

TEST REPORT

COMPLIANCE EMISSION TEST PROGRAM

SRU CAUSTIC SCRUBBER EXHAUST: EPN T-301

TCEQ AIR PERMIT NO. 22433

REGULATED ENTITY 100210608

MARATHON PETROLEUM COMPANY LLC
TEXAS CITY, TEXAS

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July 19 - 20, 2007 Test Program

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SECTION ONE

Introduction and Summary

ARI Environmental, Inc. (ARI) was retained by Marathon Petroleum Company LLC (Marathon) to conduct a Compliance Emission Test Program on the Sulfur Recovery Unit (SRU) Caustic Scrubber Exhaust Stack at Marathon's Facility in Texas City, Texas.

Compliance testing at the SRU Caustic Scrubber stack was conducted to determine the concentrations and mass emission rates of sulfur dioxide (SO₂), nitrogen oxides (NO_x), carbon monoxide (CO), sulfuric acid (H₂SO₄), hydrogen sulfide (H₂S), carbonyl sulfide (COS), carbon disulfide (CS₂) and total reduced sulfur (TRS) as SO₂. The test programs followed the regulatory requirements and sampling procedures listed below:

- Title 40 of the Code of Federal Regulations (40 CFR), Part 60, 2006, Appendix A - USEPA Methods 1-4, 6C, 7E, 8, 10 and 15
- 40 CFR, Part 60, 2006, Subpart J – Standards of Performance for Petroleum Refineries
- 40 CFR, Part 51, 2006, Appendix M, USEPA Method 205
- Quality Assurance Handbook for Air Pollution Measurement Systems, Volume III - Stationary Source Specific Methods
- TCEQ Sampling Procedures Manual

Under the direction of Mr. Greg Burch, the ARI field test team consisted of Messrs. Zach Stomant, Brian Driscoll, Shawn Moody and Dr. Steve Yuchs. Mr. John Atchison of Marathon coordinated the test activities with plant operations and provided process data to ARI for inclusion in this report. The test program was performed on July 19 and 20, 2007.

The results of the compliance test program are summarized in Table 1-1.



SECTION ONE

Introduction and Summary

TABLE 1-1. SUMMARY OF SRU CAUSTIC SCRUBBER COMPLIANCE TEST RESULTS

RUN NO. :	1	2	3	
TEST DATE :	7/19/07	7/20/07	7/20/07	
TEST TIME :	<u>16:20 – 22:01</u>	<u>09:48 – 15:00</u>	<u>15:34 – 20:34</u>	<u>Average</u>
Sulfur Dioxide				
ppmv db @ 0% O ₂	5.75	5.19	6.76	5.90
lb/hr	0.21	0.19	0.24	0.21
Nitrogen Oxides				
lb/hr	2.13	2.24	2.38	2.25
Carbon Monoxide				
lb/hr	0.11	0.10	0.05	0.09
Sulfuric Acid				
lb/hr	0.08	0.14	0.18	0.13
Hydrogen Sulfide				
lb/hr	<0.006	<0.006	<0.006	<0.006
Carbonyl Sulfide				
lb/hr	<0.009	<0.009	<0.009	<0.009
Carbon Disulfide				
lb/hr	<0.014	<0.013	<0.014	<0.014
TRS as SO₂				
lb/hr	<0.044	<0.042	<0.043	<0.043
Sulfuric Acid Mist				
lb/hr	<0.084	<0.136	<0.177	<0.132

Values represented as less than are calculated by using the analytical detection limit. If these constituents were present in the exhaust gas stream, they existed at concentrations and mass emission rates below the reported values.



SECTION TWO

Compliance Test Procedures

2.1 OVERVIEW

ARI conducted a compliance emission test on the SRU Caustic Scrubber exhaust at Marathon's refinery located in Texas City, Texas. The purpose of the test program was to determine various pollutant concentrations and mass emission rates to atmosphere.

Test methods followed those as detailed in 40CFR, Part 60, Appendix A, USEPA Methods 1-4, 6C, 7E, 8, 10 and 15 and 40CFR, Part 51, 2006, Appendix M, USEPA Method 205 as detailed in Table 2-1.

TABLE 2-1. USEPA TEST METHODOLOGIES

USEPA Method	Description
1	Sample and Velocity Traverses for Stationary Sources
2	Determination of Stack Gas Velocity and Volumetric Flow Rate (Type S Pitot Tube)
3A	Determination of Oxygen and Carbon Dioxide Concentrations in Emission from Stationary Sources (Instrumental Analyzer Procedure)
4	Determination of Moisture Content in Stack Gases
6C	Determination of Sulfur Dioxide Emissions from Stationary Sources (Instrumental Analyzer Procedure)
7E	Determination of Nitrogen Oxides Emissions from Stationary Sources (Instrumental Analyzer Procedure)
8	Determination of Sulfuric Acid Mist Emissions From Stationary Sources
10	Determination of Carbon Monoxide Emissions from Stationary Sources
15	Determination of Hydrogen Sulfide, Carbonyl Sulfide and Carbon Disulfide Emissions from Stationary Sources
205	Verification of Gas Dilution Systems for Field Instrument Calibrations

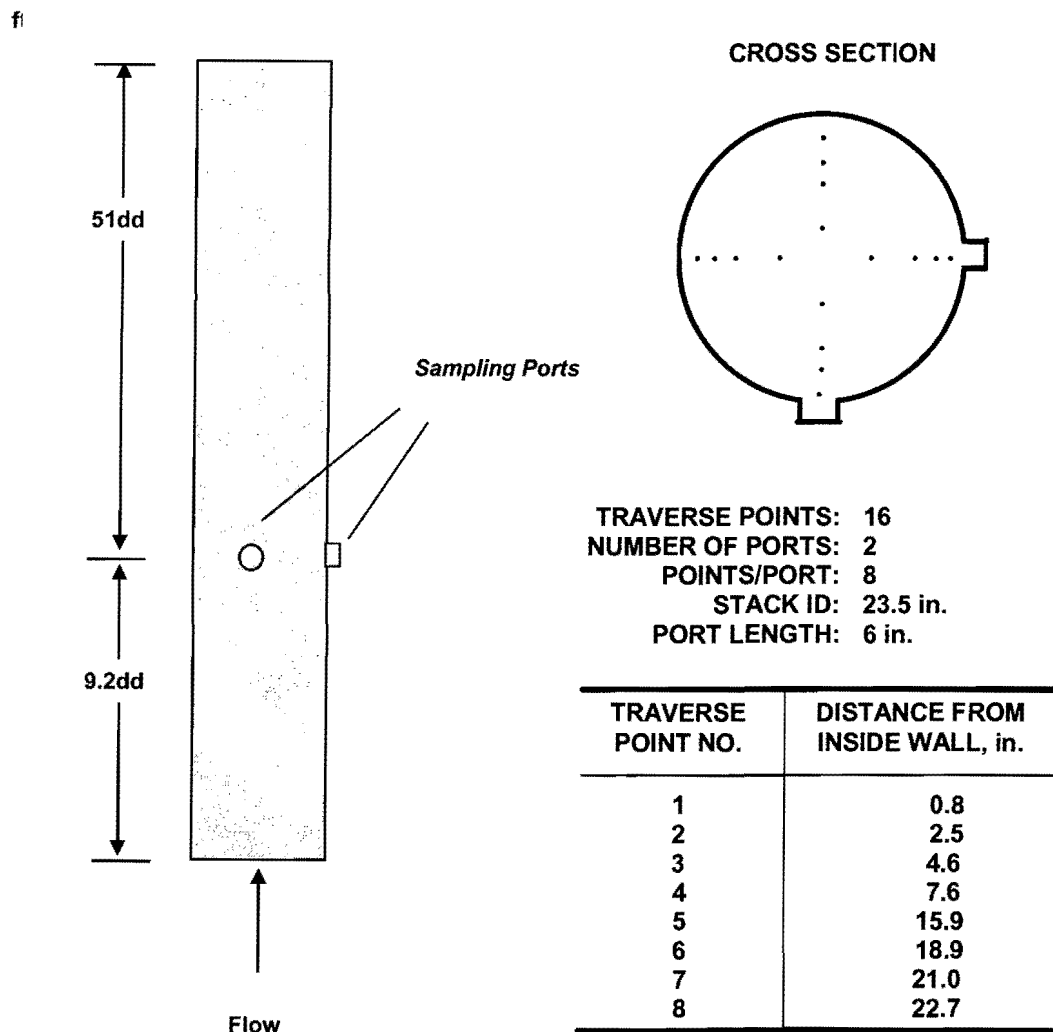
Pursuant to the requirements of 40CFR, Part 60, Subpart J – Standards of Performance for Petroleum Refineries, § 60.106(f)(1), a SO₂ test run consisted of four (4) 60-minute samples and the average of three (3) test runs was used to determine compliance. Testing for the remaining diluents and pollutants was conducted in such a manner that the SO₂ test runs encompassed the procedures and methodologies used for the other constituents.

2.2 USEPA METHOD 1 - SAMPLE AND VELOCITY TRAVERSE LOCATIONS

Sampling at the SRU Caustic Scrubber exhaust was conducted using the two (2) 4-inch diameter sampling ports provided on the exhaust duct. The sampling port locations on the 23.5-inch diameter stack are located approximately 100-feet (51.0 duct diameters) upstream and approximately 18-feet (9.2 duct diameters) downstream from the nearest flow disturbances. The sampling point locations were determined following USEPA Method 1 procedures. Specifically, eight (8) sampling points were used for each sample port for a total of 16 sampling points as presented in Figure 2-1.

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Compliance Test Procedures



**FIGURE 2-1. MARATHON PETROLEUM COMPANY
SRU CAUSTIC SCRUBBER EXHAUST
SAMPLING LOCATION**



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Compliance Test Procedures

2.3 USEPA METHOD 2 - VELOCITY AND VOLUMETRIC FLOW RATE DETERMINATION

Velocity traverses were performed using a Type "S" pitot tube with the velocity head pressure measured on a Dwyer oil gauge inclined manometer to the nearest 0.01 in. H₂O. Temperature measurements in the ducts were performed with a Chromel-Alumel thermocouple connected to a digital direct read-out potentiometer.

2.4 USEPA METHOD 3A - CO₂, O₂ AND MOLECULAR WEIGHT DETERMINATION

The molecular weight of the stack gas was determined following USEPA Method 3A. Specifically for each sampling run, the exhaust gas was analyzed for CO₂, O₂ and N₂ (by difference) using the analyzers described in Subsection 2.6.

2.5 USEPA METHOD 4 – STACK GAS MOISTURE CONTENT

Stack gas moisture determination was conducted in accordance with USEPA Method 4 procedures. Specifically, stack gas was extracted at a constant rate through a series of chilled impingers. The first two impingers contained deionized/distilled water, the third was initially empty and the final impinger contained silica gel for final water vapor removal. Total moisture collected was determined based upon the volumetric gains of impingers one through three and the weight gain of the silica gel contained in impinger four. Stack gas moisture was determined from the volume of water vapor condensed from the stack gas, the volume of gas sampled and the ideal gas law.

2.6 USEPA METHODS 3A, 6C, 7E AND 10 - O₂, CO₂, SO₂, NO_x AND CO

ARI's gaseous reference method sampling system consisted of a heated probe with in-stack filter followed by a calibration tee connected to a heated Teflon sample line. The Teflon sample line was used to transport sample to an electronic sample conditioner (Universal Analyzer Model No. 3082) to condition the sample by cooling and removing moisture. A sample manifold was connected to the exhaust side of the sample conditioner with intake lines for ARI's O₂, CO₂, SO₂, NO_x and CO analyzers as presented in Figure 2-2.

Continuous O₂ sampling was conducted following USEPA Method 3A. O₂ was measured using ARI's Servomex Model 1400 paramagnetic analyzer. A pre-test and post-test system bias along with the initial calibration error test were performed using diluted O₂ balance nitrogen standards of 5.0% and 10.0% at an analyzer span of 10%.

Continuous CO₂ sampling was conducted following USEPA Method 3A. CO₂ was measured using ARI's Servomex 1400 non-dispersive infrared (NDIR) gas analyzer. A pre-test and post-test system bias along with the initial calibration error test were performed using diluted CO₂ balance nitrogen standards of 10.0% and 20.0% at an analyzer span of 20%.

Continuous SO₂ sampling and analysis was conducted following USEPA Method 6C procedures using a Bovar Western Research Model 721-ATM ultraviolet infrared analyzer. A pre-test and post-test system bias along with the initial calibration error test were performed using diluted calibration standards of 45.0 ppm and 95.0 ppm at a span of 95 ppm.

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Compliance Test Procedures

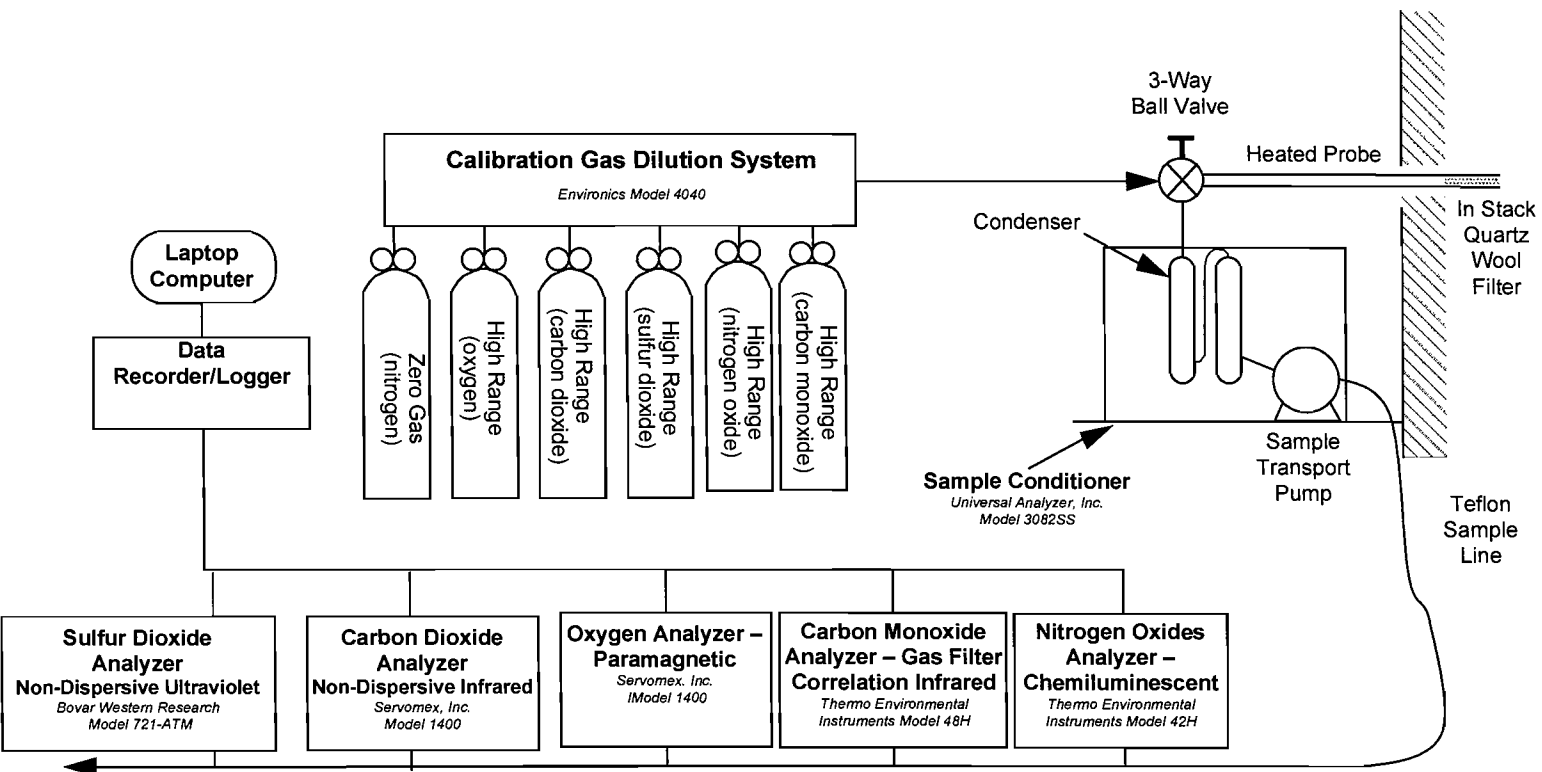


FIGURE 2-2. ARI REFERENCE METHOD O₂, CO₂, SO₂, NO_x AND CO SAMPLING SYSTEM



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Continuous NO_x sampling and analysis was conducted following USEPA Method 7E procedures. The NO_x analyzer used was ARI's Thermo Environmental Instruments, Inc. Model 42H chemiluminescent analyzer. A pre-test and post-test system bias along with the initial calibration were performed using diluted NO_x balance nitrogen standards of 200.0 ppm and 400.0 ppm at a analyzer span of 400 ppm.

Following the calibration error test and prior to sampling a NO₂ converter test was performed using a certified NO₂ standard of approximately 50 ppm. The results were considered acceptable if they were within 10% of the cylinder certified concentration.

Continuous CO sampling and analysis was conducted following USEPA Method 10 procedures. CO was measured using ARI's Thermo Environmental Instruments, Inc. Model 48H gas filter correlation infrared analyzer. A pre-test and a post-test system bias along with the calibration error test were performed using diluted CO balance nitrogen standards of 45.0 ppm and 95.0 ppm at an analyzer span of 95 ppm.

The results of the initial calibration error test performed before the test program were within 2% of span for each calibration gas. Calibration gases were introduced at the 3-way valve located at the exit end of the sample probe to perform the system bias test. The pre-test and post-test system bias results were within the 5% of span allowed for each calibration gas. The system bias drift results were within the 3% of span allowed for each test run.

Prior to the first run, response times were determined upscale and downscale for each analyzer. The start of each run was delayed for a period of at least twice the length of the longest response time following calibrations.

The zero and upscale calibration gas system bias values obtained before and after each run were averaged and used to correct the data for that test run. Calibration data is supplied in Appendix E.

Data was recorded and archived on ARI's data acquisition system consisting of a data recorder/logger linked to a computer for digital data archives and reduction.

All calibration gases were certified by USEPA Protocol 1 procedures. ARI's Environics Model 4040 Gas Dilution System introduced calibration gases to the analyzers. The gas dilution system was determined to be acceptable following the procedures described in USEPA Method 205. The procedures and results are discussed in Subsection 2.9.

2.7 USEPA METHOD 8 - SULFURIC ACID MIST

The sampling procedures followed during this test program are those described in USEPA Method 8 - Determination of Sulfuric Acid Mist and Sulfur Dioxide Emissions from Stationary Sources.

2.7.1 Sampling Apparatus

The sampling train used at the exit stack during these tests met design specifications established by the United States Environmental Protection Agency (USEPA). Assembled by ARI personnel, it consisted of the following:



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Nozzle – Borosilicate glass with sharp tapered leading edge and accurately measured round opening.

Probe - Borosilicate glass with a heating system capable of preventing visible condensation at the exit end during sampling.

Pitot Tube - A Type-S pitot tube that meets all geometric standards; attached to the probe to monitor stack gas velocity.

Filter Holder - 4-in. borosilicate glass with a Teflon frit.

Filter - Fisher Brand G6, glass-fiber, 4-in.-diameter.

Draft Gauge - A dual-inclined manometer made by Dwyer with a readability of 0.01 in. H₂O in the 0- to 1-in. range and 0.1 in. H₂O in the 1- to 10-in. range. Velocity determination was conducted with a 0- to 0.25 in. H₂O range manometer with a readability of 0.005 in. H₂O.

Impingers - Four impingers connected in series with glass ball joints. The first and third impingers are of the Greenburg-Smith design. The second and fourth Greenburg-Smith impingers modified by replacing the tip with a 1/2-in. -i.d. glass tube extending to 1/2-in. from the bottom of the flask.

Metering System - Apex Model 522 Metering system, equipped with vacuum gauge, leak-free pump, thermometers capable of measuring temperature to within 5°F, dry gas meter with ± 2 percent accuracy and related equipment as required to maintain an isokinetic sampling rate and to determine sample volume.

Barometer - Aneroid type to measure atmospheric pressure to ± 0.1 in. Hg.

2.7.2 Sampling Procedure

Approximately 200 grams of silica gel was weighed and placed in a sealed impinger prior to each test. 100 mL of 80% isopropanol was placed in the first impinger; 100 mL of 3% hydrogen peroxide was placed in the second and third impingers; and the fourth impinger contained 200 grams of silica gel. The train was set up with the probe as shown in Figure 2-3. The sampling train was leak-checked at the sampling site prior to each test run by plugging the inlet to the nozzle and pulling a 15-in. Hg vacuum; and at the conclusion of the test, by plugging the inlet to the nozzle and pulling a vacuum equal to the highest vacuum reached during the test run.

The pitot tube and lines were leak-checked at the test site prior to and at the conclusion of each test run. The check was made by blowing into the impact opening of the pitot tube until 3 or more inches of water was recorded on the manometer and then capping the impact opening and holding it for 15 seconds to assure it was leak-free. The static pressure side of the pitot tube was leak-checked by the same procedure, except suction was used to obtain the 3-in. H₂O manometer reading. Crushed ice was placed around the impingers to keep the temperature of the gases leaving the last impinger at 68°F or less.

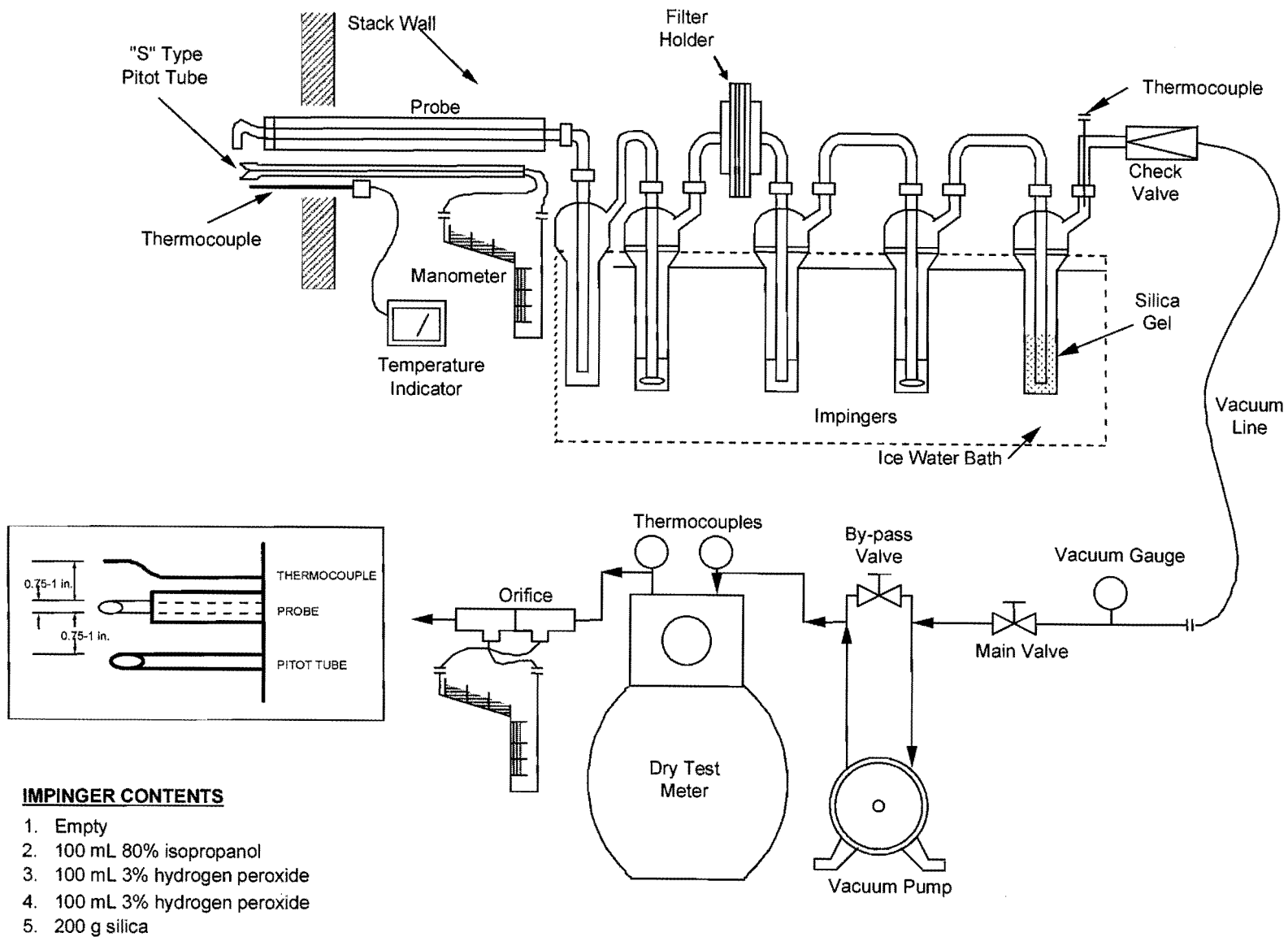


FIGURE 2-3. USEPA METHOD 8 SAMPLING TRAIN

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Compliance Test Procedures





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During sampling, stack gas and sampling train data were recorded at each sampling point and whenever significant changes occurred in stack flow conditions. Isokinetic sampling rates were set throughout the sampling period with the aid of a calculator.

2.7.3 Sample Recovery Procedure

After sampling was completed and final leak-checks were performed, the ice bath was drained, the probe was disconnected and the impingers were purged with ambient air at the average sample rate for 15 minutes. The sampling train was moved carefully from the test site to the cleanup area. The sample fraction was recovered as follows:

Container No. 1 - The contents of the first impinger were transferred to a 250 mL graduated cylinder. The probe, first impinger and connecting glassware before the filter were rinsed and added to the graduated cylinder. The solution was diluted to 250 mL with 80% isopropanol and the filter was added and then mixed. The solution was stored in a 500 mL polyethylene container. Impingers 2 and 3 were not recovered and were used to absorb SO₂ to prevent corrosion of the dry gas meter and sampling pump assemblies.

2.7.4 Analytical Procedures

The analytical procedures followed during this program are those described in USEPA Method 8. Specifically, an aliquot was taken from Container No. 1 and titrated with a 0.01N barium chloride solution to a pink endpoint.

2.8 USEPA METHOD 15 – COS, CS₂ AND H₂S

Determination of TRS was conducted in accordance with USEPA Method 15 using a gas chromatograph for separation of sulfur compounds and measurement by a flame photometric detector.

Modifications and improvements to USEPA Method 15 during the testing included the following:

1. No sample dilution was required (GC range ~50 ppm TRS)
2. USEPA Protocol 1 calibration gases were used to calibrate the GC (no permeation tubes used)

The TRS gas sampling system consisted of a heated glass lined probe connected to a heated Teflon sampling line. The exhaust gas was then conveyed through a series of Teflon impingers located on the sampling platform containing a citrate buffer solution to remove SO₂ from the sample stream.

A Teflon lined sample pump transported the sample through 0.375-inch OD Teflon tubing to the ARI mobile laboratory located at grade approximately 80-feet from the sampling location. The sample was run to a manifold system at a flow rate of approximately 3 liters per minute from which a sample was introduced to the GC-FPD.

The GC-FPD system consisted of an SRI Model 9300B field gas chromatograph containing a heated gas sampling valve, column oven and detector. A computer based integrator utilizing Peak Simple W95 software was used for data acquisition and integration.



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The GC-FPD was calibrated with a USEPA Protocol 1 TRS gas standard obtained from Specialty Gas Products. The gas standard was generated using an Environics Model 4040 mass flow controller gas dilution system. The dilution system was verified onsite in accordance with USEPA Method 205 (see Subsection 2.9).

The TRS results were converted to equivalent SO_2 concentration in parts per million (ppmv) using the equation:

$$\sum \text{SO}_2 = \text{COS} + \text{H}_2\text{S} + 2\text{CS}_2$$

During each compliance test run, there were nominally 25 to 29 injections to the GC-FPD.

2.9 USEPA METHOD 205 - GAS DILUTION SYSTEM VERIFICATION

All diluted calibration standards were prepared using an Environics Model 4040 Dilution System that was verified by a field evaluation at the job site prior to testing following the requirements of USEPA Method 205 (40 CFR 51, Appendix M).

ARI's CO_2 gas analyzer was calibrated following USEPA Method 3A procedures using CO_2 in nitrogen standards. After the calibration procedure was complete, diluted standards of 7.00% and 12.00% and a mid-range EPA Protocol 1 standard of 7.44% were alternately introduced in triplicate and an average instrument response was calculated for each standard.

No single response differed by more than $\pm 2\%$ from the average response for each standard. The difference between the instrument average and the predicted concentration was less than $\pm 2\%$ for each diluted standard. The difference between the certified gas concentration and the average instrument response for the mid-range EPA Protocol 1 standard was less than $\pm 2\%$.

Actual results of the USEPA Method 205 Dilution System Verifications are presented in Appendix E - Calibration Data.



SECTION THREE

Test Results

The data collected for the compliance emission testing are presented in Table 3-1. The test runs represent data collected on the exhaust of the SRU Caustic Scrubber Exhaust.

Appendix A presents example calculations and computer generated printouts of calculated values from the field data. Appendix B presents the field data including raw handwritten sheets. The analytical data are presented in Appendix C. Appendix D contains the 15-second interval data recorded from each of ARI's reference method analyzers. Appendix E presents the calibration data and cylinder gas certification sheets. The data supplied by Marathon plant personnel for the process operating levels are presented in Appendix F. Appendix G presents a brief description of personnel qualifications for ARI's test crew.



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Test Results

TABLE 3-1. SRU CAUSTIC SCRUBBER EXHAUST TEST RESULTS

Company	: Marathon Petroleum Company LLC			
Location	: Texas City, Texas			
Source	: SRU Caustic Scrubber Exhaust			
Operators	: Greg Burch, Steve Yuchs, Shawn Moody, Zach Stornant, Brian Driscoll			
Test Run	: 1	2	3	
Test Date	: 7/19/07	7/20/07	7/20/07	
Test Time	: 16:20 – 22:01	09:48 – 15:00	15:34 – 20:34	<u>Average</u>

PROCESS DATA

Sulfur Production, ltpd

STACK GAS

Temperature, av. °F	155.4	154.2	156.0	155.2
Velocity, ft/sec	31.684	31.279	31.382	31.449
Volume flow, acfm	5,726	5,653	5,672	5,683
Volume flow, dscfm	4,924	4,870	4,871	4,888
Volume flow, dscfh	215,489	214,850	211,518	213,952
Moisture, % vol	27.06	26.45	27.62	27.04
CO ₂ , % vol, db	10.48	10.69	10.85	10.68
O ₂ , % vol, db	4.63	4.72	4.65	4.67

SULFUR DIOXIDE

Concentration				
ppmv db @ 0% O ₂	5.75	5.19	6.76	5.90
ppmv db	7.39	6.69	8.69	7.59
lb/dscf x 10 ⁻⁶	0.96	0.86	1.12	0.98
Emission rate				
lb/hr	0.21	0.19	0.24	0.21
ton/yr	0.90	0.81	1.04	0.92

NITROGEN OXIDES as NO₂

Concentration				
ppmv db	82.94	87.14	94.32	88.13
lb/dscf x 10 ⁻⁶	9.90	10.40	11.26	10.52
Emission rate				
lb/hr	2.13	2.24	2.38	2.25
ton/yr	9.35	9.79	10.43	9.86

CARBON MONOXIDE

Concentration				
ppmv db	6.77	6.40	3.30	5.49
lb/dscf x 10 ⁻⁶	0.49	0.46	0.24	0.40
Emission rate				
lb/hr	0.11	0.10	0.05	0.09
ton/yr	0.46	0.44	0.22	0.37



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Test Results

TABLE 3-1 (CONTINUED). SRU CAUSTIC SCRUBBER EXHAUST TEST RESULTS

Test Run	:	1	2	3	
Test Date	:	7/19/07	7/20/07	7/20/07	
Test Time	:	16:20 – 22:01	09:48 – 15:00	15:34 – 20:34	Average
<u>HYDROGEN SULFIDE</u>					
Concentration					
ppmv db		<0.32	<0.32	<0.32	<0.32
lb/dscf x 10 ⁻⁶		<0.028	<0.028	<0.028	<0.028
Emission rate					
lb/hr		<0.0061	<0.0059	<0.0061	<0.0060
ton/yr		<0.0266	<0.0259	<0.0265	<0.0264
<u>CARBONYL SULFIDE</u>					
Concentration					
ppmv db		<0.26	<0.26	<0.26	<0.26
lb/dscf x 10 ⁻⁶		<0.041	<0.041	<0.041	<0.041
Emission rate					
lb/hr		<0.0087	<0.0085	<0.0087	<0.0086
ton/yr		<0.0381	<0.0372	<0.0380	<0.0378
<u>CARBON DISULFIDE</u>					
Concentration					
ppmv db		<0.32	<0.32	<0.32	<0.32
lb/dscf x 10 ⁻⁶		<0.063	<0.063	<0.063	<0.063
Emission rate					
lb/hr		<0.014	<0.013	<0.014	<0.014
ton/yr		<0.060	<0.058	<0.059	<0.059
<u>TRS as SO₂</u>					
Concentration					
ppmv db		<1.22	<1.22	<1.22	<1.22
lb/dscf x 10 ⁻⁶		<0.20	<0.20	<0.20	<0.20
Emission rate					
lb/hr		<0.044	<0.042	<0.043	<0.043
ton/yr		<0.19	<0.19	<0.19	<0.19
<u>SULFURIC ACID MIST</u>					
Concentration					
ppmv db		<1.54	<2.55	<3.25	<2.45
lb/dscf x 10 ⁻⁶		<0.39	<0.65	<0.83	<0.62
Emission rate					
lb/hr		<0.084	<0.136	<0.177	<0.132
ton/yr		<0.37	<0.59	<0.77	<0.58



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

APPENDIX A

Calculation Summaries

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : Run 1
TEST DATE : 7/19/2007
START TIME : 16:20
END TIME : 17:20

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.066
 AVERAGE ZERO BIAS (C_o): 0.273
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.71

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 197.99
 AVERAGE ZERO BIAS (C_o): 0.75
 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 82.6

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 44.73
 AVERAGE ZERO BIAS (C_o): -0.95
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.3

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 44.86
 AVERAGE ZERO BIAS (C_o): -0.47
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.4

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.91
 AVERAGE ZERO BIAS (C_o): -0.16
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.39

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
16:20	0					
16:21	1	84.1	3.9	-1.3	4.74	10.23
16:22	2	83.6	3.8	-1.2	4.73	10.24
16:23	3	82.9	3.5	-0.7	4.76	10.26
16:24	4	82.5	3.1	-0.9	4.68	10.34
16:25	5	81.9	2.8	-0.8	4.60	10.37
16:26	6	81.6	2.6	-0.1	4.78	10.22
16:27	7	81.4	2.5	0.2	4.51	10.36
16:28	8	81.7	2.3	0.9	4.68	10.25
16:29	9	81.8	1.9	2.5	4.79	10.26
16:30	10	81.0	1.7	6.6	4.65	10.48
16:31	11	79.7	1.5	7.7	4.39	10.71
16:32	12	78.6	1.3	8.3	4.49	10.61
16:33	13	78.1	2.1	12.3	4.50	10.53
16:34	14	77.5	1.6	17.0	4.38	10.63
16:35	15	77.6	1.2	16.4	4.53	10.47
16:36	16	78.2	40.5	17.7	4.69	10.33
16:37	17	78.4	78.6	23.8	4.61	10.40
16:38	18	79.4	44.3	22.6	4.57	10.41
16:39	19	80.2	1.4	22.3	4.83	10.22
16:40	20	80.7	1.4	20.1	4.81	10.19
16:41	21	81.2	1.9	17.0	4.7	10.2
16:42	22	82.1	1.7	11.0	4.8	10.2
16:43	23	82.8	1.5	9.8	5.0	10.1
16:44	24	83.2	1.4	6.1	5.0	10.1
16:45	25	83.4	3.3	4.6	4.9	10.2
16:46	26	83.7	1.6	4.1	4.9	10.2
16:47	27	83.1	1.9	3.1	5.1	10.1
16:48	28	83.3	19.2	2.2	4.9	10.2
16:49	29	83.7	5.7	1.8	4.8	10.3
16:50	30	83.0	2.6	2.5	5.0	10.2
16:51	31	82.9	3.8	2.9	4.8	10.3
16:52	32	82.9	2.8	2.2	4.7	10.4
16:53	33	82.5	3.0	2.2	4.9	10.3
16:54	34	82.4	3.0	2.6	5.0	10.2
16:55	35	82.5	3.1	2.6	4.7	10.4
16:56	36	82.6	3.1	2.2	4.7	10.3
16:57	37	82.9	3.0	4.6	4.9	10.2
16:58	38	82.5	3.1	6.2	4.8	10.4
16:59	39	81.9	3.2	6.1	4.7	10.6
17:00	40	81.5	3.3	4.0	4.7	10.5
17:01	41	81.9	3.3	4.0	4.9	10.2
17:02	42	82.2	3.5	4.5	4.7	10.2
17:03	43	82.7	-1.9	5.0	4.7	10.3
17:04	44	83.0	3.7	5.2	4.9	10.2
17:05	45	83.4	3.8	5.9	4.9	10.2
17:06	46	83.4	3.9	5.4	4.8	10.2
17:07	47	83.9	3.9	4.7	4.8	10.3
17:08	48	84.0	4.0	4.6	5.0	10.2
17:09	49	83.9	4.1	3.6	5.0	10.2
17:10	50	84.0	4.3	2.9	4.9	10.3
17:11	51	84.4	4.5	2.6	4.8	10.4
17:12	52	83.9	4.8	2.1	5.1	10.2
17:13	53	83.8	4.7	1.2	5.0	10.2
17:14	54	83.9	4.9	1.0	4.8	10.4
17:15	55	83.7	5.1	1.0	5.0	10.3
17:16	56	83.2	5.1	0.7	5.1	10.2
17:17	57	83.2	5.2	0.2	4.8	10.4
17:18	58	83.0	5.2	0.0	4.8	10.5
17:19	59	82.4	5.1	0.0	4.8	10.4
17:20	60	82.0	5.4	0.2	4.7	10.4
Uncorrected Average =		82.18	5.95	5.43	4.785	10.307

