15/11

EPA Methods 1-4: Determination of Stack Gas Velocity and Volumetric Flow Rate

Variables and Abbreviations

B_{WS} - moisture content of the gas (wet volume percent/100)

%CO - carbon monoxide content of the gas (dry volume percent)

%CO₂ - carbon dioxide content of the gas (dry volume percent)

C_P - pitot tube constant (unitless)

D_S - diameter of the stack (inches)

ΔH - pressure differential at dry gas meter exit orifice (inches water)

M_D - molecular weight of the dry gas (grams per mol)

M_A - molecular weight of the wet gas (grams per mol)

%N₂ - nitrogen content of the gas (dry volume percent)

%O₂ - oxygen content of the gas (dry volume percent)

P_{AVG} - average square root of the stack gas pitot differential pressure (inches water)

P_B - barometric pressure (inches mercury)

P_S - stack pressure relative to barometric pressure (inches water)

P_{STD} - standard pressure (29.92 inches mercury)

T_M - average dry gas meter temperature (°F)

T_S - average stack temperature (°F)

T_{STD} - standard temperature (528 °R)

V_{LC} - volume of moisture collected as a liquid (milliliters)

V_M - volume indicated on dry gas meter (uncorrected actual cubic feet)

V_{MSTD} - volume of gas through dry gas meter (corrected dry standard cubic feet)

V_S - stack gas velocity (feet per second)

V_{WSTD} - volume of moisture collected as a gas at standard conditions (standard cubic feet)

Y_D - dry gas meter calibration factor (unitless)

Cimarron Energy
Liberty Oil Well
Parshall, ND
Flare
06/15/11

EPA Method 3A: Determination of O₂ / CO₂ Concentrations in Emissions from Stationary Sources (Instrumental Analyzer Procedure)

Sample Calculations

$$\text{CO}_2 \text{ conc, drift cal (\%vd)} = \frac{(\%FS_{\text{STACK}} - \%FS_0) * [\text{Span Gas Conc (\%vd)}]}{(\%FS_{\text{SPAN}} - \%FS_0)}$$

$$= \frac{(1.5 - 0) * (2.48)}{(2.5) - (0)}$$

$$= 2.5$$

$$\text{O}_2 \text{ conc, drift cal (\%vd)} = \frac{(\%FS_{\text{STACK}} - \%FS_0) * [\text{Span Gas Conc (\%vd)}]}{(\%FS_{\text{SPAN}} - \%FS_0)}$$

$$= \frac{(18.7 - 0.0) * (10)}{(10.1) - (0.0)}$$

$$= 18.5$$

Variables and Abbreviations

cal - calibrated

conc - concentration

CO₂ - Carbon Dioxide

O₂ - Oxygen

%FS_{SPAN} - average analyzer reading for span gas (percent of full scale)

%FS_{STACK} - average analyzer reading for stack gas (percent of full scale)

%FS₀ - average analyzer reading for zero gas (percent of full scale)

%vd- dry volume percent

Cimarron Energy
Liberty Oil Well
Parshall, ND
Flare
06/15/11

EPA Method 10: Determination of Carbon Monoxide Emissions from Stationary Sources (*Instrumental Analyzer Procedure*)

Sample Calculations

$$\begin{aligned}\text{CO conc, drift cal (ppmvd)} &= \frac{(\%FS_{\text{STACK}} - \%FS_0) * [\text{Span Gas Conc (ppmvd)}]}{(\%FS_{\text{SPAN}} - \%FS_0)} \\ &= \frac{(105.1 - 1.2) * (79.1)}{(77.9) - (1.2)} \\ &= 107.2\end{aligned}$$

$$\begin{aligned}\text{CO emissions (lb/hr)} &= [\text{CO (ppmvd)}] * (F_{\text{DSCFM}}) * (1.556 \times 10^{-7}) * (46.01) \\ &= (107.2) * 1,462 * (1.556 \times 10^{-7}) * (46.01) \\ &= 0.70\end{aligned}$$

Variables and Abbreviations

cal - calibrated

conc - concentration

F_{DSCFM} - gas flow (dry standard cubic feet per minute, where standard = 29.92 inches Hg and 68oF)

$\%FS_{\text{SPAN}}$ - average analyzer reading for span gas at probe tip (percent of full scale)

$\%FS_{\text{STACK}}$ - average analyzer reading for stack gas (percent of full scale)

$\%FS_0$ - average analyzer reading for zero gas at probe tip (percent of full scale)

lb/hr - pounds per hour

ppmvd - parts per million, dry volume basis

g/bhp-hr - grams per brake horsepower-hour

Cimarron Energy
Liberty Oil Well
Parshall, ND
Flare
06/15/11

EPA Method 25A: Determination of Total Gaseous Organic Concentrations Using a Flame Ionization Analyzer

Sample Calculations

$$\begin{aligned}\text{NMOC conc, drift cal (ppmvd as C}_3\text{H}_8) &= \frac{(\%FS_{\text{STACK}} - \%FS_0) * [\text{Span Gas Conc (ppmvd)}]}{(\%FS_{\text{SPAN}} - \%FS_0)} \\ &= \frac{(43.9 - 0.0) * (30.2)}{(30.2) - (0.0)} \\ &= 43.9\end{aligned}$$

$$\begin{aligned}\text{NMOC emissions (lb/hr as C}_3\text{H}_8) &= [\text{NMOC (ppmvd)}] * (F_{\text{DSCFM}}) * (1.556 \times 10^{-7}) * (44.09) \\ &= (43.9) * (1,462) * (1.556 \times 10^{-7}) * 44.09 \\ &= 0.46\end{aligned}$$

Variables and Abbreviations

as C₃H₈ - as propane or C₃

B_{WS} - moisture content of the gas (wet volume percent/100)

cal - calibrated

conc - concentration

F_{DSCFM} - gas flow (dry standard cubic feet per minute, where standard = 29.92 inches Hg and 68oF)

%FS_{SPAN} - average analyzer reading for span gas at probe tip (percent of full scale)

%FS_{STACK} - average analyzer reading for stack gas (percent of full scale)

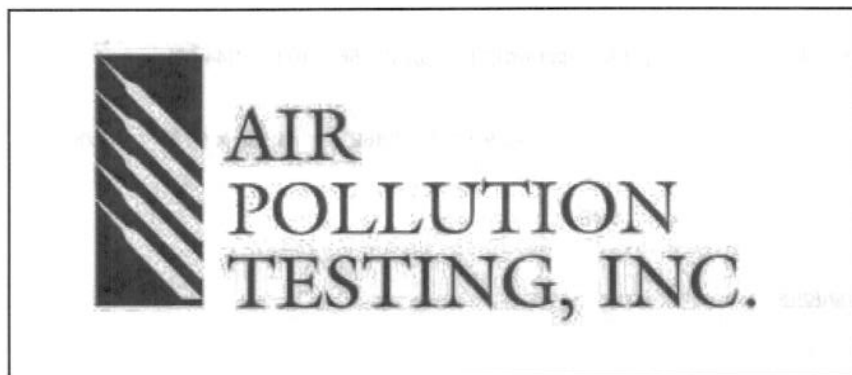
%FS₀ - average analyzer reading for zero gas at probe tip (percent of full scale)

lb/hr - pounds per hour

tpy - tons per year

ppmvw - parts per million, wet volume basis

g/bhp-hr - grams per brake horsepower-hour



Appendix Two: Field and Laboratory Data

1 oz. Inlet Pressure

Air Pollution Testing Inc. - EPA Method 2 - Pilot Traverse Worksheet

Job #:		C1M1122		Operator:		PR/DM	
Facility:		Parshall, ND		Silo:		Liberty Wells	
Date:		6/15/11		Points:		1 5 9 2 6 10 3 7 11 4 8 12	
Probe ID:		P-296 / P-34		Run #:		7 - Inlet/Outlet	
Pilot Constant:		0.83 / 0.84		CO2%:		CO2S	
				measured / estimate		CO2S	
				Pb (H ₂ O):		Pb (Hg): 936	
				Start Time:		13:08	
				Stop Time:		13:40	
				Post Test Pilot Leak Check Good?:		0.0 @ 0.85	

Stack Diameter (inches):		40	
Upstream Disturbance (inches):		48	
Downstream Disturbance (inches):		172	
Schematic of Sampling Location:			

Point #	Delta P	Ts	Notes
1-1	1.005	935	
2	.01	937	
3	.005	938	
4	.005	939	
5	.005	936	
6	.005	934	
7	.01	934	
8	.005	930	
2-1	.000	938	
2	.005	937	
3	.005	935	
4	.005	940	
5	.01	935	
6	.005	933	
7	.01	937	
8	.005	931	
Inlet	0.074	935.83	
1	.015	71	
2	.015	73	
3	.015	73	
4	.01	72	
5	.015	74	
6	.01	72	
Averages:	0.015	72.5	

Point #	Delta P	Ts	Notes
1-1	.01	810	
2	.015	812	
3	.015	812	
4	.02	811	
5	.015	808	
6	.02	810	
7	.025	810	
8	.03	809	
2-1	.005	811	
2	.01	813	
3	.02	815	
4	.03	817	
5	.035	815	
6	.025	810	
7	.02	807	
8	.025	807	
Inlet	0.138	811.188	
1	.005	73	
2	.005	74	
3	.010	74	
4	.010	75	
5	.015	73	
6	.010	74	
Averages:	0.017	73.83	

Point #	Delta P	Ts	Notes
1-1	.01	890	
2	.015	895	
3	.02	892	
4	.015	893	
5	.02	890	
6	.02	898	
7	.025	888	
8	.02	890	
2-1	.02	890	
2	.02	890	
3	.02	890	
4	.025	889	
5	.025	892	
6	.030	895	
7	.03	890	
8	.03	895	
Inlet	0.1475	899.189	
1	.005	74	
2	.005	71	
3	.01	73	
4	.005	72	
5	.01	73	
6	.010	73	
Averages:	0.143	72.667	

Reviewer's Signature:

Air Pollution Testing, Inc. : Analyzer Calibration Datasheet

Facility : Liberty Oil Refinery

Date : 6-15-11

Location : Marshall MD

APT Job # : CPM 1122

Unit :

Page # :

Analyzer Information

Analyzer Type	O ₂	CO ₂	CO	CH ₄	NMHC	
Analyzer ID #	14206-2	14152-9	48H-5	55C-2	-	-
Analyzer Scale	14000-0-25	0-20	0-1000	0-1000	0-100	0-1000
Calibration Range	0-21.1	0-5	0.388	0-1490	0-8.41	0-85.5

Calibration Gas Cylinder Information
(Cylinder ID# and Concentration)

Recal

Analyzer Type	O ₂	CO ₂	CO	CH ₄	NMHC	
Zero	0	0	0	0	0	0
Low	5.06	5.00	79.1	300	3.0	30.2
		ALM034167	CG88289	ALM036593	CG113970	ALM042562
Mid	10.0	10.1	182	750	5.97	50.1
		ALM016875	ALM053684	ALM	ALM023464	131241
High	21.1	5	388	1490	8.41	85.5
	CG19461		ALM000000	ALM062797	CG318602	AAC15598

Calibration Error

SD3
ALM013439

Analyzer Type	O ₂	CO ₂	CO	CH ₄	NMHC	
Zero	0.0	0.0	-0.2	1.9	0.0	0.0
Low	4.93	4.99	77.0	295.4	3.02	31.1
		2.49				
Mid	10.0	10.0	179.0	749.6	4.95	50.4
High	21.1	19.6	385.3	1500	8.43	85.2

Initial Bias Check

495.4

Analyzer Type	O ₂	CO ₂	CO	CH ₄	NMHC	NMHC
Zero	-0.1	0.0	1.1	0.0	0.1	1.2
Low		2.95			3.0	30.8
Mid	10.0	4.95	78.0	294.2		
High						

Air Pollution Testing, Inc. : Analyzer Calibration Data Sheet

Facility: Liberty Oil Wells

Date: 6-8-11

Location: Parshall ND

APT Job #: CIM 1122

Unit:

Page #:

Run #: 6

Start Time: 8:45

Stop Time: 9:45

Calibration Results

Analyzer Type	O ₂	CO ₂	CO	CH ₄	N ₂ O
Zero	0.0	0.0	1.1	P.1	0.0
Low		2.5			
Mid	10.0		77.1	301.4	3.04
High					

Run #: 7

Start Time: 12:34

Stop Time: 13:34

Calibration Results

Analyzer Type	O ₂	CO ₂	CO	CH ₄	N ₂ O
Zero	0.0	0.0	1.2	0.0	0.0
Low					
Mid	10.1	2.47	77.5	305.1	30.2
High					

Run #: 8

Start Time: 14:12

Stop Time: 15:12

Calibration Results

Analyzer Type	O ₂	CO ₂	CO	CH ₄	N ₂ O
Zero	0.0	0.0	77.7 1.2	0.2	0.2
Low					
Mid	10.0	2.5	77.7	302.5	3.1
High					

9					
	start 1530		end 1630		
	O ₂	CO ₂	CO	CH ₄	N ₂ O
Zero	0.0	0.0	0.0	0.0	0.0
Mid	10.0	2.46	76.6	305.8	28.1

Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #: <u>CIM1122</u>	Date: <u>4/5/11</u>	CO ₂ (%): <u>COAS</u>	O ₂ (%): <u>COAS</u>
Location: <u>Parshall, ND</u>	Operator: <u>RL</u>	Ambient Temperature (°F): <u>70</u>	Barometric Press (mbar): <u>936</u>
Run #: <u>7</u>	Meter Box ID: <u>M5-8</u>	Probe Length (ft): <u>4</u>	Moisture (grams): <u>COAS</u>
Meter Box Yd: <u>0.778</u>	Meter ΔH@: <u>1.71</u>	Static Pressure ("H ₂ O): <u>0.001</u>	Start Time: <u>12:34</u>
Pre-Test Pump Leak Check: <u>0.00 @ 14" Hg</u>	Post-Test Pump Leak Check: <u>0.00 @ 15" Hg</u>	Method: <u>4</u>	Stop Time: <u>13:34</u>

Sampling Time (minutes)	Vacuum ("Hg)	ΔH Orifice Setting ("H ₂ O)	T _m		Condenser Temp. (°F)	Meter Volume (ft ³)	Notes
			Inlet (°F)	Outlet (°F)			
5	4	1.0	74	70	40	24.02	
10	4	1.0	74	71	40	27.15	
15	4	1.0	74	71	41	30.28	
20	4	1.0	75	71	42	33.41	
25	4	1.0	75	71	42	36.54	
30	4	1.0	76	71	43	39.78	
35	4	1.0	76	72	44	42.80	
40	4	1.0	77	72	45	46.03	
45	4	1.0	78	73	45	49.16	
50	4	1.0	78	73	46	52.25	
55	4	1.0	78	73	47	55.37	
60	4	1.0	79	74	47	58.445	

Stack ID (inches): 79

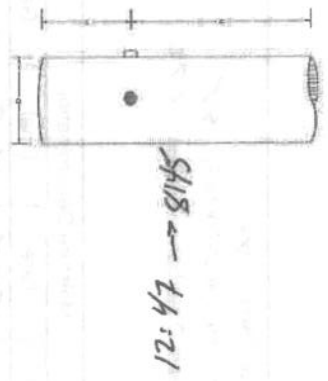
Upstream Disturbance (inches): 48

Downstream Disturbance (inches): 192

Moisture Determination			
Imp. #	Tare	Final	Gain
1	<u>5100.2</u>	<u>525.8</u>	<u>+25.6</u>
2	<u>428.2</u>	<u>452.1</u>	<u>+42</u>
3	<u>298.7</u>	<u>299.8</u>	<u>+1.1</u>
4	<u>536.1</u>	<u>539.2</u>	<u>+3.1</u>
Total			<u>+34.0</u>

Technician's Signature: [Signature]

Project Leader's Signature: [Signature]



4 oz. Inlet Pressure

OUTLET

Air Pollution Testing Inc.: EPA Method 2 - Pilot Traverse Worksheet

Job #: 2111122
 Facility: Parshall, JD
 Date: 6/14/11
 Probe ID: 0-256
 Pilot Constant: 0.83

Operator: PR/DM
 Site: PR/DM

Points: 1 5 9
 2 6 10
 3 7 11
 4 8 12

Stack Diameter (inches): 40
 Upstream Disturbance (inches): 48
 Downstream Disturbance (inches): 172
 Schematic of Sampling Location: 

Run #: 1
 O2%: 20.45 CO2%: COA
 H2O%: COA measured / estimate
 Ps (H2O): 0.01 Pb (Hg): 9
 Start Time: 11:02 Stop Time: 11:08
 Post Test Pilot Leak Check Good? 0.90

Run #: 2
 O2%: COA CO2%: COA
 H2O%: COA measured / estimate
 Ps (H2O): 0.01 Pb (Hg): 9
 Start Time: 13:22 Stop Time: 13:28
 Post Test Pilot Leak Check Good? 1.00

Run #: 3
 O2%: COA CO2%: COA
 H2O%: COA measured / estimate
 Ps (H2O): 0.01 Pb (Hg): 9
 Start Time: 14:37 Stop Time: 14:51
 Post Test Pilot Leak Check Good? 0.00

Point #	Delta P	Ts	Notes
1-1	0.02	1320	
2	0.25	1322	
3	0.03	1325	
4	0.35	1320	
5	0.35	1318	
6	0.3	1318	
7	0.3	1320	
8	0.25	1315	
2-1	0.15	1315	
2	0.2	1320	
3	0.2	1320	
4	0.25	1325	
5	0.3	1320	
6	0.35	1320	
7	0.3	1320	
8	0.15	1325	

Point #	Delta P	Ts	Notes
1-1	0.15	1326	
2	0.2	1327	
3	0.25	1330	
4	0.3	1327	
5	0.35	1330	
6	0.35	1330	
7	0.3	1329	
8	0.2	1325	
2-1	0.1	1325	
2	0.15	1336	
3	0.2	1334	
4	0.3	1330	
5	0.30	1327	
6	0.35	1324	
7	0.3	1323	
8	0.2	1321	

Point #	Delta P	Ts	Notes
1-1	0.15	1322	
2	0.2	1318	
3	0.3	1320	
4	0.3	1321	
5	0.3	1320	
6	0.3	1317	
7	0.3	1317	
8	0.2	1326	
2-1	0.15	1320	
2	0.2	1321	
3	0.25	1318	
4	0.3	1320	
5	0.3	1321	
6	0.3	1320	
7	0.3	1317	
8	0.2	1326	

Averages: 0.1607 1320.19 0.1577 1320.41 0.1560 1327.14

Reviewers Signature: _____

Air Pollution Testing, Inc. : Analyzer Calibration Datasheet

Facility: <u>Old Liberty oil well</u>	Date: <u>6-14-11</u>
Location: <u>Parshall ND</u>	APT Job #: <u>CIM1122</u>
Unit: <u>Plan</u>	Page #: <u> </u>

Analyzer Information

Analyzer Type	<u>O₂</u>	<u>CO₂</u>	<u>CO</u>	<u>CH₄</u>	<u>NMHC</u>
Analyzer ID #	<u>1420C-7</u>	<u>1415B-9</u>	<u>1481A-5</u>	<u>55C-2</u>	<u>→</u>
Analyzer Scale	<u>0-25.1</u>	<u>0-20</u>	<u>0-1000</u>	<u>0-8000</u>	<u>0-100</u>
Calibration Range	<u>0-21.1</u>	<u>0-5.00</u>	<u>0-192</u>	<u>0-750</u>	<u>0-8.47</u>

Calibration Gas Cylinder Information (Cylinder ID#/Expiration date and Concentration)

Analyzer Type	<u>O₂</u>	<u>CO₂</u>	<u>CO</u>	<u>CH₄</u>	<u>NMHC</u>
Zero					
CC#					
Expiration date					
Low	<u>21.1</u>	<u>2.48</u>		<u>300</u>	<u>3.0</u>
CC#	<u>ALM052472</u>	<u>→</u>		<u>ALM036977</u>	<u>CC113970</u>
Expiration date	<u>3-14</u>	<u>→</u>		<u>10-13</u>	<u>11-13</u>
Mid	<u>5.06</u>	<u>5.00</u>	<u>79.1</u>	<u>750</u>	<u>4.97</u>
CC#	<u>ALM034167</u>	<u>→</u>	<u>CC48289</u>		<u>ALM023464</u>
Expiration date	<u>5-13</u>	<u>→</u>	<u>9-11</u>	<u>11-13</u>	<u>7-13</u>
High	<u>10.0</u>	<u>10.1</u>	<u>192</u>	<u>1490</u>	<u>8.47</u>
CC#	<u>ALM016875</u>	<u>→</u>	<u>ALM052644</u>	<u>ALM023477</u>	<u>CC119602</u>
Expiration date	<u>3-14</u>	<u>→</u>	<u>4-13</u>	<u>10-13</u>	<u>2-28-13</u>

21.1 19.6
CC194401 →
2/14 →

Calibration Error

Analyzer Type	<u>O₂</u>	<u>CO₂</u>	<u>CO</u>	<u>CH₄</u>	<u>NMHC</u>
Zero	<u>0.0</u>	<u>0.0</u>	<u>1.2</u>	<u>1.0</u>	<u>0.1</u>
Low	<u>2.54</u>	<u>2.48</u>	<u>190.1</u>	<u>309</u>	<u>2.74</u>
Mid	<u>5.0</u>	<u>4.97</u>	<u>384.9</u>	<u>758.9</u>	<u>5.0</u>
High	<u>10.03</u>	<u>10.05</u>	<u>907.5</u>	<u>1505.2</u>	<u>8.43</u>

21.1 19.6

Initial Bias Check

Analyzer Type	<u>O₂</u>	<u>CO₂</u>	<u>CO</u>	<u>CH₄</u>	<u>NMHC</u>
Zero	<u>0.0</u>	<u>0.06</u>	<u>2.2</u>	<u>0.0</u>	<u>0.1</u>
Low	<u>2.48</u>	<u>2.41</u>	<u>79.5</u>		<u>2.99</u>
Mid	<u>5.0</u>	<u>4.95</u>	<u>385.6</u>	<u>300.9</u>	
High	<u>10.0</u>	<u>9.98</u>			

Air Pollution Testing, Inc. : Analyzer Calibration Data Sheet

Facility: Liberty Pool well

Date: 6-14-11

Location: Pershull 11 NO

APT Job # CIm 1122

Unit: flow

Page #:

Run #: 1

10:48

Start Time:

11:48

Stop Time:

Calibration Results

1148

Analyzer Type					
Zero	-0.1	0.0	5.25	0.0	3.04
Low	5.0	4.91	2.99		
Mid	10.0	10.0	81.1	505.9	3.04
High					

Run #: 2

Start Time:

12:55

Stop Time:

1355

Calibration Results

Analyzer Type	O ₂	CO	NO	Meth	NMOC
Zero	0.0	0.0	0.0	0.0	0.1
Low		2.47			
Mid	10.0	4.9	79.7	301.9	2.95
High		10.0			

Run #: 3

Start Time:

14/14

Stop Time:

15/14

Calibration Results

Analyzer Type	O ₂	CO	NO	Meth	NMOC
Zero	-0.1	0.0	0.2	0.0	0.1
Low		2.51			
Mid	5.0	4.95	81.8	307.4	2.98
High	10.0	10.0			

pilot
 15 min at 14/14
 SCFH

Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #:	C1M1122	Date:	6/14/11	CO ₂ (%):	COAS	O ₂ (%):	COAS
Location:	Parshall, ND	Operator:	PR	Ambient Temperature (°F):	58	Barometric Press (mbar):	736
Run #	1	Meter Box ID:	M5-8	Probe Length (ft):	4 ft	Moisture (grams):	COAS
Meter Box Yr:	1978	Meter ΔH@:	1.71	Static Pressure (" H ₂ O):	0.001	Start Time:	10:48
Pre-Test Pump Leak Check:	0.0014" Hg	Post-Test Pump Leak Check:	0.0015" Hg	Method:	4	Stop Time:	11:48

Sampling Time (minutes)	Vacuum (" Hg)	ΔH Office Setting (" H ₂ O)	T _m		Condenser Temp. (°F)	Meter Volume (ft ³)	Notes
			Inlet (°F)	Outlet (°F)			
5	3	1.0	55	55	34	696.568	
10	3	1.0	56	55	34	701.57	
15	3	1.0	56	55	34	701.6	
20	3	1.0	57	55	34	701.7	
25	3	1.0	58	56	34	701.7	
30	3	1.0	58	56	34	701.7	
35	3	1.0	59	57	34	701.8	
40	3	1.0	60	57	34	701.8	
45	3	1.0	60	57	34	701.8	
50	3	1.0	60	57	34	701.8	
55	3	1.0	60	57	34	701.8	
60	3	1.0	60	57	34	701.8	



Stack ID (inches):
 Upstream Disturbance (inches):
 Downstream Disturbance (inches):

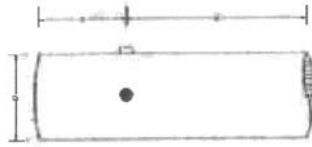
Moisture Determination			
Imp. #	Tare	Final	Gain
1	484.2	512.2	28.0
2	484.7	473.4	-11.3
3	444.1	306.6	137.5
4	516.1	517.6	-1.5
Total			32.7
Technician's Signature:		Project Leader's Signature:	
FAR		FAR	

total	60	maximum	3	average	1.0	maximum	42	difference	36.340
				57.25					

Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

APT Job #:	CIM1122	Date:	6/14/11	CO ₂ (%):	CO ₂	O ₂ (%):	CO ₂
Location:	Quasdel, ND	Operator:	PR	Ambient Temperature (°F):	62	Barometric Press (mbar):	7
Run #	3	Meter Box ID:	M5-8	Probe Length (ft):	4.24	Moisture (grams):	CO ₂
Meter Box Yd:	0.778	Meter ΔH@:	1.71	Static Pressure (" H ₂ O):	0.001	Start Time:	14:14
Pre-Test Pump Leak Check:	0.0 @ 11" H ₂ O	Post-Test Pump Leak Check:	0.0 @ 15" H ₂ O	Method:	4	Stop Time:	15:14

Sampling Time (minutes)	Vacuum (" Hg)	ΔH Orifice Setting (" H ₂ O)	T _m Meter Temp.		Condenser Temp. (°F)	Meter Volume (ft ³)	Notes
			Inlet (°F)	Outlet (°F)			
5	4	1.0	68	66	39	1271.615	
10	4	1.0	70	67	40	774.72	
15	4	1.0	70	67	41	777.83	
20	4	1.0	72	67	41	780.94	
25	4	1.0	72	67	41	784.04	
30	4	1.0	72	67	41	787.15	
35	4	1.0	71	67	42	790.26	
40	4	1.0	71	67	42	793.36	
45	4	1.0	71	67	41	796.47	
50	4	1.0	71	67	41	799.58	
55	4	1.0	71	67	41	802.69	
60	4	1.0	72	67	41	805.71	
						808.902	