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
RUN NUMBER: Runs 1-2

SOURCE: SRU Scrubber
TEST DATE: 7/19/2007

BAROMETRIC: 29.97 in. Hg	STACK DIAM: 23.50 inches	
STATIC PRES: 0.18 in.H ₂ O	CO₂: 10.43 % by volume	
STACK TEMP: 156.1 °F	O₂: 4.67 % by volume	
SQ.RT ΔP: 0.5019 in.H ₂ O		

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	29.86	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	26.59	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\overline{\sqrt{\Delta P}} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta P_i}$	=	0.5019	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 156.1\text{ °F} + 460$	=	616	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.98	in.Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg}\sqrt{\Delta P})\sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	31.68	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	5,725	acfm
Stack Area = 3.012 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	4,917 295,029	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	3,565 213,894	dscfm dscfh

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
TEST DATE: 7/19/2007
RUN NUMBER: Runs 1-2

γ FACTOR:	0.999	STACK DIAM:	23.50 inches
BAROMETRIC:	29.97 in. Hg	METER VOLUME:	56.441 ft ³
STATIC PRES:	0.18 in.H ₂ O	METER TEMP:	92.9 °F
STACK TEMP:	156.1 °F	LIQUID COLL:	437.0 milliliters
SQ. RT ΔP:	0.5019 in.H ₂ O	CO₂:	10.43 % by volume
ΔH:	2.21 in.H ₂ O	O₂:	4.67 % by volume

ENGLISH UNITS
(29.92 in.Hg & 68 °F)

VOLUME OF SAMPLE

@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \times \frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} = 54.228 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE

@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 20.570 \text{ scf}$$

$V_{lc} = 437.0 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.275$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right] - 0.5}}{P} = 0.284$$

$T = 341.9 \text{ °K}$
 $P = 761.6 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.275$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 1
TEST DATE: 7/19/2007

INPUT

SO₂ AVERAGE CHART READING (C): 5.9 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -0.5 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 44.9 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,894 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 5.9 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 6.4 \text{ ppmv db}$$

(corrected)

SO₂ CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 1.06 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,894 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.23 \text{ lbs/hr}$$

$$= 1.0 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 1
TEST DATE: 7/19/2007

INPUT

NO_x AVERAGE CHART READING (C): 82.18 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.7 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 198.0 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,894 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 82.18 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 82.57 \text{ ppmv db}$$

(corrected)

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 9.859 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,894 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 2.109 \text{ lbs/hr}$$

$$= 9.24 \text{ ton/yr}$$

SULFURIC ACID CALCULATION SHEET

Company: Marathon
Location: Texas City, Texas
Source: SRU Scrubber
Test Date: 7/20/2007
Run # : M8-1

Raw Test Data:

V_m :	54.482 ft ³	Q_s :	214,807 dscfh
Y_d :	0.999 dimensionless	T_s :	154.9 °F
P_{bar} :	29.97 in.Hg	Run Time (Q)	60.0 minutes
ΔH :	2.025 in.H ₂ O	V_s :	31.801 ft/sec
T_m :	83.0 °F	P_s :	29.98 in.Hg
V_{ic} :	431.5 mL	D_n :	0.375 in.
%O ₂ :	4.65 % by vol db	A_n :	0.0007670 ft ²

Laboratory Analysis of Isopropyl Alcohol (IPA) for H₂SO₄:

Normality of BaCl ₂ titrant:	0.009871 N
Volume of Sample:	450 milliliters
Volume of Sample Aliquot:	100 milliliters
Volume of BaCl ₂ titrant used:	4.40 milliliters
Volume of Blank titrant used:	0.05 milliliters

Calculations:

Volume of sample at standard conditions on dry basis:

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 53.276 \text{ dscf}$$

English Units
(29.92 in. Hg, 68° F)

Volume of water vapor in sample at standard conditions:

$$V_{wstd} = 0.04707 \times V_{ic} = 20.311 \text{ scf}$$

Fractional moisture content of stack gas:

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.2760 B_{wo}$$

Isokinetic sampling rate:

$$\%ISO = \frac{(100)(T_s) \left[(0.002669 \times V_{ic}) + \left(\frac{V_m}{T_m} \right) \left(P_{bar} + \left(\frac{\Delta H}{13.6} \right) \right) \right]}{(60)(Q)(V_s)(P_s)(A_n)} = 97.42 \%$$

Acid mist concentration - H₂SO₄

$$C_{H_2SO_4} = \frac{(1.081 \times 10^{-4})(N)(V_t - V_b) \left(\frac{V_{soln}}{V_a} \right)}{V_{mstd}} = 3.921E-07 \text{ lb/dscf H}_2\text{SO}_4$$

$$H_2SO_{4, ppm} = C_{H_2SO_4} \times \frac{385.26 \text{ ft}^3 / \text{lb} - \text{mole}}{98 \text{ lb} / \text{lb} - \text{mole}} \times 10^6 = 1.541 \text{ ppm H}_2\text{SO}_4$$

Acid Mist emission rate - H₂SO₄

$$H_2SO_{4, pmr} = (C_{H_2SO_4, lb/dscf})(Q_{std}) = 0.08422 \text{ lb/hr H}_2\text{SO}_4$$

$$0.3689 \text{ ton/yr H}_2\text{SO}_4$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 1
TEST DATE: 7/19/2007

INPUT

CO AVERAGE CHART READING (C): 5.4 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.0 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 44.7 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,894 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 5.4 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o} = 6.3 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.46 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,894 dscfh

STACK CO EMISSION RATE =

$$\text{CO}_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.10 \text{ lbs/hr} = 0.4 \text{ ton/yr}$$

H2S DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 1
TEST DATE: 7/20/2007

INPUT

H2S AVERAGE READING (C): <0.32 ppmv
H2S PPMV @ 3% O2: <0.35 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

H2S CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{34.08 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.0283 \times 10^{-6} \text{ lbs/dscf}$$

H2S EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK H2S EMISSION RATE =

$$H_2S_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.0061 \text{ lbs/hr}$$
$$= <0.027 \text{ ton/yr}$$

COS DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 1
TEST DATE: 7/20/2007

INPUT

COS AVERAGE CHART READING (C): <0.26 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

COS CONC. (lbs/dscf) =

$$C_{gas, lb/dscf} = (C_{gas, ppm}) \left(\frac{60.07 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.041 \times 10^{-6} \text{ lbs/dscf}$$

COS EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK COS EMISSION RATE =

$$\text{COS}_{pmr} = (C_{gas, lb/dscf})(Q_{std})$$

= <0.009 lbs/hr
= <0.038 ton/yr

CS2 DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 1
TEST DATE: 7/20/2007

INPUT

CS2 AVERAGE CHART READING (C): <0.32 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

CS2 CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{76.14 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.063 \times 10^{-6} \text{ lbs/dscf}$$

CS2 EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK CS₂ EMISSION RATE =

$$CS_2 \text{ pmr} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.014 \text{ lbs/hr}$$

$$= <0.060 \text{ ton/yr}$$

TRS as SO2 DATA SHEET **USEPA METHOD 15**

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 1
TEST DATE: 7/20/2007

INPUT

TRS AVERAGE CHART READING (C): <1.22 ppmv
 TRS PPMV @ 0% O2: <1.57 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

TRS CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.203 \times 10^{-6} \text{ lbs/dscf}$$

TRS EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK TRS EMISSION RATE =

$$\text{TRS}_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.044 \text{ lbs/hr} \\ = <0.19 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 2
TEST DATE : 7/19/2007
START TIME : 17:57
END TIME : 18:57

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.094
 AVERAGE ZERO BIAS (C_o): 0.268

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
% CORRECTED (C_{gas}): 4.64

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 199.01
 AVERAGE ZERO BIAS (C_o): 0.33

 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
PPM CORRECTED (C_{gas}): 79.6

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 44.17
 AVERAGE ZERO BIAS (C_o): -1.41

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
PPM CORRECTED (C_{gas}): 4.9

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 43.67
 AVERAGE ZERO BIAS (C_o): -0.81

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
PPM CORRECTED (C_{gas}): 6.0

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.88
 AVERAGE ZERO BIAS (C_o): -0.15

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
% CORRECTED (C_{gas}): 10.5

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
17:57	0					
17:58	1	77.6	6.9	4.3	4.84	10.33
17:59	2	75.9	6.6	4.5	4.63	10.46
18:00	3	76.8	6.3	4.5	4.58	10.48
18:01	4	76.9	6.1	4.9	4.80	10.30
18:02	5	76.5	6.0	4.7	4.85	10.23
18:03	6	75.6	6.0	3.5	4.71	10.28
18:04	7	75.8	5.8	3.8	4.66	10.30
18:05	8	75.9	5.6	2.7	4.88	10.17
18:06	9	76.7	5.7	3.4	4.89	10.21
18:07	10	77.0	19.4	3.4	4.81	10.25
18:08	11	77.4	5.3	4.1	4.71	10.32
18:09	12	77.5	5.3	2.7	4.87	10.20
18:10	13	77.9	5.0	2.7	4.91	10.19
18:11	14	78.4	4.9	2.1	4.82	10.22
18:12	15	78.9	5.1	1.8	4.67	10.31
18:13	16	78.9	4.9	2.0	4.91	10.12
18:14	17	79.3	4.9	1.7	4.96	10.10
18:15	18	79.9	5.1	2.3	4.82	10.24
18:16	19	79.8	4.9	1.1	4.68	10.32
18:17	20	79.9	4.8	1.4	4.84	10.20
18:18	21	79.9	4.8	1.7	4.9	10.2
18:19	22	79.6	5.0	3.2	4.8	10.3
18:20	23	79.3	4.9	2.4	4.6	10.5
18:21	24	79.2	4.8	2.8	4.8	10.4
18:22	25	78.5	4.8	2.0	4.9	10.3
18:23	26	78.6	4.8	2.3	4.6	10.5
18:24	27	78.9	4.7	2.2	4.6	10.5
18:25	28	79.0	4.7	2.7	4.8	10.3
18:26	29	79.4	4.5	3.8	4.7	10.4
18:27	30	79.2	4.6	4.3	4.5	10.6
18:28	31	79.0	4.6	3.1	4.7	10.4
18:29	32	79.4	4.7	3.1	4.9	10.2
18:30	33	79.4	4.8	2.7	4.6	10.4
18:31	34	80.1	4.6	2.8	4.7	10.3
18:32	35	80.1	4.6	2.3	4.9	10.2
18:33	36	80.3	4.6	2.8	4.8	10.3
18:34	37	80.0	4.4	2.9	4.6	10.5
18:35	38	80.4	4.5	1.7	4.8	10.3
18:36	39	80.4	4.5	2.1	4.8	10.3
18:37	40	80.5	4.4	2.6	4.7	10.3
18:38	41	80.4	4.6	4.1	4.6	10.5
18:39	42	80.7	4.7	3.7	4.7	10.4
18:40	43	80.6	4.5	4.8	4.8	10.4
18:41	44	80.0	4.3	5.6	4.7	10.4
18:42	45	80.3	4.3	5.2	4.5	10.6
18:43	46	80.2	4.3	5.3	4.7	10.4
18:44	47	80.4	4.3	6.4	4.8	10.4
18:45	48	80.5	4.2	5.9	4.7	10.4
18:46	49	80.3	4.2	6.9	4.5	10.6
18:47	50	80.6	4.2	6.0	4.6	10.5
18:48	51	80.9	4.1	5.3	4.8	10.4
18:49	52	80.9	4.2	6.1	4.8	10.4
18:50	53	81.3	4.3	3.8	4.6	10.5
18:51	54	82.0	4.5	3.7	4.8	10.3
18:52	55	82.1	4.6	4.6	4.9	10.2
18:53	56	82.4	4.4	4.5	4.7	10.4
18:54	57	82.5	4.3	4.7	4.7	10.4
18:55	58	82.4	4.4	4.2	4.9	10.2
18:56	59	82.3	4.3	4.0	4.9	10.3
18:57	60	81.5	4.3	4.0	4.7	10.5
Uncorrected Average =		79.421	5.08	3.56	4.748	10.340

Example Calculation =
$$C_{\text{gas}} = (\bar{C} - C_o) \frac{C_{\text{ma}}}{C_m - C_o}$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 2
TEST DATE: 7/19/2007

INPUT

SO₂ AVERAGE CHART READING (C): 5.1 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -0.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 43.7 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,894 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 5.1 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 6.0 \text{ ppmv db}$$

(corrected)

SO₂ CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.99 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,894 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.21 \text{ lbs/hr}$$

$$= 0.9 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 2
TEST DATE: 7/19/2007

INPUT

NO_x AVERAGE CHART READING (C): 79.42 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.3 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 199.0 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,894 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 79.42 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \left(\bar{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 79.62 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 9.506 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,894 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 2.033 \text{ lbs/hr} = 8.91 \text{ ton/yr}$$

SULFURIC ACID CALCULATION SHEET

Company: Marathon
Location: Texas City, Texas
Source: SRU Scrubber
Test Date: 7/20/2007
Run # : M8-2

Raw Test Data:

V_m :	53.855 ft ³	Q_s :	209,249 dscfh
Y_d :	0.999 dimensionless	T_s :	157.0 °F
P_{bar} :	29.97 in.Hg	Run Time (Q)	60.0 minutes
ΔH :	2.06 in.H ₂ O	V_s :	31.588 ft/sec
T_m :	95.9 °F	P_s :	29.98 in.Hg
V_{ic} :	441.2 mL	D_n :	0.375 in.
%O ₂ :	4.57 % by vol db	A_n :	0.0007670 ft ²

Laboratory Analysis of Isopropyl Alcohol (IPA) for H₂SO₄:

Normality of BaCl ₂ titrant:	0.009871 N
Volume of Sample:	570 milliliters
Volume of Sample Aliquot:	100 milliliters
Volume of BaCl ₂ titrant used:	5.53 milliliters
Volume of Blank titrant used:	0.05 milliliters

Calculations:

Volume of sample at standard conditions on dry basis:

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 51.445 \text{ dscf}$$

**English Units
(29.92 in. Hg, 68° F)**

Volume of water vapor in sample at standard conditions:

$$V_{wstd} = 0.04707 \times V_{ic} = 20.767 \text{ scf}$$

Fractional moisture content of stack gas:

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.2876 B_{wo}$$

Isokinetic sampling rate:

$$\%ISO = \frac{(100)(T_s) \left[(0.002669 \times V_{ic}) + \left(\frac{V_m}{T_m} \right) \left(\gamma \left(P_{bar} + \left(\frac{\Delta H}{13.6} \right) \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)} = 96.57 \%$$

Acid mist concentration - H₂SO₄

$$C_{H_2SO_4} = \frac{(1.081 \times 10^{-4})(N)(V_t - V_b) \left(\frac{V_{soln}}{V_a} \right)}{V_{mstd}} = 6.479E-07 \text{ lb/dscf H}_2\text{SO}_4$$

$$H_2SO_{4, ppm} = C_{H_2SO_4} \times \frac{385.26 \text{ ft}^3 / \text{lb} - \text{mole}}{98 \text{ lb} / \text{lb} - \text{mole}} \times 10^6 = 2.547 \text{ ppm H}_2\text{SO}_4$$

Acid Mist emission rate - H₂SO₄

$$H_2SO_{4, pmr} = (C_{H_2SO_4, lb/dscf})(Q_{std}) = 0.13557 \text{ lb/hr H}_2\text{SO}_4$$

0.5938 ton/yr H₂SO₄

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 2
TEST DATE: 7/19/2007

INPUT

CO AVERAGE CHART READING (C): 3.6 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.4 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 44.2 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,894 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 3.6 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o} = 4.9 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.36 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,894 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.08 \text{ lbs/hr} = 0.3 \text{ ton/yr}$$

H2S DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 2
TEST DATE: 7/20/2007

INPUT

H2S AVERAGE READING (C): <0.32 ppmv
 H2S PPMV @ 3% O2: <0.35 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

H2S CONC. (lbs/dscf) =

$$C_{gas, lb/dscf} = (C_{gas, ppm}) \left(\frac{34.08 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.0283 \times 10^{-6} \text{ lbs/dscf}$$

H2S EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK H2S EMISSION RATE =

$$H_2S_{pmr} = (C_{gas, lb/dscf})(Q_{std}) = <0.0059 \text{ lbs/hr}$$

$$= <0.026 \text{ ton/yr}$$

COS DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 2
TEST DATE: 7/20/2007

INPUT

COS AVERAGE CHART READING (C): <0.26 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

COS CONC. (lbs/dscf) =

$$C_{gas, lb/dscf} = (C_{gas, ppm}) \left(\frac{60.07 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.041 \times 10^{-6} \text{ lbs/dscf}$$

COS EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK COS EMISSION RATE =

$$COS_{pmr} = (C_{gas, lb/dscf}) (Q_{std}) = <0.008 \text{ lbs/hr}$$

$$= <0.037 \text{ ton/yr}$$

CS2 DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 2
TEST DATE: 7/20/2007

INPUT

CS2 AVERAGE CHART READING (C): <0.32 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

CS2 CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{76.14 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.063 \times 10^{-6} \text{ lbs/dscf}$$

CS2 EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK CS₂ EMISSION RATE =

$$CS_2 \text{ pmr} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.013 \text{ lbs/hr}$$

$$= <0.058 \text{ ton/yr}$$

TRS as SO2 DATA SHEET **USEPA METHOD 15**

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 2
TEST DATE: 7/20/2007

INPUT

TRS AVERAGE CHART READING (C): <1.22 ppmv
 TRS PPMV @ 0% O2: <1.56 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

TRS CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.203 \times 10^{-6} \text{ lbs/dscf}$$

TRS EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK TRS EMISSION RATE =

$$\text{TRS} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = <0.042 \text{ lbs/hr}$$

$$= <0.19 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 3
TEST DATE : 7/19/2007
START TIME : 19:32
END TIME : 20:32

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.074
 AVERAGE ZERO BIAS (C_o): 0.241

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): **4.68**

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 199.00
 AVERAGE ZERO BIAS (C_o): 0.33

 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): **84.7**

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 43.91
 AVERAGE ZERO BIAS (C_o): -1.80

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): **5.6**

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 42.35
 AVERAGE ZERO BIAS (C_o): -1.28

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): **5.1**

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.86
 AVERAGE ZERO BIAS (C_o): -0.11

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): **10.6**

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
19:32	0					
19:33	1	85.4	5.4	0.0	4.94	10.46
19:34	2	85.4	5.9	0.0	4.79	10.59
19:35	3	84.8	6.1	0.0	4.89	10.50
19:36	4	83.9	5.9	-0.9	4.88	10.43
19:37	5	83.1	6.0	-0.2	4.67	10.56
19:38	6	82.9	5.9	-0.7	4.61	10.61
19:39	7	82.9	6.0	-0.5	4.80	10.39
19:40	8	82.7	5.9	1.7	4.61	10.52
19:41	9	82.4	5.9	5.0	4.49	10.65
19:42	10	83.0	5.6	6.0	4.69	10.50
19:43	11	82.7	5.4	4.6	4.73	10.40
19:44	12	83.1	5.3	7.8	4.67	10.42
19:45	13	83.2	5.3	7.7	4.58	10.52
19:46	14	83.9	5.3	8.5	4.79	10.36
19:47	15	84.0	5.0	8.5	4.83	10.36
19:48	16	83.9	4.9	9.4	4.75	10.41
19:49	17	83.8	4.8	9.1	4.54	10.59
19:50	18	84.1	4.8	10.0	4.75	10.47
19:51	19	83.8	4.7	11.9	4.82	10.41
19:52	20	83.6	4.7	10.1	4.75	10.43
19:53	21	83.6	4.8	9.6	4.5	10.6
19:54	22	84.1	4.7	10.1	4.6	10.5
19:55	23	84.0	4.5	11.0	4.8	10.3
19:56	24	84.3	4.5	13.1	4.7	10.4
19:57	25	84.4	4.6	12.9	4.6	10.5
19:58	26	84.1	4.6	12.1	4.5	10.5
19:59	27	84.2	4.6	11.7	4.8	10.3
20:00	28	84.4	4.5	11.9	4.8	10.3
20:01	29	84.9	4.5	10.0	4.6	10.4
20:02	30	85.2	4.4	11.0	4.6	10.4
20:03	31	85.7	4.1	7.2	4.8	10.2
20:04	32	85.9	4.1	6.0	4.9	10.2
20:05	33	86.2	4.1	4.0	4.8	10.3
20:06	34	86.5	4.0	2.6	4.8	10.3
20:07	35	86.4	2.7	1.8	5.0	10.2
20:08	36	86.4	2.0	0.9	4.9	10.3
20:09	37	86.0	1.4	0.9	4.7	10.5
20:10	38	85.9	1.3	1.0	4.8	10.4
20:11	39	85.4	1.2	1.0	4.9	10.3
20:12	40	85.4	1.3	0.6	4.8	10.4
20:13	41	85.4	1.4	0.6	4.7	10.4
20:14	42	85.4	1.4	0.5	4.9	10.3
20:15	43	85.5	1.6	-0.3	4.9	10.3
20:16	44	85.6	5.7	-0.1	4.9	10.3
20:17	45	85.4	1.8	-0.4	4.7	10.4
20:18	46	85.4	1.9	-0.6	4.9	10.3
20:19	47	85.4	1.8	-0.7	5.0	10.3
20:20	48	85.3	1.9	-0.4	4.7	10.5
20:21	49	85.1	1.9	-0.7	4.8	10.4
20:22	50	84.8	2.0	-0.2	5.0	10.3
20:23	51	84.1	1.9	-0.6	4.8	10.4
20:24	52	84.3	2.0	-0.6	4.6	10.6
20:25	53	84.4	2.0	-0.3	4.9	10.4
20:26	54	84.2	2.0	-0.8	4.9	10.4
20:27	55	84.3	2.2	-0.8	4.7	10.6
20:28	56	84.1	2.1	-0.6	4.8	10.4
20:29	57	84.0	2.1	-0.7	4.9	10.4
20:30	58	83.6	2.1	-0.4	4.9	10.4
20:31	59	83.1	2.2	-0.1	4.6	10.7
20:32	60	82.8	2.3	0.3	4.7	10.6
Uncorrected Average =		84.46	3.72	3.84	4.763	10.420

Example Calculation =
$$C_{\text{gas}} = (\bar{C} - C_o) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
RUN NUMBER: Runs 3-4

SOURCE: SRU Scrubber
TEST DATE: 7/19/2007

BAROMETRIC: 29.97 in. Hg	STACK DIAM: 23.50 inches	
STATIC PRES: 0.17 in.H ₂ O	CO₂: 10.54 % by volume	
STACK TEMP: 154.6 °F	O₂: 4.59	
SQ.RT ΔP: 0.5037 in.H ₂ O		

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	29.87	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	26.71	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.5037	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 154.6 \text{ °F} + 460$	=	615	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.98	in.Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	31.69	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	5,727	acfm
Stack Area = 3.012 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	4,930 295,800	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	3,618 217,083	dscfm dscfh

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
TEST DATE: 7/19/2007
RUN NUMBER: Runs 3-4

γ FACTOR:	0.999	STACK DIAM:	23.50 inches
BAROMETRIC:	29.97 in. Hg	METER VOLUME:	63.005 ft ³
STATIC PRES:	0.17 in.H ₂ O	METER TEMP:	90.3 °F
STACK TEMP:	154.6 °F	LIQUID COLL:	468.0 milliliters
SQ.RT ΔP:	0.5037 in.H ₂ O	CO₂:	10.54 % by volume
ΔH:	1.70 in.H ₂ O	O₂:	4.59 % by volume

ENGLISH UNITS
(29.92 in.Hg & 68 °F)

VOLUME OF SAMPLE

@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 60.750 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE

@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 22.029 \text{ scf}$$

$V_{lc} = 468.0 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.266$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right]} - 0.5}{P} = 0.274$$

$T = 341.1 \text{ °K}$
 $P = 761.6 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.266$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 3
TEST DATE: 7/19/2007

INPUT

SO₂ AVERAGE CHART READING (C): 3.7 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.3 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 42.3 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 217,083 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 3.7 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 5.1 \text{ ppmv db}$$

(corrected)

SO₂ CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.86 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 217,083 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.19 \text{ lbs/hr}$$

= 0.8 ton/yr

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 3
TEST DATE: 7/19/2007

INPUT

NO_x AVERAGE CHART READING (C): 84.46 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.3 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 199.0 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 217,083 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 84.46 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o} = 84.69 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 10.113 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 217,083 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = \begin{matrix} 2.195 \text{ lbs/hr} \\ 9.62 \text{ ton/yr} \end{matrix}$$

SULFURIC ACID CALCULATION SHEET

Company: Marathon
 Location: Texas City, Texas
 Source: SRU Scrubber
 Test Date: 7/20/2007
 Run #: M8-3

Raw Test Data:

V_m :	53.602 ft ³	Q_s :	213,787 dscfh
Y_d :	0.999 dimensionless	T_s :	155.0 °F
P_{bar} :	29.97 in.Hg	Run Time (Q)	60.0 minutes
ΔH :	2 in.H ₂ O	V_s :	31.176 ft/sec
T_m :	88.8 °F	P_s :	29.98 in.Hg
V_{ic} :	397 mL	D_n :	0.375 in.
%O ₂ :	4.72 % by vol db	A_n :	0.0007670 ft ²

Laboratory Analysis of Isopropyl Alcohol (IPA) for H₂SO₄:

Normality of BaCl ₂ titrant:	0.009871 N
Volume of Sample:	580 milliliters
Volume of Sample Aliquot:	100 milliliters
Volume of BaCl ₂ titrant used:	6.98 milliliters
Volume of Blank titrant used:	0.05 milliliters

Calculations:

Volume of sample at standard conditions on dry basis:

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 51.855 \text{ dscf}$$

English Units
(29.92 in. Hg, 68° F)

Volume of water vapor in sample at standard conditions:

$$V_{wstd} = 0.04707 \times V_{ic} = 18.687 \text{ scf}$$

Fractional moisture content of stack gas:

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.2649 B_{wo}$$

Isokinetic sampling rate:

$$\%ISO = \frac{(100)(T_s) \left[(0.002669 \times V_{ic}) + \left(\frac{V_m}{T_m} \right) \left(\gamma \left(P_{bar} + \left(\frac{\Delta H}{13.6} \right) \right) \right) \right]}{(60)(\theta)(V_s)(P_s)(A_n)} = 95.27 \%I$$

Acid mist concentration - H₂SO₄

$$C_{H_2SO_4} = \frac{(1.081 \times 10^{-4})(N)(V_t - V_b) \left(\frac{V_{soln}}{V_a} \right)}{V_{mstd}} = 8.271E-07 \text{ lb/dscf H}_2\text{SO}_4$$

$$H_2SO_{4, ppm} = C_{H_2SO_4} \times \frac{385.26 \text{ ft}^3 / \text{lb-mole}}{98 \text{ lb/lb-mole}} \times 10^6 = 3.251 \text{ ppm H}_2\text{SO}_4$$

Acid Mist emission rate - H₂SO₄

$$H_2SO_{4, pmv} = (C_{H_2SO_4, lb/dscf})(Q_{std}) = 0.17682 \text{ lb/hr H}_2\text{SO}_4$$

$$0.7745 \text{ ton/yr H}_2\text{SO}_4$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 3
TEST DATE: 7/19/2007

INPUT

CO AVERAGE CHART READING (C): 3.8 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 43.9 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 217,083 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 3.8 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 5.6 \text{ ppmv db}$$

CO CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.40 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 217,083 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = \begin{matrix} 0.09 \text{ lbs/hr} \\ 0.4 \text{ ton/yr} \end{matrix}$$

H2S DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 3
TEST DATE: 7/20/2007

INPUT

H2S AVERAGE READING (C): <0.32 ppmv
H2S PPMV @ 3% O2: <0.35 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

H2S CONC. (lbs/dscf) =

$$C_{\text{gas, lb/dscf}} = (C_{\text{gas, ppm}}) \left(\frac{34.08 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.0283 \times 10^{-6} \text{ lbs/dscf}$$

H2S EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK H2S EMISSION RATE =

$$H_2S_{\text{pmr}} = (C_{\text{gas, lb/dscf}})(Q_{\text{std}}) = <0.0061 \text{ lbs/hr}$$
$$= <0.027 \text{ ton/yr}$$

**COS DATA SHEET
USEPA METHOD 15**

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 3
TEST DATE: 7/20/2007

INPUT

COS AVERAGE CHART READING (C): <0.26 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

COS CONC. (lbs/dscf) =

$$C_{gas, lb/dscf} = (C_{gas, ppm}) \left(\frac{60.07 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.041 \times 10^{-6} \text{ lbs/dscf}$$

COS EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK COS EMISSION RATE =

$$\text{COS}_{pmr} = (C_{gas, lb/dscf})(Q_{std}) = <0.009 \text{ lbs/hr}$$
$$= <0.038 \text{ ton/yr}$$

CS2 DATA SHEET USEPA METHOD 15

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 3
TEST DATE: 7/20/2007

INPUT

CS2 AVERAGE CHART READING (C): <0.32 ppmv

STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

CS2 CONC.(lbs/dscf) =

$$C_{gas,lb/dscf} = (C_{gas,ppm}) \left(\frac{76.14 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.063 \times 10^{-6} \text{ lbs/dscf}$$

CS2 EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK CS₂ EMISSION RATE =

$$CS_2 \text{ pmr} = (C_{gas,lb/dscf})(Q_{std}) = <0.014 \text{ lbs/hr}$$

$$= <0.059 \text{ ton/yr}$$

**TRS as SO2 DATA SHEET
USEPA METHOD 15**

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: GC-FPD
RUN NO: 3
TEST DATE: 7/20/2007

INPUT

TRS AVERAGE CHART READING (C): <1.2 ppmv
TRS PPMV @ 0% O2: <1.6 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

TRS CONC. (lbs/dscf) =

$$C_{\text{gas, lb/dscf}} = (C_{\text{gas, ppm}}) \left(\frac{64 \text{ lb/lb-mole}}{385.26 \times 10^6 \text{ ft}^3/\text{lb-mole}} \right) = <0.203 \times 10^{-6} \text{ lbs/dscf}$$

TRS EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK TRS EMISSION RATE =

$$\text{TRS} = (C_{\text{gas, lb/dscf}})(Q_{\text{std}}) = <0.043 \text{ lbs/hr} \\ = <0.19 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
 SOURCE : SRU Scrubber
 REPETITION : 4
 TEST DATE : 7/19/2007
 START TIME : 21:01
 END TIME : 22:01

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.120
 AVERAGE ZERO BIAS (C_o): 0.220
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.51

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 198.39
 AVERAGE ZERO BIAS (C_o): 0.67
 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 84.9

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 44.02
 AVERAGE ZERO BIAS (C_o): -2.01
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 10.3

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 42.58
 AVERAGE ZERO BIAS (C_o): -1.43
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 5.5

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.89
 AVERAGE ZERO BIAS (C_o): -0.12
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.5

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
21:01	0	---	---	---	---	---
21:02	1	82.4	4.5	20.5	4.60	10.52
21:03	2	82.3	4.2	27.0	4.42	10.67
21:04	3	82.1	4.1	26.1	4.58	10.55
21:05	4	82.4	4.1	25.7	4.68	10.45
21:06	5	82.8	3.9	28.8	4.65	10.44
21:07	6	82.9	3.6	29.6	4.44	10.57
21:08	7	83.4	4.0	22.8	4.53	10.46
21:09	8	83.9	3.5	20.6	4.78	10.27
21:10	9	84.0	3.2	17.1	4.75	10.29
21:11	10	84.4	3.1	17.8	4.54	10.45
21:12	11	84.5	3.0	17.2	4.51	10.48
21:13	12	84.6	3.0	17.8	4.75	10.37
21:14	13	84.4	2.8	14.6	4.72	10.40
21:15	14	84.9	3.0	15.2	4.82	10.46
21:16	15	84.9	3.1	12.3	4.49	10.53
21:17	16	85.3	3.3	10.2	4.72	10.35
21:18	17	85.7	3.2	7.9	4.81	10.28
21:19	18	86.1	3.1	7.9	4.72	10.33
21:20	19	86.4	3.1	6.8	4.53	10.45
21:21	20	86.7	2.9	5.1	4.73	10.31
21:22	21	86.4	2.6	5.8	4.8	10.3
21:23	22	86.2	2.5	6.1	4.7	10.4
21:24	23	85.5	2.5	6.5	4.6	10.4
21:25	24	85.8	2.9	5.7	4.7	10.4
21:26	25	85.9	3.1	5.4	4.7	10.3
21:27	26	85.8	3.2	4.0	4.7	10.3
21:28	27	86.2	3.4	4.0	4.6	10.4
21:29	28	86.4	3.5	3.5	4.8	10.2
21:30	29	86.4	3.5	4.2	4.8	10.2
21:31	30	86.0	3.8	5.3	4.7	10.3
21:32	31	85.4	3.8	6.9	4.5	10.5
21:33	32	85.1	3.9	8.1	4.7	10.4
21:34	33	84.9	4.0	7.4	4.7	10.3
21:35	34	84.8	4.1	6.5	4.6	10.4
21:36	35	84.8	4.1	6.2	4.5	10.5
21:37	36	85.4	4.1	3.9	4.8	10.3
21:38	37	85.4	4.1	4.2	4.8	10.3
21:39	38	85.6	4.1	2.6	4.6	10.4
21:40	39	85.9	4.2	2.2	4.8	10.3
21:41	40	86.1	4.3	1.1	4.9	10.2
21:42	41	86.0	4.2	1.5	4.8	10.3
21:43	42	84.4	-14.2	1.0	4.3	10.0
21:44	43	84.5	5.9	0.3	4.7	10.2
21:45	44	85.3	6.0	1.2	4.9	10.2
21:46	45	85.0	6.2	0.8	4.7	10.4
21:47	46	85.4	6.2	0.2	4.6	10.4
21:48	47	85.1	6.1	1.3	4.8	10.4
21:49	48	84.4	6.0	1.4	4.7	10.5
21:50	49	83.5	6.1	2.4	4.4	10.7
21:51	50	82.5	6.1	1.8	4.3	10.6
21:52	51	82.4	6.1	3.7	4.5	10.5
21:53	52	82.7	6.0	3.5	4.6	10.5
21:54	53	82.4	6.1	6.3	4.4	10.6
21:55	54	82.4	6.1	7.1	4.4	10.6
21:56	55	83.0	6.1	7.8	4.6	10.5
21:57	56	83.4	6.1	5.7	4.7	10.4
21:58	57	83.4	6.2	6.6	4.5	10.5
21:59	58	83.6	6.0	3.4	4.6	10.5
22:00	59	83.9	6.0	3.8	4.8	10.3
22:01	60	84.3	5.9	2.5	4.8	10.4
Uncorrected Average =		84.59	3.99	8.55	4.637	10.402

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 4
TEST DATE: 7/19/2007

INPUT

SO₂ AVERAGE CHART READING (C): 4.0 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -1.4 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 42.6 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 217,083 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 3.99 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 5.5 \text{ ppmv db}$$

(corrected)

SO₂ CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.92 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 217,083 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.20 \text{ lbs/hr}$$

= 0.9 ton/yr

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 4
TEST DATE: 7/19/2007

INPUT

NO_x AVERAGE CHART READING (C): 84.59 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.7 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 198.4 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 217,083 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 84.59 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o} = 84.88 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 10.135 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 217,083 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 2.200 \text{ lbs/hr} = 9.64 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 4
TEST DATE: 7/19/2007

INPUT

CO AVERAGE CHART READING (C): 8.5 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -2.0 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 44.0 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 217,083 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 8.5 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 10.3 \text{ ppmv db}$$

(corrected)

CO CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.75 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 217,083 dscfh

STACK CO EMISSION RATE =

$$\boxed{\text{CO}_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = \begin{matrix} 0.16 \text{ lbs/hr} \\ 0.7 \text{ ton/yr} \end{matrix}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 5
TEST DATE : 7/20/2007
START TIME : 9:48
END TIME : 10:48

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.041
 AVERAGE ZERO BIAS (C_o): 0.189

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.87

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 195.15
 AVERAGE ZERO BIAS (C_o): 0.93

 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 82.2

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 45.29
 AVERAGE ZERO BIAS (C_o): -0.29

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 3.8

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 42.58
 AVERAGE ZERO BIAS (C_o): 1.52

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 3.3

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.91
 AVERAGE ZERO BIAS (C_o): -0.16

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.8

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
9:48	0					
9:49	1	78.2	4.2	-0.8	4.68	10.99
9:50	2	77.5	5.5	-1.4	4.50	11.10
9:51	3	76.9	5.8	-0.6	4.57	11.04
9:52	4	76.8	6.0	0.0	4.64	10.98
9:53	5	76.1	5.3	-0.1	4.51	11.01
9:54	6	76.4	5.0	0.5	4.62	10.87
9:55	7	76.5	4.9	1.0	4.84	10.72
9:56	8	76.4	5.4	3.1	4.68	10.92
9:57	9	77.1	5.1	3.8	4.73	10.98
9:58	10	77.0	4.6	4.5	4.82	10.93
9:59	11	77.1	4.2	5.9	4.76	10.99
10:00	12	77.1	4.2	7.4	4.79	11.00
10:01	13	76.9	4.4	6.9	4.76	11.03
10:02	14	77.5	4.5	6.4	4.88	10.93
10:03	15	77.5	4.1	6.4	4.87	10.99
10:04	16	77.9	4.5	7.7	4.74	11.09
10:05	17	77.9	4.5	6.1	4.66	11.08
10:06	18	77.9	4.6	6.2	4.89	10.85
10:07	19	78.3	4.7	5.2	4.96	10.74
10:08	20	79.0	4.5	5.9	4.80	10.86
10:09	21	79.7	4.1	5.0	4.9	10.8
10:10	22	79.9	3.5	6.5	5.0	10.7
10:11	23	80.1	3.1	5.8	5.0	10.7
10:12	24	80.4	3.6	5.5	4.7	10.9
10:13	25	80.9	3.6	6.6	4.9	10.8
10:14	26	80.5	3.1	8.3	5.0	10.7
10:15	27	80.4	2.8	10.8	4.8	10.9
10:16	28	80.6	2.3	8.7	4.7	11.0
10:17	29	80.9	1.9	7.6	4.9	10.8
10:18	30	81.0	1.7	7.2	4.9	10.7
10:19	31	81.8	1.8	7.0	4.9	10.7
10:20	32	82.6	1.7	5.5	4.8	10.8
10:21	33	82.9	1.6	5.8	5.0	10.6
10:22	34	82.8	1.6	5.4	5.1	10.5
10:23	35	83.0	1.8	4.0	5.1	10.6
10:24	36	83.7	2.0	2.1	4.9	10.7
10:25	37	84.1	2.4	1.8	5.1	10.5
10:26	38	83.9	2.9	1.3	5.1	10.5
10:27	39	83.9	3.0	1.2	5.1	10.5
10:28	40	83.9	3.2	0.6	5.0	10.6
10:29	41	83.6	3.4	1.3	5.3	10.5
10:30	42	83.4	3.7	1.2	5.2	10.6
10:31	43	83.1	4.2	1.2	4.9	10.8
10:32	44	82.9	4.3	1.9	4.8	10.8
10:33	45	82.2	4.3	1.4	4.9	10.7
10:34	46	81.8	4.5	1.6	4.9	10.7
10:35	47	81.5	4.5	2.1	4.7	10.8
10:36	48	82.3	4.6	2.4	4.8	10.7
10:37	49	82.4	4.4	3.5	4.9	10.6
10:38	50	82.8	4.7	3.6	4.9	10.6
10:39	51	83.5	4.8	3.5	4.9	10.5
10:40	52	83.9	4.8	3.6	5.0	10.4
10:41	53	84.3	4.9	4.1	4.9	10.5
10:42	54	84.4	10.3	2.2	4.8	10.6
10:43	55	85.2	28.7	-0.3	5.2	10.2
10:44	56	84.4	4.9	0.8	5.5	10.1
10:45	57	83.9	4.8	-0.4	5.3	10.6
10:46	58	83.2	4.9	-1.1	5.4	10.6
10:47	59	82.3	7.9	-0.9	5.6	10.6
10:48	60	81.9	4.5	-0.9	5.4	10.7
Uncorrected Average =		80.76	4.52	3.53	4.916	10.743

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
RUN NUMBER: Runs 5-6

SOURCE: SRU Scrubber
TEST DATE: 7/20/2007

BAROMETRIC: 29.97 in. Hg	STACK DIAM: 23.50 inches	
STATIC PRES: 0.18 in.H ₂ O	CO₂: 10.83 % by volume	
STACK TEMP: 153.4 °F	O₂: 4.80 % by volume	
SQ. RT ΔP: 0.4912 in.H ₂ O		

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	29.92	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	26.91	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.4912	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 153.4 \text{ °F} + 460$	=	613	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.98	in. Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	30.76	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	5,559	acfm
Stack Area = 3.012 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	4,795 287,694	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	3,581 214,885	dscfm dscfh

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
TEST DATE: 7/20/2007
RUN NUMBER: Runs 5-6

γ FACTOR:	0.999	STACK DIAM:	23.50 inches
BAROMETRIC:	29.97 in. Hg	METER VOLUME:	48.569 ft ³
STATIC PRES:	0.18 in.H ₂ O	METER TEMP:	78.3 °F
STACK TEMP:	153.4 °F	LIQUID COLL:	344.6 milliliters
SQ. RT ΔP:	0.4912 in.H ₂ O	CO₂:	10.83 % by volume
ΔH:	1.67 in.H ₂ O	O₂:	4.80 % by volume

ENGLISH UNITS
(29.92 in.Hg & °F)

VOLUME OF SAMPLE

@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 47.871 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE

@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 16.220 \text{ scf}$$

$V_{lc} = 344.6 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.253$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right]} - 0.5}{P} = 0.266$$

$T = 340.4 \text{ °K}$
 $P = 761.6 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.253$$

SO₂ CALIBRATION CORRECTION DATA SHEET USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 5
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 4.5 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 1.5 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 42.6 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,885 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 4.5 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \text{C}_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 3.3 \text{ ppmv db}$$

(corrected)

SO₂ CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.55 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,885 dscfh

STACK SO₂ EMISSION RATE =

$$\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.12 \text{ lbs/hr}$$

$$= 0.5 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 5
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 80.76 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.9 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 195.2 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,885 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 80.76 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 82.21 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 9.815 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,885 dscfh

STACK NO_x EMISSION RATE =

$$\boxed{\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 2.109 \text{ lbs/hr} = 9.24 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 5
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C):	3.5 ppmv
AVG PRE/POST ZERO DRIFT READING (C _o):	-0.3 ppmv
CAL GAS CONCENTRATION (C _{ma}):	45.0 ppmv
AVG CAL PRE/POST TEST READING (C _m):	45.3 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q _{std}):	214,885 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 3.5 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 3.8 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.27 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,885 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.06 \text{ lbs/hr} = 0.3 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 6
TEST DATE : 7/20/2007
START TIME : 11:17
END TIME : 12:17

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.048
 AVERAGE ZERO BIAS (C_o): 0.197

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.72

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 193.11
 AVERAGE ZERO BIAS (C_o): 0.88

 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 83.4

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 46.36
 AVERAGE ZERO BIAS (C_o): -0.22

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 9.7

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 43.30
 AVERAGE ZERO BIAS (C_o): 1.15

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 4.1

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.77
 AVERAGE ZERO BIAS (C_o): -0.10

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.8

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
11:17	0	---	---	---	---	---
11:18	1	74.9	8.6	3.0	4.91	10.92
11:19	2	74.7	7.9	4.5	4.85	11.16
11:20	3	74.4	7.1	4.3	5.14	10.94
11:21	4	74.4	6.5	3.0	4.84	10.96
11:22	5	74.9	6.0	3.3	4.66	11.10
11:23	6	74.7	5.7	7.1	4.78	11.13
11:24	7	74.3	5.4	9.0	4.66	11.17
11:25	8	74.2	5.2	10.9	4.56	11.18
11:26	9	74.9	5.1	11.1	4.67	11.02
11:27	10	75.0	4.9	14.6	4.62	10.96
11:28	11	75.7	4.9	18.0	4.84	10.76
11:29	12	76.0	4.7	21.2	4.71	10.83
11:30	13	76.7	4.6	22.3	4.51	10.93
11:31	14	77.3	4.5	21.4	4.85	10.72
11:32	15	77.7	4.7	20.5	4.81	10.76
11:33	16	78.1	4.4	19.9	4.65	10.86
11:34	17	78.5	4.8	15.4	4.70	10.78
11:35	18	78.9	4.7	16.1	4.85	10.71
11:36	19	79.1	3.9	17.1	4.76	10.80
11:37	20	79.7	3.9	15.5	4.80	10.73
11:38	21	79.9	4.0	11.4	4.9	10.6
11:39	22	80.0	4.3	15.5	4.6	10.8
11:40	23	80.7	4.5	13.1	4.7	10.7
11:41	24	80.9	4.6	11.6	4.9	10.6
11:42	25	81.7	4.6	10.5	4.9	10.6
11:43	26	82.5	4.4	7.7	4.8	10.6
11:44	27	82.9	4.7	7.6	4.9	10.5
11:45	28	82.9	5.0	6.3	5.0	10.5
11:46	29	82.9	5.8	4.5	5.0	10.5
11:47	30	83.5	5.6	2.1	4.8	10.6
11:48	31	83.9	5.7	4.2	4.8	10.6
11:49	32	83.0	5.4	4.0	5.0	10.4
11:50	33	83.1	5.2	4.1	5.0	10.4
11:51	34	83.1	5.7	4.8	4.8	10.6
11:52	35	82.6	5.5	6.2	4.7	10.6
11:53	36	82.4	5.5	7.1	4.8	10.5
11:54	37	82.4	5.9	8.6	4.7	10.5
11:55	38	82.2	5.2	11.0	4.5	10.6
11:56	39	82.4	4.2	13.3	4.7	10.5
11:57	40	82.4	4.1	13.1	4.8	10.4
11:58	41	82.4	12.8	15.1	4.6	10.5
11:59	42	82.6	5.2	14.5	4.5	10.5
12:00	43	83.2	5.4	12.4	4.8	10.3
12:01	44	83.5	5.8	14.7	4.8	10.2
12:02	45	83.9	5.8	15.5	4.7	10.3
12:03	46	84.6	6.2	11.5	4.6	10.4
12:04	47	85.2	7.8	10.7	4.8	10.2
12:05	48	84.8	5.2	8.7	4.8	10.2
12:06	49	85.6	1.9	7.1	4.7	10.3
12:07	50	85.8	1.3	7.8	4.9	10.2
12:08	51	85.3	1.4	6.4	5.0	10.1
12:09	52	85.6	1.5	5.0	4.8	10.3
12:10	53	85.9	2.0	4.6	4.7	10.3
12:11	54	85.5	2.6	5.5	4.9	10.2
12:12	55	85.4	3.1	3.9	4.9	10.2
12:13	56	85.8	3.7	5.3	4.7	10.4
12:14	57	85.2	4.1	5.0	4.6	10.4
12:15	58	84.9	4.4	5.6	4.8	10.2
12:16	59	84.9	4.7	5.4	4.9	10.2
12:17	60	85.2	5.0	4.5	4.6	10.1
Uncorrected Average =		81.06	4.96	9.87	4.777	10.588

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

SO₂ CALIBRATION CORRECTION DATA SHEET
USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 6
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 5.0 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): 1.2 ppmv
CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 43.3 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,885 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 5.0 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 4.1 \text{ ppmv db}$$

(corrected)

SO₂ CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.67 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,885 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.15 \text{ lbs/hr}$$

= 0.6 ton/yr

Marathon CORRECTION DATA SHEET USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 6
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 81.06 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.9 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 193.1 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,885 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 81.06 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \left(\bar{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 83.42 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = \left(C_{\text{gas,ppm}} \right) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 9.961 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,885 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = \left(C_{\text{gas,lb/dscf}} \right) (Q_{\text{std}}) = 2.140 \text{ lbs/hr} = 9.37 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 6
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C): 9.9 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): -0.2 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 46.4 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,885 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 9.9 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 9.7 \text{ ppmv db}$$

CO CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.71 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,885 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = \begin{matrix} 0.15 \text{ lbs/hr} \\ 0.7 \text{ ton/yr} \end{matrix}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 7
TEST DATE : 7/20/2007
START TIME : 12:40
END TIME : 13:40

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.087
 AVERAGE ZERO BIAS (C_o): 0.219

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.69

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 191.69
 AVERAGE ZERO BIAS (C_o): 0.83

 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 91.6

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 45.51
 AVERAGE ZERO BIAS (C_o): 0.46

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 5.4

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 43.19
 AVERAGE ZERO BIAS (C_o): 0.79

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.6

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.72
 AVERAGE ZERO BIAS (C_o): -0.13

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.5

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
12:40	0					
12:41	1	85.6	9.1	5.9	4.78	10.29
12:42	2	85.1	8.2	5.6	4.53	10.45
12:43	3	85.3	7.7	3.9	4.59	10.38
12:44	4	85.6	7.6	5.6	4.81	10.25
12:45	5	85.6	7.5	7.1	4.67	10.35
12:46	6	85.5	7.4	5.2	4.51	10.43
12:47	7	85.9	7.2	5.6	4.81	10.21
12:48	8	85.9	7.2	6.6	4.81	10.18
12:49	9	86.0	7.4	6.6	4.57	10.38
12:50	10	86.4	7.5	6.3	4.73	10.29
12:51	11	86.1	7.4	6.1	4.79	10.23
12:52	12	86.0	7.3	6.5	4.74	10.26
12:53	13	86.0	7.5	6.3	4.60	10.36
12:54	14	86.2	7.5	6.6	4.75	10.27
12:55	15	86.6	7.3	6.0	4.87	10.18
12:56	16	86.5	7.3	6.3	4.76	10.27
12:57	17	86.4	7.4	7.2	4.60	10.38
12:58	18	86.8	7.4	4.4	4.79	10.26
12:59	19	86.9	7.4	6.0	4.80	10.26
13:00	20	86.9	7.3	6.7	4.78	10.29
13:01	21	86.9	7.5	7.9	4.6	10.4
13:02	22	87.0	7.6	7.2	4.8	10.3
13:03	23	87.1	7.6	5.9	4.9	10.1
13:04	24	87.7	7.5	7.0	4.8	10.2
13:05	25	87.9	7.7	5.7	4.7	10.3
13:06	26	88.1	7.8	6.0	4.9	10.2
13:07	27	88.4	7.7	5.5	4.9	10.1
13:08	28	88.4	7.8	5.7	4.8	10.3
13:09	29	88.0	7.6	7.2	4.7	10.4
13:10	30	87.9	7.6	8.2	4.9	10.3
13:11	31	87.4	7.7	8.0	4.8	10.4
13:12	32	86.9	7.8	8.6	4.5	10.6
13:13	33	87.2	7.8	8.1	4.7	10.4
13:14	34	87.6	7.8	5.6	4.9	10.3
13:15	35	87.9	6.6	6.1	4.7	10.3
13:16	36	88.7	5.4	4.9	4.7	10.2
13:17	37	89.4	5.3	3.9	5.0	10.0
13:18	38	90.0	5.5	4.2	5.0	9.9
13:19	39	90.7	6.2	5.6	4.8	10.1
13:20	40	91.2	6.1	4.1	4.9	10.0
13:21	41	91.4	6.0	4.1	5.0	9.9
13:22	42	91.6	6.0	5.2	5.0	10.0
13:23	43	91.2	6.1	6.9	4.7	10.3
13:24	44	90.6	6.3	5.8	4.8	10.3
13:25	45	90.4	6.4	6.0	5.0	10.2
13:26	46	90.0	6.5	7.1	4.9	10.3
13:27	47	89.4	6.3	5.8	4.7	10.5
13:28	48	89.4	6.1	5.6	4.8	10.4
13:29	49	89.4	6.3	4.7	4.9	10.2
13:30	50	89.6	6.5	4.6	4.9	10.3
13:31	51	89.7	6.5	4.9	4.7	10.3
13:32	52	90.3	6.6	4.7	4.8	10.2
13:33	53	91.0	6.5	4.6	4.9	10.1
13:34	54	91.2	6.6	4.6	4.9	10.2
13:35	55	90.9	6.7	5.7	4.7	10.3
13:36	56	91.2	7.0	4.5	4.9	10.2
13:37	57	91.2	7.0	4.6	4.9	10.2
13:38	58	90.9	7.0	5.0	4.9	10.2
13:39	59	90.9	6.6	4.9	4.7	10.3
13:40	60	90.4	6.3	4.6	4.9	10.1
Uncorrected Average =		88.26	7.04	5.84	4.781	10.250

Example Calculation =
$$C_{\text{gas}} = \frac{(\bar{C} - C_o) C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
TEST DATE: 7/20/2007
RUN NUMBER: Runs 7-8

γ FACTOR:	0.999	STACK DIAM:	23.50 inches
BAROMETRIC:	29.97 in. Hg	METER VOLUME:	54.482 ft ³
STATIC PRES:	0.15 in.H ₂ O	METER TEMP:	83.0 °F
STACK TEMP:	154.9 °F	LIQUID COLL:	431.5 milliliters
SQ. RT ΔP:	0.5043 in.H ₂ O	CO₂:	10.56 % by volume
ΔH:	2.03 in.H ₂ O	O₂:	4.65 % by volume

ENGLISH UNITS
(29.92 in.Hg & °F)

VOLUME OF SAMPLE

@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 53.276 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE

@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 20.311 \text{ scf}$$

$V_{lc} = 431.5 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.276$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right] - 0.5}}{P} = 0.276$$

$T = 341.3 \text{ °K}$
 $P = 761.5 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.276$$

SO₂ CALIBRATION CORRECTION DATA SHEET USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 7
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 7.0 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 43.2 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 7.04 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 6.6 \text{ ppmv db}$$

(corrected)

SO₂ CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 1.10 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.24 \text{ lbs/hr}$$

= 1.0 ton/yr

NO_x CALIBRATION CORRECTION DATA SHEET
USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 7
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 88.26 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 191.7 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 88.26 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 91.62 \text{ ppmv db}$$

(corrected)

NO_x CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 10.939 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK NO_x EMISSION RATE =

$$\boxed{\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 2.350 \text{ lbs/hr}$$

= 10.29 ton/yr

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
RUN NUMBER: Runs 7-8

SOURCE: SRU Scrubber
TEST DATE: 7/20/2007

BAROMETRIC: 29.97 in. Hg	STACK DIAM: 23.50 inches	
STATIC PRES: 0.15 in.H ₂ O	CO₂: 10.56 % by volume	
STACK TEMP: 154.9 °F	O₂: 4.65 % by volume	
SQ.RT ΔP: 0.5043 in.H ₂ O		

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	29.88	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d (1 - B_{ws}) + 18B_{ws}$	=	26.60	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\overline{\sqrt{\Delta P}} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.5043	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 154.9 \text{ °F} + 460$	=	615	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.98	in.Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg} \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	31.80	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	5,747	acfm
Stack Area = 3.012 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92} \right) (Q_s) \left(\frac{P_s}{T_s} \right)$	=	4,945 296,697	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92} \right) (Q_s) \left(\frac{P_s}{T_s} \right) (1 - B_{ws})$	=	3,580 214,815	dscfm dscfh

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 7
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C): 5.8 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.5 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 45.5 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 5.8 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 5.4 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.39 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK CO EMISSION RATE =

$$\text{CO}_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = \begin{matrix} 0.08 \text{ lbs/hr} \\ 0.4 \text{ ton/yr} \end{matrix}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
 SOURCE : SRU Scrubber
 REPETITION : 8
 TEST DATE : 7/20/2007
 START TIME : 14:00
 END TIME : 15:00

GAS ANALYZER O₂

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.087
 AVERAGE ZERO BIAS (C_o): 0.220
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.62

GAS ANALYZER NO_x

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 193.68
 AVERAGE ZERO BIAS (C_o): 0.83
 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 91.3

GAS ANALYZER CO

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 45.29
 AVERAGE ZERO BIAS (C_o): 0.47
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.7

GAS ANALYZER SO₂

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 44.14
 AVERAGE ZERO BIAS (C_o): 0.73
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.8

GAS ANALYZER CO₂

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.71
 AVERAGE ZERO BIAS (C_o): -0.13
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.6

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
14:00	0					
14:01	1	89.6	7.1	7.4	4.80	10.27
14:02	2	89.0	6.9	8.0	4.63	10.42
14:03	3	88.9	6.7	6.6	4.78	10.32
14:04	4	88.6	6.3	6.5	4.87	10.25
14:05	5	88.2	5.9	7.2	4.62	10.42
14:06	6	87.9	5.8	6.0	4.58	10.43
14:07	7	88.8	5.6	5.5	4.82	10.24
14:08	8	88.7	5.3	5.8	4.82	10.18
14:09	9	88.9	5.4	5.4	4.62	10.32
14:10	10	89.0	5.3	5.8	4.68	10.28
14:11	11	89.4	5.3	6.5	4.82	10.19
14:12	12	89.3	5.3	7.4	4.79	10.24
14:13	13	87.5	5.4	8.1	4.67	10.37
14:14	14	86.5	5.5	8.5	4.58	10.44
14:15	15	86.9	5.2	8.9	4.81	10.28
14:16	16	86.9	5.3	8.4	4.81	10.28
14:17	17	86.7	5.3	9.5	4.69	10.36
14:18	18	86.5	5.4	9.3	4.54	10.42
14:19	19	87.3	6.2	9.3	4.81	10.24
14:20	20	87.8	6.4	9.6	4.88	10.18
14:21	21	87.9	6.5	9.5	4.6	10.3
14:22	22	88.3	6.7	8.4	4.6	10.3
14:23	23	88.9	6.8	8.3	4.9	10.2
14:24	24	88.9	7.0	8.1	4.8	10.2
14:25	25	88.9	7.1	8.0	4.7	10.3
14:26	26	88.8	7.4	7.7	4.7	10.3
14:27	27	88.9	7.6	6.1	4.9	10.2
14:28	28	88.8	7.7	6.7	4.8	10.2
14:29	29	88.9	18.3	6.0	4.8	10.3
14:30	30	88.9	7.7	5.0	4.6	10.4
14:31	31	89.4	7.7	5.4	4.8	10.2
14:32	32	89.4	7.9	5.1	4.9	10.2
14:33	33	89.3	7.7	6.0	4.8	10.3
14:34	34	88.9	7.8	5.8	4.7	10.3
14:35	35	89.6	7.8	5.6	4.8	10.2
14:36	36	89.9	7.9	5.2	4.9	10.2
14:37	37	89.3	7.9	5.8	4.7	10.3
14:38	38	89.0	8.1	5.4	4.6	10.4
14:39	39	89.3	8.1	5.2	4.8	10.3
14:40	40	89.2	9.1	5.7	4.8	10.3
14:41	41	88.4	8.1	6.8	4.6	10.4
14:42	42	87.9	8.2	6.1	4.5	10.5
14:43	43	88.1	8.2	6.1	4.7	10.3
14:44	44	88.0	8.1	6.6	4.7	10.3
14:45	45	88.1	8.1	8.3	4.6	10.4
14:46	46	87.8	7.9	7.8	4.5	10.4
14:47	47	89.1	8.0	6.3	4.7	10.2
14:48	48	90.2	7.8	7.9	4.8	10.2
14:49	49	90.3	8.1	8.9	4.7	10.2
14:50	50	89.9	7.9	7.8	4.6	10.3
14:51	51	90.9	7.7	6.7	4.8	10.2
14:52	52	90.9	7.6	7.4	4.8	10.2
14:53	53	90.9	7.7	7.8	4.7	10.3
14:54	54	90.4	7.5	7.8	4.6	10.4
14:55	55	90.3	7.6	7.1	4.7	10.3
14:56	56	90.8	7.6	6.8	4.8	10.3
14:57	57	90.3	7.5	6.5	4.7	10.3
14:58	58	89.5	7.7	7.8	4.5	10.5
14:59	59	89.2	7.7	5.9	4.6	10.4
15:00	60	89.1	7.7	12.8	4.8	10.1
Uncorrected Average =		88.88	7.25	7.14	4.717	10.297

Example Calculation =
$$C_{\text{gas}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o}$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 8
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 7.3 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.7 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 44.1 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 7.25 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o} = 6.8 \text{ ppmv db}$$

SO₂ CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 1.12 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK SO₂ EMISSION RATE =

$$\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.24 \text{ lbs/hr} = 1.1 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 8
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 88.88 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 193.7 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 88.88 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = \frac{(\bar{C} - C_o) C_{ma}}{C_m - C_o} = 91.31 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 10.902 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 2.342 \text{ lbs/hr} = 10.26 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 8
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C): 7.1 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.5 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 45.3 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 214,815 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 7.1 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 6.7 \text{ ppmv db}$$

CO CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 0.49 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 214,815 dscfh

STACK CO EMISSION RATE =

$$CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.10 \text{ lbs/hr} = 0.5 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 9
TEST DATE : 7/20/2007
START TIME : 15:34
END TIME : 16:34

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.067
 AVERAGE ZERO BIAS (C_o): 0.212
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.58

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 193.61
 AVERAGE ZERO BIAS (C_o): 0.83
 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 97.0

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 46.35
 AVERAGE ZERO BIAS (C_o): 0.30
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 4.8

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 44.50
 AVERAGE ZERO BIAS (C_o): 0.75
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 7.4

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.72
 AVERAGE ZERO BIAS (C_o): -0.14
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.5

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
15:34	0					
15:35	1	92.5	10.7	8.9	4.66	10.36
15:36	2	91.4	10.1	7.4	4.44	10.49
15:37	3	92.2	9.6	6.0	4.72	10.27
15:38	4	92.9	9.8	5.8	4.83	10.12
15:39	5	92.8	9.9	5.6	4.55	10.24
15:40	6	93.3	9.8	5.2	4.65	10.15
15:41	7	94.4	9.8	6.2	4.84	10.05
15:42	8	94.0	9.4	8.3	4.79	10.17
15:43	9	93.4	9.5	8.6	4.59	10.40
15:44	10	92.8	9.2	6.2	4.51	10.43
15:45	11	93.7	9.1	5.2	4.78	10.19
15:46	12	93.7	8.9	4.8	4.83	10.05
15:47	13	94.4	8.7	4.9	4.74	10.04
15:48	14	94.5	8.9	5.6	4.58	10.14
15:49	15	95.2	8.8	6.2	4.80	10.01
15:50	16	95.4	8.6	6.6	4.84	10.04
15:51	17	95.1	8.5	6.5	4.76	10.17
15:52	18	94.2	9.0	8.9	4.57	10.37
15:53	19	94.0	8.9	7.0	4.66	10.31
15:54	20	94.3	8.6	7.0	4.78	10.25
15:55	21	94.0	8.6	7.3	4.7	10.3
15:56	22	92.8	8.4	7.7	4.5	10.5
15:57	23	93.1	8.3	6.4	4.6	10.4
15:58	24	93.8	7.8	5.9	4.8	10.3
15:59	25	93.7	7.5	5.9	4.6	10.3
16:00	26	93.5	7.6	3.3	4.5	10.3
16:01	27	95.0	7.6	3.4	4.8	10.1
16:02	28	95.6	7.4	4.9	4.9	10.0
16:03	29	95.5	7.4	5.3	4.6	10.2
16:04	30	96.1	7.4	5.3	4.7	10.2
16:05	31	96.9	7.3	4.5	4.8	10.1
16:06	32	96.8	7.5	4.7	4.7	10.2
16:07	33	95.9	7.7	4.5	4.6	10.3
16:08	34	96.0	7.7	2.8	4.7	10.2
16:09	35	96.3	7.9	4.7	4.8	10.2
16:10	36	95.8	7.7	4.9	4.8	10.2
16:11	37	94.8	7.8	4.5	4.5	10.4
16:12	38	95.1	7.9	3.6	4.7	10.3
16:13	39	95.0	7.7	4.2	4.7	10.3
16:14	40	94.8	7.8	4.6	4.7	10.3
16:15	41	93.7	7.7	4.7	4.5	10.4
16:16	42	93.9	7.7	2.6	4.6	10.3
16:17	43	94.8	7.7	3.0	4.7	10.2
16:18	44	94.9	7.6	2.9	4.7	10.2
16:19	45	94.3	7.2	4.3	4.5	10.4
16:20	46	93.8	7.0	3.7	4.5	10.4
16:21	47	94.4	7.0	4.1	4.7	10.3
16:22	48	94.7	7.0	4.3	4.7	10.3
16:23	49	94.0	7.1	4.6	4.5	10.4
16:24	50	93.7	7.2	3.3	4.6	10.3
16:25	51	95.0	7.3	4.0	4.8	10.1
16:26	52	94.4	7.2	4.3	4.5	10.3
16:27	53	93.8	7.1	3.3	4.4	10.4
16:28	54	94.8	7.0	4.0	4.7	10.2
16:29	55	94.9	6.7	4.4	4.7	10.3
16:30	56	94.4	5.8	5.3	4.5	10.4
16:31	57	93.3	5.6	5.2	4.4	10.4
16:32	58	94.5	5.6	4.2	4.7	10.3
16:33	59	95.2	5.8	4.5	4.7	10.2
16:34	60	94.9	5.8	7.8	4.6	10.3
Uncorrected Average =		94.36	7.96	5.23	4.660	10.253

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
RUN NUMBER: Runs 9-10

SOURCE: SRU Scrubber
TEST DATE: 7/20/2007

BAROMETRIC: 29.97 in. Hg	STACK DIAM: 23.50 inches	
STATIC PRES: 0.16 in.H ₂ O	CO₂: 10.78 % by volume	
STACK TEMP: 157 °F	O₂: 4.57 % by volume	
SQ.RT ΔP: 0.499 in.H ₂ O		

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	29.91	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	26.48	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.4990	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 157.0\text{ °F} + 460$	=	617	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.98	in.Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	31.59	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	5,709	acfm
Stack Area = 3.012 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	4,895 293,719	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	3,487 209,249	dscfm dscfh

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
TEST DATE: 7/20/2007
RUN NUMBER: Runs 9-10

γ FACTOR:	0.999	STACK DIAM:	23.5 inches
BAROMETRIC:	29.97 in. Hg	METER VOLUME:	53.855 ft ³
STATIC PRES:	0.16 in.H ₂ O	METER TEMP:	95.9 °F
STACK TEMP:	157 °F	LIQUID COLL:	441.2 milliliters
SQ. RT ΔP:	0.499 in.H ₂ O	CO₂:	10.78142 % by volume
ΔH:	2.06 in.H ₂ O	O₂:	4.574363 % by volume

ENGLISH UNITS
(29.92 in.Hg & °F)

VOLUME OF SAMPLE
@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 51.445 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE
@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 20.767 \text{ scf}$$

$V_{lc} = 441.2 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.288$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right]} - 0.5}{P} = 0.291$$

$T = 342.4 \text{ °K}$
 $P = 761.5 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.288$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 9
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 8.0 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 44.5 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 8.0 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 7.4 \text{ ppmv db}$$

SO₂ CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 1.23 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK SO₂ EMISSION RATE =

$$\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.26 \text{ lbs/hr} = 1.1 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET
USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 9
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 94.36 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 193.6 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 94.36 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 97.03 \text{ ppmv db}$$

NO_x CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 11.586 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK NO_x EMISSION RATE =

$$\boxed{\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 2.424 \text{ lbs/hr} \\ = 10.62 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 9
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C):	5.2 ppmv
AVG PRE/POST ZERO DRIFT READING (C _o):	0.3 ppmv
CAL GAS CONCENTRATION (C _{ma}):	45.0 ppmv
AVG CAL PRE/POST TEST READING (C _m):	46.3 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q _{std}):	209,249 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 5.2 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 4.8 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.35 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK CO EMISSION RATE =

$$\boxed{CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.07 \text{ lbs/hr} = 0.3 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
 SOURCE : SRU Scrubber
 REPETITION : 10
 TEST DATE : 7/20/2007
 START TIME : 16:54
 END TIME : 17:54

GAS ANALYZER O₂

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.065
 AVERAGE ZERO BIAS (C_o): 0.209
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.57

GAS ANALYZER NO_x

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 190.80
 AVERAGE ZERO BIAS (C_o): 0.83
 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 92.4

GAS ANALYZER CO

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 47.05
 AVERAGE ZERO BIAS (C_o): 0.28
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 1.7

GAS ANALYZER SO₂

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 43.41
 AVERAGE ZERO BIAS (C_o): 0.59
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.7

GAS ANALYZER CO₂

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.72
 AVERAGE ZERO BIAS (C_o): -0.15
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 11.0

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
16:54	0					
16:55	1	93.5	7.7	8.2	4.54	10.36
16:56	2	93.9	8.2	8.6	4.59	10.34
16:57	3	93.9	7.9	9.1	4.58	10.35
16:58	4	93.8	7.8	9.4	4.47	10.38
16:59	5	94.5	8.1	6.4	4.63	10.23
17:00	6	95.8	7.6	5.7	4.75	10.16
17:01	7	96.3	7.2	6.1	4.74	10.21
17:02	8	95.8	7.1	7.7	4.58	10.46
17:03	9	94.9	7.2	6.2	4.59	10.62
17:04	10	95.0	7.1	3.8	4.79	10.55
17:05	11	93.8	7.2	1.7	4.60	10.65
17:06	12	91.9	7.4	0.9	4.34	10.80
17:07	13	92.4	7.5	0.9	4.55	10.62
17:08	14	92.9	7.4	-0.4	4.66	10.47
17:09	15	91.7	7.5	0.0	4.42	10.59
17:10	16	92.1	7.5	0.1	4.57	10.48
17:11	17	92.9	7.3	0.8	4.76	10.38
17:12	18	91.8	7.5	0.0	4.51	10.57
17:13	19	91.4	7.8	0.5	4.60	10.51
17:14	20	91.6	7.8	1.2	4.64	10.49
17:15	21	89.0	7.7	1.4	4.3	10.8
17:16	22	89.4	7.5	0.7	4.5	10.6
17:17	23	89.4	7.3	1.3	4.5	10.7
17:18	24	87.6	7.3	1.2	4.3	10.8
17:19	25	88.8	6.9	-0.1	4.6	10.6
17:20	26	89.9	6.3	0.6	4.8	10.5
17:21	27	89.5	6.1	0.6	4.7	10.7
17:22	28	89.0	6.1	0.2	4.8	10.7
17:23	29	89.7	6.0	-0.4	4.8	10.6
17:24	30	88.3	6.1	0.2	4.5	10.8
17:25	31	87.8	6.2	0.0	4.6	10.8
17:26	32	86.8	6.1	0.7	4.5	10.9
17:27	33	84.2	6.5	0.6	4.2	11.2
17:28	34	84.9	6.5	0.4	4.5	11.0
17:29	35	84.4	6.7	1.2	4.4	11.0
17:30	36	81.6	6.2	1.6	4.1	11.2
17:31	37	82.0	4.8	0.8	4.3	11.0
17:32	38	82.9	4.4	2.1	4.5	10.9
17:33	39	81.7	4.3	4.2	4.3	11.1
17:34	40	81.7	4.5	2.2	4.4	11.1
17:35	41	83.3	5.9	2.9	4.5	10.9
17:36	42	83.0	6.6	4.7	4.5	10.9
17:37	43	82.5	7.3	5.1	4.5	11.0
17:38	44	83.9	7.5	5.4	4.7	10.9
17:39	45	85.0	7.5	3.7	4.7	10.9
17:40	46	85.8	7.8	2.8	4.8	10.9
17:41	47	86.3	7.6	1.9	4.9	10.8
17:42	48	86.4	7.5	1.2	4.9	10.8
17:43	49	86.4	7.5	1.0	4.8	10.9
17:44	50	87.3	7.3	1.5	5.1	10.8
17:45	51	87.3	7.3	0.5	5.1	10.8
17:46	52	87.2	7.2	0.1	4.8	10.8
17:47	53	87.4	7.2	-0.2	5.1	10.7
17:48	54	87.4	7.2	-0.5	5.1	10.7
17:49	55	87.4	7.0	-0.5	5.0	10.8
17:50	56	88.3	7.1	-1.0	5.4	10.6
17:51	57	88.3	7.0	-0.8	5.3	10.8
17:52	58	86.6	6.9	-1.0	4.8	11.1
17:53	59	84.9	6.9	-0.8	4.7	11.0
17:54	60	83.4	6.7	0.1	4.6	11.0
Uncorrected Average =		88.60	6.96	2.04	4.645	10.724

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_{\text{m}} - C_o}$$

SO₂ CALIBRATION CORRECTION DATA SHEET USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 10
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 7.0 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.6 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 43.4 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 7.0 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \text{(corrected)} \quad C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 6.7 \text{ ppmv db}$$

SO₂ CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 1.11 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK SO₂ EMISSION RATE =

$$\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.23 \text{ lbs/hr} = 1.0 \text{ ton/yr}$$

Marathon CORRECTION DATA SHEET
USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 10
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 88.60 ppmv
AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
AVG CAL PRE/POST TEST READING (C_m): 190.8 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 209,249 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 88.60 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 92.41 \text{ ppmv db}$$

(corrected)

NO_x CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 11.034 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK NO_x EMISSION RATE =

$$\boxed{\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 2.309 \text{ lbs/hr}$$

10.11 ton/yr

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 10
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C):	2.0 ppmv
AVG PRE/POST ZERO DRIFT READING (C _o):	0.3 ppmv
CAL GAS CONCENTRATION (C _{ma}):	45.0 ppmv
AVG CAL PRE/POST TEST READING (C _m):	47.1 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q _{std}):	209,249 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 2.0 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 1.7 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 0.12 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 209,249 dscfh

STACK CO EMISSION RATE =

$$\boxed{CO_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.03 \text{ lbs/hr}$$

$$= 0.1 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
 SOURCE : SRU Scrubber
 REPETITION : 11
 TEST DATE : 7/20/2007
 START TIME : 18:14
 END TIME : 19:14

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.062
 AVERAGE ZERO BIAS (C_o): 0.209
 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.71

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 191.02
 AVERAGE ZERO BIAS (C_o): 0.85
 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 91.7

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 47.20
 AVERAGE ZERO BIAS (C_o): 0.58
 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 3.3

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 43.20
 AVERAGE ZERO BIAS (C_o): 0.42
 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.7

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.72
 AVERAGE ZERO BIAS (C_o): -0.15
 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 11.0