Stack ID (inches): **41**
 Upstream Disturbance (inches): **44**
 Downstream Disturbance (inches): **192**

Moisture Determination			
Imp. #	Tare	Final	Gain
1	484.5	512.5	+26.0
2	419.3	427.1	+7.8
3	365.1	365.4	+0.3
4	523.5	526.6	+3.1
Total			37.2
Technician's Signature:		Project Leader's Signature:	

total	maximum	average	maximum difference
60	4	68.158	42
		1.0	57.287

10 oz. Inlet Pressure									
Time	Temp	Pressure	Flow	Volume	Weight	Height	Area	Perimeter	Notes
10:00	72.5	10.0	1.0	1.0	1.0	1.0	1.0	1.0	Start of run
10:05	73.0	10.5	1.1	1.1	1.1	1.1	1.1	1.1	
10:10	73.5	11.0	1.2	1.2	1.2	1.2	1.2	1.2	
10:15	74.0	11.5	1.3	1.3	1.3	1.3	1.3	1.3	
10:20	74.5	12.0	1.4	1.4	1.4	1.4	1.4	1.4	
10:25	75.0	12.5	1.5	1.5	1.5	1.5	1.5	1.5	
10:30	75.5	13.0	1.6	1.6	1.6	1.6	1.6	1.6	
10:35	76.0	13.5	1.7	1.7	1.7	1.7	1.7	1.7	
10:40	76.5	14.0	1.8	1.8	1.8	1.8	1.8	1.8	
10:45	77.0	14.5	1.9	1.9	1.9	1.9	1.9	1.9	
10:50	77.5	15.0	2.0	2.0	2.0	2.0	2.0	2.0	
10:55	78.0	15.5	2.1	2.1	2.1	2.1	2.1	2.1	
11:00	78.5	16.0	2.2	2.2	2.2	2.2	2.2	2.2	
11:05	79.0	16.5	2.3	2.3	2.3	2.3	2.3	2.3	
11:10	79.5	17.0	2.4	2.4	2.4	2.4	2.4	2.4	
11:15	80.0	17.5	2.5	2.5	2.5	2.5	2.5	2.5	
11:20	80.5	18.0	2.6	2.6	2.6	2.6	2.6	2.6	
11:25	81.0	18.5	2.7	2.7	2.7	2.7	2.7	2.7	
11:30	81.5	19.0	2.8	2.8	2.8	2.8	2.8	2.8	
11:35	82.0	19.5	2.9	2.9	2.9	2.9	2.9	2.9	
11:40	82.5	20.0	3.0	3.0	3.0	3.0	3.0	3.0	
11:45	83.0	20.5	3.1	3.1	3.1	3.1	3.1	3.1	
11:50	83.5	21.0	3.2	3.2	3.2	3.2	3.2	3.2	
11:55	84.0	21.5	3.3	3.3	3.3	3.3	3.3	3.3	
12:00	84.5	22.0	3.4	3.4	3.4	3.4	3.4	3.4	
12:05	85.0	22.5	3.5	3.5	3.5	3.5	3.5	3.5	
12:10	85.5	23.0	3.6	3.6	3.6	3.6	3.6	3.6	
12:15	86.0	23.5	3.7	3.7	3.7	3.7	3.7	3.7	
12:20	86.5	24.0	3.8	3.8	3.8	3.8	3.8	3.8	
12:25	87.0	24.5	3.9	3.9	3.9	3.9	3.9	3.9	
12:30	87.5	25.0	4.0	4.0	4.0	4.0	4.0	4.0	
12:35	88.0	25.5	4.1	4.1	4.1	4.1	4.1	4.1	
12:40	88.5	26.0	4.2	4.2	4.2	4.2	4.2	4.2	
12:45	89.0	26.5	4.3	4.3	4.3	4.3	4.3	4.3	
12:50	89.5	27.0	4.4	4.4	4.4	4.4	4.4	4.4	
12:55	90.0	27.5	4.5	4.5	4.5	4.5	4.5	4.5	
13:00	90.5	28.0	4.6	4.6	4.6	4.6	4.6	4.6	
13:05	91.0	28.5	4.7	4.7	4.7	4.7	4.7	4.7	
13:10	91.5	29.0	4.8	4.8	4.8	4.8	4.8	4.8	
13:15	92.0	29.5	4.9	4.9	4.9	4.9	4.9	4.9	
13:20	92.5	30.0	5.0	5.0	5.0	5.0	5.0	5.0	
13:25	93.0	30.5	5.1	5.1	5.1	5.1	5.1	5.1	
13:30	93.5	31.0	5.2	5.2	5.2	5.2	5.2	5.2	
13:35	94.0	31.5	5.3	5.3	5.3	5.3	5.3	5.3	
13:40	94.5	32.0	5.4	5.4	5.4	5.4	5.4	5.4	
13:45	95.0	32.5	5.5	5.5	5.5	5.5	5.5	5.5	
13:50	95.5	33.0	5.6	5.6	5.6	5.6	5.6	5.6	
13:55	96.0	33.5	5.7	5.7	5.7	5.7	5.7	5.7	
14:00	96.5	34.0	5.8	5.8	5.8	5.8	5.8	5.8	
14:05	97.0	34.5	5.9	5.9	5.9	5.9	5.9	5.9	
14:10	97.5	35.0	6.0	6.0	6.0	6.0	6.0	6.0	
14:15	98.0	35.5	6.1	6.1	6.1	6.1	6.1	6.1	
14:20	98.5	36.0	6.2	6.2	6.2	6.2	6.2	6.2	
14:25	99.0	36.5	6.3	6.3	6.3	6.3	6.3	6.3	
14:30	99.5	37.0	6.4	6.4	6.4	6.4	6.4	6.4	
14:35	100.0	37.5	6.5	6.5	6.5	6.5	6.5	6.5	
14:40	100.5	38.0	6.6	6.6	6.6	6.6	6.6	6.6	
14:45	101.0	38.5	6.7	6.7	6.7	6.7	6.7	6.7	
14:50	101.5	39.0	6.8	6.8	6.8	6.8	6.8	6.8	
14:55	102.0	39.5	6.9	6.9	6.9	6.9	6.9	6.9	
15:00	102.5	40.0	7.0	7.0	7.0	7.0	7.0	7.0	
15:05	103.0	40.5	7.1	7.1	7.1	7.1	7.1	7.1	
15:10	103.5	41.0	7.2	7.2	7.2	7.2	7.2	7.2	
15:15	104.0	41.5	7.3	7.3	7.3	7.3	7.3	7.3	
15:20	104.5	42.0	7.4	7.4	7.4	7.4	7.4	7.4	
15:25	105.0	42.5	7.5	7.5	7.5	7.5	7.5	7.5	
15:30	105.5	43.0	7.6	7.6	7.6	7.6	7.6	7.6	
15:35	106.0	43.5	7.7	7.7	7.7	7.7	7.7	7.7	
15:40	106.5	44.0	7.8	7.8	7.8	7.8	7.8	7.8	
15:45	107.0	44.5	7.9	7.9	7.9	7.9	7.9	7.9	
15:50	107.5	45.0	8.0	8.0	8.0	8.0	8.0	8.0	
15:55	108.0	45.5	8.1	8.1	8.1	8.1	8.1	8.1	
16:00	108.5	46.0	8.2	8.2	8.2	8.2	8.2	8.2	
16:05	109.0	46.5	8.3	8.3	8.3	8.3	8.3	8.3	
16:10	109.5	47.0	8.4	8.4	8.4	8.4	8.4	8.4	
16:15	110.0	47.5	8.5	8.5	8.5	8.5	8.5	8.5	
16:20	110.5	48.0	8.6	8.6	8.6	8.6	8.6	8.6	
16:25	111.0	48.5	8.7	8.7	8.7	8.7	8.7	8.7	
16:30	111.5	49.0	8.8	8.8	8.8	8.8	8.8	8.8	
16:35	112.0	49.5	8.9	8.9	8.9	8.9	8.9	8.9	
16:40	112.5	50.0	9.0	9.0	9.0	9.0	9.0	9.0	
16:45	113.0	50.5	9.1	9.1	9.1	9.1	9.1	9.1	
16:50	113.5	51.0	9.2	9.2	9.2	9.2	9.2	9.2	
16:55	114.0	51.5	9.3	9.3	9.3	9.3	9.3	9.3	
17:00	114.5	52.0	9.4	9.4	9.4	9.4	9.4	9.4	
17:05	115.0	52.5	9.5	9.5	9.5	9.5	9.5	9.5	
17:10	115.5	53.0	9.6	9.6	9.6	9.6	9.6	9.6	
17:15	116.0	53.5	9.7	9.7	9.7	9.7	9.7	9.7	
17:20	116.5	54.0	9.8	9.8	9.8	9.8	9.8	9.8	
17:25	117.0	54.5	9.9	9.9	9.9	9.9	9.9	9.9	
17:30	117.5	55.0	10.0	10.0	10.0	10.0	10.0	10.0	
17:35	118.0	55.5	10.1	10.1	10.1	10.1	10.1	10.1	
17:40	118.5	56.0	10.2	10.2	10.2	10.2	10.2	10.2	
17:45	119.0	56.5	10.3	10.3	10.3	10.3	10.3	10.3	
17:50	119.5	57.0	10.4	10.4	10.4	10.4	10.4	10.4	
17:55	120.0	57.5	10.5	10.5	10.5	10.5	10.5	10.5	
18:00	120.5	58.0	10.6	10.6	10.6	10.6	10.6	10.6	
18:05	121.0	58.5	10.7	10.7	10.7	10.7	10.7	10.7	
18:10	121.5	59.0	10.8	10.8	10.8	10.8	10.8	10.8	
18:15	122.0	59.5	10.9	10.9	10.9	10.9	10.9	10.9	
18:20	122.5	60.0	11.0	11.0	11.0	11.0	11.0	11.0	
18:25	123.0	60.5	11.1	11.1	11.1	11.1	11.1	11.1	
18:30	123.5	61.0	11.2	11.2	11.2	11.2	11.2	11.2	
18:35	124.0	61.5	11.3	11.3	11.3	11.3	11.3	11.3	
18:40	124.5	62.0	11.4	11.4	11.4	11.4	11.4	11.4	
18:45	125.0	62.5	11.5	11.5	11.5	11.5	11.5	11.5	
18:50	125.5	63.0	11.6	11.6	11.6	11.6	11.6	11.6	
18:55	126.0	63.5	11.7	11.7	11.7	11.7	11.7	11.7	
19:00	126.5	64.0	11.8	11.8	11.8	11.8	11.8	11.8	
19:05	127.0	64.5	11.9	11.9	11.9	11.9	11.9	11.9	
19:10	127.5	65.0	12.0	12.0	12.0	12.0	12.0	12.0	
19:15	128.0	65.5	12.1	12.1	12.1	12.1	12.1	12.1	
19:20	128.5	66.0	12.2	12.2	12.2	12.2	12.2	12.2	
19:25	129.0	66.5	12.3	12.3	12.3	12.3	12.3	12.3	
19:30	129.5	67.0	12.4	12.4	12.4	12.4	12.4	12.4	
19:35	130.0	67.5	12.5	12.5	12.5	12.5	12.5	12.5	
19:40	130.5	68.0	12.6	12.6	12.6	12.6	12.6	12.6	
19:45	131.0	68.5	12.7	12.7	12.7	12.7	12.7	12.7	
19:50	131.5	69.0	12.8	12.8	12.8	12.8	12.8	12.8	
19:55	132.0	69.5	12.9	12.9	12.9	12.9	12.9	12.9	
20:00	132.5	70.0	13.0	13.0	13.0	13.0	13.0	13.0	
20:05	133.0	70.5	13.1	13.1	13.1	13.1	13.1	13.1	
20:10	133.5	71.0	13.2	13.2	13.2	13.2	13.2	13.2	
20:15	134.0	71.5	13.3	13.3	13.3	13.3	13.3	13.3	
20:20	134.5	72.0	13.4	13.4	13.4	13.4	13.4	13.4	
20:25	135.0	72.5	13.5	13.5	13.5	13.5	13.5	13.5	
20:30	135.5	73.0	13.6	13.6	13.6	13.6	13.6	13.6	
20:35	136.0	73.5	13.7	13.7	13.7	13.7	13.7	13.7	
20:40	136.5	74.0	13.8	13.8	13.8	13.8	13.8	13.8	
20:45	137.0	74.5	13.9	13.9	13.9	13.9	13.9	13.9	
20:50	137.5	75.0	14.0	14.0	14.0	14.0	14.0	14.0	
20:55	138.0	75.5	14.1	14.1	14.1	14.1	14.1	14.1	
21:00	138.5	76.0	14.2	14.2	14.2	14.2	14.2	14.2	
21:05	139.0	76.5	14.3	14.3	14.3	14.3	14.3	14.3	
21:10	139.5	77.0	14.4	14.4	14.4	14.4	14.4	14.4	
21:15	140.0	77.5	14.5	14.5	14.5	14.5	14.5	14.5	
21:20	140.5	78.0	14.6	14.6	14.6	14.6	14.6	14.6	
21:25	141.0	78.5	14.7						