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
18:14	0					
18:15	1	88.3	7.7	30.6	4.76	10.58
18:16	2	89.4	7.8	23.1	4.65	10.68
18:17	3	90.5	8.1	19.8	4.79	10.56
18:18	4	91.0	7.8	16.8	4.81	10.56
18:19	5	91.8	7.6	15.0	4.75	10.62
18:20	6	92.4	7.7	12.5	4.61	10.69
18:21	7	92.8	7.7	7.4	4.70	10.58
18:22	8	94.0	7.4	6.5	4.90	10.38
18:23	9	94.3	7.4	7.3	4.90	10.46
18:24	10	93.7	7.3	9.1	4.70	10.81
18:25	11	92.7	7.4	7.8	4.61	10.98
18:26	12	92.9	7.3	3.9	4.88	10.75
18:27	13	92.8	7.1	1.1	4.93	10.58
18:28	14	92.5	7.0	0.5	4.72	10.58
18:29	15	93.5	7.0	0.0	4.86	10.40
18:30	16	95.0	7.1	-0.1	5.17	10.17
18:31	17	95.4	7.0	-0.7	5.10	10.23
18:32	18	95.4	7.0	-0.6	4.99	10.32
18:33	19	95.9	6.9	0.4	5.29	10.16
18:34	20	94.9	6.9	-1.0	5.01	10.47
18:35	21	94.4	6.7	-0.6	4.9	10.6
18:36	22	93.6	6.6	-0.7	5.1	10.4
18:37	23	92.9	6.6	-1.0	5.0	10.5
18:38	24	91.4	6.5	-0.4	4.7	10.7
18:39	25	90.9	6.4	-0.8	4.8	10.7
18:40	26	90.2	6.4	-1.1	4.8	10.7
18:41	27	88.5	6.4	-0.8	4.6	10.8
18:42	28	88.1	6.5	-1.2	4.7	10.7
18:43	29	87.9	6.4	-1.3	4.8	10.6
18:44	30	87.5	6.4	-0.9	4.8	10.7
18:45	31	87.5	6.4	-1.4	5.0	10.5
18:46	32	87.8	6.3	-1.0	5.1	10.5
18:47	33	87.0	6.2	-1.2	4.8	10.7
18:48	34	87.1	6.3	-0.9	4.9	10.7
18:49	35	87.0	6.2	-0.7	5.1	10.6
18:50	36	86.3	6.1	-0.2	4.9	10.8
18:51	37	85.1	6.1	-0.1	4.7	11.0
18:52	38	84.4	6.2	-0.9	4.7	11.0
18:53	39	83.3	6.3	-0.1	4.6	11.0
18:54	40	80.8	6.4	-0.2	4.3	11.2
18:55	41	80.8	6.5	0.5	4.5	11.1
18:56	42	80.0	6.5	1.1	4.3	11.2
18:57	43	79.4	6.6	0.8	4.3	11.1
18:58	44	81.2	6.5	1.8	4.7	10.8
18:59	45	81.8	6.4	2.7	4.7	10.9
19:00	46	81.6	6.4	4.9	4.6	11.0
19:01	47	82.8	6.4	6.3	4.8	10.9
19:02	48	82.6	6.4	7.5	4.8	11.0
19:03	49	82.5	6.5	6.6	4.6	11.1
19:04	50	82.8	6.5	5.1	4.7	11.1
19:05	51	83.3	6.5	6.2	4.7	11.1
19:06	52	83.1	6.7	5.3	4.7	11.0
19:07	53	83.7	6.6	4.8	4.7	10.9
19:08	54	83.9	6.7	3.2	4.8	10.8
19:09	55	84.4	6.8	5.3	4.7	10.9
19:10	56	84.8	6.6	6.7	4.8	10.9
19:11	57	85.4	6.8	6.8	4.8	10.8
19:12	58	85.8	6.7	6.4	4.7	10.9
19:13	59	86.5	6.7	7.3	4.9	10.8
19:14	60	86.3	6.6	8.0	4.9	10.7
Uncorrected Average =		88.06	6.77	4.01	4.782	10.734

Example Calculation =
$$C_{\text{gas}} = (\bar{C} - C_o) \frac{C_{\text{ma}}}{C_m - C_o}$$

ARI ENVIRONMENTAL, INC.
FLOW RATE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
RUN NUMBER: Runs 11-12

SOURCE: SRU Scrubber
TEST DATE: 7/20/2007

BAROMETRIC: 29.97 in. Hg	STACK DIAM: 23.50 inches
STATIC PRES: 0.15 in.H ₂ O	CO₂: 10.93 % by volume
STACK TEMP: 155 °F	O₂: 4.72 % by volume
SQ. RT ΔP: 0.496 in.H ₂ O	

DRY MOLECULAR WEIGHT OF STACK GAS			
$M_d = 0.44(\%CO_2) + 0.32(\%O_2) + 0.28(\%N_2 + \%CO)$	=	29.94	lb/lb-mole
MOLECULAR WEIGHT OF STACK GAS, wet basis			
$M_s = M_d(1 - B_{ws}) + 18B_{ws}$	=	26.77	lb/lb-mole
PITOT TUBE COEFFICIENT			
C_p (from calibration curve or geometric specifications)	=	0.84	
AVERAGE VELOCITY HEAD OF STACK GAS, in. H₂O			
$\sqrt{\Delta P} = \frac{1}{n} \sum_{i=1}^n \sqrt{\Delta p_i}$	=	0.4960	in. H ₂ O
AVERAGE ABSOLUTE STACK GAS TEMPERATURE			
$T_s = 155.0 \text{ °F} + 460$	=	615	°R
ABSOLUTE STACK GAS PRESSURE			
$P_s = P_{bar} + \frac{P_{static}}{13.6}$	=	29.98	in.Hg
STACK GAS VELOCITY			
$V_s = (85.49)(C_p)(\text{avg } \sqrt{\Delta P}) \sqrt{\frac{T_s}{(P_s)(M_s)}}$	=	31.18	ft/sec
STACK GAS VOLUMETRIC FLOW RATE, actual			
$Q_s = 60 \times V_s \times A_s$	=	5,634	acfm
Stack Area = 3.012 ft ²			
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, wet basis			
$Q_{stdw} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)$	=	4,847 290,828	scfm, wb scfh, wb
STACK GAS VOLUMETRIC FLOW RATE, standard conditions, dry basis			
$Q_{std} = \left(\frac{528}{29.92}\right)(Q_s)\left(\frac{P_s}{T_s}\right)(1 - B_{ws})$	=	3,563 213,787	dscfm dscfh

ARI ENVIRONMENTAL, INC.
MOISTURE CALCULATION SUMMARY

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
TEST DATE: 7/20/2007
RUN NUMBER: Runs 11-12

γ FACTOR:	0.999	STACK DIAM:	23.5 inches
BAROMETRIC:	29.97 in. Hg	METER VOLUME:	53.602 ft ³
STATIC PRES:	0.15 in.H ₂ O	METER TEMP:	88.83 °F
STACK TEMP:	155 °F	LIQUID COLL:	397 milliliters
SQ.RT ΔP:	0.496 in.H ₂ O	CO₂:	10.92611 % by volume
ΔH:	2 in.H ₂ O	O₂:	4.720006 % by volume

ENGLISH UNITS
(29.92 in.Hg & °F)

VOLUME OF SAMPLE
@ STANDARD CONDITIONS, DRY BASIS

$$V_{mstd} = \left(\frac{528}{29.92} \right) \times V_m \times \gamma \left[\frac{P_{bar} + \frac{\Delta H}{13.6}}{T_m} \right] = 51.855 \text{ dscf}$$

$\gamma = 0.999$

VOLUME OF WATER IN SAMPLE
@ STANDARD CONDITIONS

$$V_{wstd} = 0.04707 \times V_{lc} = 18.687 \text{ scf}$$

$V_{lc} = 397.0 \text{ mL}$

FRACTIONAL MOISTURE CONTENT OF STACK GAS AS MEASURED

$$B_{ws} = \frac{V_{wstd}}{V_{wstd} + V_{mstd}} = 0.265$$

FRACTIONAL MOISTURE CONTENT OF STACK GAS @ SATURATION

$$MF = \frac{10^{\left[8.361 - \left(\frac{1893.5}{T - 27.65} \right) \right]} - 0.5}{P} = 0.277$$

$T = 341.3 \text{ °K}$
 $P = 761.5 \text{ mmHg}$

FRACTIONAL MOISTURE CONTENT USED IN CALCULATIONS

$$B_{ws} = 0.265$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 11
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 6.8 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.4 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 43.2 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 6.77 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 6.7 \text{ ppmv db}$$

(corrected)

SO₂ CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 1.11 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK SO₂ EMISSION RATE =

$$\boxed{\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.24 \text{ lbs/hr}$$

= 1.0 ton/yr

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 11
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 88.06 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 191.0 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 88.06 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 91.72 \text{ ppmv db}$$

(corrected)

NO_x CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 10.952 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK NO_x EMISSION RATE =

$$\boxed{\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 2.341 \text{ lbs/hr}$$

= 10.25 ton/yr

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 11
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C):	4.0 ppmv
AVG PRE/POST ZERO DRIFT READING (C _o):	0.6 ppmv
CAL GAS CONCENTRATION (C _{ma}):	45.0 ppmv
AVG CAL PRE/POST TEST READING (C _m):	47.2 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q _{std}):	213,787 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 4.0 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv (corrected)} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 3.3 \text{ ppmv db}$$

CO CONC. (lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 / \text{lb - mole}} \right)} = 0.24 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK CO EMISSION RATE =

$$\boxed{\text{CO}_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.05 \text{ lbs/hr}$$

$$= 0.2 \text{ ton/yr}$$

MONITOR DATA SUMMARY

COMPANY : Marathon
SOURCE : SRU Scrubber
REPETITION : 12
TEST DATE : 7/20/2007
START TIME : 19:34
END TIME : 20:34

GAS ANALYZER **O₂**

SPAN VALUE : 10 %
 AVERAGE CAL. BIAS (C_m): 5.058
 AVERAGE ZERO BIAS (C_o): 0.208

 CALIBRATION GAS: EPA Protocol O₂
 CALIBRATION % (C_{ma}): 5.00
 % CORRECTED (C_{gas}): 4.73

GAS ANALYZER **NO_x**

SPAN VALUE : 400 ppm
 AVERAGE CAL. BIAS (C_m): 190.33
 AVERAGE ZERO BIAS (C_o): 0.85

 CALIBRATION GAS: EPA Protocol NO_x
 CALIBRATION PPM (C_{ma}): 200.0
 PPM CORRECTED (C_{gas}): 96.1

GAS ANALYZER **CO**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 46.64
 AVERAGE ZERO BIAS (C_o): 0.32

 CALIBRATION GAS: EPA Protocol CO
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 3.3

GAS ANALYZER **SO₂**

SPAN VALUE : 95 ppm
 AVERAGE CAL. BIAS (C_m): 42.70
 AVERAGE ZERO BIAS (C_o): 0.38

 CALIBRATION GAS: EPA Protocol SO₂
 CALIBRATION PPM (C_{ma}): 45.0
 PPM CORRECTED (C_{gas}): 6.3

GAS ANALYZER **CO₂**

SPAN VALUE : 20 %
 AVERAGE CAL. BIAS (C_m): 9.70
 AVERAGE ZERO BIAS (C_o): -0.15

 CALIBRATION GAS: EPA Protocol CO₂
 CALIBRATION % (C_{ma}): 10.00
 % CORRECTED (C_{gas}): 10.8

CLOCK TIME	ELAPSED TIME	NO _x	SO ₂	CO	O ₂	CO ₂
19:34	0					
19:35	1	91.8	9.2	2.8	4.95	10.51
19:36	2	91.8	8.8	2.9	4.75	10.63
19:37	3	92.1	8.6	1.1	4.82	10.61
19:38	4	92.3	8.0	1.6	4.97	10.50
19:39	5	92.0	7.8	2.6	4.95	10.49
19:40	6	92.1	7.8	2.2	4.85	10.58
19:41	7	92.3	7.7	1.0	4.91	10.53
19:42	8	92.3	7.7	2.5	5.07	10.45
19:43	9	92.0	7.5	2.7	4.97	10.58
19:44	10	91.2	7.3	2.2	4.74	10.75
19:45	11	91.4	7.2	1.2	4.78	10.66
19:46	12	91.9	7.2	1.5	5.02	10.44
19:47	13	92.1	7.0	1.0	4.96	10.45
19:48	14	92.1	6.9	1.8	4.80	10.56
19:49	15	93.0	6.9	1.1	5.06	10.37
19:50	16	93.0	7.0	0.0	5.13	10.33
19:51	17	92.9	6.7	0.4	4.88	10.55
19:52	18	92.9	6.6	0.3	4.84	10.61
19:53	19	92.9	6.6	0.2	5.10	10.41
19:54	20	92.9	6.4	0.1	5.11	10.38
19:55	21	92.5	6.3	0.4	4.9	10.6
19:56	22	91.8	6.3	1.0	4.8	10.7
19:57	23	91.7	6.2	0.8	4.9	10.5
19:58	24	90.9	23.9	0.8	4.8	10.6
19:59	25	89.8	6.2	3.0	4.5	10.8
20:00	26	89.1	6.5	3.8	4.6	10.7
20:01	27	89.5	5.8	4.4	4.7	10.5
20:02	28	89.9	5.9	5.0	4.7	10.5
20:03	29	89.4	5.8	8.9	4.5	10.7
20:04	30	89.4	5.8	8.6	4.6	10.6
20:05	31	90.1	5.7	12.5	4.7	10.5
20:06	32	89.2	5.6	17.9	4.7	10.6
20:07	33	88.4	5.5	17.7	4.5	10.6
20:08	34	88.9	5.7	11.3	4.5	10.5
20:09	35	91.2	5.6	7.9	4.8	10.4
20:10	36	92.2	5.6	5.6	4.9	10.4
20:11	37	93.0	5.6	4.6	4.8	10.4
20:12	38	92.9	5.4	4.4	4.7	10.5
20:13	39	93.6	5.4	3.6	4.8	10.4
20:14	40	93.5	5.4	4.1	4.9	10.4
20:15	41	93.8	5.4	4.3	4.8	10.4
20:16	42	92.8	5.5	3.9	4.6	10.6
20:17	43	93.1	5.4	4.3	4.7	10.5
20:18	44	93.4	5.4	4.2	4.8	10.4
20:19	45	93.3	5.5	5.2	4.8	10.4
20:20	46	92.6	5.4	5.4	4.6	10.6
20:21	47	92.7	5.5	5.1	4.7	10.6
20:22	48	92.6	5.3	3.5	4.8	10.5
20:23	49	92.8	5.2	2.9	4.8	10.4
20:24	50	92.3	5.1	3.6	4.7	10.6
20:25	51	91.7	4.1	3.5	4.6	10.7
20:26	52	92.3	3.6	3.8	4.8	10.5
20:27	53	91.9	3.4	2.3	4.8	10.5
20:28	54	92.2	3.4	2.7	4.7	10.4
20:29	55	92.2	3.6	1.7	4.6	10.5
20:30	56	92.8	3.8	2.0	4.9	10.3
20:31	57	93.2	4.0	3.3	4.9	10.3
20:32	58	92.7	4.2	3.0	4.7	10.5
20:33	59	92.4	4.4	2.2	4.6	10.5
20:34	60	92.8	4.8	4.1	4.8	10.4
Uncorrected Average =		91.92	6.27	3.77	4.795	10.514

Example Calculation =
$$C_{\text{gas}} = \left(\bar{C} - C_o \right) \frac{C_{\text{ma}}}{C_m - C_o}$$

SO₂ CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 6C

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Western Research 721-ATM
RUN NO: 12
TEST DATE: 7/20/2007

INPUT

SO₂ AVERAGE CHART READING (C): 6.3 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.4 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 45.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 42.7 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

STACK SO₂ AVERAGE CHART READING = 6.27 ppmv

STACK SO₂ CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{SO}_2 \text{ CONC, ppmv (corrected)} = C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o} = 6.3 \text{ ppmv db}$$

SO₂ CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{64 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 1.04 \times 10^{-6} \text{ lbs/dscf}$$

SO₂ EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK SO₂ EMISSION RATE =

$$\text{SO}_{2\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 0.22 \text{ lbs/hr} = 1.0 \text{ ton/yr}$$

NO_x CALIBRATION CORRECTION DATA SHEET

USEPA METHOD 7E

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42H
RUN NO: 12
TEST DATE: 7/20/2007

INPUT

NO_x AVERAGE CHART READING (C): 91.92 ppmv
 AVG PRE/POST ZERO DRIFT READING (C_o): 0.8 ppmv
 CAL GAS CONCENTRATION (C_{ma}): 200.0 ppmv
 AVG CAL PRE/POST TEST READING (C_m): 190.3 ppmv
 STACK GAS VOLUMETRIC FLOW RATE (Q_{std}): 213,787 dscfh

CALCULATIONS

STACK NO_x AVERAGE CHART READING = 91.92 ppmv

STACK NO_x CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{NO}_x \text{ CONC, ppmv} = \left(\bar{C} - C_o \right) \frac{C_{ma}}{C_m - C_o} = 96.13 \text{ ppmv db}$$

(corrected)

NO_x CONC.(lbs/dscf) =

$$C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{46 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right) = 11.478 \times 10^{-6} \text{ lbs/dscf}$$

NO_x EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK NO_x EMISSION RATE =

$$\text{NO}_{x\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}}) = 2.454 \text{ lbs/hr}$$

$$= 10.75 \text{ ton/yr}$$

CO CALIBRATION CORRECTION DATA SHEET USEPA METHOD 10

COMPANY: Marathon
LOCATION: Texas City, Texas
SOURCE: SRU Scrubber
MONITOR ID: Thermo Environmental Model 42C
RUN NO: 12
TEST DATE: 7/20/2007

INPUT

CO AVERAGE CHART READING (C):	3.8 ppmv
AVG PRE/POST ZERO DRIFT READING (C _o):	0.3 ppmv
CAL GAS CONCENTRATION (C _{ma}):	45.0 ppmv
AVG CAL PRE/POST TEST READING (C _m):	46.6 ppmv
STACK GAS VOLUMETRIC FLOW RATE (Q _{std}):	213,787 dscfh

CALCULATIONS

STACK CO AVERAGE CHART READING = 3.8 ppmv

STACK CO CONC. CORRECTED FOR ZERO AND CALIBRATION DRIFT:

$$\text{CO CONC, ppmv} = \boxed{C_{\text{gas,ppm}} = (\bar{C} - C_o) \frac{C_{ma}}{C_m - C_o}} = 3.3 \text{ ppmv db}$$

(corrected)

CO CONC.(lbs/dscf) =

$$\boxed{C_{\text{gas,lb/dscf}} = (C_{\text{gas,ppm}}) \left(\frac{28 \text{ lb / lb - mole}}{385.26 \times 10^6 \text{ ft}^3 \text{ / lb - mole}} \right)} = 0.24 \times 10^{-6} \text{ lbs/dscf}$$

CO EMISSION RATE:

STACK GAS VOLUMETRIC FLOW RATE = 213,787 dscfh

STACK CO EMISSION RATE =

$$\boxed{\text{CO}_{\text{pmr}} = (C_{\text{gas,lb/dscf}})(Q_{\text{std}})} = 0.05 \text{ lbs/hr}$$

$$= 0.2 \text{ ton/yr}$$



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

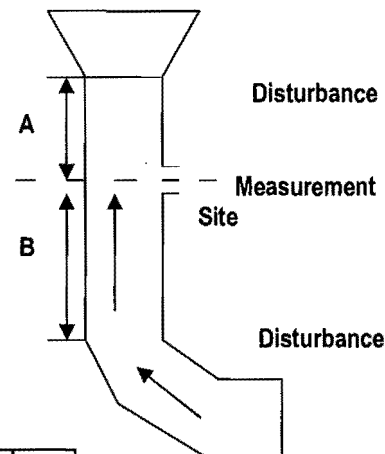
APPENDIX B

Field Data

TRAVERSE POINT LOCATION FOR CIRCULAR AND RECTANGULAR DUCTS

Plant: Marathon
 Date: 7-19-07
 Sampling Location SRU Scrubber
 Inside Of Far Wall To _____
 Outside Of Port (Distance C) 29.5
 Inside Of Near Wall To _____
 Outside Of Port (Distance D) 6
 Stack Id 22.5
 Distance Upstream From Disturbance (A) > 50'
 Distance Downstream From Disturbance (B) 18'
 Calculator go

Location of Traverse Points in Rectangular Stacks											
	2	3	4	5	6	7	8	9	10	11	12
1	25.0	16.7	12.5	10.0	8.3	7.1	6.3	5.6	5.0	4.5	4.2
2	75.0	50.0	37.5	30.0	25.0	21.4	18.8	16.7	15.0	13.6	12.5
3		83.3	62.5	50.0	41.7	35.7	31.3	27.8	25.0	22.7	20.8
4			87.5	70.0	58.3	50.0	43.8	38.9	35.0	31.8	29.2
5				90.0	75.0	64.3	56.3	50.0	45.0	40.9	37.5
6					91.7	78.6	68.8	61.1	55.0	50.0	45.8
7						92.9	81.3	72.2	66.0	59.1	54.2
8							93.8	83.3	75.0	68.2	62.5
9								94.4	85.0	77.3	70.8
10									95.0	86.4	79.2
11										95.5	87.5
12											95.8



Equivalent Diameters From Upstream Disturbance (A) _____
 Equivalent Diameters From Downstream Disturbance(B) _____

Rectangular Duct Equivalent Diameter Determination $\frac{2 \times L \times W}{L + W}$

LOCATION OF TRAVERSE POINTS ON CIRCULAR STACKS											
	4	6	8	10	12	14	16	18	20	22	24
1	6.7	4.4	3.2	2.6	2.1	1.8	1.6	1.4	1.3	1.1	1.1
2	25.0	14.6	10.5	8.2	6.7	5.7	4.9	4.4	3.9	3.5	3.2
3	75.0	29.6	19.4	14.6	11.8	9.9	8.5	7.5	6.7	6.0	5.5
4	93.3	70.4	32.3	22.6	17.7	14.6	12.5	10.9	9.7	8.7	7.9
5		85.4	67.7	34.2	25.0	20.1	16.9	14.6	12.9	11.6	10.5
6		95.6	80.6	65.8	35.6	26.9	22.0	18.8	16.5	14.6	13.2
7			89.5	77.4	64.4	36.6	28.3	23.6	20.4	18.0	16.1
8			96.8	85.4	75.0	63.4	37.5	29.6	25.0	21.8	19.4
9				91.8	82.3	73.1	62.5	38.2	30.6	26.2	23.0
10				97.4	88.2	79.9	71.7	61.8	38.8	31.5	27.2
11					93.3	85.4	78.0	70.4	61.2	39.3	32.3
12					97.9	90.1	83.1	76.4	69.4	60.7	39.8
13						94.3	87.5	81.2	75.0	68.5	60.2
14						98.2	91.5	85.4	79.6	73.8	67.7
15							95.1	89.1	83.5	78.2	72.8
16							98.4	92.5	87.1	82.0	77.0
17								95.6	90.3	85.4	80.6
18								98.6	93.3	88.4	83.9
19									96.1	91.3	86.8
20									98.7	94.0	89.5
21										96.5	92.1
22										98.9	94.5
23											96.8
24											98.9

TRAVERSE POINT NUMBER	FRACTION OF STACK I.D.	STACK I.D.	PRODUCT OF COLUMNS 1 AND 2 (TO NEAREST 1/8 INCH)	DISTANCE D (PORT DEPTH)	TRAVERSE POINT LOCATION FROM OUTSIDE OF PORT(SUM OF COLUMNS 3 AND 4)
1	.032	23.5	0.8	6	6.8
2	.105		2.5		8.5
3	.194		4.6		10.6
4	.323		7.6		13.6
5	.677		15.9		21.9
6	.806		18.9		24.9
7	.895		21.0		27.8
8	.968		22.7		28.7
9					
10					
11					
12					
13					

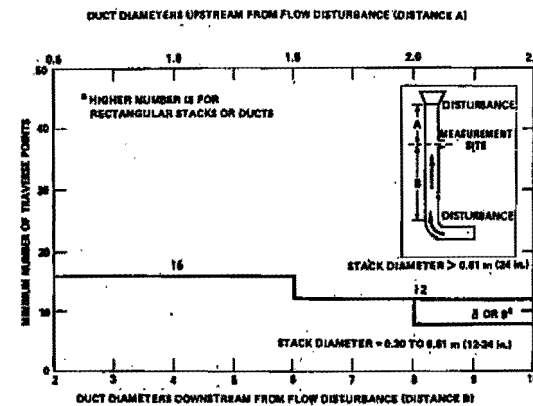
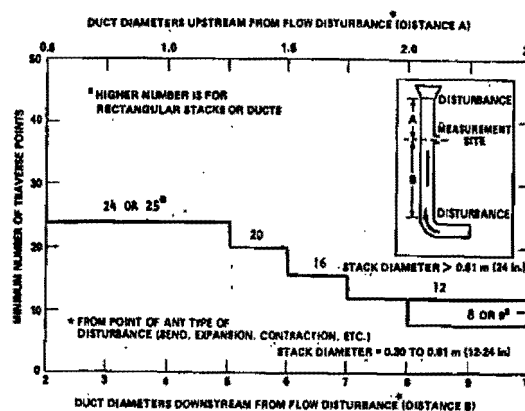


Figure 1-2. Minimum number of traverse points for velocity (nonparticulate) traverses.



RR SETTING *AA250*

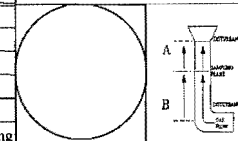
DATE	2-19-07	BAROMETRIC PRESSURE
LOCATION	TEXAS CITY	ASSUMED MOISTURE, %
OPERATOR	SM 25 AD	PROBE LENGTH, in.
STACK NO.	SRU number	NOZZLE DIAMETER, in.
RUN NO.	3-4	STACK DIAMETER, in.
SAMPLE BOX NO.		MINUTES PER POINT
METER BOX NO.	604/80	NUMBER OF POINTS
START TIME	941	NUMBER OF PORTS

PROBE HEATER SETTING 250
HEATER BOX SETTING 15A
METER H₀ 1.23
C_p FACTOR 0.34
Y_d FACTOR 0.795
PITOT/THERM # _____

WEIGHT OF PARTICULATE, mg

Filter No.			
Sample			
Final wt			
Tare wt			
Wt. gain			
TOTAL			m

A= B=



CROSS SECTION

[illegible]

VOLUME OR WEIGHT OF LIQUID		IMPINGER				SILICA GEL
WATER COLLECTED	VOLUME (ml) OR WEIGHT (g)				WEIGHT	
	#1	#2	#3	#4	g	
FINAL	270	210	0	—	278	
INITIAL	100	100	160	—	250	
LIQUID COLLECTED	170	110	160	—	28	
TOTAL	COLLECTED (specify ml or g)					

ORSAT DATA	TIME	CO ₂	O ₂
TRIAL 1			
TRIAL 2			
TRIAL 3			
Average			

LEAK CHECK		
SYSTEM PRE:	<u>000</u>	CFM@15"Hg
POST:	<u>000</u>	CFM@15"Hg
PITOT PRE:	<u>✓</u>	@ > 3"H ₂ O
POST:	<u>✓</u>	@ > 3"H ₂ O



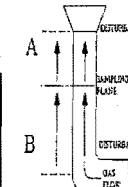
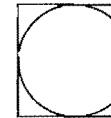
FIELD DATA

PLANT Marathon
 DATE 7-20-07
 LOCATION Texas City
 OPERATOR SM, ZS, BP
 STACK NO. SR050550
 METHOD g
 RUN NO. 7-83 (mol)
 METER NO.

METER BOX NO. 6A180 BAROMETER NO. 004852
 AMBIENT TEMPERATURE 84.0 PROBE HEATER SETTING
 BAROMETRIC PRESSURE 29.97 HEATER BOX SETTING
 ASSUMED MOISTURE, % 24% METER H 1.73
 PROBE LENGTH, in. 98" C_d FACTOR 0.924
 NOZZLE DIAMETER, in. 0.795 Y FACTOR 0.999
 STACK DIAMETER, in. 23.5
 PITOT NO.

PARTICULATE COLLECTED, mg		
FILTER NO.		
SAMPLE	FILTER	PROBE
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

A=
 B=



CLOCK TIME	TRAVERSE POINT NUMBER	SAMPLE TIME min.	STATIC PRESSURE (in., H ₂ O)	STACK TEMP (T _s), °F	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS ORIFICE (ΔH) In., H ₂ O		GAS SAMPLE VOLUME (V _m), ft ³	GAS TEMP AT DRY GAS METER		SAMPLE BOX TEMP °F	TEMP OF GAS LEAVING LAST IMPINGER	PUMP VACUUM in., Hg
					(ΔP _s)	(√ΔP _s)	ACTUAL	DESIRED		INLET (T _{m(in)}), °F	OUTLET (T _{m(out)}), °F			
12:07	A-1	0	0.15	154	0.25		1.7	1.73	727.638	76	75		60	7
12:11	2	4		154	0.26		2.0	1.97	731.02	86	74		60	7
12:15	3	8		154	0.26		2.1	2.09	734.46	86	73		60	7
12:19	4	12		154	0.26		2.1	2.09	737.91	87	75		60	7
12:23	5	16		154	0.25		2.1	2.09	741.35	88	76		60	7
12:27	6	20		154	0.25		2.0	2.02	744.73	88	76		60	7
12:31	7	24		154	0.25		2.0	2.02	748.11	89	76		60	7
12:35	8	28		154	0.26		2.0	2.02	751.49	90	76		61	7
12:41	B-1	32		155	0.25		2.2	2.15	754.93	90	77		61	7
12:45	2	36		155	0.25		2.0	2.02	758.31	91	78		63	7
12:49	3	40		156	0.26		2.0	2.03	761.68	91	78		63	7
12:51	4	44		156	0.26		2.1	2.10	765.12	93	78		63	7
12:55	5	48		156	0.25		2.1	2.11	768.56	94	79		64	5
12:59	6	52		156	0.25		2.0	2.03	771.94	93	79		64	6
13:03	7	56		156	0.25		2.0	2.03	775.31	92	79		64	6
13:07	8	60		156	0.26		2.0	2.03	778.68	93	79		64	6
13:11		64		-	-		-	-	782.120	-	-		-	-
				159.9		50%		2.025	54.482	82	83.0			
13:14				Purge Start					782.29					
13:29				Purge End					794.515					
TOTAL				154.9		1.3181			54.482	89.2	76.8		61.7	6.8

AVERAGE

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT
	1	2	3	4	
CONTENTS	CPA	HO ₂	HO ₂	HO ₂	Silica
FINAL	319.3	15.7	136.1	123.6	287.4
INITIAL	426	0	100	100	25
LIQUID COLLECTED	236.7	15.7	36.1	23.6	39.4
TOTAL	COLLECTED (specify ml or mg)				

ORSAT MEASUREMENT	TIME	CO ₂	O ₂	CO
1				
2				
3				
AVG				

LEAK CHECK		
SYSTEM	PRE: 0.00	CFM at 15" Hg
	POST: 0.00	CFM at 15" Hg
PITOT	PRE: ✓	3" H ₂ O for 15 sec
	POST: ✓	3" H ₂ O for 15 sec



PLANT Marathon
DATE 7-20-97
LOCATION Texas City
OPERATOR SM, BD
STACK NO. SLU scrubber
METHOD g
RUN NO. 5-104 (m8-2)
METER NO.

METER BOX NO.	<u>604180</u>	BAROMETER NO.	
AMBIENT TEMPERATURE	<u>87°</u>	PROBE HEATER SETTING	
BAROMETRIC PRESSURE	<u>29.97</u>	HEATER BOX SETTING	
ASSUMED MOISTURE, %	<u>24%</u>	METER H	
PROBE LENGTH, in.	<u>48"</u>	C _d FACTOR	
NOZZLE DIAMETER, in.	<u>0.375</u>	Y FACTOR	
STACK DIAMETER, in.	<u>23.5</u>		
PITOT NO.			

004452

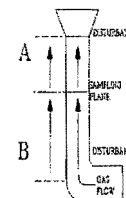
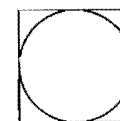
1.73

0.84

0.89

PARTICULATE COLLECTED, mg		
FILTER NO.		
SAMPLE	FILTER	PROBE
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		

A= _____
B= _____

[illegible]

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT
	1	2	3	4	
CONTENTS	IPA	7	H ₂ O ₂	H ₂ O ₂	250.3
FINAL	358.5	16.1	121.8	117.7	293.7
INITIAL	92.6	0	100.3	100.3	250.9
LIQUID COLLECTED	275.9	16.1	21.5	17.7	43.7
TOTAL	COLLECTED (specify ml or mg)				

ORSAT MEASUREMENT	TIME	CO ₂	O ₂	CO
1				
2				
3				
AVG				

LEAK CHECK		
SYSTEM	PRE: <u>0.00</u>	CFM at 15" Hg
	POST: <u>✓</u>	CFM at <u> </u> Hg
PITOT	PRE: <u>0.00</u>	3" H ₂ O for 15 sec
	POST: <u>✓</u>	3" H ₂ O for 15 sec



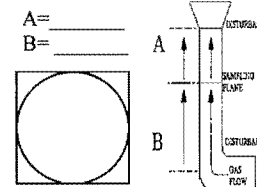
FIELD DATA

PLANT Marathon
 DATE 7-29-07
 LOCATION Texas City
 OPERATOR SM, BD
 STACK NO. 320 Scubber
 METHOD 9
 RUN NO. 5 (M8-3)
 METER NO. _____

METER BOX NO. 624140
 AMBIENT TEMPERATURE 83°
 BAROMETRIC PRESSURE 29.97
 ASSUMED MOISTURE, % 24%
 PROBE LENGTH, in. 48"
 NOZZLE DIAMETER, in. 0.395
 STACK DIAMETER, in. 23.5
 PITOT NO. _____

BAROMETER NO. 004852
 PROBE HEATER SETTING _____
 HEATER BOX SETTING _____
 METER H 1.73
 C_d FACTOR 0.84
 Y FACTOR 0.99

PARTICULATE COLLECTED, mg		
FILTER NO.		
SAMPLE	FILTER	PROBE
FINAL WEIGHT		
TARE WEIGHT		
WEIGHT GAIN		
TOTAL		



CLOCK TIME	TRAVERSE POINT NUMBER	SAMPLE TIME min.	STATIC PRESSURE (in., H ₂ O)	STACK TEMP (T _s), °F	VELOCITY HEAD		PRESSURE DIFFERENTIAL ACROSS ORIFICE (ΔH) In., H ₂ O		GAS SAMPLE VOLUME (V _m), ft ³	GAS TEMP AT DRY GAS METER		SAMPLE BOX TEMP °F	TEMP OF GAS LEAVING LAST IMPINGER	PUMP VACUUM in., Hg
					(ΔP _s)	(√ΔP _s)	ACTUAL	DESIRED		INLET (T _m _{in}), °F	OUTLET (T _m _{out}), °F			
18:41	A-1	0	0.15	155	0.24		1.7	1.73	945.141	85	81		58	3
18:45	2	4		155	0.24		1.9	1.92	948.45	86	82		58	3
18:49	3	8		155	0.24		1.9	1.93	951.76	88	81		56	3
18:53	4	12		155	0.24		1.9	1.94	955.06	89	81		56	3
18:57	5	16		155	0.24		1.9	1.94	958.37	91	82		59	3
19:01	6	20		155	0.24		1.9	1.94	961.68	93	82		60	3
19:05	7	24		155	0.25		2.0	1.95	964.99	95	82		60	3
19:09	8	28		155	0.25		2.0	2.04	968.36	97	82		60	3
19:15	B-1	32		155	0.25		2.1	2.05	971.74	99	84		60	3
19:19	2	36		155	0.25		2.1	2.05	975.11	97	84		60	3
19:23	3	40		155	0.25		2.1	2.05	978.49	97	85		61	3
19:27	4	44		155	0.25		2.1	2.05	981.86	97	85		62	3
19:31	5	48		155	0.25		2.1	2.05	985.24	97	85		62	3
19:35	6	52		155	0.25		2.1	2.05	988.62	97	85		63	10
19:39	7	56		155	0.25		2.1	2.05	991.99	97	85		64	11
19:43	8	60		155	0.25		2.1	2.05	995.37	96	85		64	10
19:47		64		-	-		-	-	998.743	-	-		-	-
					0.496									
										88.83				
19:52									998.919					
20:07									012.591					
TOTAL														
AVERAGE														

VOLUME OR WEIGHT OF LIQUID COLLECTED	IMPINGER VOLUME (ml) OR WEIGHT (g)				SILICA GEL WEIGHT
	1	2	3	4	
CONTENTS	IPA	0	H ₂ O	H ₂ O	Silica
FINAL	323.6	66.5	24.5	119.3	295.7
INITIAL	92.6	0	100.3	199.3	250.3
LIQUID COLLECTED	241.0	66.5	24.5	119.3	45.7
TOTAL	597.0				

ORSAT MEASUREMENT	TIME	CO ₂	O ₂	CO
1				
2				
3				
AVG				

LEAK CHECK		
SYSTEM	PRE: 0.00	CFM at 15" Hg
	POST: ✓	CFM at 15" Hg
PITOT	PRE: 0.78	3" H ₂ O for 15 sec
	POST: ✓	3" H ₂ O for 15 sec



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

APPENDIX C

Analytical Data

Analytical Titration Data Sheet – USEPA Methods 6 and/or 8



Company: marathon
 Location: Texas City, TX
 Source: SRU Scrubber
 Analytical Date: 8-1-07
 Analyst: D. Engel

BaCl₂ Normality: 0.009871

0.01N H₂SO₄ Standardization

#1: 25.35 mL
 #2: 25.30 mL
 Average: 25.325 mL

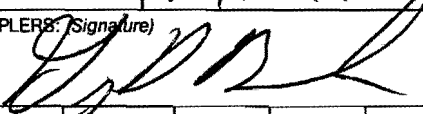
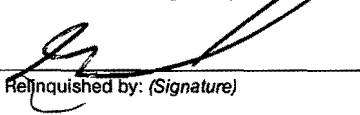
Blank

#1: 0.05 mL
 #2: 0.05 mL
 Average (V_{tb}): 0.05 mL

Run No.	Aliquot Volume (V _a) mL	Sample Volume (V _{soln}) mL	Volume of Titrant (V _t) mL
#1	100	600	5.05
#1	100	600	5.20
#2	100	425	6.60
#2	100	425	6.60
#3	100	450	4.50
#3	100	450	4.30
#4	100	570	5.60
#4	100	570	5.45
#5	100	580	7.05
#5	100	580	6.90

7419

CHAIN OF CUSTODY RECORD

PROJ. NO.		PROJECT NAME			NO. OF CONTAINERS	REMARKS							
SAMPLER'S (Signature)		LAB NO.	SAMPLE NO.	DATE							TIME	SAMPLE LOCATION	
		H0807003	24719	7-19	1900	SRU Scrubber	1	X					Run 1 Temp 1
		H0807004	24396	7-20	1100	"	1	X					Run 2
		H0807005	24397	7-20	1300	"	1	X					Run 3
		H0807006	24398	7-20	1500	"	1	X					Run 4
		H0807007	24400	7-20	1800	"	1	X					Run 5
Relinquished by: (Signature)		Date / Time		Received by: (Signature)		Date / Time		Relinquished by: (Signature)		Date / Time		Received by: (Signature)	
		7-20-07 8:24am		D. G. G. G.		7-30-07							
Relinquished by: (Signature)		Date / Time		Received by: (Signature)		Date / Time		Relinquished by: (Signature)		Date / Time		Received by: (Signature)	
Relinquished by: (Signature)		Date / Time		Received for Laboratory by:		Date / Time							
REMARKS:													



951 Old Rand Road, Unit 106
 Wauconda, IL 60084
 Telephone (847) 487-1580
 Fax (847) 487-1587

PRINT FILE COPY - WHITE

RECORD FILE COPY - CANARY

RETAIN COPY - PINK

CUSTOMER COPY - GOLDENROD



Concentration Calculation Summary

Client: Marathon Ashland
Location: Texas City, Texas
Source: SRU
Date sampled: 7/20/2007
Run Number: 3
Compound Analyzed: TRS
Units of Detection: ppm

File Name	Date	Time	H ₂ S area cts	H ₂ S ppm v	COS area cts	COS ppm v	CS ₂ area cts	CS ₂ ppm v	TRS ppm v
720runs37.CHR	7/20/2007	17:00:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs38.CHR	7/20/2007	17:10:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs39.CHR	7/20/2007	17:20:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs40.CHR	7/20/2007	17:30:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs41.CHR	7/20/2007	17:40:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs42.CHR	7/20/2007	17:50:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs43.CHR	7/20/2007	18:00:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs44.CHR	7/20/2007	18:10:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs45.CHR	7/20/2007	18:20:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs46.CHR	7/20/2007	18:30:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs47.CHR	7/20/2007	18:40:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs48.CHR	7/20/2007	18:50:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs49.CHR	7/20/2007	19:00:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs50.CHR	7/20/2007	19:10:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs51.CHR	7/20/2007	19:20:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs52.CHR	7/20/2007	19:30:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs53.CHR	7/20/2007	19:40:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs54.CHR	7/20/2007	19:50:19	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
Averages				<0.32		<0.26		<0.32	<1.22



Concentration Calculation Summary

Client: Marathon Ashland
 Location: Texas City, Texas
 Source: SRU
 Date sampled: 7/20/2007
 Run Number: 2
 Compound Analyzed: TRS
 Units of Detection: ppm

File Name	Date	Time	H ₂ S area cts	H ₂ S ppm v	COS area cts	COS ppm v	CS ₂ area cts	CS ₂ ppm v	TRS ppm v
720runs19.CHR	7/20/2007	14:00:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs20.CHR	7/20/2007	14:10:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs21.CHR	7/20/2007	14:20:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs22.CHR	7/20/2007	14:30:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs23.CHR	7/20/2007	14:40:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs24.CHR	7/20/2007	14:50:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs25.CHR	7/20/2007	15:00:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs26.CHR	7/20/2007	15:10:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs27.CHR	7/20/2007	15:20:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs28.CHR	7/20/2007	15:30:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs29.CHR	7/20/2007	15:40:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs30.CHR	7/20/2007	15:50:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs31.CHR	7/20/2007	16:00:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs32.CHR	7/20/2007	16:10:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs33.CHR	7/20/2007	16:20:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs34.CHR	7/20/2007	16:30:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs35.CHR	7/20/2007	16:40:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs36.CHR	7/20/2007	16:50:18	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
Averages				<0.32		<0.26		<0.32	<1.22



Concentration Calculation Summary

Client: Marathon Ashland
 Location: Texas City, Texas
 Source: SRU
 Date sampled: 7/20/2007
 Run Number: 1
 Compound Analyzed: TRS
 Units of Detection: ppm

File Name	Date	Time	H ₂ S area cts	H ₂ S ppm v	COS area cts	COS ppm v	CS ₂ area cts	CS ₂ ppm v	TRS ppm v
720runs01.CHR	7/20/2007	11:00:41	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs01.CHR	7/20/2007	11:10:41	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs03.CHR	7/20/2007	11:20:16	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs04.CHR	7/20/2007	11:30:16	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs05.CHR	7/20/2007	11:40:16	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs06.CHR	7/20/2007	11:50:16	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs07.CHR	7/20/2007	12:00:16	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs08.CHR	7/20/2007	12:10:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs09.CHR	7/20/2007	12:20:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs10.CHR	7/20/2007	12:30:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs11.CHR	7/20/2007	12:40:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs12.CHR	7/20/2007	12:50:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs13.CHR	7/20/2007	13:00:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs14.CHR	7/20/2007	13:10:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs15.CHR	7/20/2007	13:20:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs16.CHR	7/20/2007	13:30:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs17.CHR	7/20/2007	13:40:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
720runs18.CHR	7/20/2007	13:50:17	<18.00	<0.32	<45.00	<0.26	<13.00	<0.32	<1.22
Averages				<0.32		<0.26		<0.32	<1.22

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007 11:40 am

Method: USEPA Method 15

Description: FPD

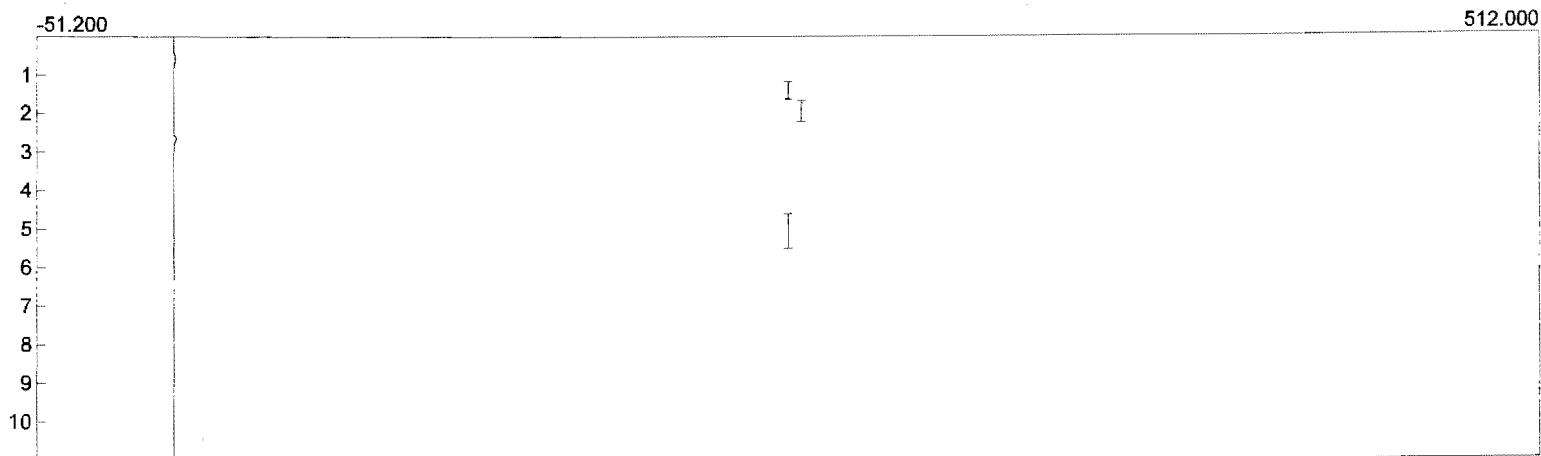
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720runs01.CHR ()

Sample: SRU Runs

Operator: SEY

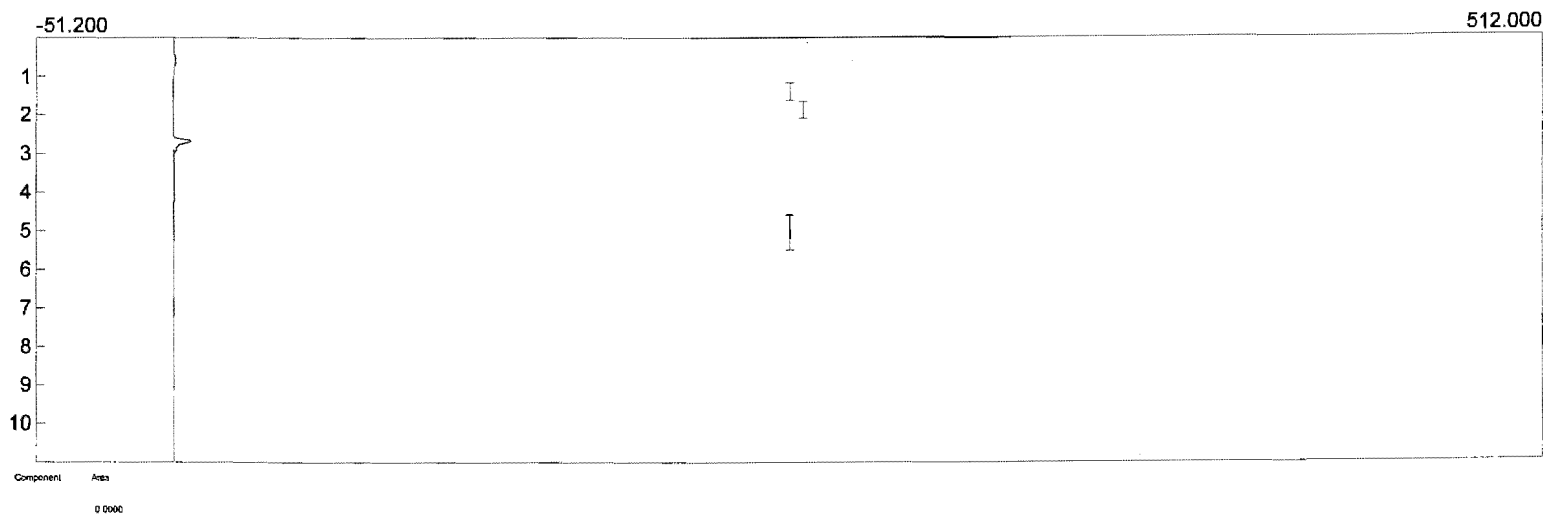


Component

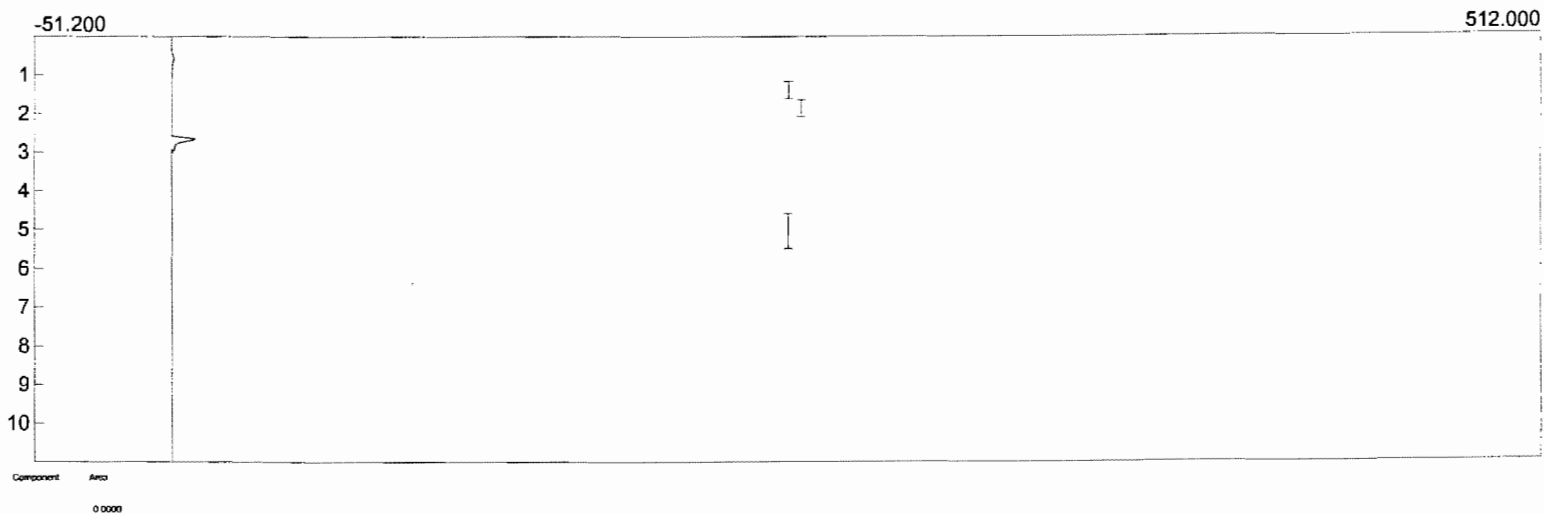
Area

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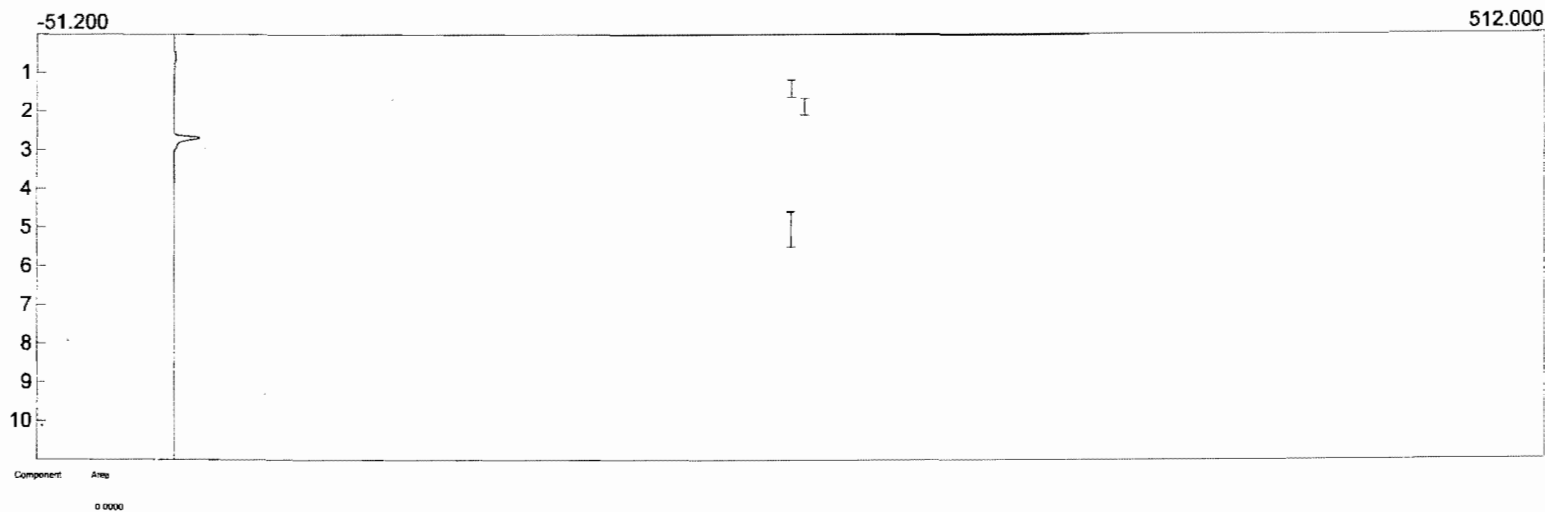
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 11:10:41
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs02.CHR ()
Sample: SRU Runs
Operator: SEY



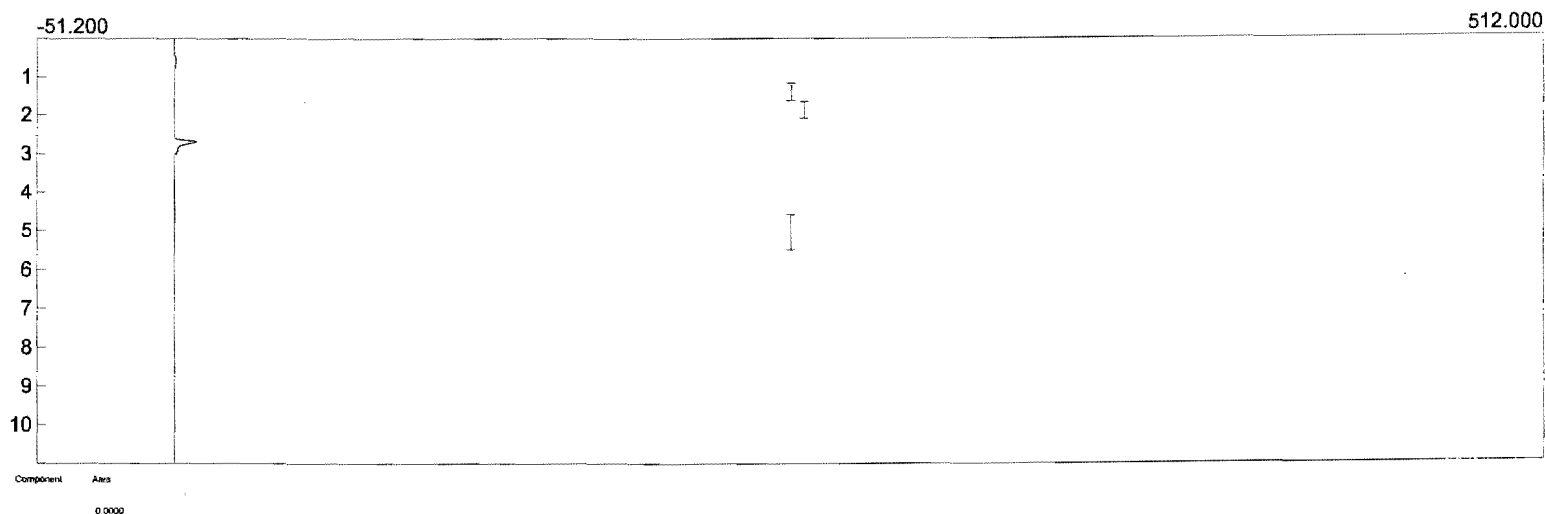
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 11:20:16
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs03.CHR ()
Sample: SRU Runs
Operator: SEY



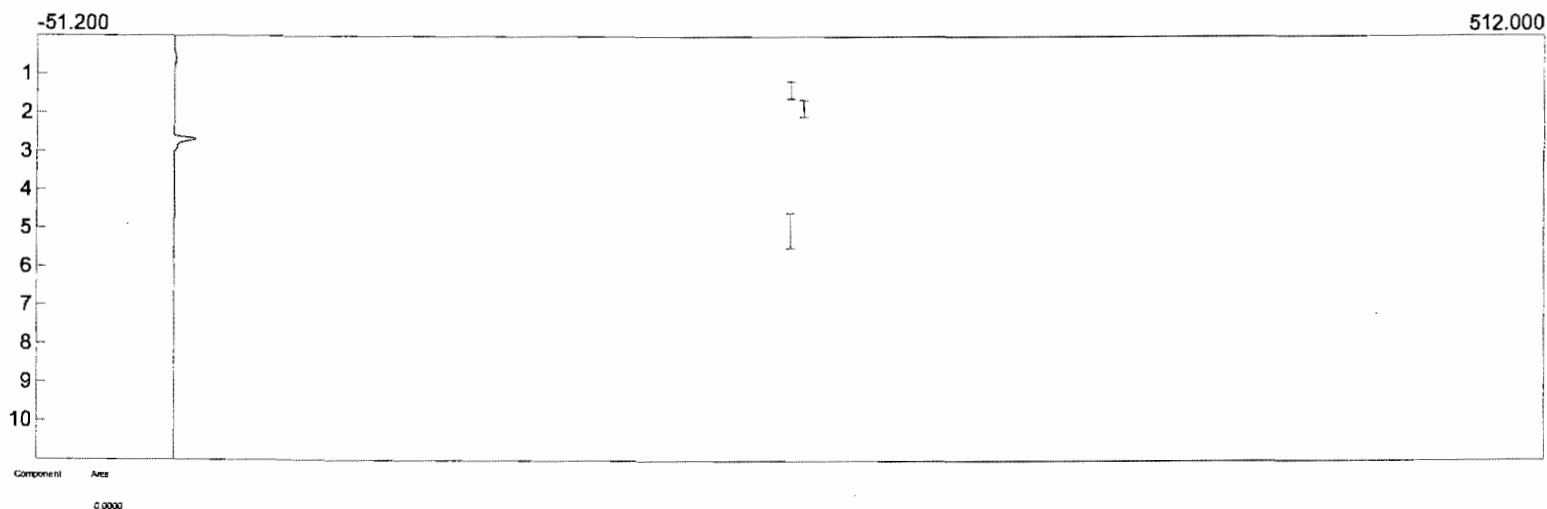
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 11:30:16
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs04.CHR ()
Sample: SRU Runs
Operator: SEY



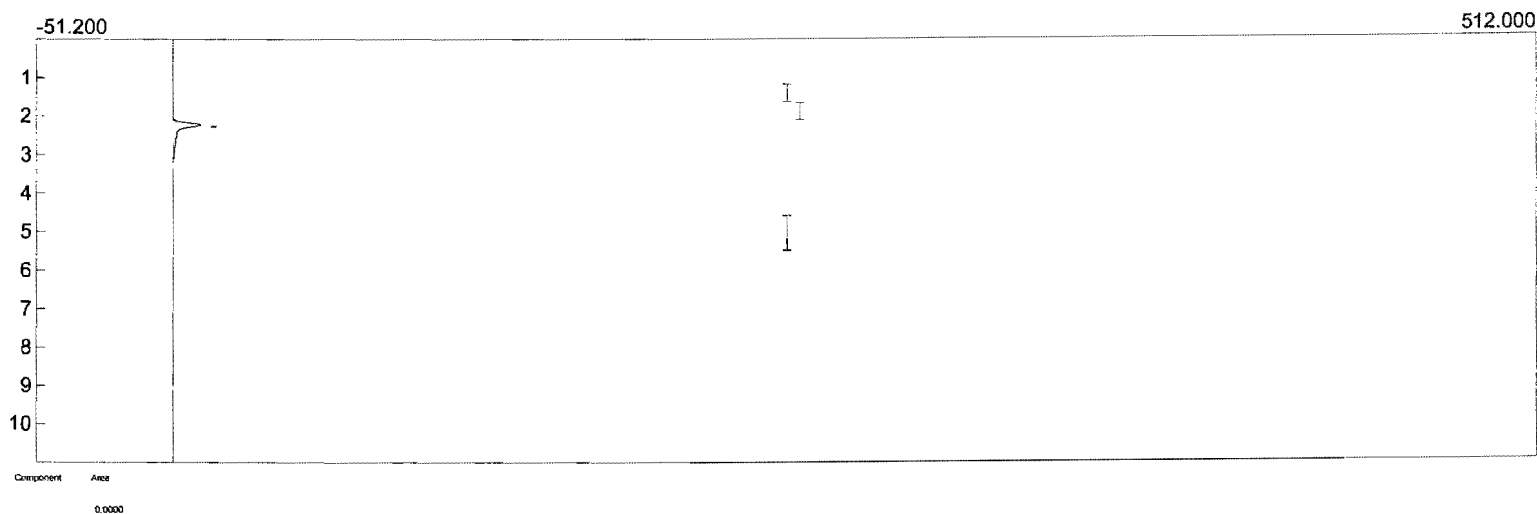
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 11:40:16
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs05.CHR ()
Sample: SRU Runs
Operator: SEY



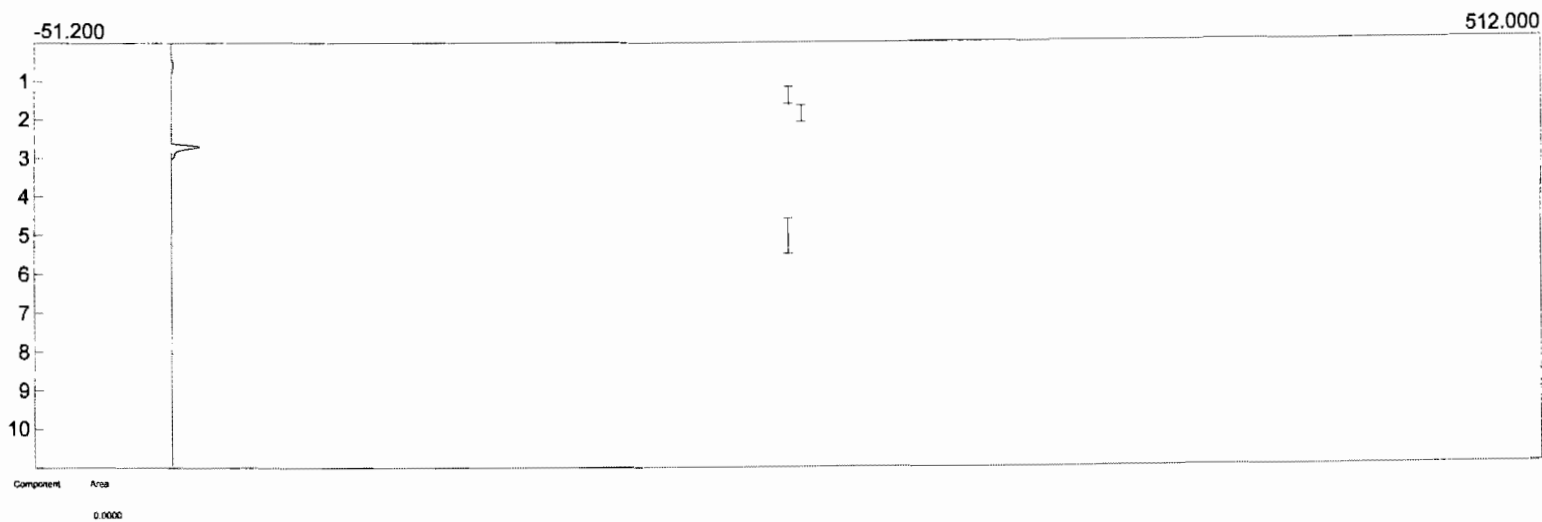
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 11:50:16
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs06.CHR ()
Sample: SRU Runs
Operator: SEY



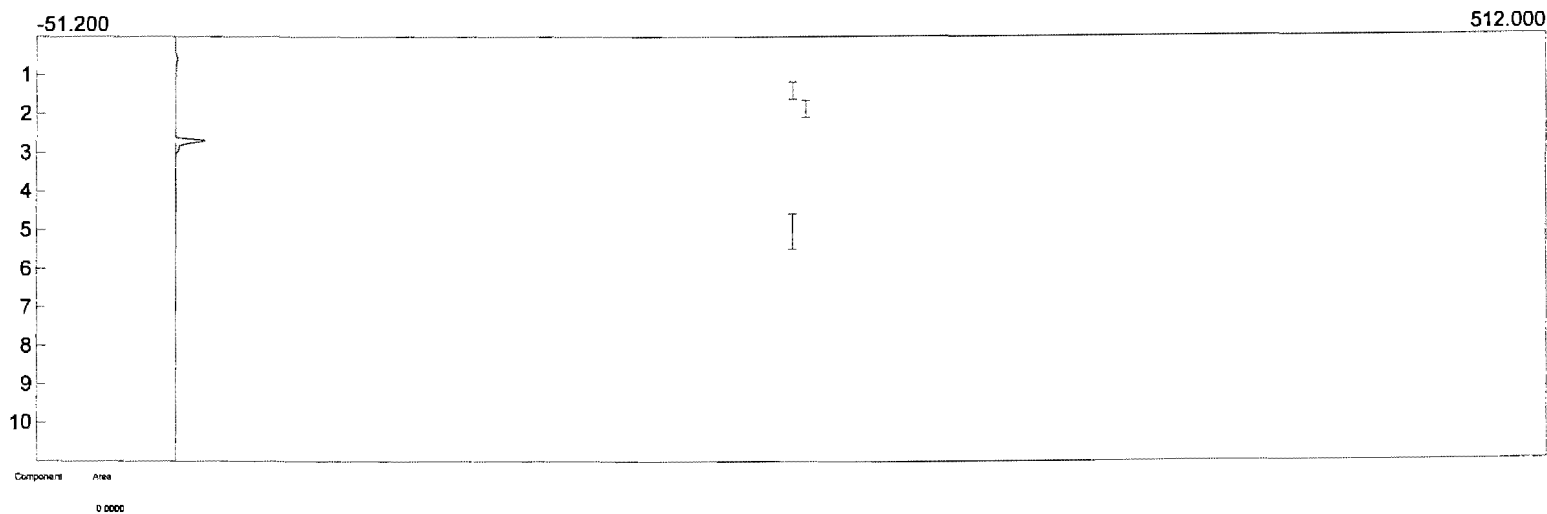
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 12:00:16
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs07.CHR ()
Sample: SRU Runs
Operator: SEY



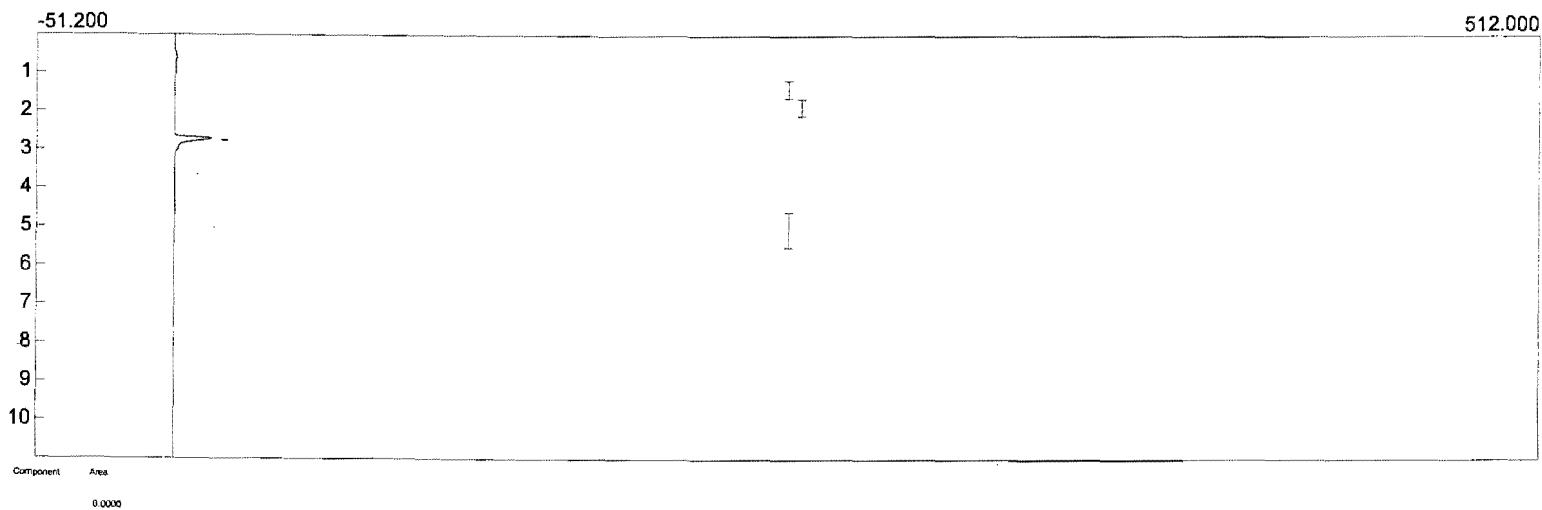
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 12:10:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs08.CHR ()
Sample: SRU Runs
Operator: SEY



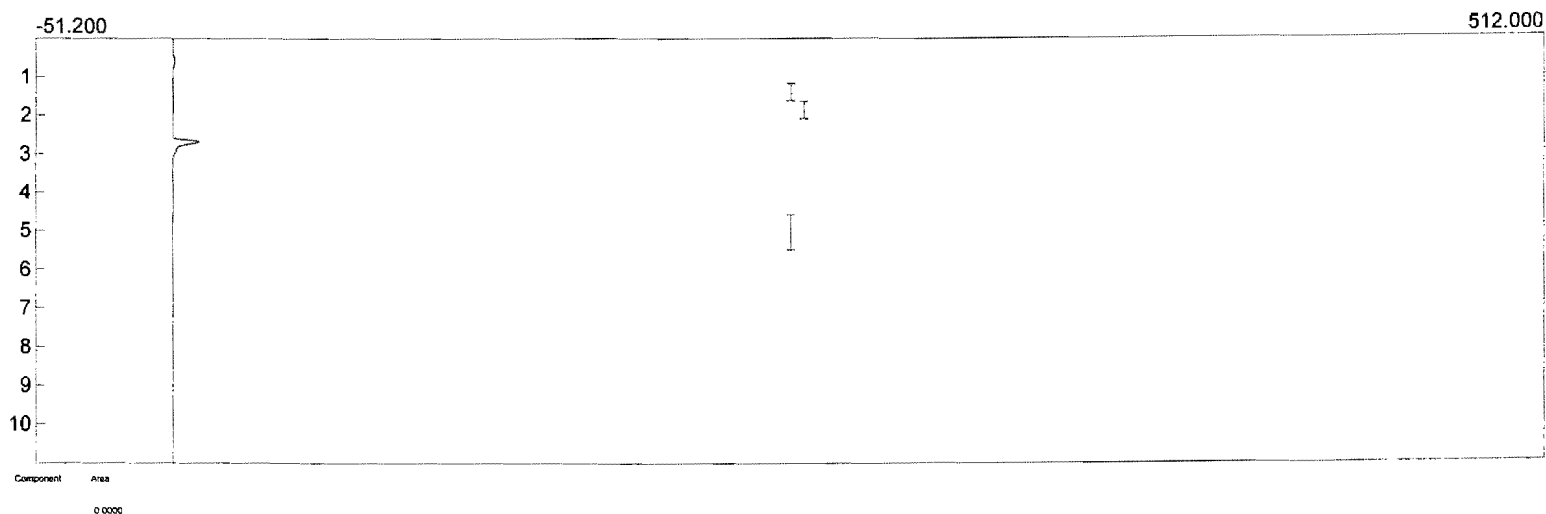
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 12:30:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs10.CHR ()
Sample: SRU Runs
Operator: SEY



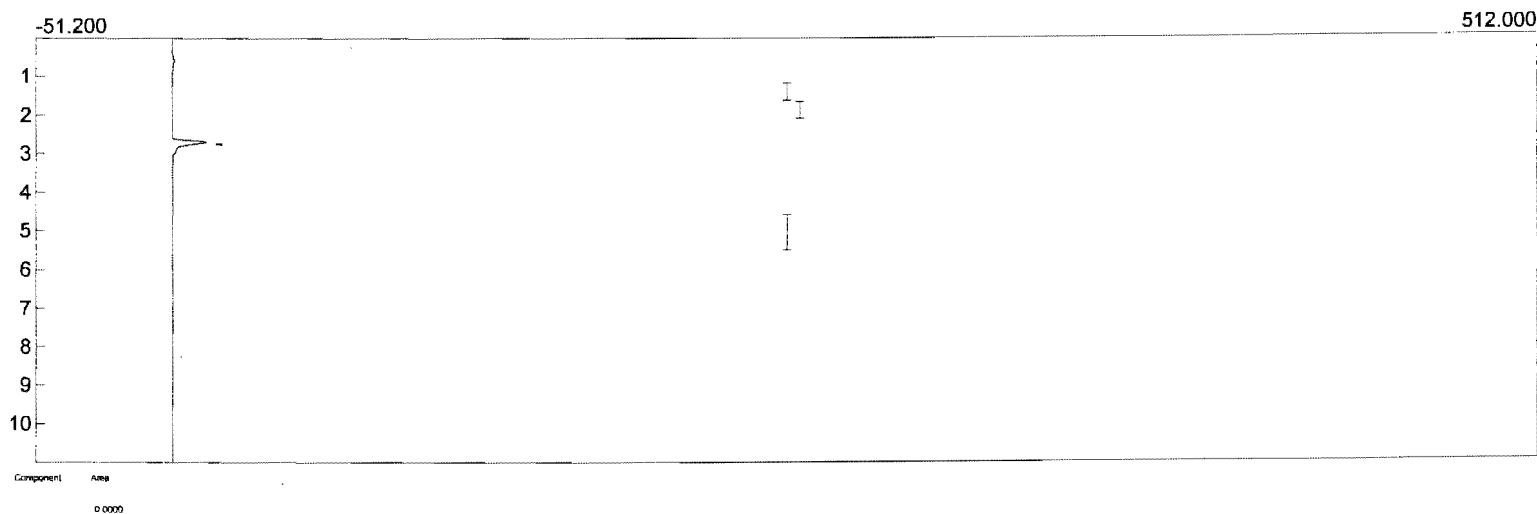
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 12:40:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs11.CHR ()
Sample: SRU Runs
Operator: SEY