Inlet Flows

Air Pollution Testing Inc. : EPA Method 2 - Pilot Traverse Datasheet										
Job #:	CTM 1122			Operator:	PRM dm			Stack Diameter (Inches):	40	
Facility:	Parsippany NJ			Site:	Liberty way			Upstream Disturbance (Inches):	48	
Date:	6-14-11 → 6-15			Points:	1	5	9	Downstream Disturbance (Inches):	192	
Probe ID:	P-4			2	6	10		Schematic of Sampling Location:		
Pilot Constant:	.84			3	7	11				
				4	8	12				
Run #:	4 - inlet			Run #:	5 - inlet			Run #:	6 - inlet	
O2%:	CDA			O2%:	CDA			O2%:	CDA	
H2O%:	CDA			H2O%:	CDA			H2O%:	CDA	
Ps (H2O):	9.5			Ps (H2O):	9.5			Ps (H2O):	9.5	
Start Time:	1537			Start Time:	1656			Start Time:	8:56	
Stop Time:	1544			Stop Time:	1708			Stop Time:	9:03	
Post Test Pilot Leak Check Good?	000 340			Post Test Pilot Leak Check Good?	✓			Post Test Pilot Leak Check Good?	✓	
Point #	Delta P	Ts	Notes	Point #	Delta P	Ts	Notes	Point #	Delta P	Ts
1	0.10	68		1	0.10	72		1	0.11	75
2	0.11	66		2	0.12	73		2	0.10	73
3	0.12	68		3	0.12	75		3	0.12	76
4	0.11	68		4	0.11	75		4	0.13	71
5	0.10	69		5	0.11	75		5	0.10	72
6	0.11	69		6	0.1	70		6	0.11	74
Averages:	0.329 68.0			Averages:	0.3314 73.33			Averages:	0.334 73.5	
								Reviewers Signature :		

Air Pollution Testing Inc. : EPA Method 2 - Pilot Traverse Worksheet

Job #: CIM1122
 Facility: Parshall, ND
 Date: 6/14/11
 Probe ID: P-286
 Pilot Constant: 0.93
 Operator: PR/DM
 Site: LIBERTY ON WELLS
 Points: 1 5 9
 2 6 10
 3 7 11
 4 8 12
 Run #: 4
 O2%: 10.45 CO2%: COAS
 H2O%: COAS measured / estimate
 Ps (H2O): 0.02 Pb (Hg): 938
 Start Time: 1545 Stop Time: 1600
 Post Test Pilot Leak Check Good? ☒

Stack Diameter (inches): 40
 Upstream Disturbance (inches): 48
 Downstream Disturbance (inches): 192
 Schematic of Sampling Location:
 Run #: 6
 O2%: COAS CO2%: COAS
 H2O%: COAS measured / estimate
 Ps (H2O): 0.03 Pb (Hg): 938
 Start Time: 1600 Stop Time: 1728
 Post Test Pilot Leak Check Good? ☒

Point #	Delta P	Ts	Notes	Point #	Delta P	Ts	Notes
1-1	0.01	1984		1-1	0.01	1984	
2	0.015	1987		2	0.015	1987	
3	0.02	1990		3	0.02	1990	
4	0.03	1989		4	0.03	1989	
5	0.035	1993		5	0.035	1993	
6	0.04	1989		6	0.04	1989	
7	0.045	1995		7	0.045	1995	
8	0.130	1999		8	0.130	1999	
2-1	0.02	1980		2-1	0.02	1980	
2	0.025	1991		2	0.025	1991	
3	0.03	1993		3	0.03	1993	
4	0.130	1991		4	0.130	1991	
5	0.035	1992		5	0.035	1992	
6	0.041	1989		6	0.041	1989	
7	0.030	1996		7	0.030	1996	
8	0.030	1997		8	0.030	1997	

Averages: 0.1681 1991.563
 Averages: 0.17186 1993.94
 Reviewers Signature:

Air Pollution Testing Inc. : EPA Method 2 - Pilot Traverse Data Sheet

Job # : <u>C1M 1122</u>		Operator : <u>PR/DM</u>		Stack Diameter (inches) : <u>40</u>	
Facility : <u>Parshall, IND</u>		Site : <u>Liberty Wells</u>		Upstream Disturbance (inches) : <u>48</u>	
Date : <u>6/15/11</u>		Points : 1 5 9		Downstream Disturbance (inches) : <u>192</u>	
Probe ID : <u>P-286</u>		2 6 10		Schematic of Sampling Location :	
Pilot Constant : <u>083</u>		3 7 11			
		4 8 12			

Run # : <u>6-outlet</u>	Run # :	Notes	Notes
O2% : <u>COAS</u>	O2% :	CO2% :	CO2% :
H2O% : <u>COAS</u>	H2O% :	measured / estimate	measured / estimate
Ps ("H2O) : <u>1001</u>	Ps ("H2O) :	Pb ("Hg) :	Pb ("Hg) :
Start Time : <u>9:04</u>	Start Time :	Slop Time :	Slop Time :
Post Test Pilot Leak Check Good? : <u>GOOD</u>	Post Test Pilot Leak Check Good? :		

Point #	Delta P	Ts	Notes	Delta P	Ts	Notes
1-1	0.15	1005		0.08	61	
2	0.2	1007		0.09	61	
3	0.3	1004		0.01	64	
4	0.4	1011		0.03	63	
5	0.45	1000		0.07	62	
6	0.5	1004		0.08	60	
7	0.55	1007				
8	0.6	1008				
9	0.6	1009				
10	0.6	1009				
11	0.6	1009				
12	0.6	1009				
13	0.6	1009				
14	0.6	1009				
15	0.6	1009				
16	0.6	1009				
17	0.6	1009				
18	0.6	1009				
19	0.6	1009				
20	0.6	1009				
21	0.6	1009				
22	0.6	1009				
23	0.6	1009				
24	0.6	1009				
25	0.6	1009				
26	0.6	1009				
27	0.6	1009				
28	0.6	1009				
29	0.6	1009				
30	0.6	1009				
31	0.6	1009				
32	0.6	1009				
33	0.6	1009				
34	0.6	1009				
35	0.6	1009				
36	0.6	1009				
37	0.6	1009				
38	0.6	1009				
39	0.6	1009				
40	0.6	1009				
41	0.6	1009				
42	0.6	1009				
43	0.6	1009				
44	0.6	1009				
45	0.6	1009				
46	0.6	1009				
47	0.6	1009				
48	0.6	1009				
49	0.6	1009				
50	0.6	1009				
51	0.6	1009				
52	0.6	1009				
53	0.6	1009				
54	0.6	1009				
55	0.6	1009				
56	0.6	1009				
57	0.6	1009				
58	0.6	1009				
59	0.6	1009				
60	0.6	1009				
61	0.6	1009				
62	0.6	1009				
63	0.6	1009				
64	0.6	1009				
65	0.6	1009				
66	0.6	1009				
67	0.6	1009				
68	0.6	1009				
69	0.6	1009				
70	0.6	1009				
71	0.6	1009				
72	0.6	1009				
73	0.6	1009				
74	0.6	1009				
75	0.6	1009				
76	0.6	1009				
77	0.6	1009				
78	0.6	1009				
79	0.6	1009				
80	0.6	1009				
81	0.6	1009				
82	0.6	1009				
83	0.6	1009				
84	0.6	1009				
85	0.6	1009				
86	0.6	1009				
87	0.6	1009				
88	0.6	1009				
89	0.6	1009				
90	0.6	1009				
91	0.6	1009				
92	0.6	1009				
93	0.6	1009				
94	0.6	1009				
95	0.6	1009				
96	0.6	1009				
97	0.6	1009				
98	0.6	1009				
99	0.6	1009				
100	0.6	1009				

Averages :	0.1710	1992.125	Averages :	0.2855	61.833
	0.1813				

Reviewers Signature : _____

Air Pollution Testing, Inc. : Analyzer Calibration Data Sheet

Facility : LIBERTY OIL WELLSDate : 6/14/11Location : PARSHALLAPT Job # : CIM1122

Unit :

Page # :

Run # : 4Start Time : 1531Stop Time : 163110 02.

Calibration Results

Analyzer Type	O ₂	CO ₂	CO	CH ₄	NMHC	
Zero	<u>0.0</u>	<u>0.0</u>	<u>1.4</u>	<u>0.0</u>	<u>0.1</u>	
Low		<u>2.49</u>				
Mid	<u>1</u>	<u>4.94</u>	<u>80.2</u>	<u>205</u>	<u>3.0</u>	
High	<u>10.0</u>	<u>10.2</u>				

Run # : 5Start Time : 1648Stop Time : 1748

Calibration Results

Analyzer Type	O ₂	CO ₂	CO	CH ₄	NMHC	
Zero	<u>-0.07</u>	<u>0.0</u>	<u>0.2</u>	<u>0.0</u>	<u>0.1</u>	
Low		<u>2.49</u> <u>4.96</u>				
Mid	<u>10.0</u>		<u>81.3</u>	<u>299.1</u>	<u>3.06</u>	
High						

Run # :

Start Time :

Stop Time :

Calibration Results

Analyzer Type						
Zero						
Low						
Mid						
High						

Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet

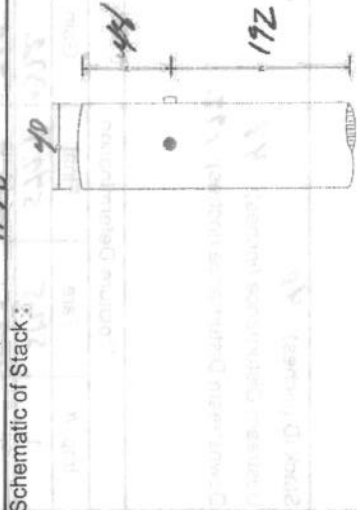
APT Job #:	51M1122	Date:	6/4/11	CO ₂ (%):	COAS	O ₂ (%):	COAS
Location:	Farshad, ND	Operator:	PR	Ambient Temperature (°F):	63	Barometric Press (mbar):	938
Run #	5	Meter Box ID:	MS-8	Probe Length (ft):	4	Moisture (grams):	COAS
Meter Box Y ₀ :	0.978	Meter ΔH@:	1.71	Static Pressure (" H ₂ O):	0.001	Start Time:	1648
Pre-Test Pump Leak Check:	0.002/14	Post-Test Pump Leak Check:	0.0015	Method:	4	Stop Time:	1748

Sampling Time (minutes)	Vacuum (" Hg)	ΔH Office Setting (" H ₂ O)	T _m Meter Temp.		Condenser Temp. (°F)	Meter Volume (ft ³)	Notes
			Inlet (°F)	Outlet (°F)			
5	4	1.0	78	76	40	849.549	
10	4	1.0	79	77	40	852.645	
15	4	1.0	80	77	41	855.7	
20	4	1.0	80	77	41	858.8	
25	4	1.0	80	77	41	861.7	
30	4	1.0	80	77	42	865.0	
35	4	1.0	81	77	43	868.1	
40	4	1.0	81	77	43	871.2	
45	4	1.0	82	77	44	874.3	
50	4	1.0	82	77	45	877.4	
55	4	1.0	82	77	46	880.5	
60	4	1.0	82	77	47	883.601	

Stack ID (inches): 40
 Upstream Disturbance (inches): 48
 Downstream Disturbance (inches): 192

Moisture Determination			
Imp. #	Tare	Final	Gain
1	487.8	524.8	+40.0
2	459.2	461.5	+2.3
3	299.5	297.7	-1.6
4	532.2	535.2	+3.0
Total			+43.7

Technician's Signature: 
 Project Leader's Signature: 



total	maximum	average	maximum	difference
60	4	78.75	47	37.148

Air Pollution Testing, Inc. : EPA Method 4 - Moisture Determination Datasheet									
APT Job #: CUM1122		Date: 6/15/11		CO ₂ (%): 1.0%		O ₂ (%): 20.8%			
Location: Pasadena, CA		Operator: R		Ambient Temperature (°F): 58		Barometric Press (mbar): 736			
Run #: 6		Meter Box ID: MS-8		Probe Length (ft): 4		Moisture (grams): 1.0%			
Meter Box Yd: 0.018		Meter ΔH@: 1.21		Static Pressure (" H ₂ O): 0.001		Start Time: 8:45			
Pre-Test Pump Leak Check: 0.0012" Hg		Post-Test Pump Leak Check: 0.0015" Hg		Method: 4		Stop Time: 9:45			
Sampling Time (minutes)	Vacuum (" Hg)	ΔH Orifice Setting (" H ₂ O)	T _m Meter Temp.		Condenser Temp. (°F)	Meter Volume (ft ³)	Notes	Schematic of Stack:	
			Inlet (°F)	Outlet (°F)					
5	4	1.0	58	56	38	886.8	Pilot flow 454.7 → 8145 (X100) 9.55 → 8145 2.5 ST		
10	4	1.0	60	58	37	889.9			
15	4	1.0	60	58	37	892.99			
20	4	1.0	61	58	40	896.08			
25	4	1.0	63	58	40	899.1			
30	4	1.0	63	59	42	902.2			
35	4	1.0	66	59	41	905.3			
40	4	1.0	68	59	43	908.4			
45	4	1.0	68	60	42	911.5			
50	4	1.0	68	60	42	914.6			
55	4	1.0	69	62	42	917.7			
60	4	1.0	70	62	44	920.826			
							Stack ID (inches): 40		
							Upstream Disturbance (inches): 48		
							Downstream Disturbance (inches): 192		
Moisture Determination									
Imp. #	Tare	Final	Gain						
1	504.2	548.9	44.7						
2	461.2	486.2	25.0						
3	294.5	331.1	36.6						
4	532.2	536.1	3.9						
Total			152.2						
Technician's Signature: [Signature]				Project Leader's Signature: [Signature]					
Total	60	maximum	average	61.7916	maximum	74	difference	37.088	