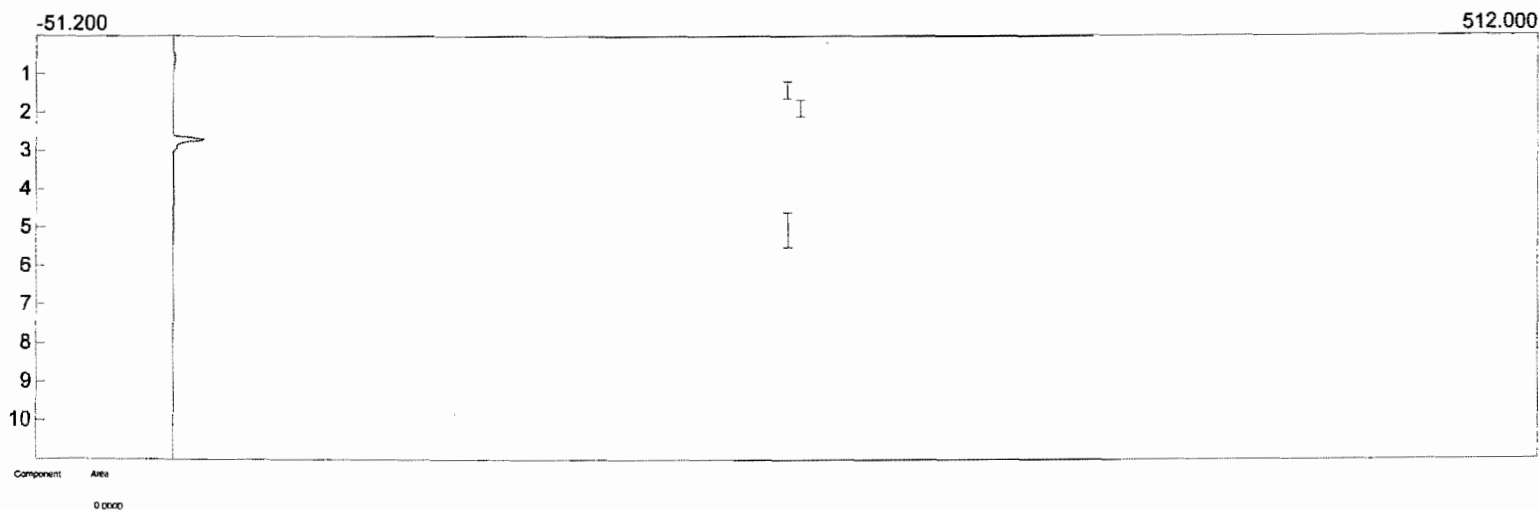
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 12:20:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs09.CHR ()
Sample: SRU Runs
Operator: SEY



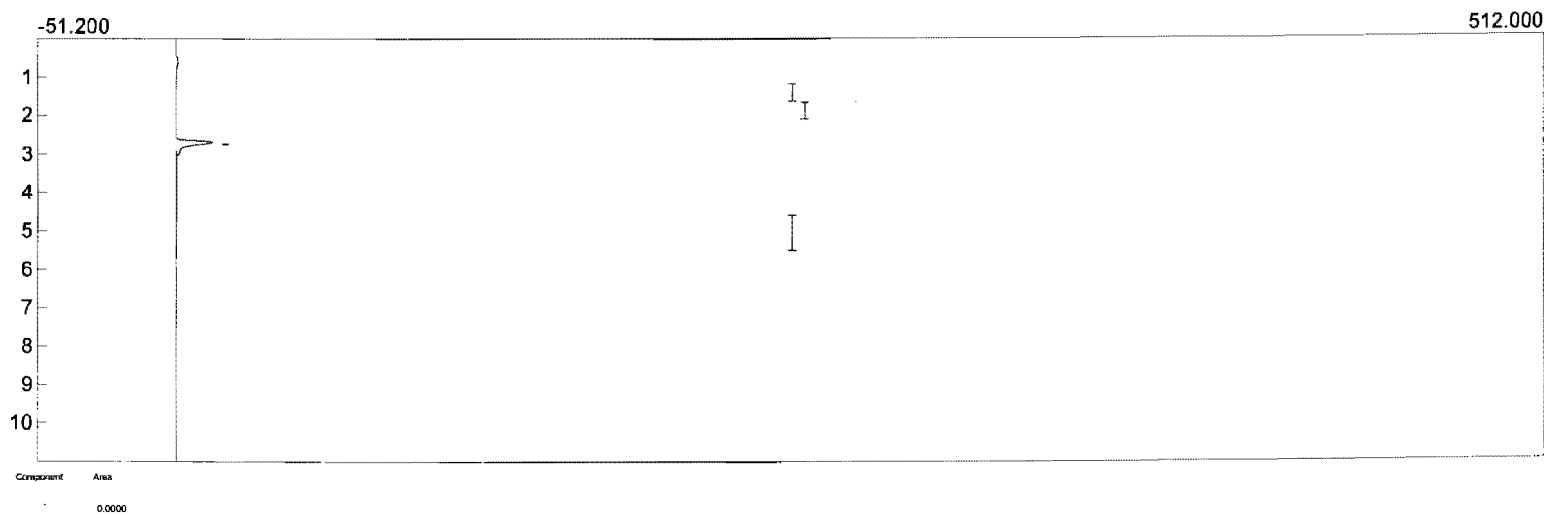
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 12:50:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs12.CHR ()
Sample: SRU Runs
Operator: SEY



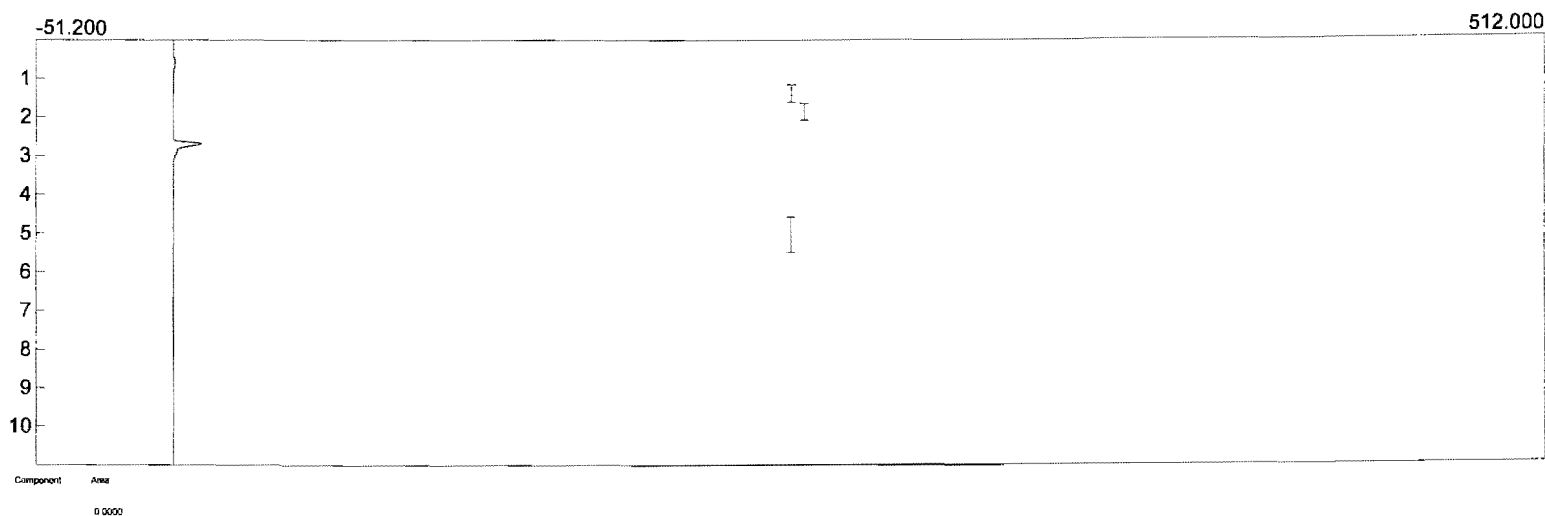
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 13:00:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs13.CHR ()
Sample: SRU Runs
Operator: SEY



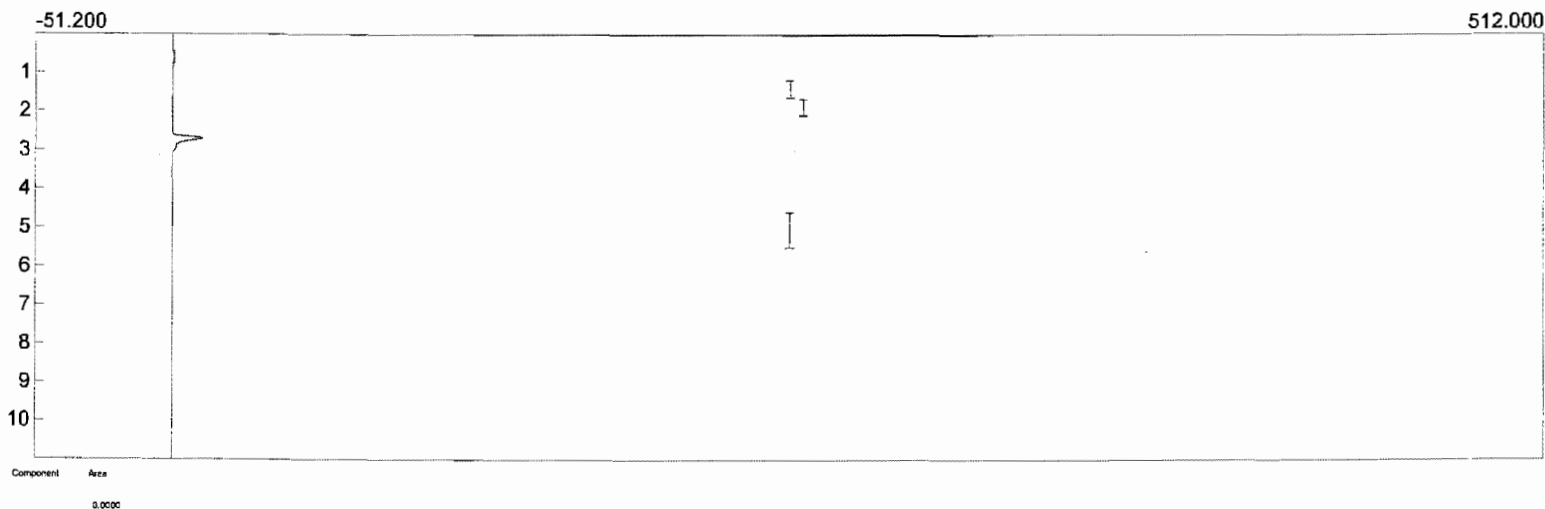
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 13:10:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs14.CHR ()
Sample: SRU Runs
Operator: SEY



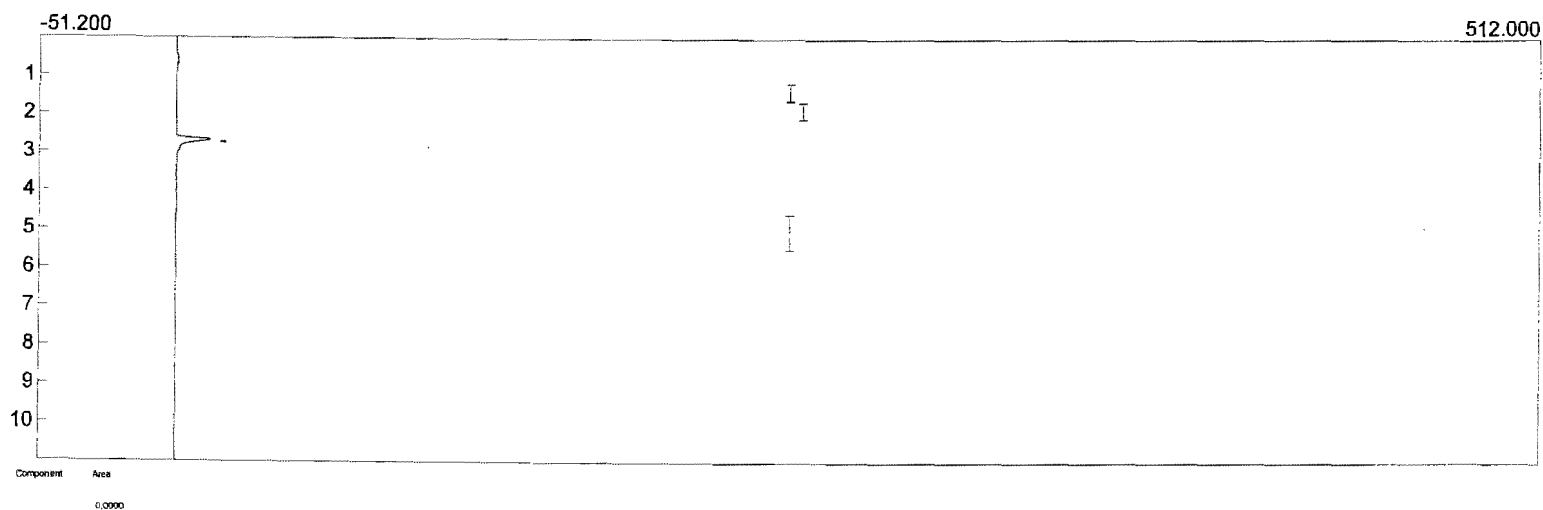
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 13:20:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs15.CHR ()
Sample: SRU Runs
Operator: SEY



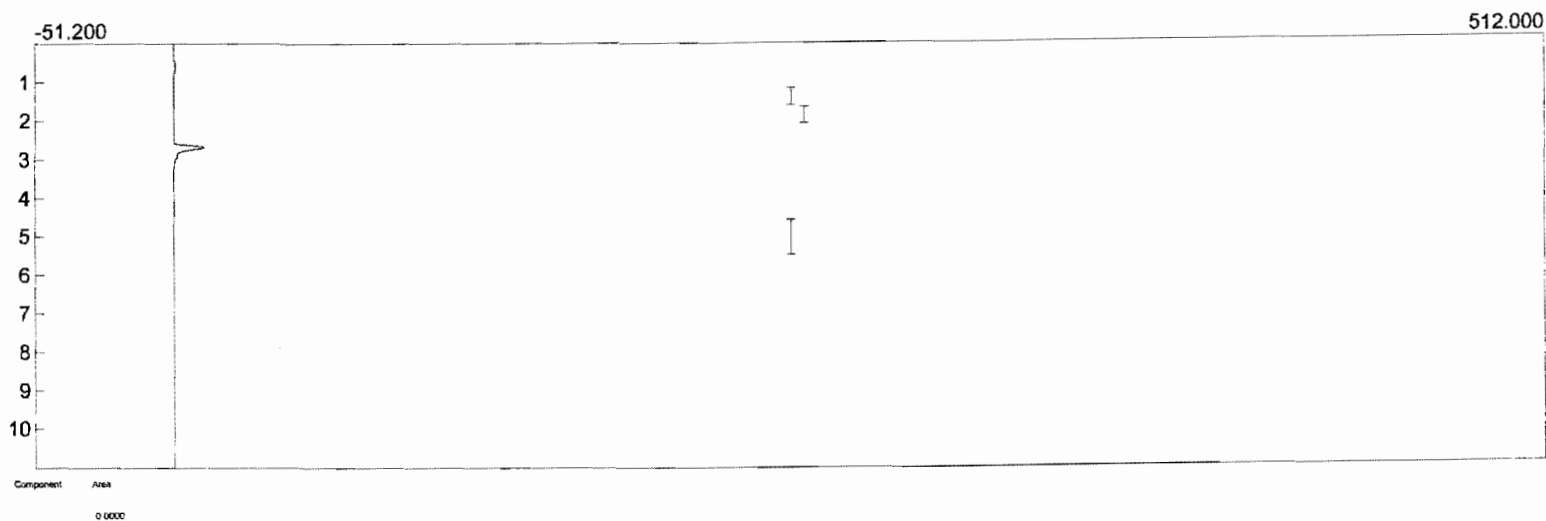
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 13:30:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs16.CHR ()
Sample: SRU Runs
Operator: SEY



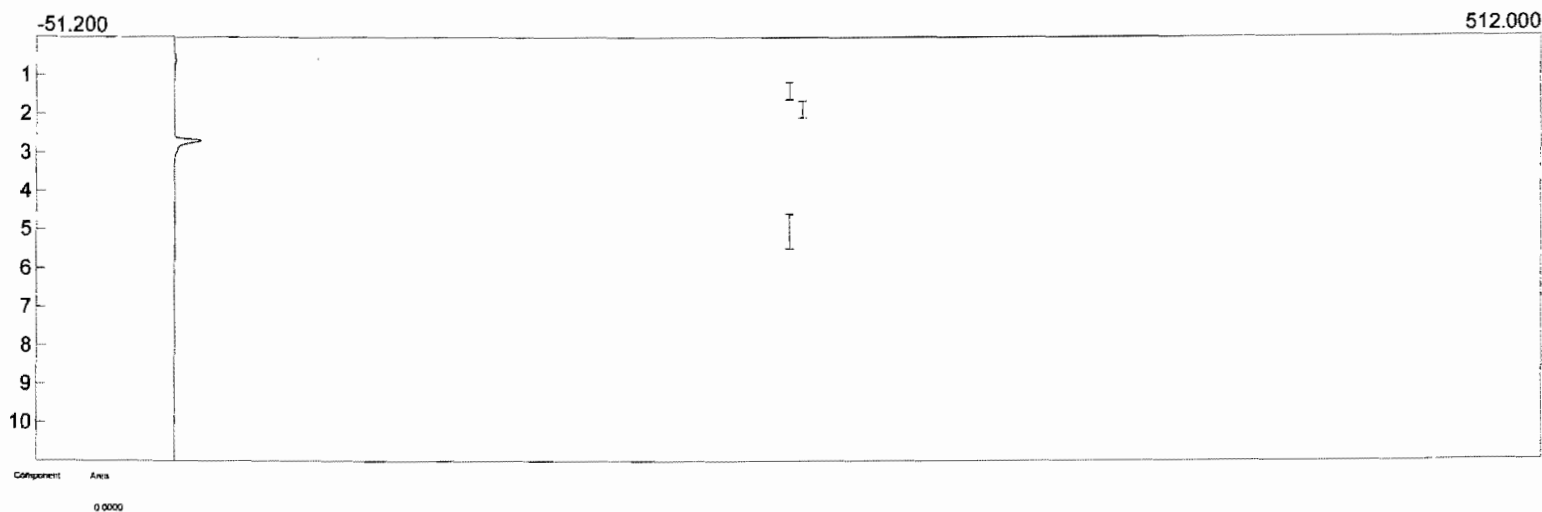
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 13:40:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs17.CHR ()
Sample: SRU Runs
Operator: SEY



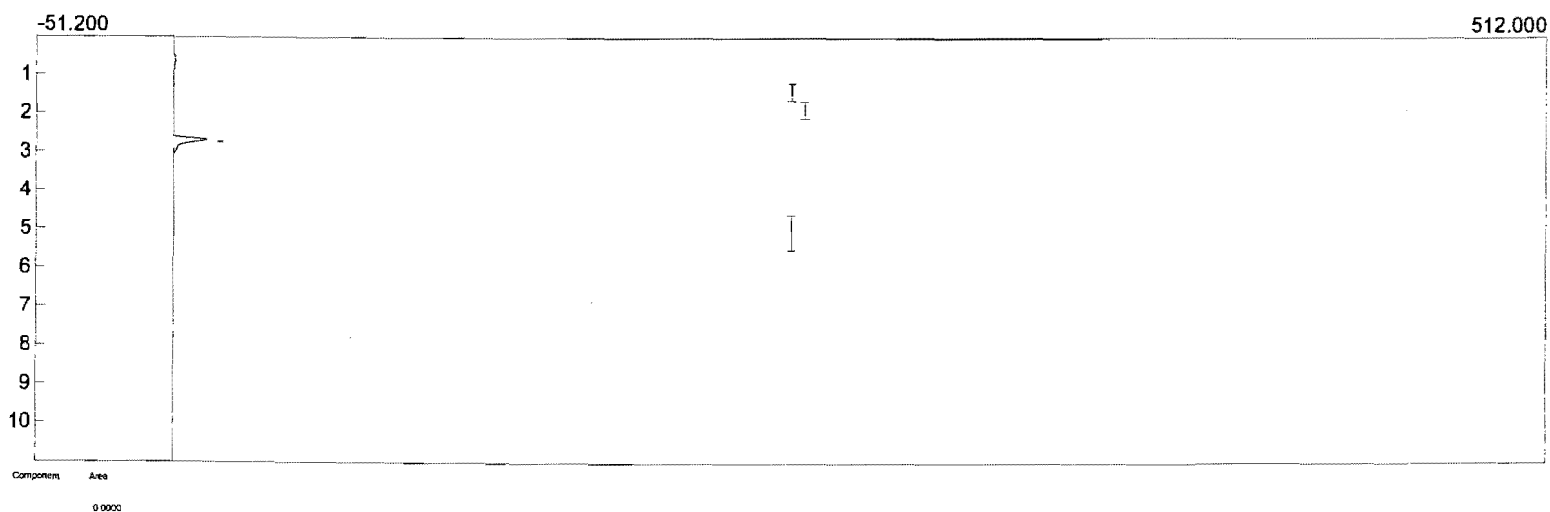
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 13:50:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs18.CHR ()
Sample: SRU Runs
Operator: SEY



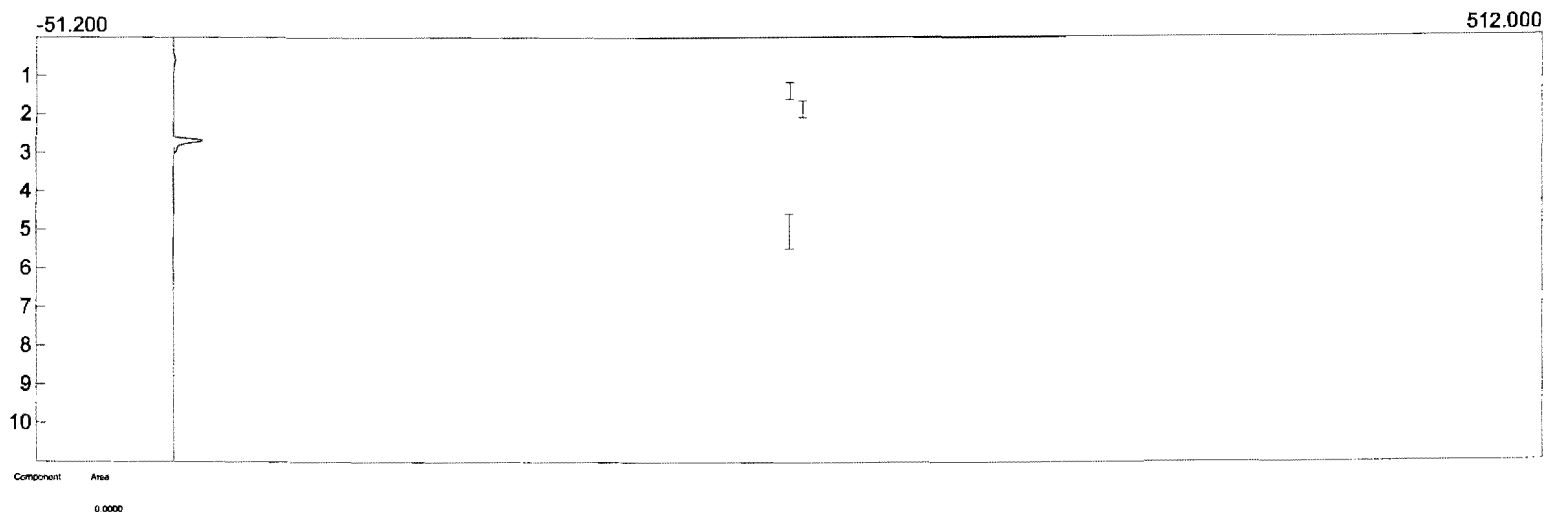
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 14:00:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs19.CHR ()
Sample: SRU Runs
Operator: SEY



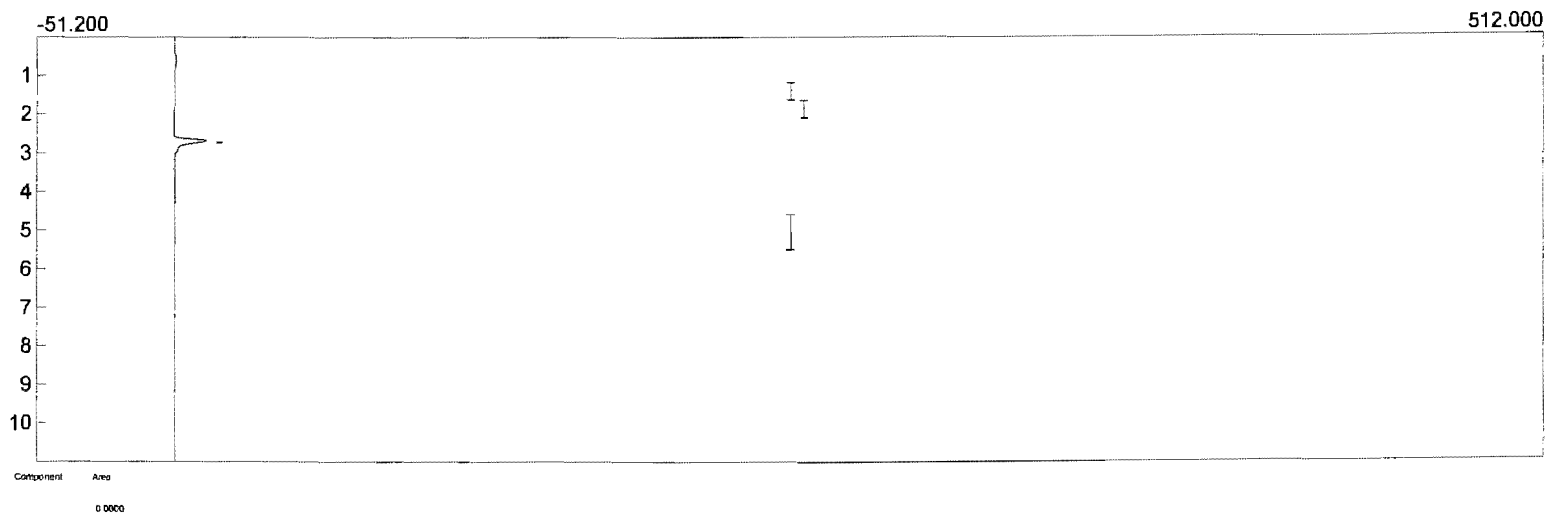
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 14:10:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs20.CHR ()
Sample: SRU Runs
Operator: SEY



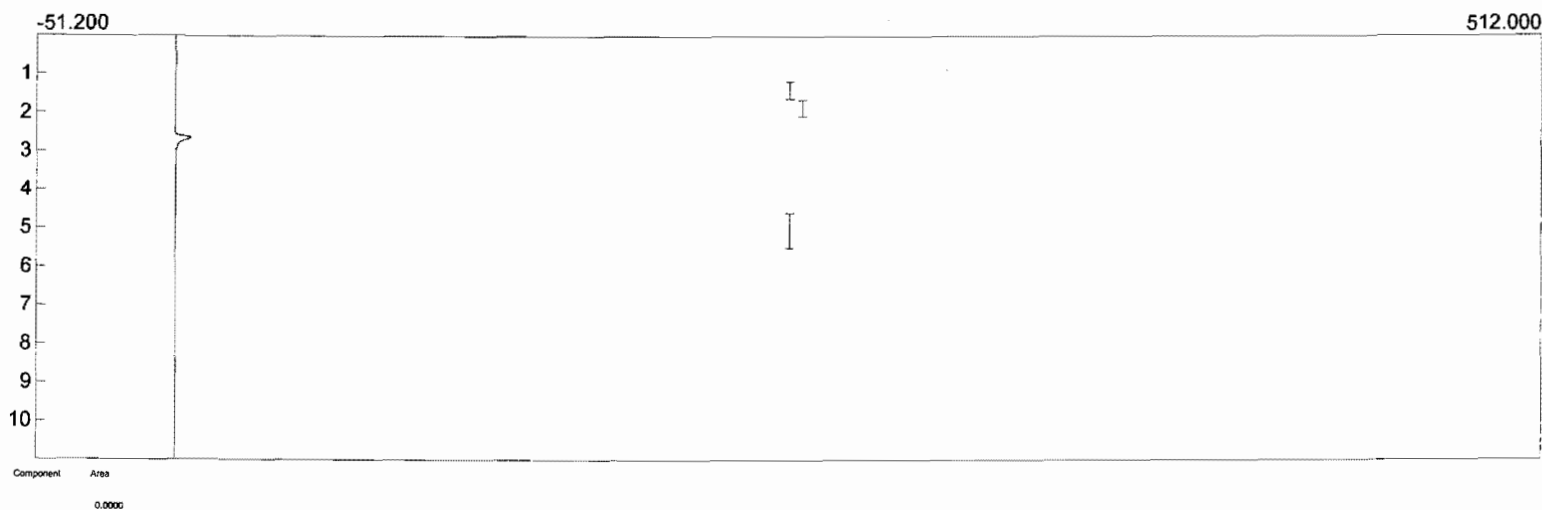
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 14:20:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs21.CHR ()
Sample: SRU Runs
Operator: SEY



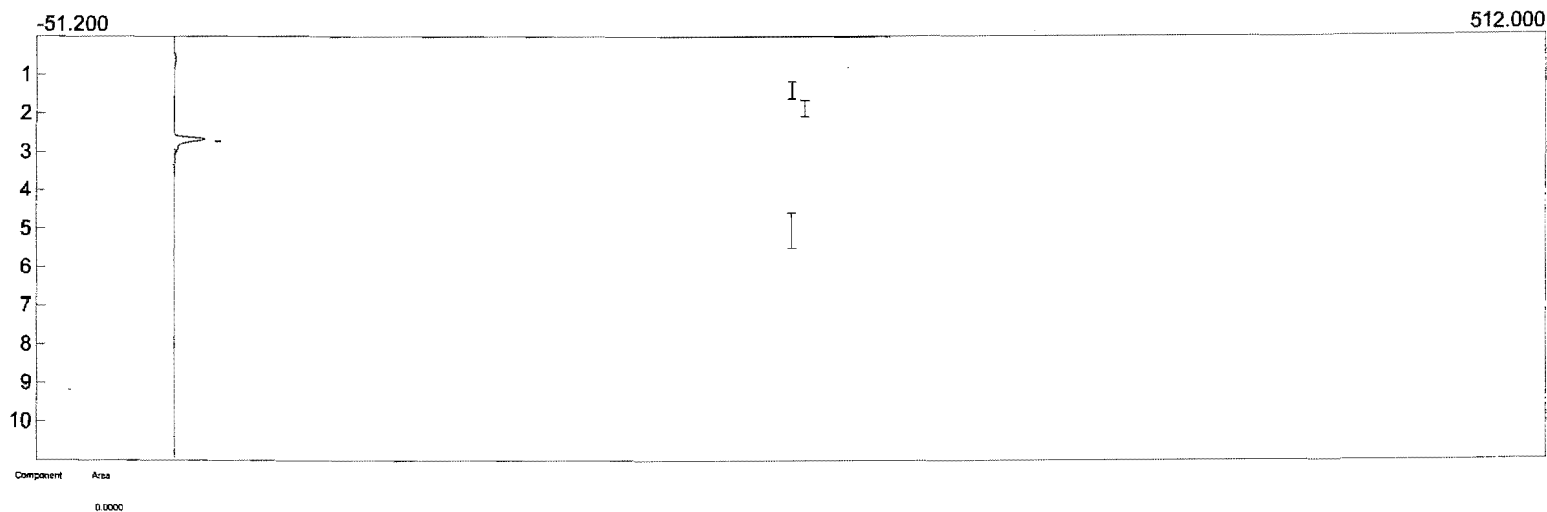
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 14:30:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs22.CHR ()
Sample: SRU Runs
Operator: SEY



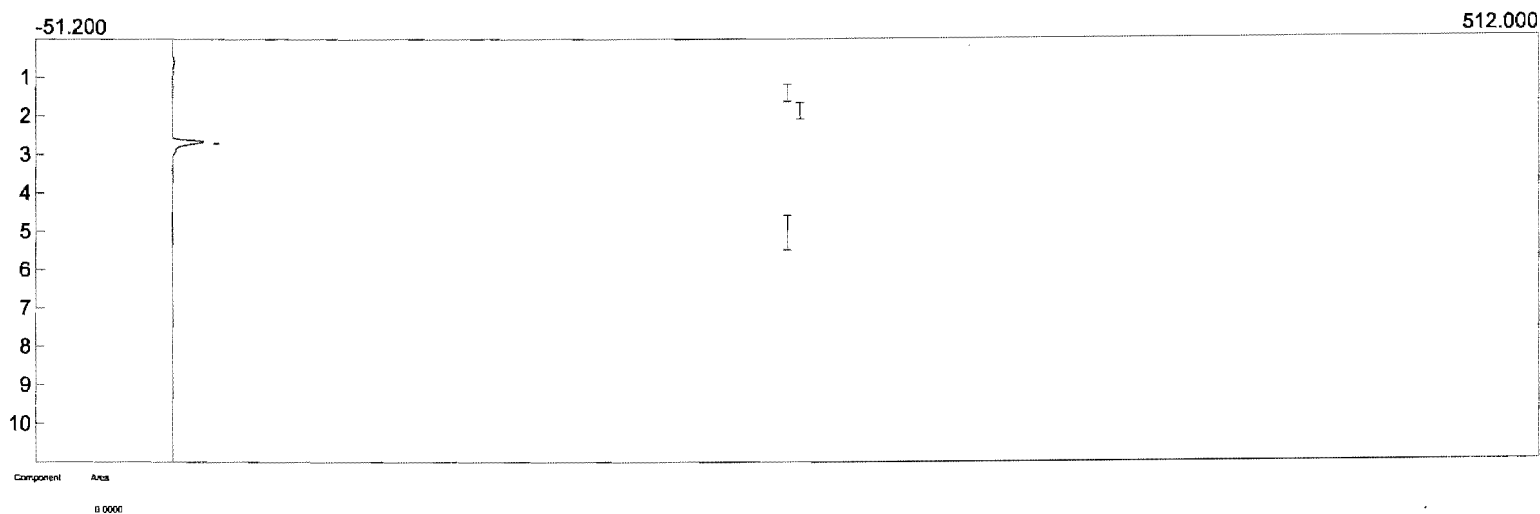
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 14:40:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs23.CHR ()
Sample: SRU Runs
Operator: SEY



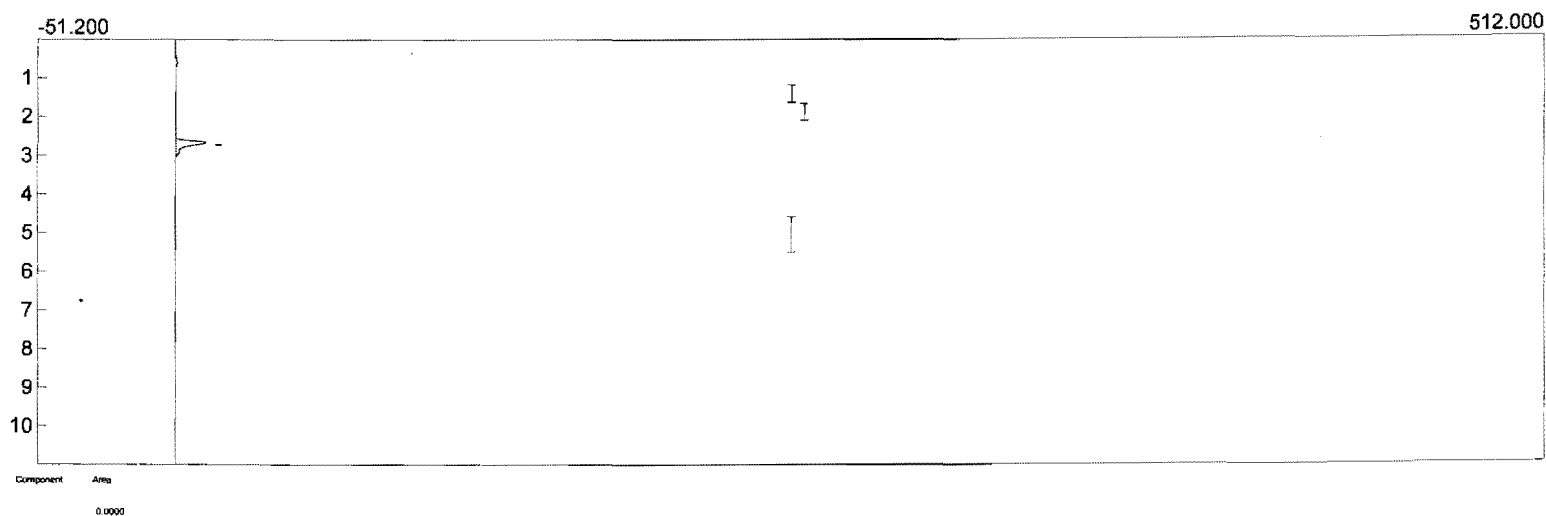
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 14:50:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs24.CHR ()
Sample: SRU Runs
Operator: SEY



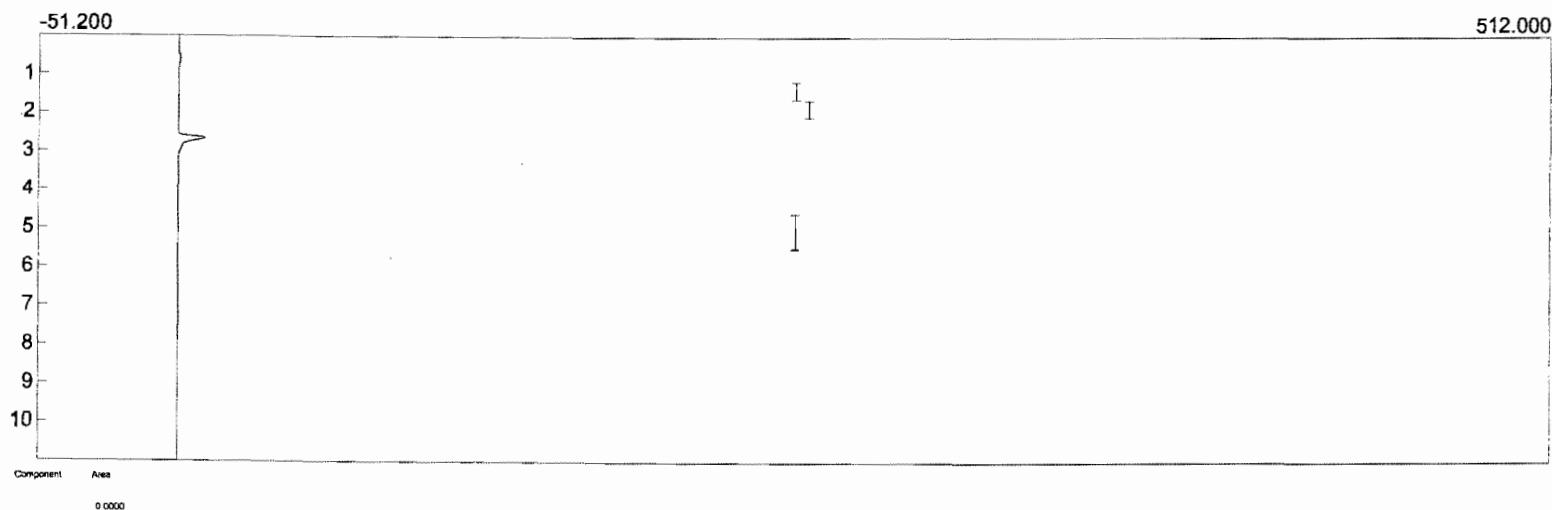
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 15:00:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs25.CHR ()
Sample: SRU Runs
Operator: SEY



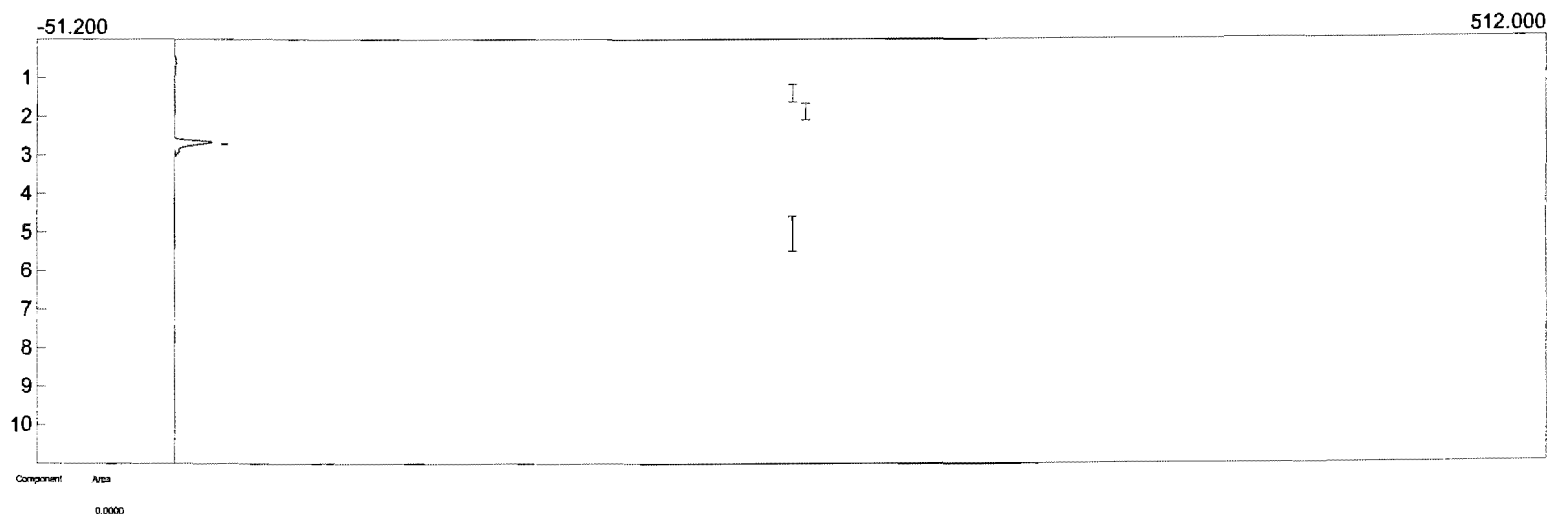
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 15:10:17
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs26.CHR ()
Sample: SRU Runs
Operator: SEY



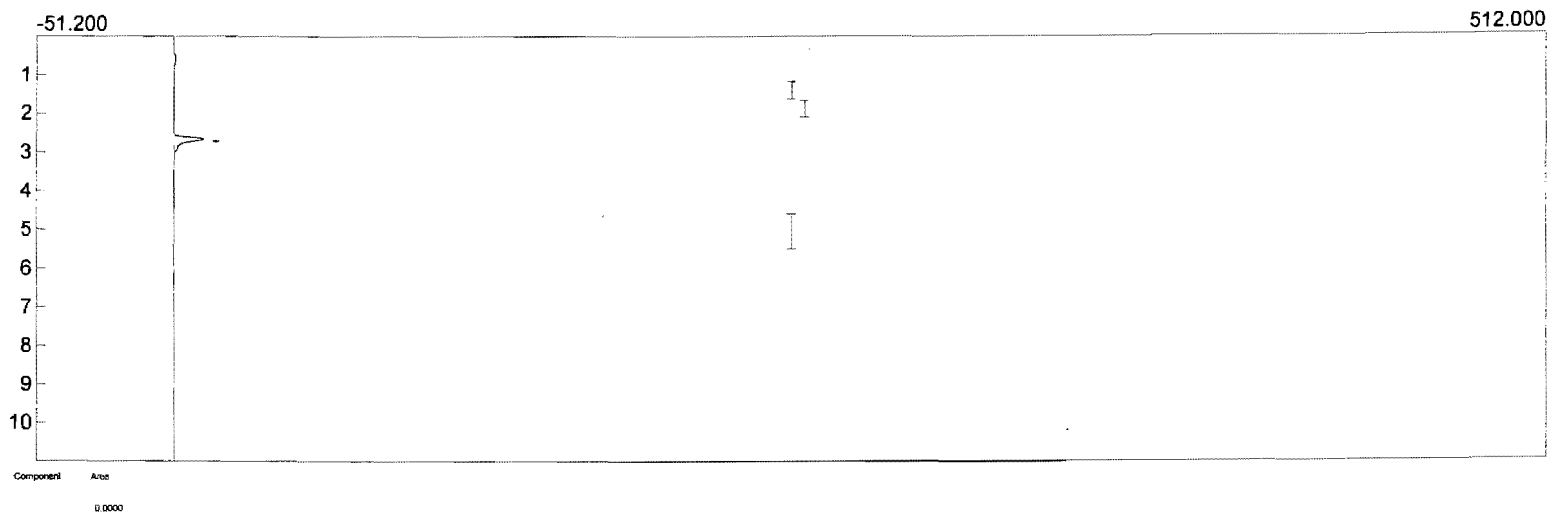
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 15:20:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs27.CHR ()
Sample: SRU Runs
Operator: SEY



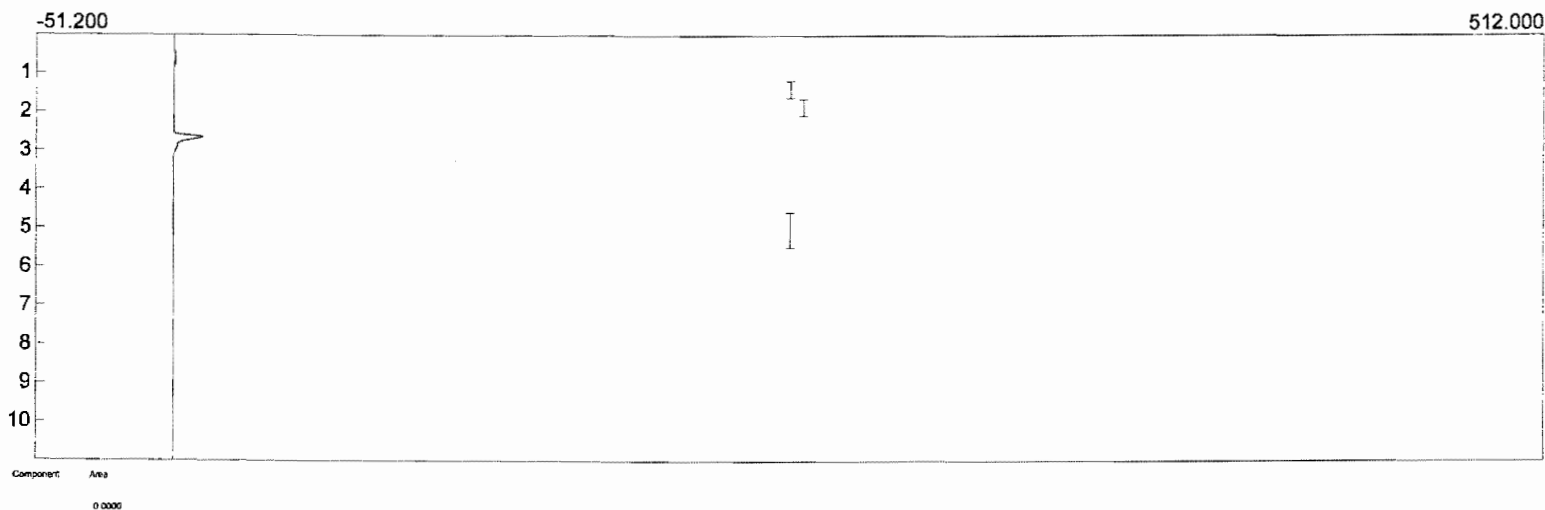
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 15:30:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs28.CHR ()
Sample: SRU Runs
Operator: SEY



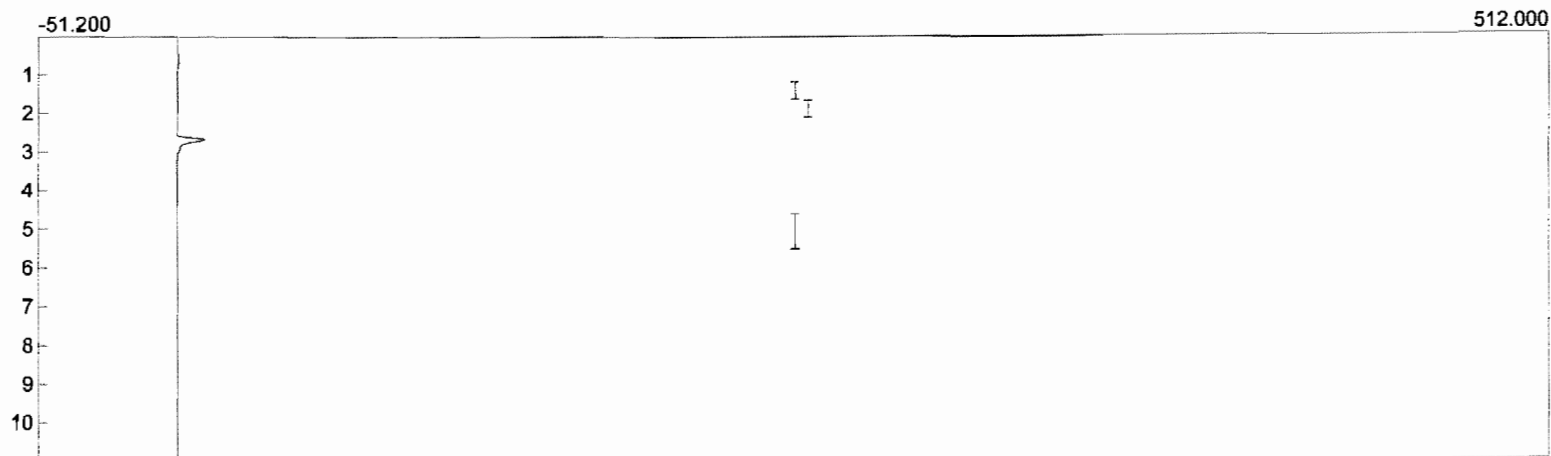
Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 15:40:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs29.CHR ()
Sample: SRU Runs
Operator: SEY



Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 15:50:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs30.CHR ()
Sample: SRU Runs
Operator: SEY



Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 16:00:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs31.CHR ()
Sample: SRU Runs
Operator: SEY

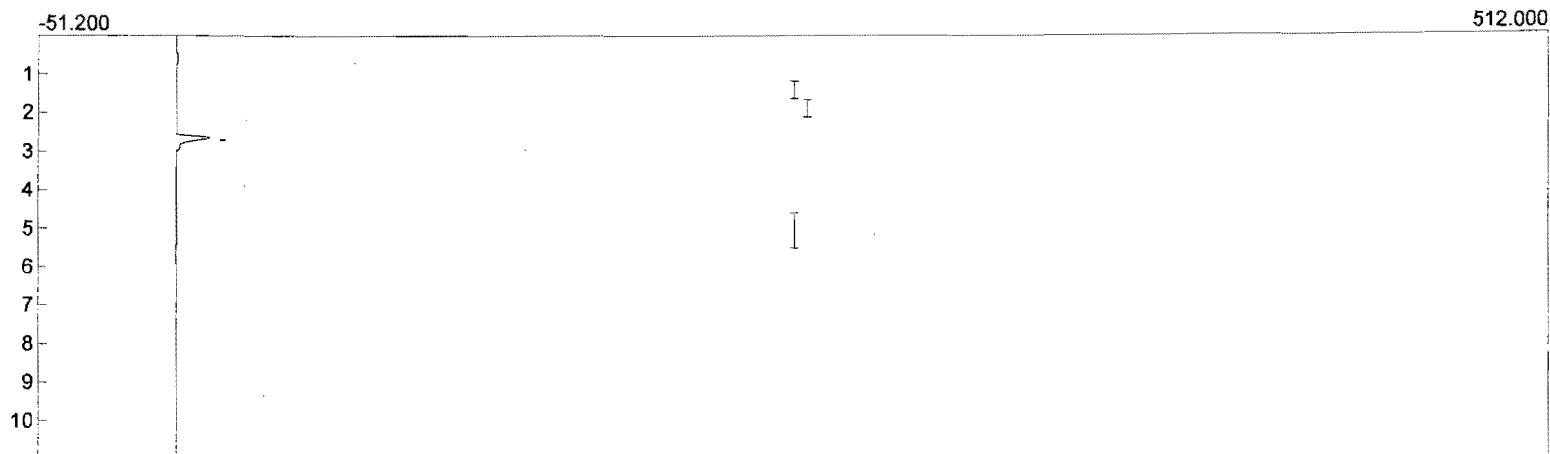


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 16:10:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs32.CHR ()
Sample: SRU Runs
Operator: SEY

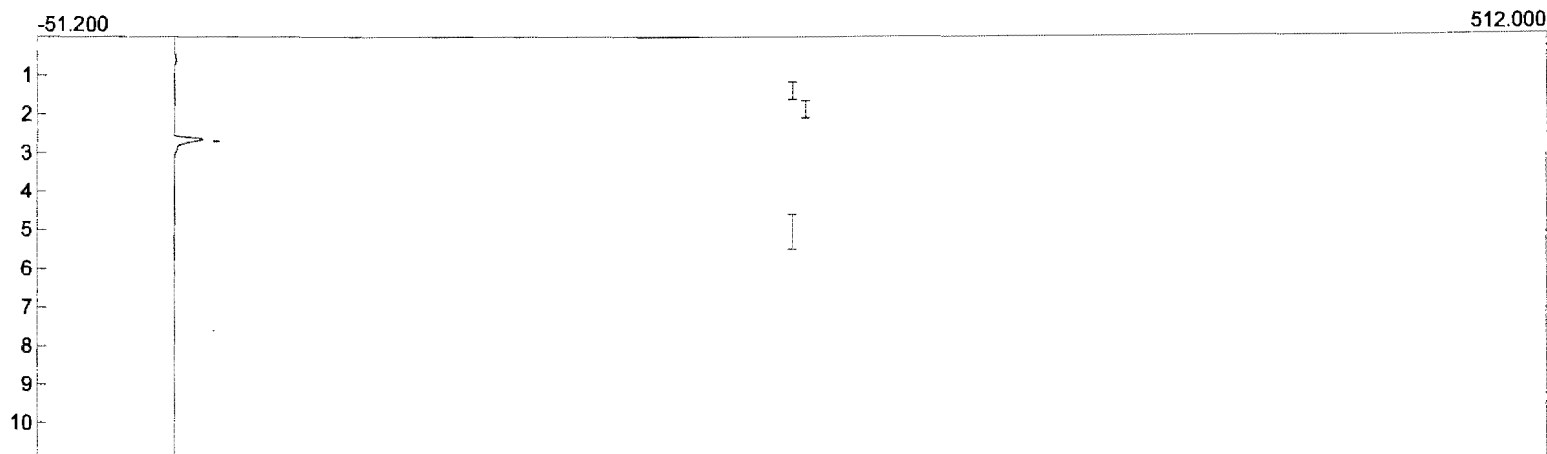


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 16:20:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs33.CHR ()
Sample: SRU Runs
Operator: SEY

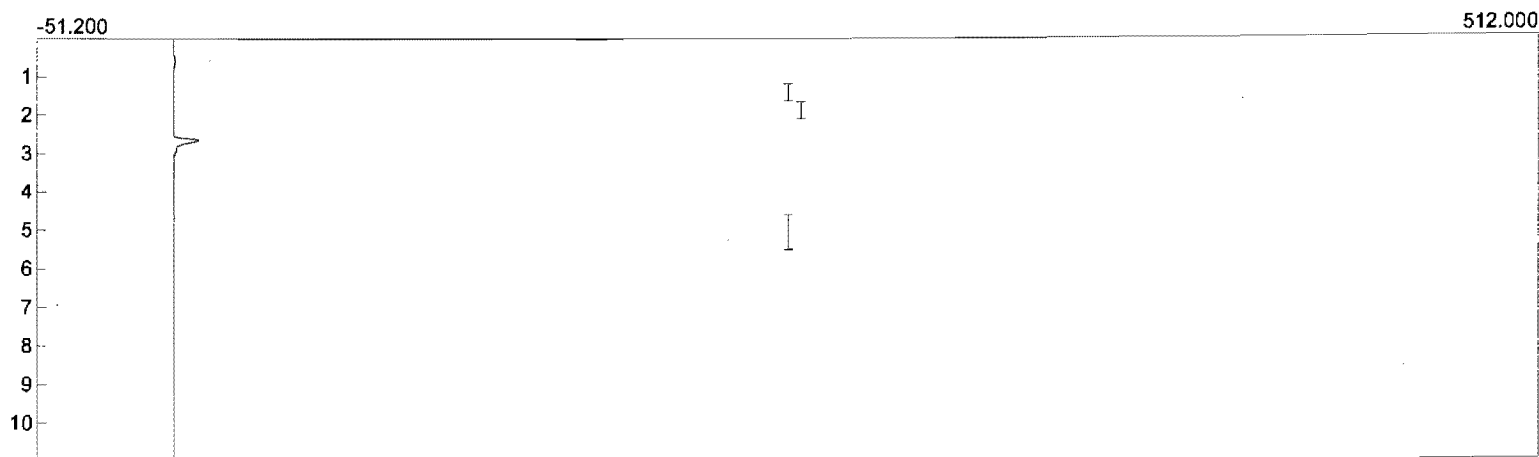


Component

Area

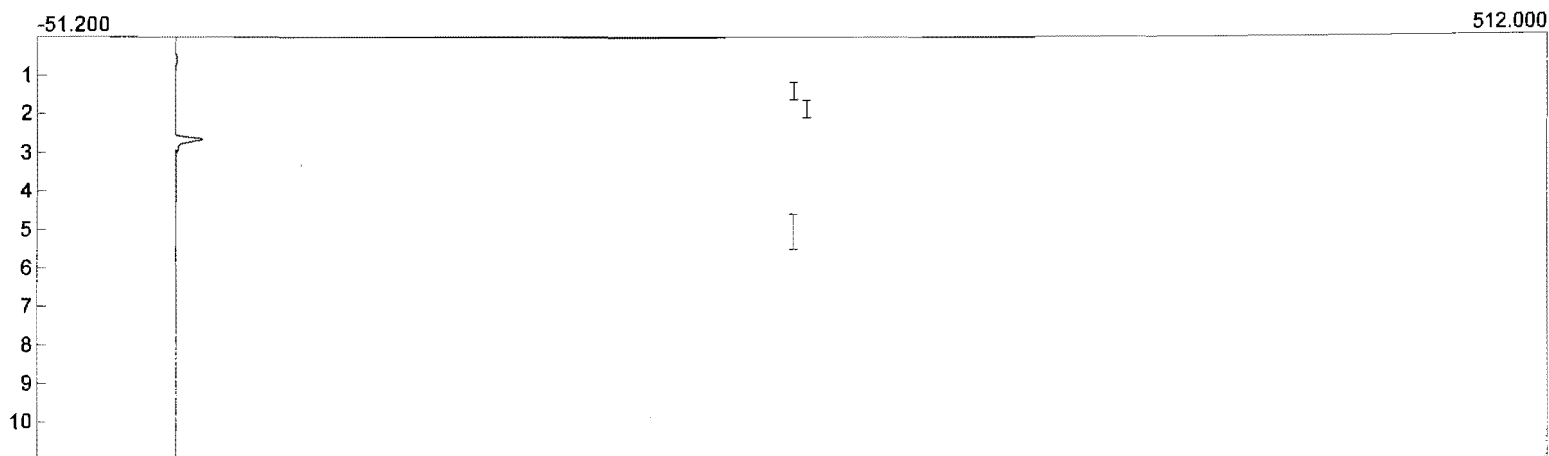
0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 16:30:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs34.CHR ()
Sample: SRU Runs
Operator: SEY



Component	Area
	0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 16:40:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs35.CHR ()
Sample: SRU Runs
Operator: SEY

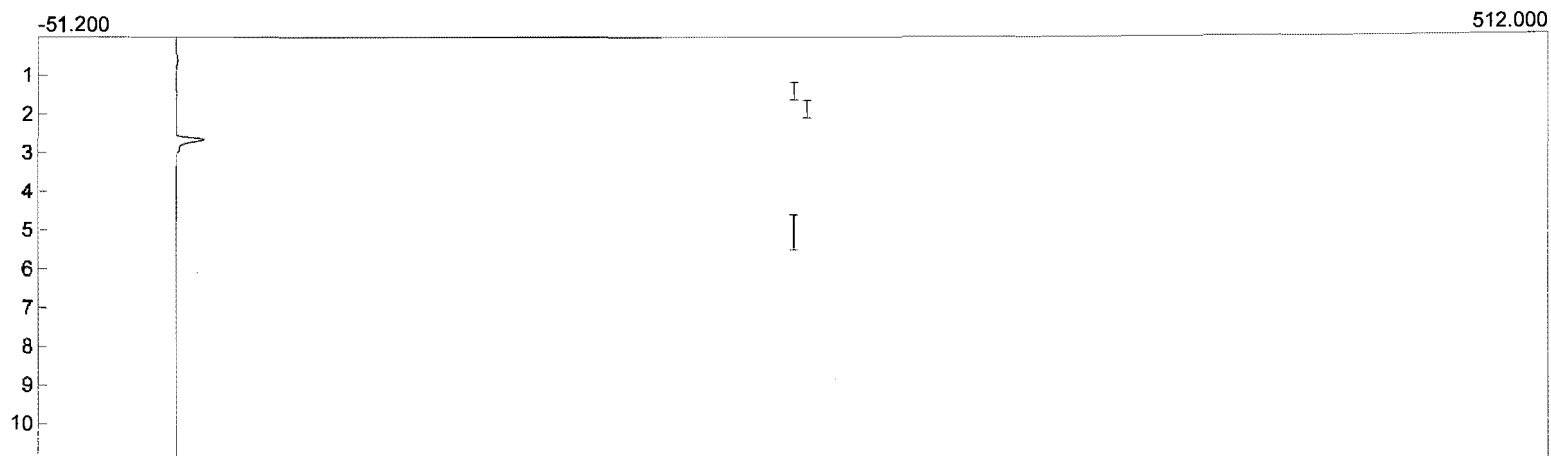


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 16:50:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs36.CHR ()
Sample: SRU Runs
Operator: SEY

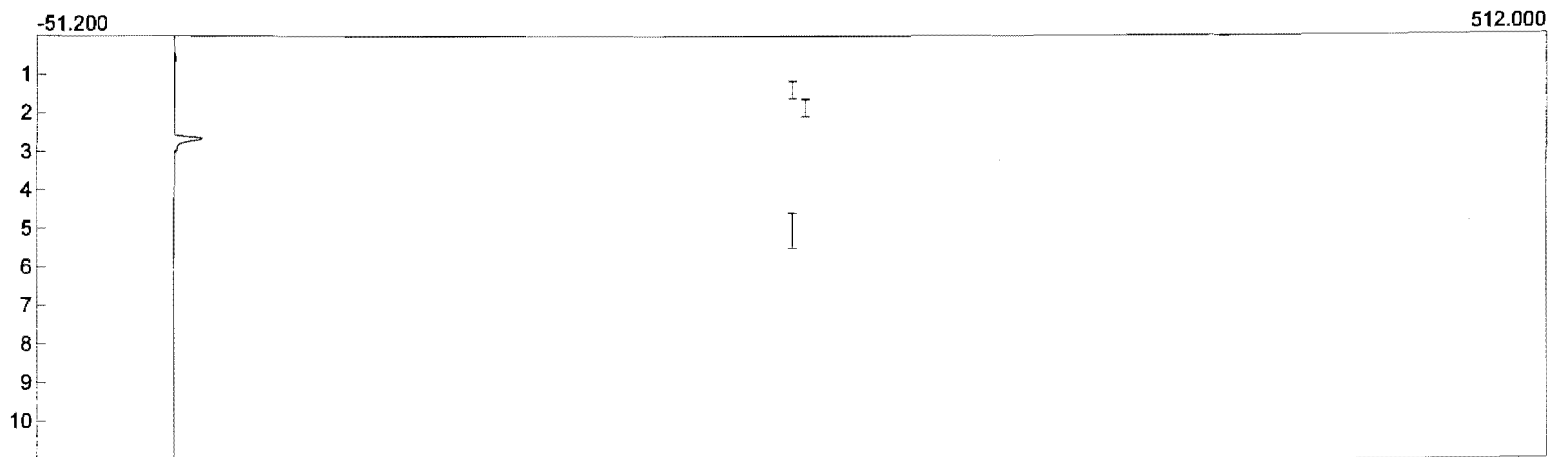


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 17:00:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs37.CHR ()
Sample: SRU Runs
Operator: SEY

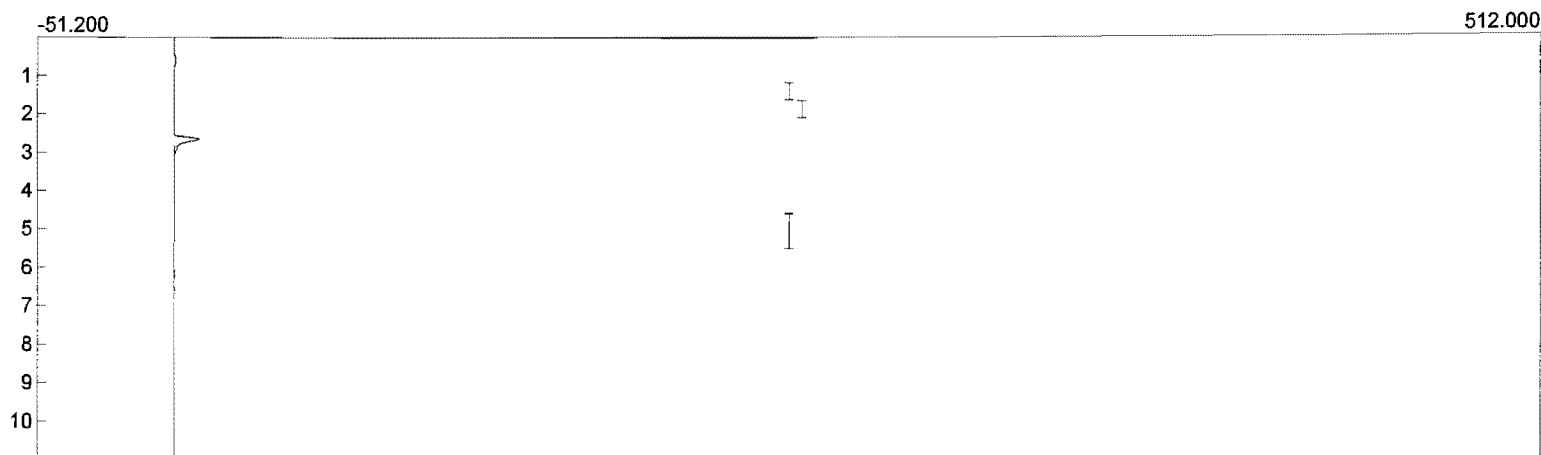


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 17:10:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs38.CHR ()
Sample: SRU Runs
Operator: SEY

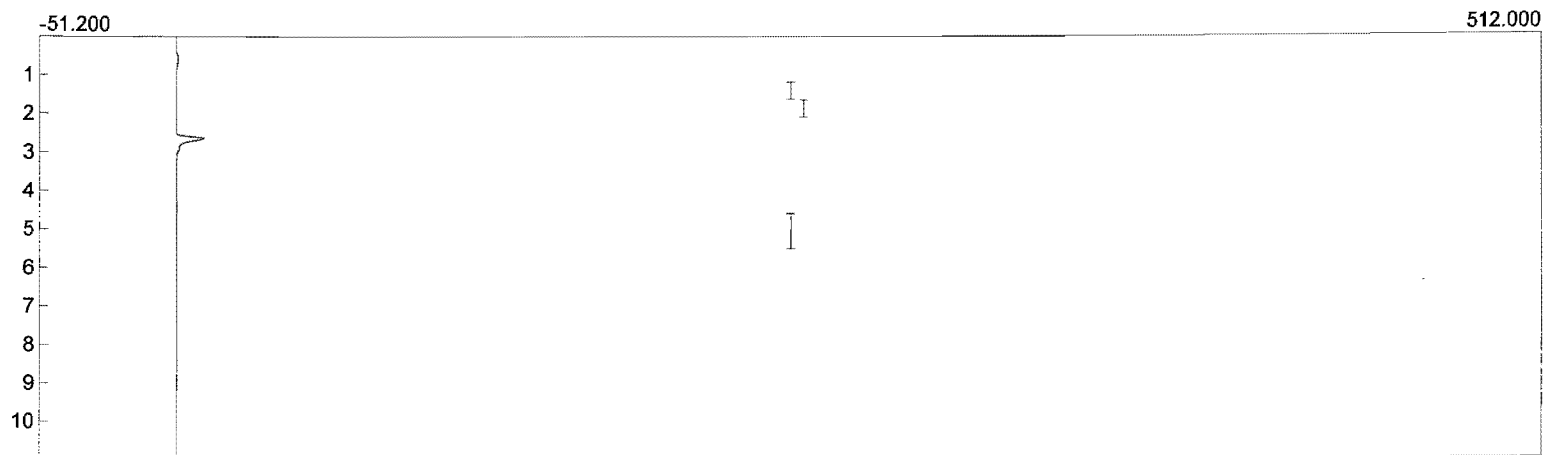


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 17:20:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs39.CHR ()
Sample: SRU Runs
Operator: SEY

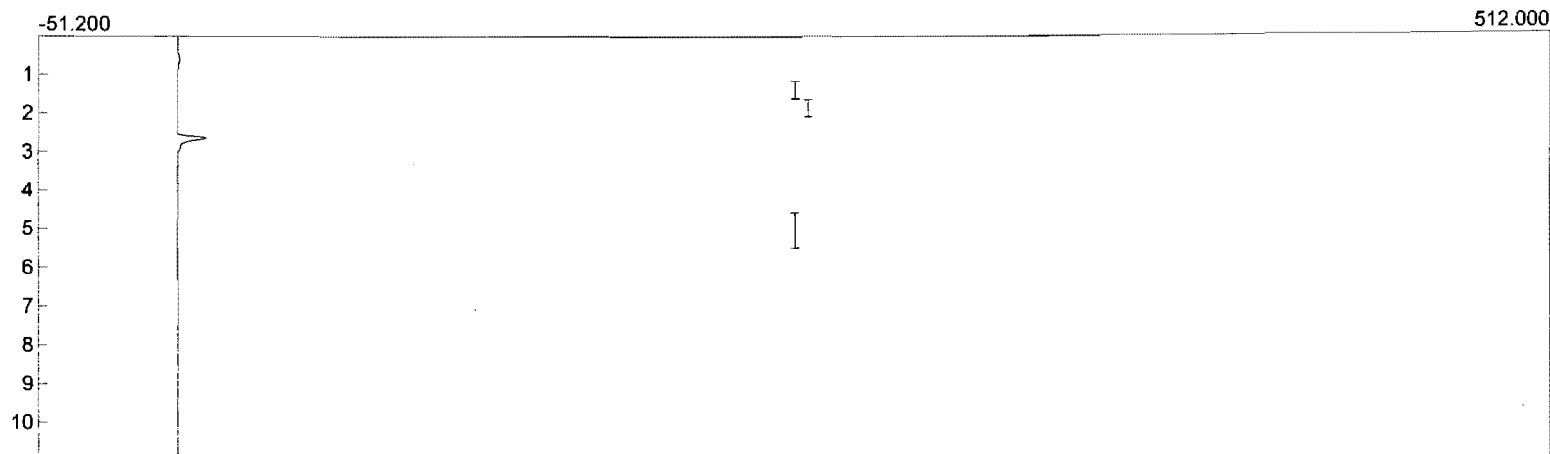


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 17:30:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs40.CHR ()
Sample: SRU Runs
Operator: SEY

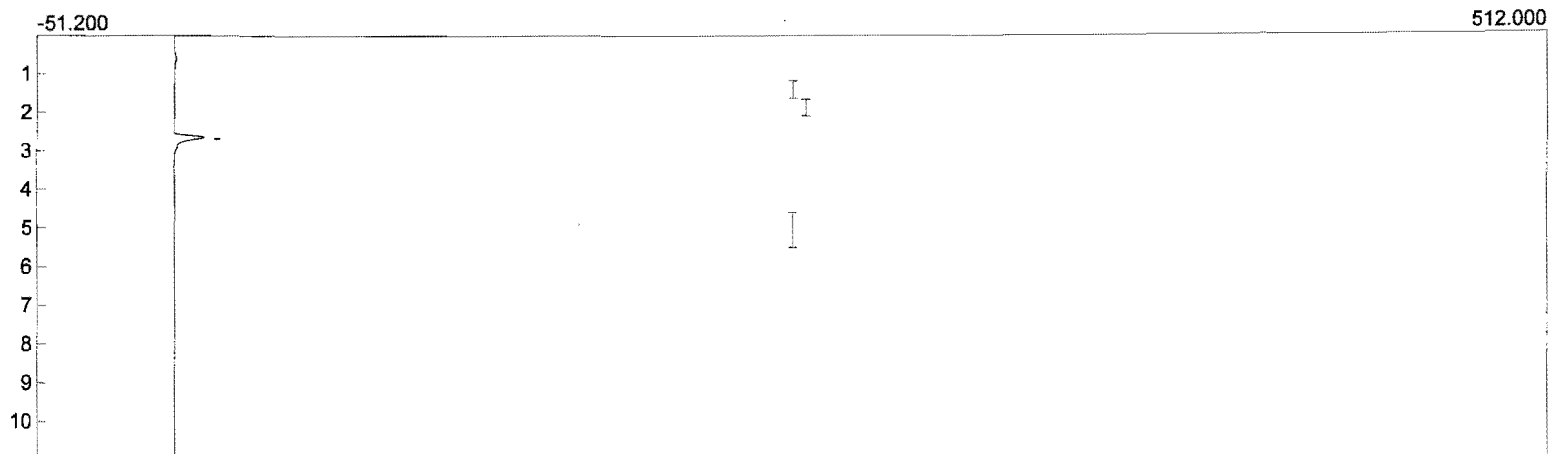


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 17:40:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs41.CHR ()
Sample: SRU Runs
Operator: SEY