IMPACT



U.S. DEPARTMENT OF HEALTH & HUMAN SERVICES

Environmental Health Sciences
National Institute of Environmental Health Sciences
Research Triangle Park, NC 27709
Telephone: (919) 747-8000
Fax: (919) 747-8000
E-mail: impact@niehs.nih.gov
Web: <http://www.niehs.nih.gov/impact>

1 oz. Inlet Pressure

Flow Rate (L/min)	Pressure (mmHg)	Flow Rate (L/min)	Pressure (mmHg)
0.0	0.0	0.0	0.0
0.1	0.1	0.1	0.1
0.2	0.2	0.2	0.2
0.3	0.3	0.3	0.3
0.4	0.4	0.4	0.4
0.5	0.5	0.5	0.5
0.6	0.6	0.6	0.6
0.7	0.7	0.7	0.7
0.8	0.8	0.8	0.8
0.9	0.9	0.9	0.9
1.0	1.0	1.0	1.0
1.1	1.1	1.1	1.1
1.2	1.2	1.2	1.2
1.3	1.3	1.3	1.3
1.4	1.4	1.4	1.4
1.5	1.5	1.5	1.5
1.6	1.6	1.6	1.6
1.7	1.7	1.7	1.7
1.8	1.8	1.8	1.8
1.9	1.9	1.9	1.9
2.0	2.0	2.0	2.0
2.1	2.1	2.1	2.1
2.2	2.2	2.2	2.2
2.3	2.3	2.3	2.3
2.4	2.4	2.4	2.4
2.5	2.5	2.5	2.5
2.6	2.6	2.6	2.6
2.7	2.7	2.7	2.7
2.8	2.8	2.8	2.8
2.9	2.9	2.9	2.9
3.0	3.0	3.0	3.0
3.1	3.1	3.1	3.1
3.2	3.2	3.2	3.2
3.3	3.3	3.3	3.3
3.4	3.4	3.4	3.4
3.5	3.5	3.5	3.5
3.6	3.6	3.6	3.6
3.7	3.7	3.7	3.7
3.8	3.8	3.8	3.8
3.9	3.9	3.9	3.9
4.0	4.0	4.0	4.0
4.1	4.1	4.1	4.1
4.2	4.2	4.2	4.2
4.3	4.3	4.3	4.3
4.4	4.4	4.4	4.4
4.5	4.5	4.5	4.5
4.6	4.6	4.6	4.6
4.7	4.7	4.7	4.7
4.8	4.8	4.8	4.8
4.9	4.9	4.9	4.9
5.0	5.0	5.0	5.0
5.1	5.1	5.1	5.1
5.2	5.2	5.2	5.2
5.3	5.3	5.3	5.3
5.4	5.4	5.4	5.4
5.5	5.5	5.5	5.5
5.6	5.6	5.6	5.6
5.7	5.7	5.7	5.7
5.8	5.8	5.8	5.8
5.9	5.9	5.9	5.9
6.0	6.0	6.0	6.0
6.1	6.1	6.1	6.1
6.2	6.2	6.2	6.2
6.3	6.3	6.3	6.3
6.4	6.4	6.4	6.4
6.5	6.5	6.5	6.5
6.6	6.6	6.6	6.6
6.7	6.7	6.7	6.7
6.8	6.8	6.8	6.8
6.9	6.9	6.9	6.9
7.0	7.0	7.0	7.0
7.1	7.1	7.1	7.1
7.2	7.2	7.2	7.2
7.3	7.3	7.3	7.3
7.4	7.4	7.4	7.4
7.5	7.5	7.5	7.5
7.6	7.6	7.6	7.6
7.7	7.7	7.7	7.7
7.8	7.8	7.8	7.8
7.9	7.9	7.9	7.9
8.0	8.0	8.0	8.0
8.1	8.1	8.1	8.1
8.2	8.2	8.2	8.2
8.3	8.3	8.3	8.3
8.4	8.4	8.4	8.4
8.5	8.5	8.5	8.5
8.6	8.6	8.6	8.6
8.7	8.7	8.7	8.7
8.8	8.8	8.8	8.8
8.9	8.9	8.9	8.9
9.0	9.0	9.0	9.0
9.1	9.1	9.1	9.1
9.2	9.2	9.2	9.2
9.3	9.3	9.3	9.3
9.4	9.4	9.4	9.4
9.5	9.5	9.5	9.5
9.6	9.6	9.6	9.6
9.7	9.7	9.7	9.7
9.8	9.8	9.8	9.8
9.9	9.9	9.9	9.9
10.0	10.0	10.0	10.0

Flow Rate (L/min) vs. Pressure (mmHg) for 1 oz. Inlet Pressure

Flow Rate (L/min) vs. Pressure (mmHg) for 1 oz. Inlet Pressure



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 12
COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 15, 2011
PRODUCER : TO:
LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
NAME/DESCRIP : CIM1122-R7.PG
NORTH DAKOTA

FIELD DATA

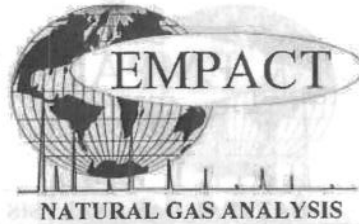
SAMPLED BY : SAMPLE TEMP. :
SAMPLE PRES. : AMBIENT TEMP. :
COMMENTS : PILOT GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.03	-	-
HYDROGEN	0.01	-	-
OXYGEN/ARGON	0.31	-	-
NITROGEN	8.85	-	-
CO2	0.50	-	-
METHANE	47.45	-	-
ETHANE	19.20	5.106	5.133
PROPANE	15.36	4.208	4.231
ISOBUTANE	1.59	0.517	0.520
N-BUTANE	4.46	1.398	1.406
ISOPENTANE	0.65	0.236	0.238
N-PENTANE	0.82	0.296	0.297
HEXANES+	0.77	0.332	0.334
TOTAL	100.00	12.093	12.159

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	1505.5	1513.7
GROSS SATURATED REAL =	1479.2	1487.4

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 0.9809
COMPRESSIBILITY FACTOR : 0.99398

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



PROJECT NO. : 201106125 ANALYSIS NO. : 07
 COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
 ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 15, 2011
 PRODUCER : TO:
 LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
 NAME/DESCRIP : CIM1122-R7.DG
 NORTH DAKOTA

FIELD DATA

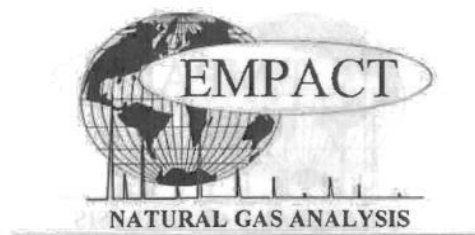
SAMPLED BY : SAMPLE TEMP. :
 SAMPLE PRES. : AMBIENT TEMP. :
 COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.01	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	0.50	-	-
NITROGEN	2.95	-	-
CO2	0.32	-	-
METHANE	16.06	-	-
ETHANE	20.36	5.414	5.444
PROPANE	33.00	9.040	9.089
ISOBUTANE	4.57	1.487	1.495
N-BUTANE	14.30	4.483	4.507
ISOPENTANE	2.31	0.840	0.845
N-PENTANE	2.94	1.060	1.065
HEXANES+	2.68	1.156	1.163
TOTAL	100.00	23.480	23.608

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	2345.0	2357.8
GROSS SATURATED REAL =	2304.0	2316.8

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 1.4594
 COMPRESSIBILITY FACTOR : 0.98443

NOTE: REFERENCE GPA 2261 (ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



PROJECT NO. : 201106125 ANALYSIS NO. : 08
 COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
 ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 15, 2011
 PRODUCER : TO:
 LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
 NAME/DESCRIP : CIM1122-R8.DG
 NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
 SAMPLE PRES. : AMBIENT TEMP. :
 COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.00	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	1.54	-	-
NITROGEN	6.47	-	-
CO2	0.28	-	-
METHANE	13.95	-	-
ETHANE	19.18	5.100	5.128
PROPANE	32.14	8.804	8.852
ISOBUTANE	4.55	1.480	1.489
N-BUTANE	14.16	4.439	4.463
ISOPENTANE	2.30	0.836	0.841
N-PENTANE	2.91	1.049	1.055
HEXANES+	2.52	1.087	1.093
TOTAL	100.00	22.795	22.921

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	2263.3	2275.6
GROSS SATURATED REAL =	2223.7	2236.0

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 1.4569
 COMPRESSIBILITY FACTOR : 0.98522

NOTE: REFERENCE GPA 2261 (ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 09
COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 15, 2011
PRODUCER : TO:
LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
NAME/DESCRIP : CIM1122-R9.DG
NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
SAMPLE PRES. : AMBIENT TEMP.:
COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.00	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	0.89	-	-
NITROGEN	4.17	-	-
CO2	0.30	-	-
METHANE	14.79	-	-
ETHANE	19.82	5.270	5.299
PROPANE	32.92	9.018	9.067
ISOBUTANE	4.62	1.503	1.511
N-BUTANE	14.46	4.533	4.558
ISOPENTANE	2.35	0.855	0.859
N-PENTANE	2.99	1.078	1.084
HEXANES+	2.69	1.161	1.167
TOTAL	100.00	23.418	23.545

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	2331.2	2343.9
GROSS SATURATED REAL =	2290.4	2303.1

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 1.4683
COMPRESSIBILITY FACTOR : 0.98449

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 10
COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 14, 2011
PRODUCER : TO:
LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
NAME/DESCRIP : CIM1122-R2.PG
NORTH DAKOTA

FIELD DATA

SAMPLED BY :
SAMPLE PRES. :
COMMENTS : PILOT GAS

SAMPLE TEMP. :
AMBIENT TEMP. :

(90F)
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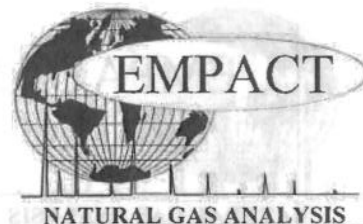
COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.02	-	-
HYDROGEN	0.01	-	-
OXYGEN/ARGON	0.42	-	-
NITROGEN	8.50	-	-
CO2	0.52	-	-
METHANE	46.34	-	-
ETHANE	19.92	5.297	5.326
PROPANE	15.81	4.331	4.355
ISOBUTANE	1.64	0.534	0.537
N-BUTANE	4.63	1.451	1.459
ISOPENTANE	0.67	0.244	0.245
N-PENTANE	0.83	0.299	0.301
HEXANES+	0.69	0.298	0.299
TOTAL	100.00	12.454	12.522

P, I

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	1522.9	1531.2
GROSS SATURATED REAL =	1496.2	1504.6

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F): 0.9900
COMPRESSIBILITY FACTOR : 0.99383

NOTE: REFERENCE GPA 2261(ASM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



PROJECT NO. : 201106125 ANALYSIS NO. : 01
 COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
 ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 14, 2011
 PRODUCER : TO:
 LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
 NAME/DESCRIP : CIM1122-R1.DG
 NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
 SAMPLE PRES. : AMBIENT TEMP. :
 COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.01	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	1.23	-	-
NITROGEN	5.34	-	-
CO2	0.42	-	-
METHANE	15.43	-	-
ETHANE	20.18	5.366	5.396
PROPANE	31.45	8.615	8.662
ISOBUTANE	4.38	1.425	1.433
N-BUTANE	13.69	4.291	4.315
ISOPENTANE	2.15	0.782	0.786
N-PENTANE	2.90	1.045	1.051
HEXANES+	2.82	1.217	1.223
TOTAL	100.00	22.741	22.866

BTU @ 60 DEG F 14.65 14.73
 GROSS DRY REAL = 2266.7 2279.1
 GROSS SATURATED REAL = 2227.0 2239.5

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) 1.4453
 COMPRESSIBILITY FACTOR : 0.98522

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 02
COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 14, 2011
PRODUCER : TO:
LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
NAME/DESCRIP : CIM1122-R2.DG
NORTH DAKOTA

FIELD DATA

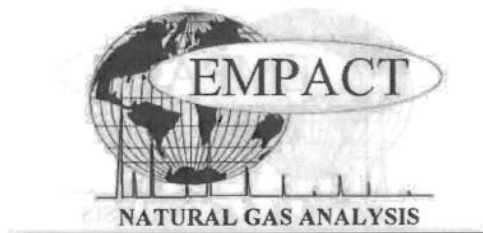
SAMPLED BY : SAMPLE TEMP. :
SAMPLE PRES. : AMBIENT TEMP. :
COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.00	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	0.86	-	-
NITROGEN	4.26	-	-
CO2	0.32	-	-
METHANE	16.69	-	-
ETHANE	20.48	5.446	5.476
PROPANE	32.23	8.829	8.877
ISOBUTANE	4.36	1.419	1.426
N-BUTANE	13.55	4.248	4.271
ISOPENTANE	2.14	0.778	0.782
N-PENTANE	2.73	0.984	0.989
HEXANES+	2.38	1.027	1.033
TOTAL	100.00	22.731	22.854

BTU @ 60 DEG F 14.65 14.73
GROSS DRY REAL = 2269.1 2281.4
GROSS SATURATED REAL = 2229.4 2241.7

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) 1.4289
COMPRESSIBILITY FACTOR : 0.98538

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



PROJECT NO. : 201106125 ANALYSIS NO. : 03
 COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
 ACCOUNT NO. : CIM1122 SAMPLE DATE : JUNE 14, 2011
 PRODUCER : TO:
 LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
 NAME/DESCRIP : CIM1122-R3.DG
 NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
 SAMPLE PRES. : AMBIENT TEMP. :
 COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.01		
HYDROGEN	0.01		
OXYGEN/ARGON	0.30		
NITROGEN	2.63		
CO2	0.31		
METHANE	17.50		
ETHANE	20.43	5.433	5.462
PROPANE	32.09	8.791	8.839
ISOBUTANE	4.50	1.464	1.472
N-BUTANE	14.08	4.414	4.438
ISOPENTANE	2.27	0.825	0.830
N-PENTANE	2.91	1.049	1.055
HEXANES+	2.96	1.277	1.284
TOTAL	100.00	23.253	23.380

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	2339.7	2352.5
GROSS SATURATED REAL =	2298.8	2311.6

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 1.4500
 COMPRESSIBILITY FACTOR : 0.98452

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 11
COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 14, 2011
PRODUCER : TO:
LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
NAME/DESCRIP : CIM1122-R5.PG
NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
SAMPLE PRES. : AMBIENT TEMP. :
COMMENTS : PILOT GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.02	-	-
HYDROGEN	0.01	-	-
OXYGEN/ARGON	0.35	-	-
NITROGEN	8.30	-	-
CO2	0.53	-	-
METHANE	46.14	-	-
ETHANE	19.85	5.278	5.307
PROPANE	15.91	4.358	4.382
ISOBUTANE	1.65	0.537	0.540
N-BUTANE	4.75	1.489	1.497
ISOPENTANE	0.70	0.255	0.256
N-PENTANE	0.89	0.321	0.323
HEXANES+	0.90	0.388	0.390
TOTAL	100.00	12.626	12.695

BTU @ 60 DEG F 14.65 14.73
GROSS DRY REAL = 1541.1 1549.5
GROSS SATURATED REAL = 1514.1 1522.6

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 0.9991
COMPRESSIBILITY FACTOR : 0.99366

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125

ANALYSIS NO. : 04

COMPANY NAME : AIR POLLUTION TESTING

ANALYSIS DATE : JUNE 21, 2011

ACCOUNT NO. : CIM 1122

SAMPLE DATE : JUNE 14, 2011

PRODUCER :

TO:

LEASE NO. :

CYLINDER NO. : 10 L TEDLAR BAG

NAME/DESCRIP : CIM1122-R4.DG
NORTH DAKOTA

FIELD DATA

SAMPLED BY :

SAMPLE TEMP. :

SAMPLE PRES. :

AMBIENT TEMP. :

COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.00	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	0.29	-	-
NITROGEN	2.28	-	-
CO2	0.32	-	-
METHANE	16.45	-	-
ETHANE	20.53	5.459	5.489
PROPANE	33.02	9.045	9.095
ISOBUTANE	4.60	1.497	1.505
N-BUTANE	14.41	4.517	4.542
ISOPENTANE	2.33	0.847	0.852
N-PENTANE	2.97	1.070	1.076
HEXANES+	2.80	1.208	1.215
TOTAL	100.00	23.643	23.774

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	2366.0	2378.9
GROSS SATURATED REAL =	2324.6	2337.5

RELATIVE DENSITY (AIR=1 @ 14.696 PSIA 60F) : 1.4632

COMPRESSIBILITY FACTOR : 0.98419

NOTE: REFERENCE GPA 2261 (ASTM D1945 & ASME-PTC, 2145, & 2172 CURRENT PUBLICATIONS)



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 05
 COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
 ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 14, 2011
 PRODUCER : TO:
 LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
 NAME/DESCRIP : CIM1122-R5.DG
 NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
 SAMPLE PRES. : AMBIENT TEMP. :
 COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.01	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	0.22	-	-
NITROGEN	2.34	-	-
CO2	0.31	-	-
METHANE	17.85	-	-
ETHANE	20.49	5.449	5.478
PROPANE	31.98	8.760	8.808
ISOBUTANE	4.49	1.461	1.469
N-BUTANE	14.03	4.398	4.422
ISOPENTANE	2.29	0.833	0.837
N-PENTANE	2.95	1.063	1.069
HEXANES+	3.04	1.312	1.319
TOTAL	100.00	23.276	23.402

BTU @ 60 DEG F	14.65	14.73
GROSS DRY REAL =	2346.3	2359.1
GROSS SATURATED REAL =	2305.2	2318.1

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 1.4502
 COMPRESSIBILITY FACTOR : 0.98445

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS



NATURAL GAS ANALYSIS

PROJECT NO. : 201106125 ANALYSIS NO. : 06
COMPANY NAME : AIR POLLUTION TESTING ANALYSIS DATE: JUNE 21, 2011
ACCOUNT NO. : CIM 1122 SAMPLE DATE : JUNE 15, 2011
PRODUCER : TO:
LEASE NO. : CYLINDER NO. : 10 L TEDLAR BAG
NAME/DESCRIP : CIM1122-R6.DG
NORTH DAKOTA

FIELD DATA

SAMPLED BY : SAMPLE TEMP. :
SAMPLE PRES. : AMBIENT TEMP. :
COMMENTS : DIRTY GAS

COMPONENTS	NORM. MOLE%	GPM @ 14.65	GPM @ 14.73
HELIUM	0.00	-	-
HYDROGEN	0.00	-	-
OXYGEN/ARGON	0.19	-	-
NITROGEN	1.99	-	-
CO2	0.32	-	-
METHANE	17.56	-	-
ETHANE	21.29	5.661	5.692
PROPANE	32.93	9.021	9.070
ISOBUTANE	4.43	1.441	1.449
N-BUTANE	13.71	4.298	4.321
ISOPENTANE	2.19	0.796	0.801
N-PENTANE	2.79	1.006	1.011
HEXANES+	2.60	1.122	1.128
TOTAL	100.00	23.345	23.472

BTU @ 60 DEG F 14.65 14.73
GROSS DRY REAL = 2335.4 2348.1
GROSS SATURATED REAL = 2294.5 2307.3

RELATIVE DENSITY (AIR=1 @14.696 PSIA 60F) : 1.4392
COMPRESSIBILITY FACTOR : 0.98468

NOTE: REFERENCE GPA 2261(ASTM D1945 & ASME-PTC), 2145, & 2172 CURRENT PUBLICATIONS

201106125

CHAIN OF CUSTODY RECORD

AIR POLLUTION TESTING
5530 MARSHALL ST.
ARVADA, CO 80002
T: (303) 420-5949
F: (303) 420-5920

Temperature on Receipt _____

PROJECT CODE CIM 1122		PROJECT MANAGER DANE		CHAIN OF CUSTODY #	
CLIENT NAME Cimcon		TELEPHONE # / FAX #		Page 1 of 1	
ADDRESS		DATE 6-17-11		CONTRACT/PURCHASE QUOTE #	
CITY North Dakota	STATE	ZIP CODE	SITE CONTACT	LAB CONTACT	CARRIER / WAYBILL #
SAMPLE ID		RUN	FILTER/BEAKER ID	DATE COLLECTED	MATRIX
CIM1122 R1. DG		1		6/14	Duty Gas
CIM1122 R2. DG		2			Standard
CIM1122 R3. DG		3			Natural
CIM1122 R4. DG		4			gas
CIM1122 R5. DG		5			
CIM1122 R6. DG		6		6-15	
CIM1122 R7. DG		7		6/15	
CIM1122 R8. DG		8			
CIM1122 R9. DG		9			
CIM1122 R2. PG		10		6/14	Pilot gas
CIM1122 R5. PG				6/14	
CIM1122 R7. PG				6/15	
POSSIBLE HAZARD IDENTIFICATION: (CIRCLE)		SAMPLE DISPOSAL: (CIRCLE)		TURN AROUND TIME: (CIRCLE)	
NON HAZARD FLAMMABLE		RETURN TO CLIENT		24 HRS 48 HRS 7 DAYS 14 DAYS 21 DAYS OTHER	
1. Requested By Dane Murray		1. Received By Dane Murray		Date 6/17/11	
2. Requested By		2. Received By Dane Murray		Date 6/17/11	
3. Requested By		3. Received By Dane Murray		Date 6/17/11	
Comments					

Wind Tunnel Pitot Calibration

Customer: Air Pollution Testing
 S-type Pitot ID: P-286
 Standard Pitot ID: 001
 Date: 12-Jan-02
 Personnel: DH
 Cp(Std): 0.99
 Cp(Actual): 0.81
 Part Number: pps12-y-7.5
 Test Velocity (fps): 50
 P(bar): 30.10
 T(F): 35.00

$\Delta P_{(std)}$ [in H ₂ O]	$\Delta P_{(a)}$ [in H ₂ O]	Cp(a)
0.600	0.602	0.81
0.603	0.611	0.81
0.599	0.603	0.81
0.598	0.604	0.81
0.604	0.601	0.81
0.602	0.602	0.81
0.604	0.603	0.81
AVERAGE	0.602	0.81
	Std deviation	0.003

Appendix Three: Calibration Data

$$Cp(a) = Cp(Std) \left[\frac{\Delta P(a)}{\Delta P(Std)} \right]$$

$$Cp(A) - Cp(B) = 0.005$$

(must be < 0.010)

$$\text{Deviation} = [(Cp(a) - AVE Cp(a)) / AVE Cp(a)]$$

(must be < 0.010)

Standard deviation of the deviation must be less than 0.02 for both sides.

Pitot tube S/N P-286 was calibrated in accordance with the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Section 10.

Date: 1-17-02

Signature: _____



Wind Tunnel Pitot Calibration

Customer: **Air Pollution Testing**S-type Pitot ID: **P-286**Date: **17-Jan-05**Standard Pitot ID: **001**Personnel: **DH**Cp(std): **0.99**Cp(actual): **0.81**Part Number: **pps12-y-7.5**P(bar): **30.10**Test Velocity (fps): **50**T(°F): **35.00**

A-SIDE

$\Delta P_{(std)}$ ["H ₂ O]	$\Delta P_{(s)}$ ["H ₂ O]	$Cp_{(s)}$	Deviation*
0.600	0.905	0.806	0.002
0.603	0.911	0.805	0.001
0.599	0.914	0.801	-0.003
0.598	0.907	0.804	0.000
	AVERAGE	0.804	0.002
		Std deviation	0.002

B-SIDE

$\Delta P_{(std)}$ ["H ₂ O]	$\Delta P_{(s)}$ ["H ₂ O]	$Cp_{(s)}$	Deviation*
0.599	0.918	0.799	-0.010
0.604	0.903	0.809	0.000
0.605	0.901	0.811	0.002
0.604	0.890	0.816	0.007
	AVERAGE	0.809	0.005
		Std deviation	0.007

 $Cp(A) - Cp(B) =$ **0.005**

{must be <0.010}

$$Cp_{(s)} = Cp_{(std)} \sqrt{\Delta P_{(std)} / \Delta P_{(s)}}$$

$$*Deviation = | \{ Cp_{(s)} - AVG Cp_{(s)} \} |$$

{must be <0.010}

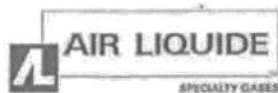
Standard deviation of the deviations must be less than 0.02 for both sides.

Pitot tube S/N **P-286** was calibrated in accordance with
the Code of Federal Regulations, Title 40, Part 60, Appendix A, Method 2, Section 10

Signature

1-17-05

Date



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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Document #: 40878491-003

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM052472
Cylinder Pressure***: 2015 PSIG

Certification Date: 14Mar2011

Exp. Date: 13Mar2014
Batch No: LGM0021293

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
CARBON DIOXIDE	2.48 %	+/- 1%	Direct NIST and VSL
OXYGEN	2.52 %	+/- 1%	Direct NIST and VSL
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2624	02Oct2011	ALM028578	2.976 %	CARBON DIOXIDE
NTRM 2657	02Oct2011	AAL067792	1.995 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/0929062	18Feb2011	FTIR
OXYMAT/6E/W5-951	07Mar2011	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**CARBON DIOXIDE**

Date: 11Mar2011 Response Unit: %
Z1=-0.00047 R1=2.97949 T1=2.47792
R2=2.98193 Z2=0.00002 T2=2.48196
Z3=0.00077 T3=2.48485 R3=2.98759
Avg. Concentration: 2.476 %

OXYGEN

Date: 14Mar2011 Response Unit: VOLTS
Z1=0.00000 R1=1.97600 T1=2.49400
R2=1.97400 Z2=0.00000 T2=2.49200
Z3=0.00000 T3=2.49100 R3=1.97000
Avg. Concentration: 2.518 %

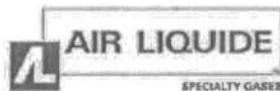
Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4
r=9.99998E-1
Constants: A=0.00000E+0
B=9.25088E-1 C=4.89450E-2
D=1.44200E-3 E=0.00000E+0

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999999
Constants: A=0.00785819
B=0.98622145 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: ADAM HANLEY
(signature on file)

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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS**Dual-Analyzed Calibration Standard****CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Project No.: 08-88565-002

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM034167
Cylinder Pressure***: 2000 PSIG

Certification Date: 22May2010

Exp. Date: 21May2013

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
CARBON DIOXIDE	5.00 %	+/- 1%	Direct NIST and VSL
OXYGEN	5.06 %	+/- 1%	Direct NIST and VSL
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2000	15Dec2011	K001817	4.854 %	CARBON DIOXIDE
NTRM 2658	02Oct2010	ALM065029	9.930 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/1602651 OXYMAT/6E/W5-951	17May2010 26Apr2010	FTIR PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**CARBON DIOXIDE**

Date: 22May2010 Response Unit: %

Z1=0.00003 R1=4.94733 T1=4.99516

R2=4.95171 Z2=0.00040 T2=4.99916

Z3=0.00098 T3=5.00358 R3=4.95676

Avg. Concentration: 5.001 %

OXYGEN

Date: 20May2010 Response Unit: VOLTS

Z1=0.00000 R1=9.96100 T1=5.09500

R2=9.95000 Z2=0.00000 T2=5.08500

Z3=0.00000 T3=5.08000 R3=9.95200

Avg. Concentration: 5.065 %

Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4

r=9.99994E-1

Constants: A=0.00000E+0

B=5.68671E-1 C=1.25580E-2

D=9.80000E-5 E=0.00000E+0

Concentration=A+Bx+Cx2+Dx3+Ex4

r=0.999999

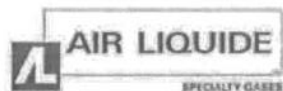
Constants: A=-0.01985233

B=0.999350024 C=

D= E=

QUALITY ASSURANCE

APPROVED BY: Jon Witzak
(signature on file)



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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Document #: 40901858-001

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM016875
Cylinder Pressure***: 2015 PSIG

Certification Date: 17Mar2011

Exp. Date: 16Mar2014
Batch No: LGM0021833

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
CARBON DIOXIDE	10.1 %	+/- 1%	Direct NIST and VSL
OXYGEN	10.0 %	+/- 1%	
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1675	02Oct2012	K008042	13.93 %	CARBON DIOXIDE
NTRM 2658	01Feb2016	K012175	10.03 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/0929062	18Feb2011	FTIR
OXYMAT/6E/W5-951	07Mar2011	PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**CARBON DIOXIDE**

Date: 16Mar2011 Response Unit: %
Z1=0.00166 R1=13.85925 T1=10.03521
R2=13.87143 Z2=0.00057 T2=10.03868
Z3=0.00258 T3=10.05472 R3=13.87292
Avg. Concentration: 10.09 %

OXYGEN

Date: 17Mar2011 Response Unit: VOLTS
Z1=0.00000 R1=10.03000 T1=10.01000
R2=10.03000 Z2=0.00000 T2=10.01000
Z3=0.00000 T3=10.01000 R3=10.03000
Avg. Concentration: 10.01 %

Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.99999E-1
Constants: A=0.00000E+0
B=7.95633E-1 C=9.58500E-3
D=0.00000E+0 E=0.00000E+0

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.99999
Constants: A=0.00785819
B=0.998922145 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: ADAM HANLEY
(signature on file)

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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: Interference Free™ Multi-Component EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Document #: 40540527-003

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: CC191401
Cylinder Pressure***: 2015 PSIG

Certification Date: 14Feb2011

Exp. Date: 13Feb2014
Batch No: LGM0019045

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
CARBON DIOXIDE	19.6 %	+/- 1%	Direct NIST and VSI
OXYGEN	21.1 %	+/- 1%	
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1675	02Oct2012	K008042	13.93 %	CARBON DIOXIDE
NTRM 2658	01Feb2016	K012175	10.03 %	OXYGEN

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/0929062 OXYMAT/BE/W5-951	20Jan2011 03Feb2011	FTIR PARAMAGNETIC

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**CARBON DIOXIDE**

Date: 11Feb2011 Response Unit: %
Z1=0.00478 R1=13.89532 T1=19.49738
R2=13.89695 Z2=0.00660 T2=19.51082
Z3=0.00869 T3=19.51217 R3=13.90695
Avg. Concentration: 19.55 %

OXYGEN

Date: 14Feb2011 Response Unit: VOLTS
Z1=0.00000 R1=9.97500 T1=21.05000
R2=9.99600 Z2=0.00000 T2=21.05000
Z3=0.00000 T3=21.02000 R3=9.95700
Avg. Concentration: 21.14 %

Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.99996E-1
Constants: A=0.00000E+0
B=7.82576E-1 C=9.21200E-3
D=0.00000E+0 E=0.00000E+0

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.99999
Constants: A=0.01404922
B=0.996073345 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: ADAM HANLEY
(signature on file)



3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE #: G1

CUSTOMER: Air Pollution Testing
SGI ORDER #: 0135883
ITEM#: 7
P.O.#: D00FC

CYLINDER #: CC-88289
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 350

CERTIFICATION DATE: 9/29/2008

EXPIRATION DATE: 9/29/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Carbon Monoxide	9/16/2008 9/29/2008	79.11 ppm 79.13 ppm	79.1 ppm	+/- 1%

BALANCE Nitrogen

PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Carbon Monoxide	NTRM-81679	CC-135124	101 ppm

INSTRUMENTATION

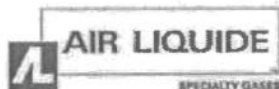
COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Carbon Monoxide	Horiba VIA-510	H0002L2Y	NDIR	9/9/2008

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST:

MATTHEW BOOTH

DATE: 9/30/2008

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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501P.O. No.: D00FC
Project No.: 08-87157-002

Customer

AIR POLLUTION TESTING INC

5530 MARSHALL STREET
ARVADA CO 80002**ANALYTICAL INFORMATION**

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM053684

Certification Date: 12Apr2010

Exp. Date: 11Apr2013

Cylinder Pressure***: 2000 PSIG

COMPONENT
CARBON MONOXIDE
NITROGENCERTIFIED CONCENTRATION (Moles)
182 PPM
BALANCEACCURACY**
+/- 1%TRACEABILITY
Direct NIST and VSL

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARDTYPE/SRM NO.
NTRM 2636EXPIRATION DATE
02Oct2011CYLINDER NUMBER
KAL003925CONCENTRATION
240.8 PPMCOMPONENT
CARBON MONOXIDE**INSTRUMENTATION**INSTRUMENT/MODEL/SERIAL#
FTIR/1802851DATE LAST CALIBRATED
26Mar2010ANALYTICAL PRINCIPLE
FTIR**ANALYZER READINGS**First Triad Analysis
CARBON MONOXIDEDate: 05Apr2010 Response Unit: PPM
Z1=-0.05783 R1=240.1740 T1=181.2107
R2=240.3093 Z2=-0.02721 T2=181.4076
Z3=-0.01142 T3=181.6201 R3=240.5254
Avg. Concentration: 181.8 PPM

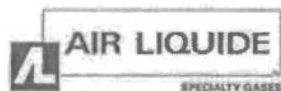
(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

Second Triad Analysis

Date: 12Apr2010 Response Unit: PPM
Z1=-0.04601 R1=240.2760 T1=181.4830
R2=240.8474 Z2=0.02595 T2=181.5343
Z3=0.03382 T3=181.6031 R3=240.9703
Avg. Concentration: 181.7 PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=1.00000E+0
Constants: A=0.00000E+0
B=6.54306E-1 C=1.75000E-4
D=0.00000E+0 E=0.00000E+0**QUALITY ASSURANCE**APPROVED BY: Jon Witzak
(signature on file)



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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS**Dual-Analyzed Calibration Standard****CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D0OFC
Project No.: 08-79413-002

Customer:
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM054858

Certification Date: 08Sep2009

Exp. Date: 07Sep2012

Cylinder Pressure***: 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)
CARBON MONOXIDE	388 PPM
NITROGEN	BALANCE

ACCURACY**
+/- 1%TRACEABILITY
Direct NIST and VSL

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1680	02Oct2011	KAL003794	499.8 PPM	CARBON MONOXIDE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
FTIR/1602651	28Aug2009	FTIR

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**CARBON MONOXIDE**

Date: 29Aug2009 Response Unit: PPM
Z1=0.01766 R1=497.9256 T1=386.2595
R2=497.9261 Z2=0.07154 T2=386.3915
Z3=0.11816 T3=386.4520 R3=498.1253
Avg. Concentration: 387.7 PPM

Second Triad Analysis

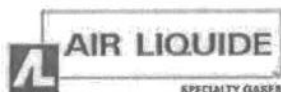
Date: 08Sep2009 Response Unit: PPM
Z1=0.01427 R1=498.4078 T1=386.7752
R2=498.8390 Z2=0.02926 T2=386.8982
Z3=0.11319 T3=387.2257 R3=499.4104
Avg. Concentration: 387.7 PPM

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=1.00000E+0
Constants: A=0.00000E+0
B=5.18547E-1 C=6.90000E-5
D=0.00000E+0 E=0.00000E+0

QUALITY ASSURANCE

APPROVED BY: JON WITZAK
(signature on file)



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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Document #: 39440095-002

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: CC113970
Cylinder Pressure***: 2000 PSIG

Certification Date: 08Nov2010

Exp. Date: 07Nov2013
Batch No: LGM0010328

COMPONENT	CERTIFIED CONCENTRATION (Moles)
PROPANE	3.00 PPM
NITROGEN	BALANCE

ACCURACY**	TRACEABILITY
+/- 1%	Direct NIST and VSLA

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1667	02Oct2012	ALM036360	49.80 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HP/6890/US00034440	05Nov2010	TCD/FID

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**PROPANE**

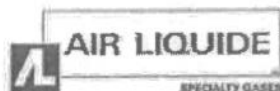
Date: 08Nov2010 Response Unit: AREA
Z1=0.00000 R1=220326.0 T1=14574.00
R2=220393.0 Z2=0.00000 T2=14650.00
Z3=0.00000 T3=14631.00 R3=220104.0
Avg. Concentration: 2.999 PPM

Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999997
Constants: A=-0.38582965
B=0.000225658 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: JOHN ROZOF
(signature on file)



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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Project No.: 08-91010-010

Customer
AIR POLLUTION TESTING INC.
5530 MARSHALL STREET
ARVADA CO 80002

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM023464**Certification Date:** 20Jul2010**Exp. Date:** 19Jul2013**Cylinder Pressure***:** 2000 PSIG**Batch No:** LGM0001374

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
PROPANE	4.97 PPM	+/- 1%	Direct NIST and VSL
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1667	02Oct2012	ALM036360	49.80 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HP6890/US00034440	20Jul2010	TCD/FID

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**PROPANE**

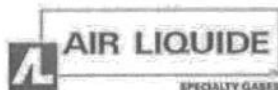
Date: 20Jul2010 Response Unit: AREA
Z1=0.00000 R1=226052.0 T1=24461.00
R2=225501.0 Z2=0.00000 T2=24379.00
Z3=0.00000 T3=24370.00 R3=224943.0
Avg. Concentration: 4.967 PPM

Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999997
Constants: A=-0.47367784
B=0.000224069 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: JOHN ROZOF
(signature on file)



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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Project No.: 08-85742-003

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: CC318602**Certification Date:** 01Mar2010**Exp. Date:** 28Feb2013**Cylinder Pressure***:** 2000 PSIG

COMPONENT	CERTIFIED CONCENTRATION (Moles)
PROPANE	8.41 PPM
NITROGEN	BALANCE

ACCURACY**	TRACEABILITY
+/- 1%	Direct NIST and VSL

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1667	02Oct2012	ALM036360	49.80 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HP/6890/US00034440	26Feb2010	TCD/FID

ANALYZER READINGS

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)

First Triad Analysis**PROPANE**

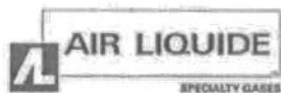
Date: 01Mar2010 Response Unit: AREA
Z1=0.00000 R1=222469.0 T1=39422.00
R2=222834.0 Z2=0.00000 T2=39426.00
Z3=0.00000 T3=39420.00 R3=222549.0
Avg. Concentration: 8.406 PPM

Second Triad Analysis**Calibration Curve**

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999995
Constants: A=-0.50220364
B=0.000224315 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: JOHN ROZOF
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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011
AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501

P.O. No.: D00FC
Document #: 39053979-003

Customer
AIR POLLUTION TESTING INC
5530 MARSHALL STREET
ARVADA CO 80002
US

ANALYTICAL INFORMATION

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM042963
Cylinder Pressure***: 2000 PSIG

Certification Date: 05Oct2010

Exp. Date: 04Oct2013
Batch No: LGM0008261

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
PROPANE	30.2 PPM	+/- 1%	Direct NIST and VSL
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1667	02Oct2012	ALM036360	49.80 PPM	PROPANE

INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HP/6890/US00034440	05Oct2010	TCD/FID

ANALYZER READINGS**First Triad Analysis**

PROPANE
Date: 05Oct2010 Response Unit: AREA
Z1=0.00000 R1=227426.0 T1=139129.0
R2=227644.0 Z2=0.00000 T2=139150.0
Z3=0.00000 T3=139022.0 R3=227654.0
Avg. Concentration: 30.17 PPM

(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient)
Second Triad Analysis

Calibration Curve

Concentration=A+Bx+Cx2+Dx3+Ex4
r=0.999991
Constants: A=-0.68953099
B=0.000223256 C=
D= E=

QUALITY ASSURANCE

APPROVED BY: JOHN ROZOF
(signature on file)



3434 Route 22 West, Branchburg, New Jersey 08876 USA

ISO 9001:2000

Shipped from: 80 Industrial Drive, Alpha, NJ 08865

CERTIFICATE OF ANALYSIS

EPA PROTOCOL MIXTURE

PROCEDURE #: G1

CUSTOMER: Air Pollution Testing
SGI ORDER #: 0138195
ITEM#: 10
P.O.#: D00FC

CYLINDER #: CC-131241
CYLINDER PRES: 2000 PSIG
CGA OUTLET: 350

CERTIFICATION DATE: 11/6/2008

EXPIRATION DATE: 11/6/2011

CERTIFICATION HISTORY

COMPONENT	DATE OF ASSAY	MEAN CONCENTRATION	CERTIFIED CONCENTRATION	ANALYTICAL ACCURACY
Propane	11/6/2008	50.1 ppm	50.1 ppm	+/- 1%

BALANCE Nitrogen
PREVIOUS CERTIFICATION DATES: None

REFERENCE STANDARDS

COMPONENT	SRM/NTRM#	CYLINDER#	CONCENTRATION
Propane	GMIS-1	CC-113884	100.4 ppm

INSTRUMENTATION

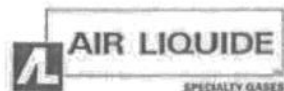
COMPONENT	MAKE/MODEL	SERIAL #	DETECTOR	CALIBRATION DATE(S)
Propane	H. Packard 6890	US00001434	GC - FID	11/6/2008

THIS STANDARD IS NIST TRACEABLE. IT WAS CERTIFIED ACCORDING TO THE EPA PROTOCOL PROCEDURES.
DO NOT USE THIS STANDARD IF THE CYLINDER PRESSURE IS LESS THAN 150 PSIG.

ANALYST: 

FRED PIKULA

DATE: 11/6/2008



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RATA CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas**

Assay Laboratory - PGVP Vendor ID: A42011

AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501P.O. No.: D00FC
Project No.: 08-90896-004**Customer**AIR POLLUTION TESTING INC
JOHN MILLER
5530 MARSHALL STREET
ARVADA CO 80002**ANALYTICAL INFORMATION**

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM013439

Certification Date: 16Jul2010

Exp. Date: 15Jul2013

Cylinder Pressure***: 2000 PSIG

Batch No: LGM0001035

COMPONENT	CERTIFIED CONCENTRATION (Moles)
PROPANE	503 PPM
NITROGEN	BALANCE

ACCURACY**
+/- 1%TRACEABILITY
Direct NIST and VSI

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol Procedure G1, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 1669	02Dec2010	ALM020021	497.0 PPM	PROPANE

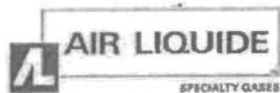
INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HP/6890/US00034440	14Jul2010	TCD/FID

ANALYZER READINGS

First Triad Analysis	(Z=Zero Gas R=Reference Gas T=Test Gas r=Correlation Coefficient) Second Triad Analysis	Calibration Curve
PROPANE Date: 16Jul2010 Response Unit: AREA Z1=0.00000 R1=2230580 T1=2284593 R2=2226450 Z2=0.00000 T2=2282729 Z3=0.00000 T3=2283285 R3=2227711 Avg. Concentration: 503.4 PPM		Concentration=A+Bx+Cx2+Dx3+Ex4 r=0.999999 Constants: A=0.13534477 B=0.000224442 C= D= E=

QUALITY ASSURANCEAPPROVED BY: JOHN ROZOF
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500 WEAVER PARK RD, LONGMONT, CO 80501 Phone: 888-253-1635 Fax: 303-772-7673

COMPLIANCE CLASS*Dual-Analyzed Calibration Standard***CERTIFICATE OF ACCURACY: EPA Protocol Gas****Assay Laboratory - PGVP Vendor ID: A42011**AIR LIQUIDE AMERICA SPECIALTY GASES LLC
500 WEAVER PARK RD
LONGMONT, CO 80501P.O. No.: D00FC
Document #: 39315414-001**Customer**AIR POLLUTION TESTING INC
JOHN MILLER
5530 MARSHALL STREET
ARVADA CO 80002
US**ANALYTICAL INFORMATION**

This certification was performed according to EPA Traceability Protocol For Assay & Certification of Gaseous Calibration Standards; Procedure G-1; September, 1997.

Cylinder Number: ALM062797**Certification Date:** 26Oct2010**Exp. Date:** 25Oct2013**Cylinder Pressure***:** 2000 PSIG**Batch No:** LGM0010068

COMPONENT	CERTIFIED CONCENTRATION (Moles)	ACCURACY**	TRACEABILITY
METHANE	1,490 PPM	+/- 2%	NIST and VSL
NITROGEN	BALANCE		

*** Do not use when cylinder pressure is below 150 psig.

** Analytical accuracy is based on the requirements of EPA Protocol procedures, September 1997.

REFERENCE STANDARD

TYPE/SRM NO.	EXPIRATION DATE	CYLINDER NUMBER	CONCENTRATION	COMPONENT
NTRM 2750	02Oct2011	ALM048818	49.80 PPM	METHANE

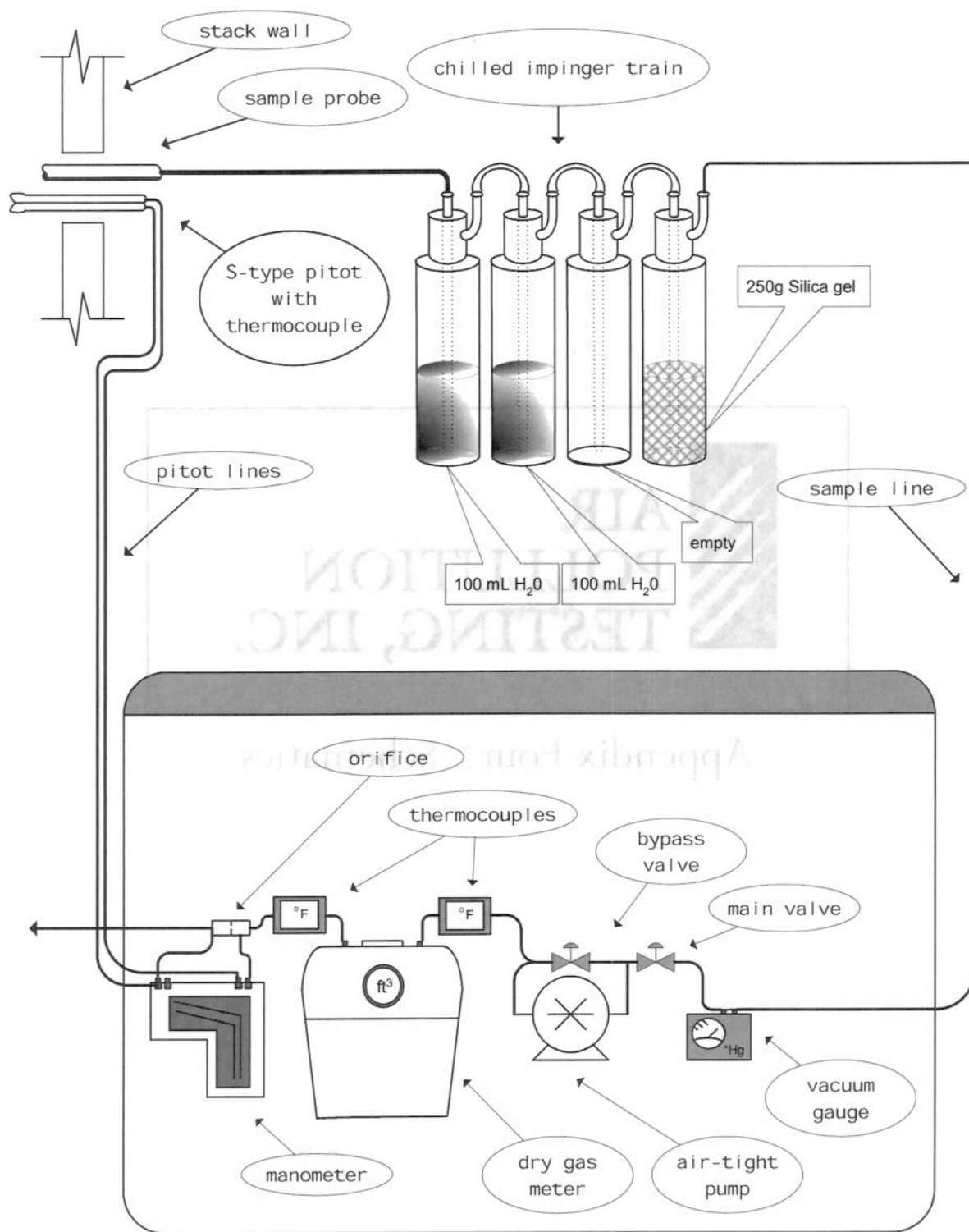
INSTRUMENTATION

INSTRUMENT/MODEL/SERIAL#	DATE LAST CALIBRATED	ANALYTICAL PRINCIPLE
HP/6890/US00006537	04Oct2010	FID

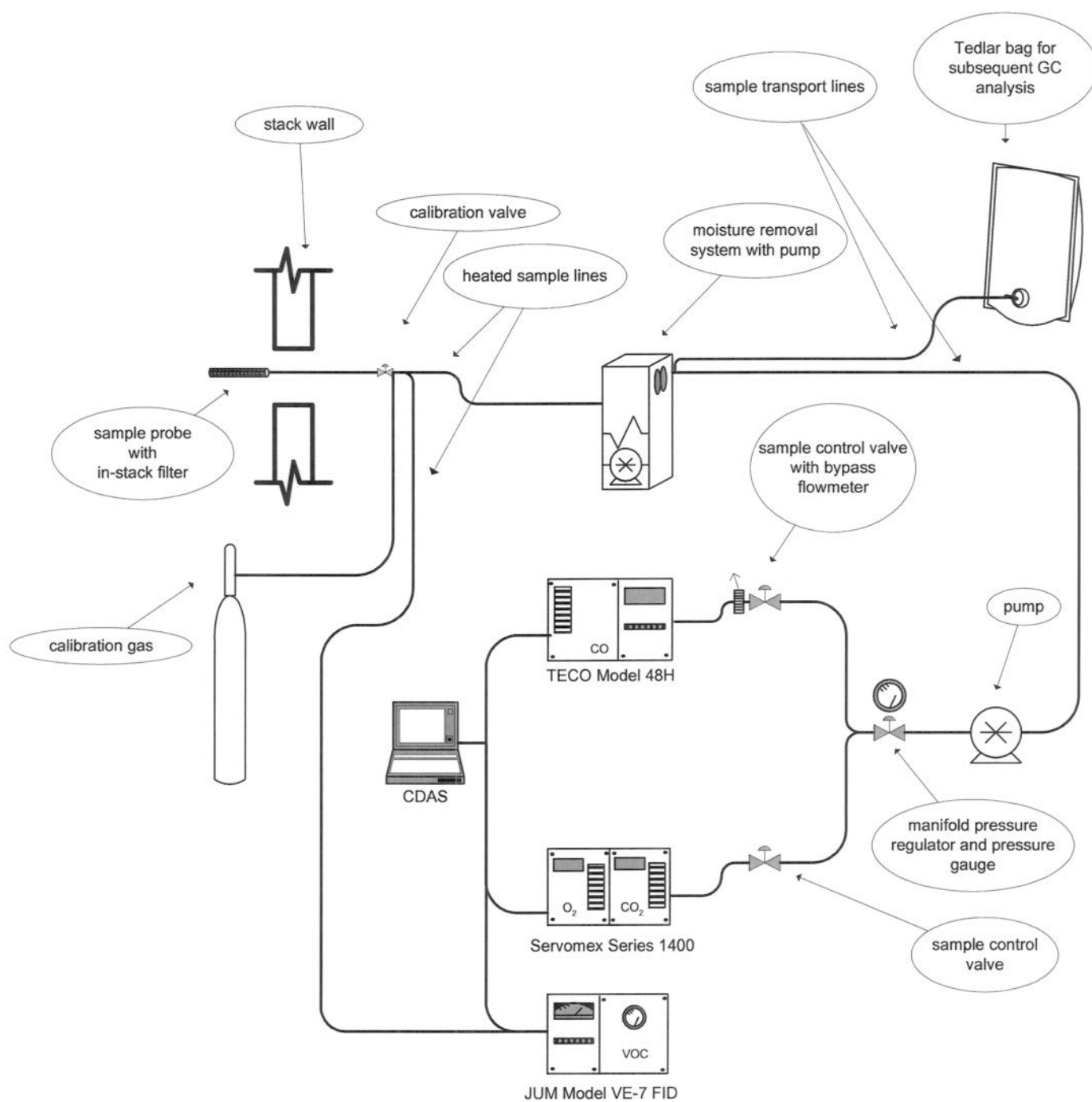
QUALITY ASSURANCEAPPROVED BY: SAM BENNETT
(signature on file)



4 & 5
 EPA Methods 1, 2, & 4
 Sampling Train Schematic



EPA Methods 1, 2, & 4
sampling train schematic



EPA Methods 3A, 10, 18 & 25A
sampling train schematic