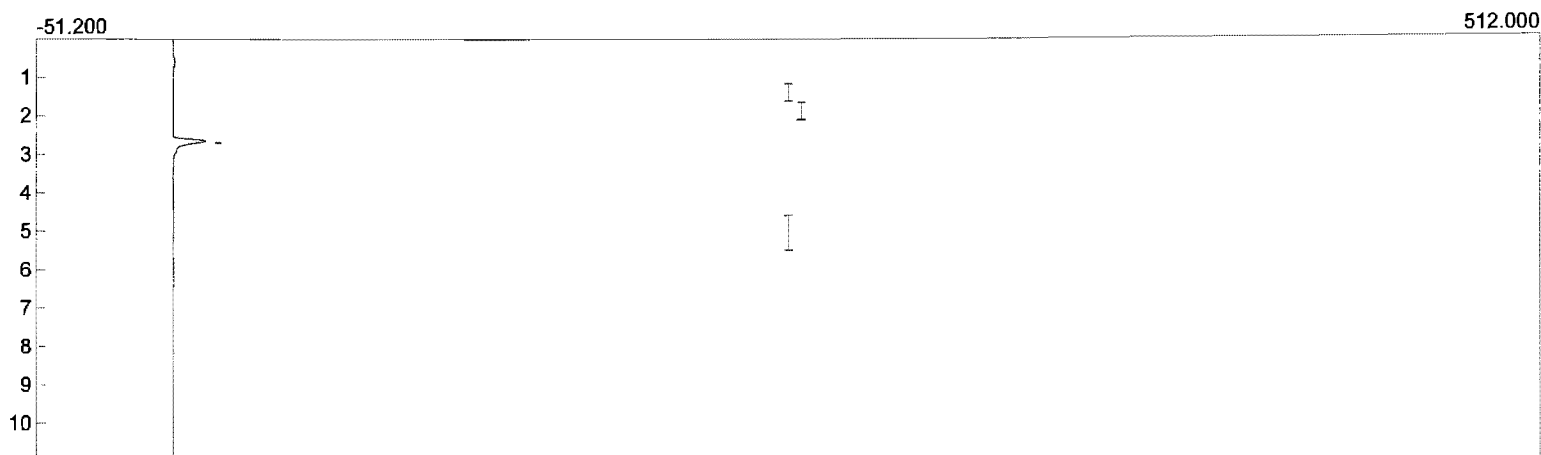


Component

Area

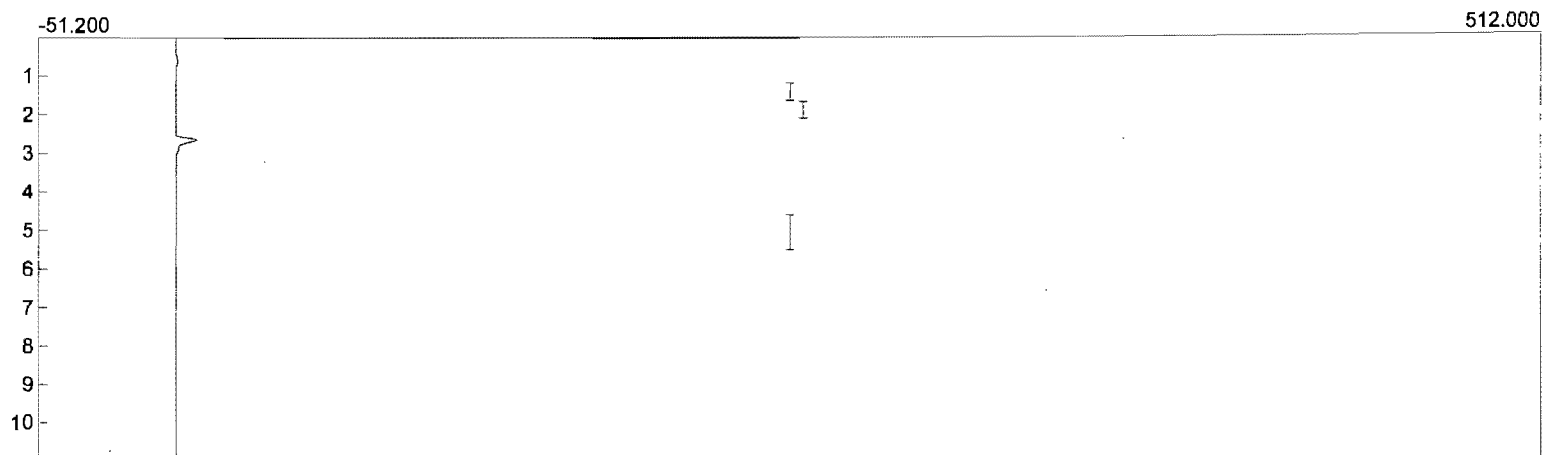
0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 17:50:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs42.CHR ()
Sample: SRU Runs
Operator: SEY



Component	Area
	0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 18:00:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs43.CHR ()
Sample: SRU Runs
Operator: SEY

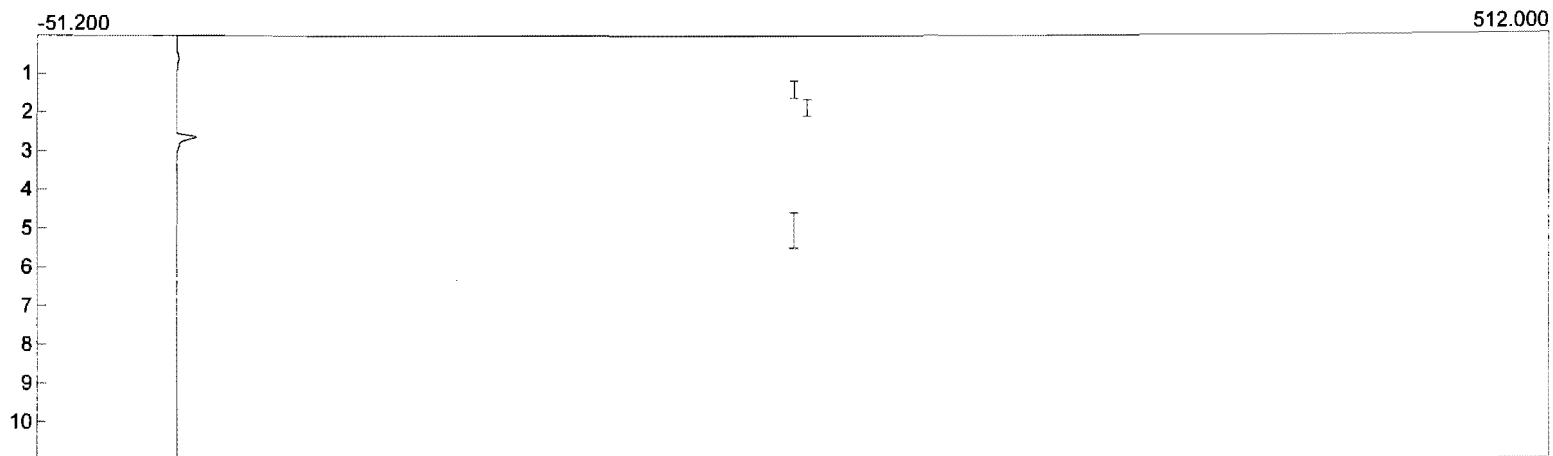


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 18:10:18
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs44.CHR ()
Sample: SRU Runs
Operator: SEY

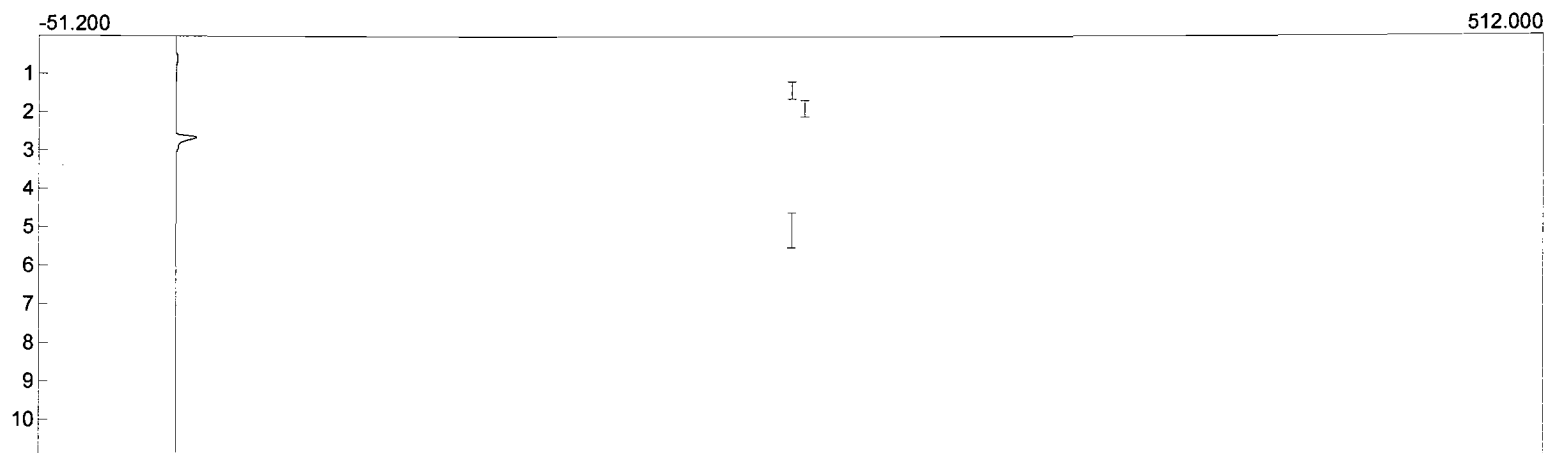


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 18:20:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs45.CHR ()
Sample: SRU Runs
Operator: SEY

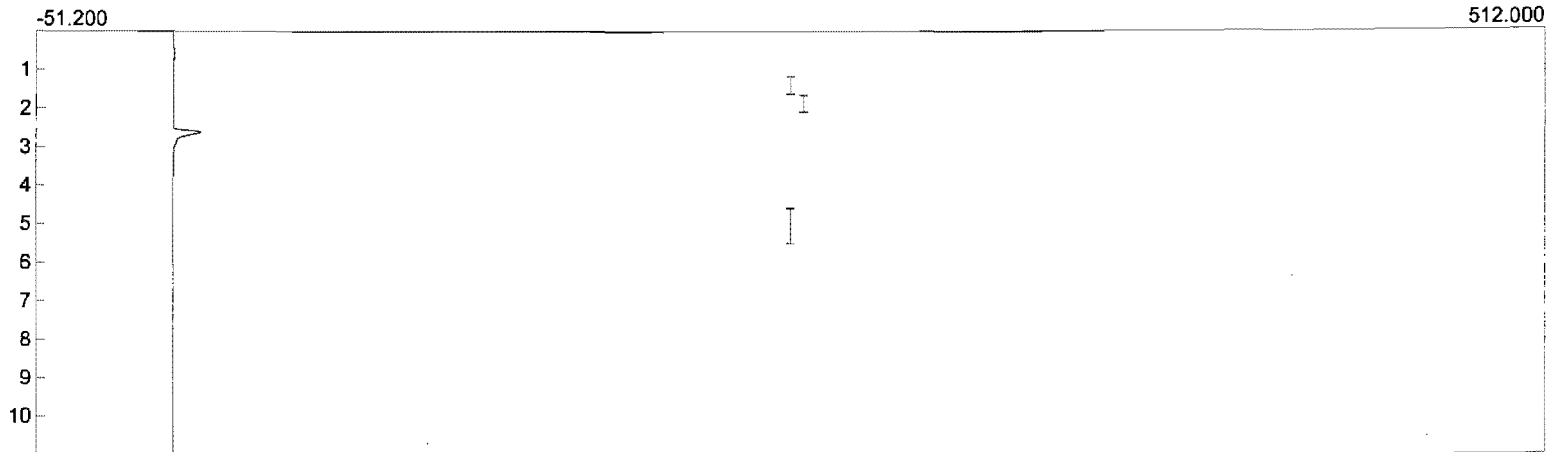


Component

Area

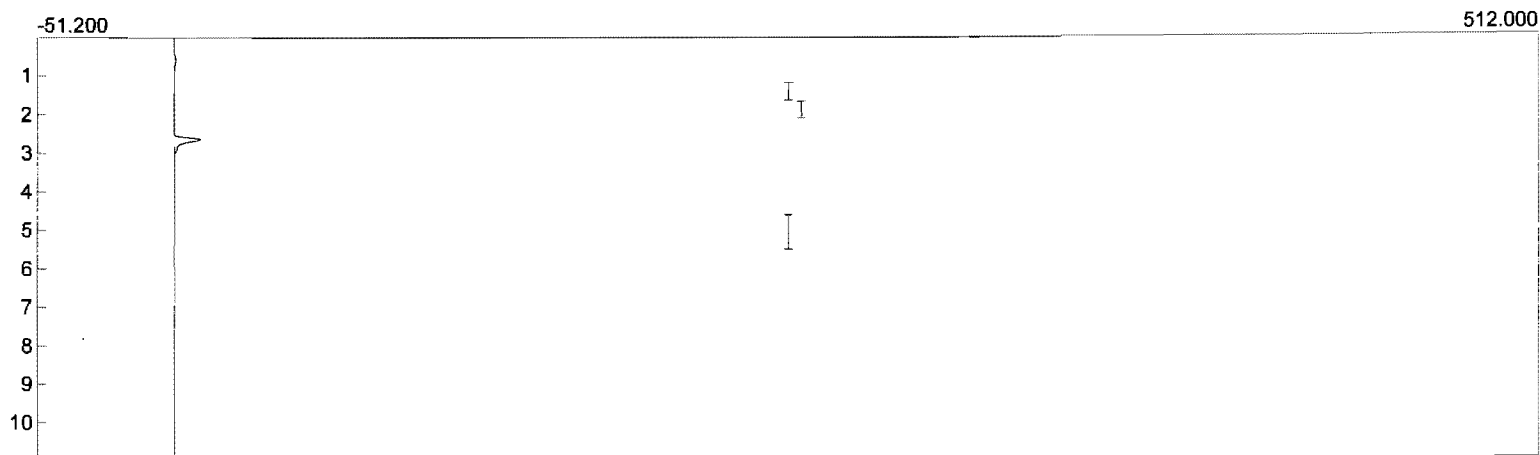
0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 18:30:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs46.CHR ()
Sample: SRU Runs
Operator: SEY



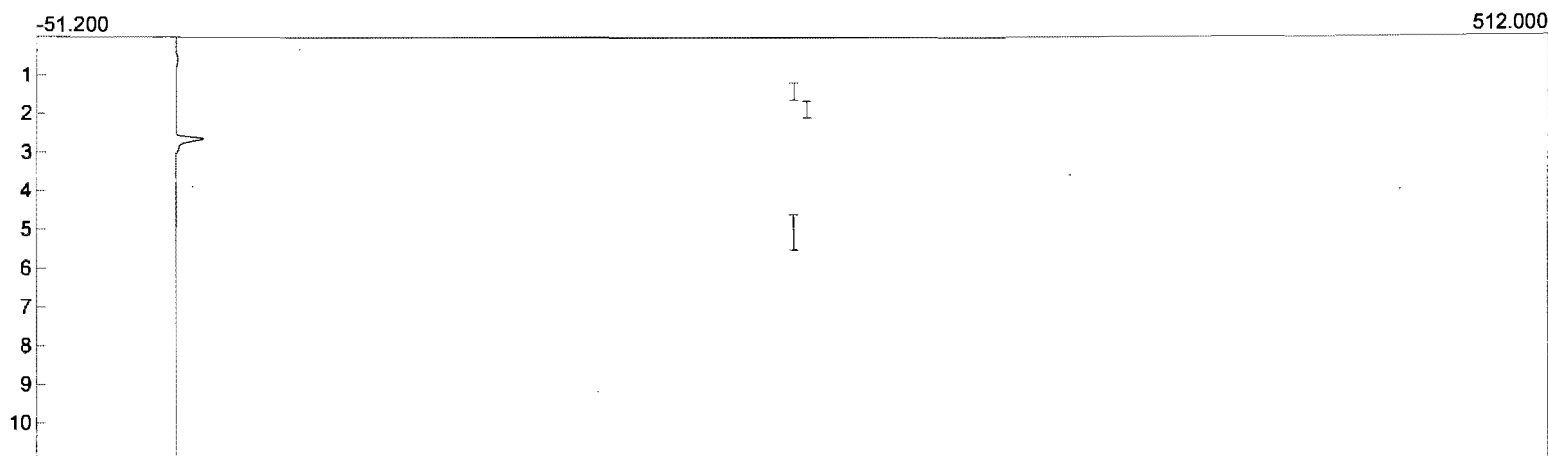
Component	Area
	0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 18:40:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs47.CHR ()
Sample: SRU Runs
Operator: SEY



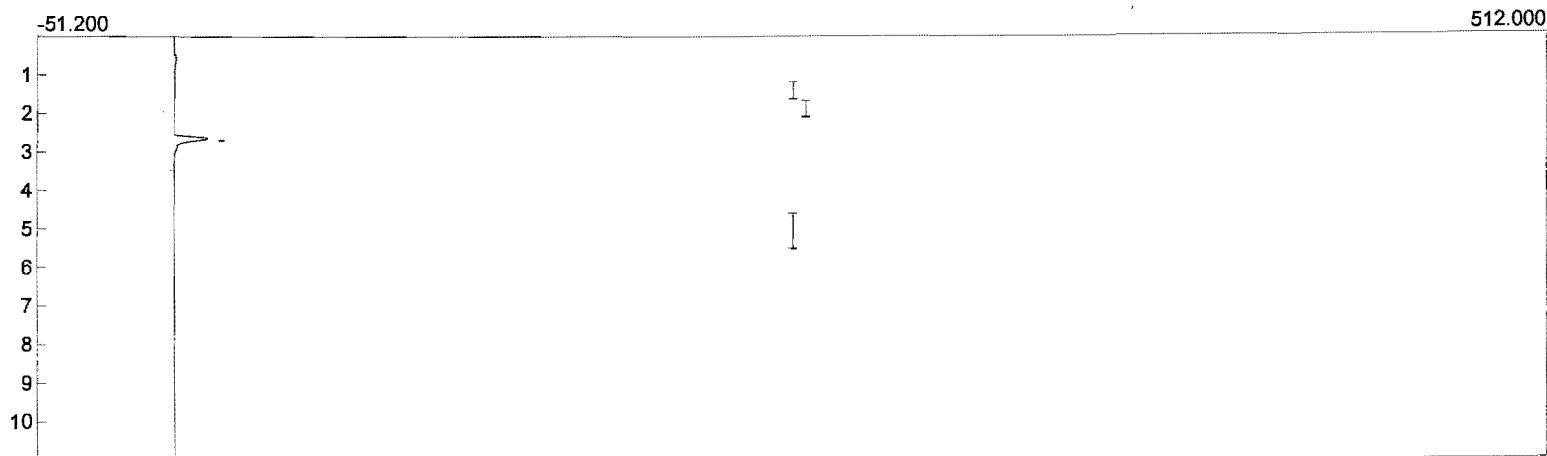
Component	Area
	0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 18:50:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs48.CHR ()
Sample: SRU Runs
Operator: SEY



Component	Area
	0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 19:00:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs49.CHR ()
Sample: SRU Runs
Operator: SEY

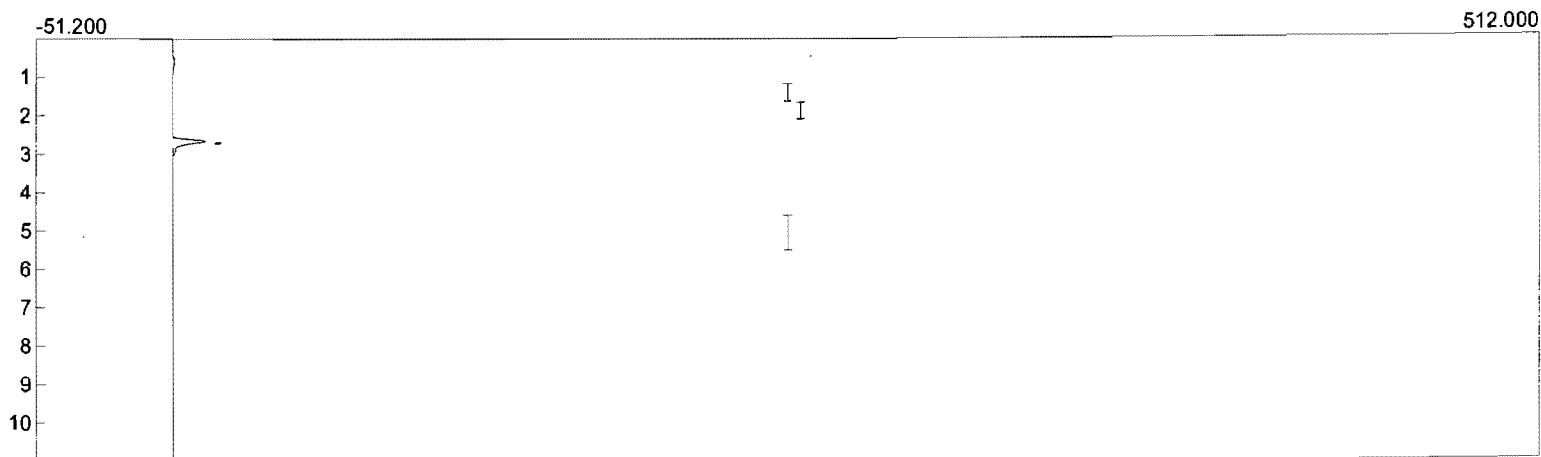


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 19:10:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs50.CHR ()
Sample: SRU Runs
Operator: SEY



Component

Area

0.0000

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Analysis date: 07/20/2007 19:20:19

Method: USEPA Method 15

Description: FPD

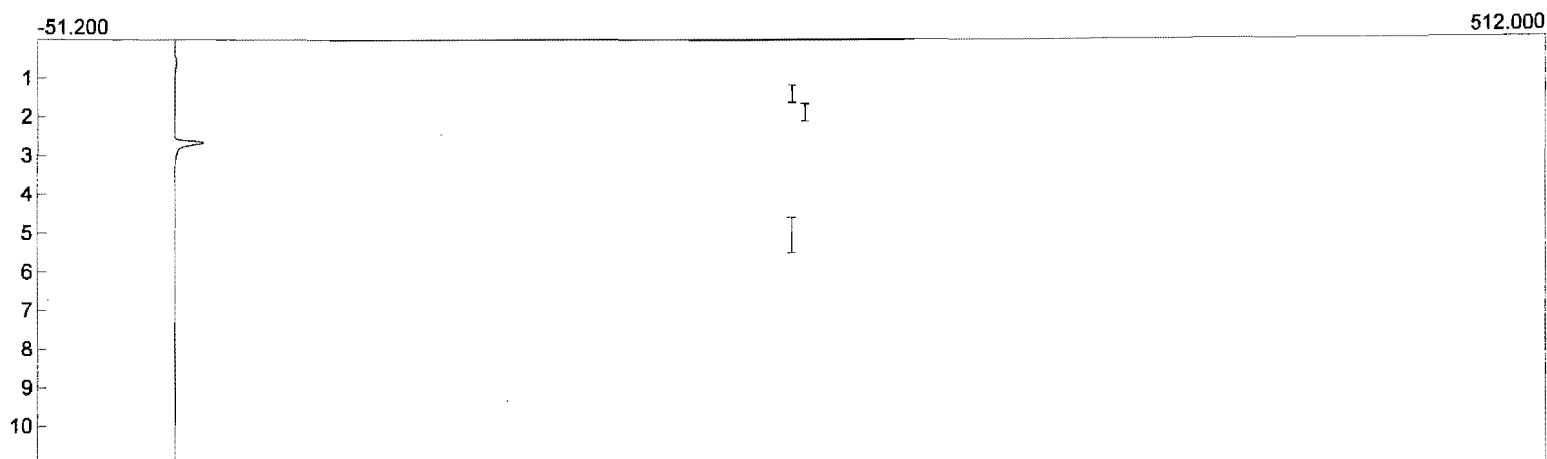
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720runs51.CHR ()

Sample: SRU Runs

Operator: SEY

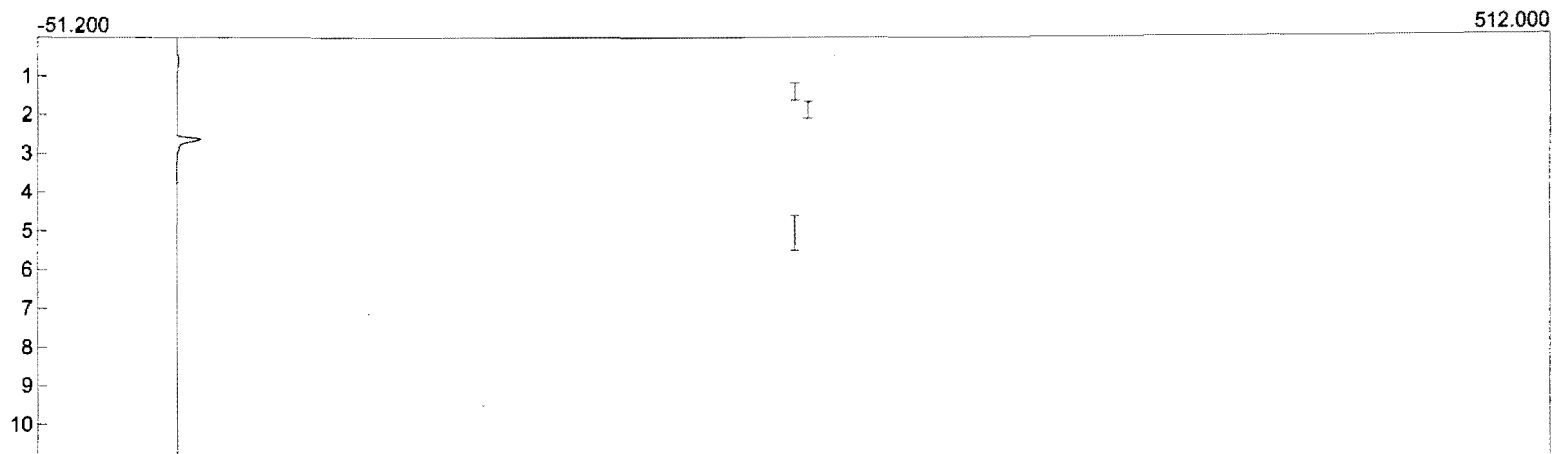


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 19:30:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs52.CHR ()
Sample: SRU Runs
Operator: SEY

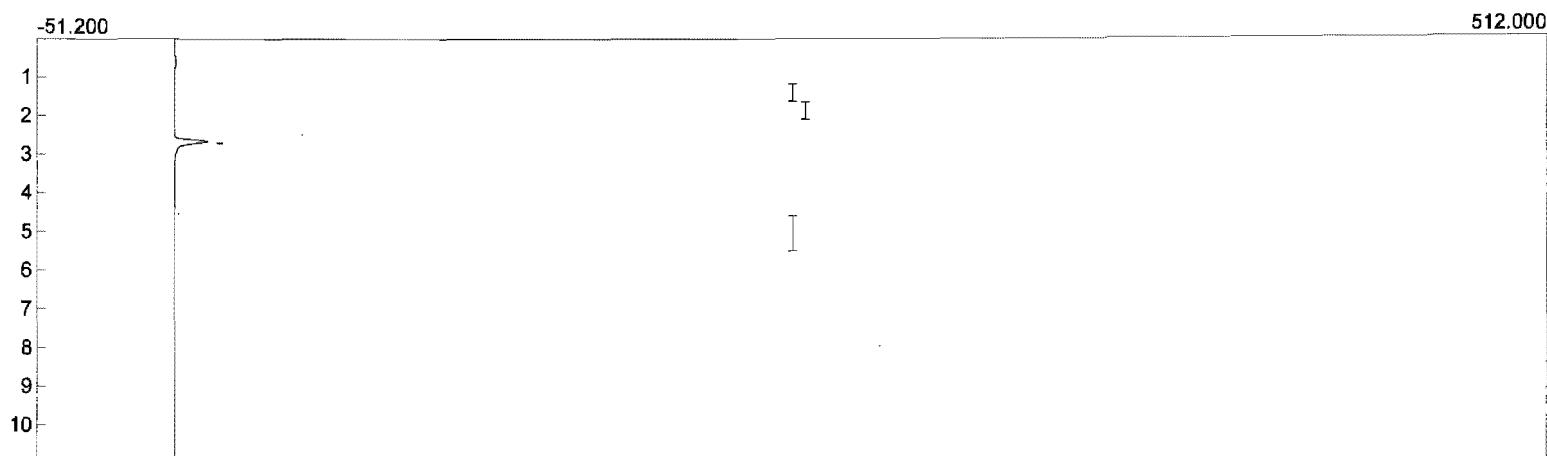


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 19:40:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs53.CHR ()
Sample: SRU Runs
Operator: SEY

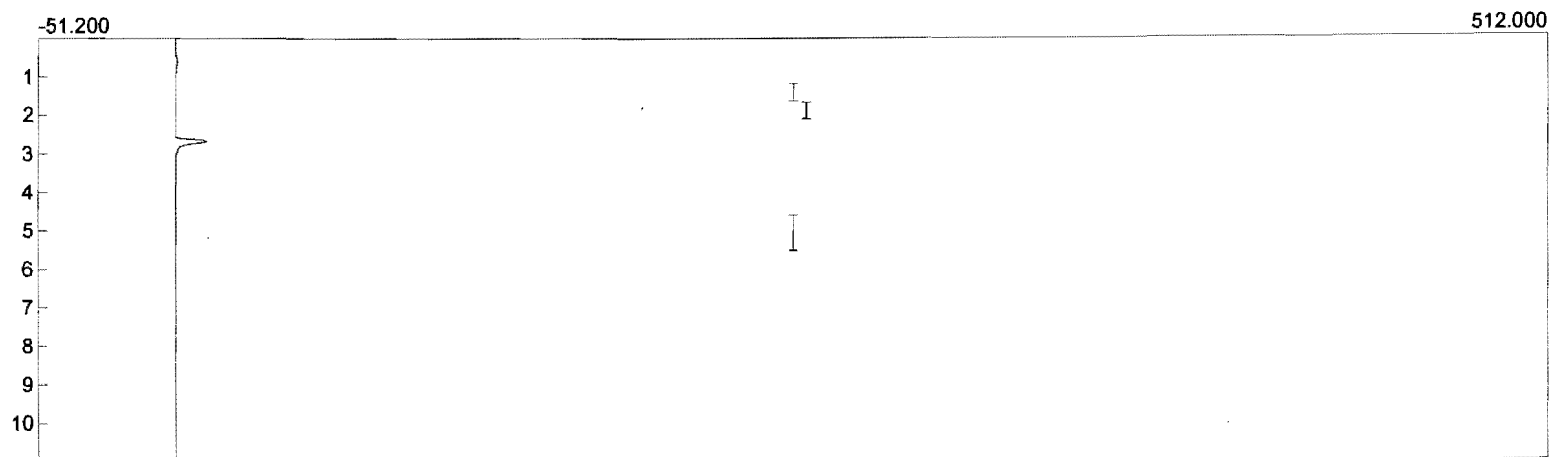


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Analysis date: 07/20/2007 19:50:19
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720runs54.CHR ()
Sample: SRU Runs
Operator: SEY



Component

Area

0.0000



TRS STANDARDS PRETEST DATA

Client: Marathon Ashland
Location: Texas City, Texas
Source: SRU
Date sampled: 7/20/2007
Run Number: M15 1-3
Compound Analyzed: TRS
Method: USEPA Method 15
Instrument: SRI-9300B
Detector: GC-FPD
Units of Detection: ppm

Carbonyl Sulfide Standards			
Standard No	Concentration	Area	Sq Rt Area Counts
1	0.0	0.0	0.0
2	26.4	3,380.1	58.1
3	52.8	9,665.2	98.3
4	79.1	15,548.3	124.7

Hydrogen Sulfide Standards			
Standard No	Concentration	Area	Sq Rt Area Counts
1	0.0	0.0	0.0
2	25.0	1,883.1	43.4
3	50.0	6,647.0	81.5
4	75.0	10,685.1	103.4

Carbon Disulfide Standards			
Standard No	Concentration	Area	Sq Rt Area Counts
1	0.0	0.0	0.0
2	25.4	3,281.9	57.3
3	50.7	15,639.4	125.1
4	76.1	23,083.2	151.9

Analytical Calculation Summary

Calibration Standards Area Linear Regression Fit

Client: Marathon Ashland
Location: Texas City, Texas
Source: SRU
Date sampled: 7/20/2007
Run Number: M15 1-3
Compound Analyzed: Hydrogen Sulfide
Method: USEPA Method 15
Instrument: SRI-9300B
Detector: GC-FPD
Units of Detection: ppm

Calibration Standards

Statistical Analysis Summary

Standard #	Standard Peak Area (mv)	Square Root Peak Area (mv)	Standard Concentration (ppm)
1	0.0	0.0	0.0
2	1,883.1	43.4	25.0
3	6,647.0	81.5	50.0
4	10,685.1	103.4	75.0

Σxy : 12913.98
 Σx : 228.3
 Σy : 150
 Σx^2 : 19215
 $\Sigma (x)^2$: 52117
 N : 4
 m : 0.703706
 b : -2.66267



Analytical Calculation Summary

Calibration Standards Area Linear Regression Fit

Client: Marathon Ashland
Location: Texas City, Texas
Source: SRU
Date sampled: 7/20/2007
Run Number: M15 1-3
Compound Analyzed: Carbonyl Sulfide
Method: USEPA Method 15
Instrument: SRI-9300B
Detector: GC-FPD
Units of Detection: ppm

Calibration Standards

Statistical Analysis Summary

Standard #	Standard Peak Area (mv)	Square Root Peak Area (mv)	Standard Concentration (ppm)
1	0.0	0.0	0.0
2	3,380.1	58.1	26.4
3	9,665.2	98.3	52.8
4	15,548.3	124.7	79.1

Σxy : 16588.9
 Σx : 281.1
 Σy : 158.3
 Σx^2 : 28594
 $\Sigma (x)^2$: 79041
N: 4
m: 0.618425
b: -3.8915

Analytical Calculation Summary

Calibration Standards Area Linear Regression Fit

Client: Marathon Ashland
Location: Texas City, Texas
Source: SRU
Date sampled: 7/20/2007
Run Number: M15 1-3
Compound Analyzed: Carbon Disulfide
Method: USEPA Method 15
Instrument: SRI-9300B
Detector: GC-FPD
Units of Detection: ppm

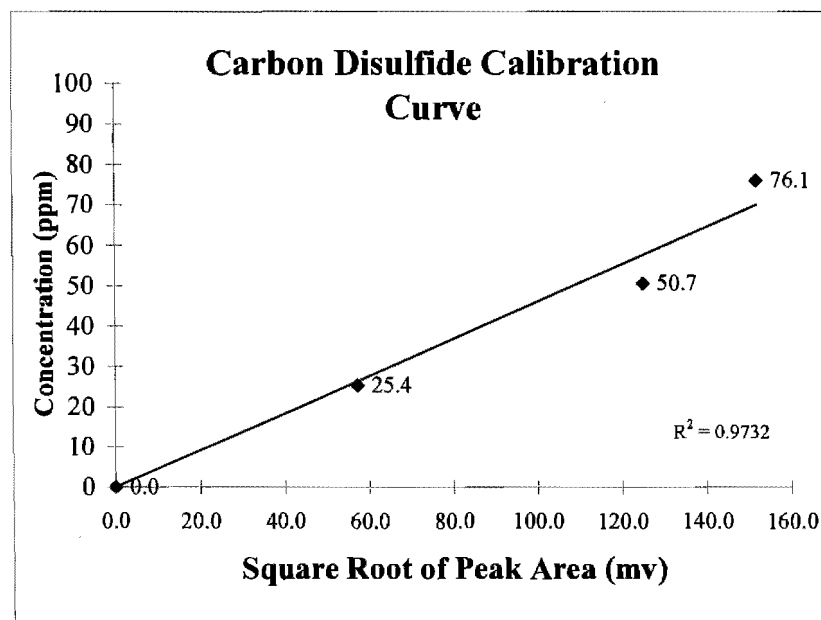
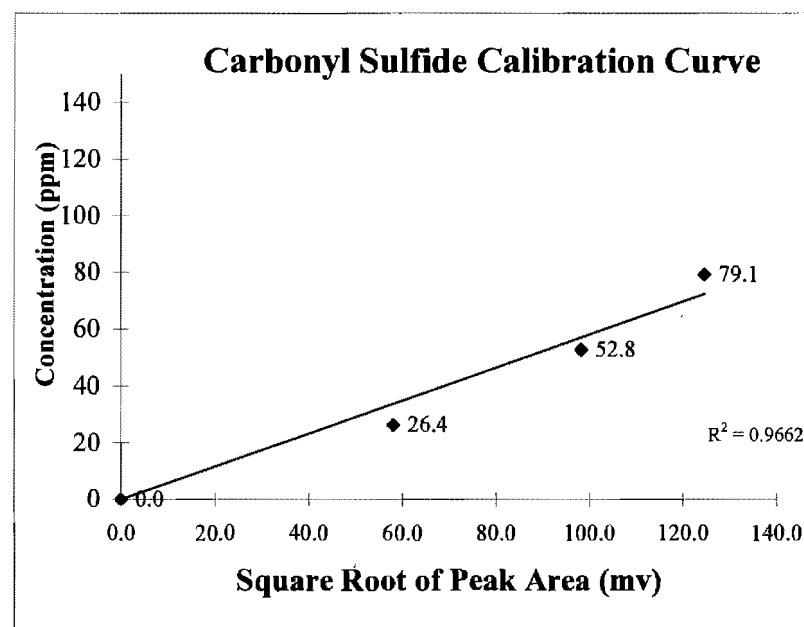
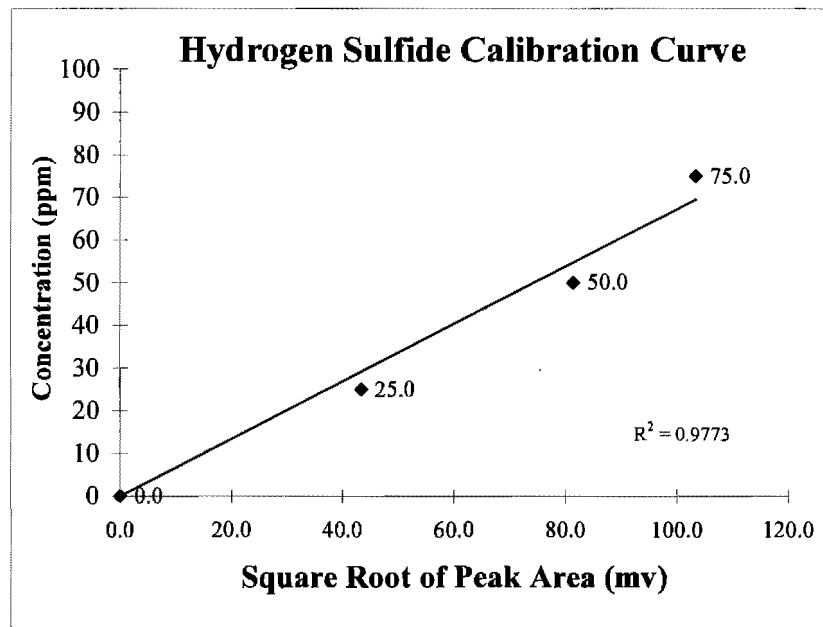
Calibration Standards

Statistical Analysis Summary

Standard #	Standard Peak Area (mv)	Square Root Peak Area (mv)	Standard Concentration (ppm)	
1	0.0	0.0	0.0	Σxy : 19357.52
2	3,281.9	57.3	25.4	Σx : 334.3
3	15,639.4	125.1	50.7	Σy : 152.2
4	23,083.2	151.9	76.1	Σx^2 : 42005
				$\Sigma (x)^2$: 111741
				N : 4
				m : 0.471831
				b : -1.38055

Calibration Curves

July 20, 2007

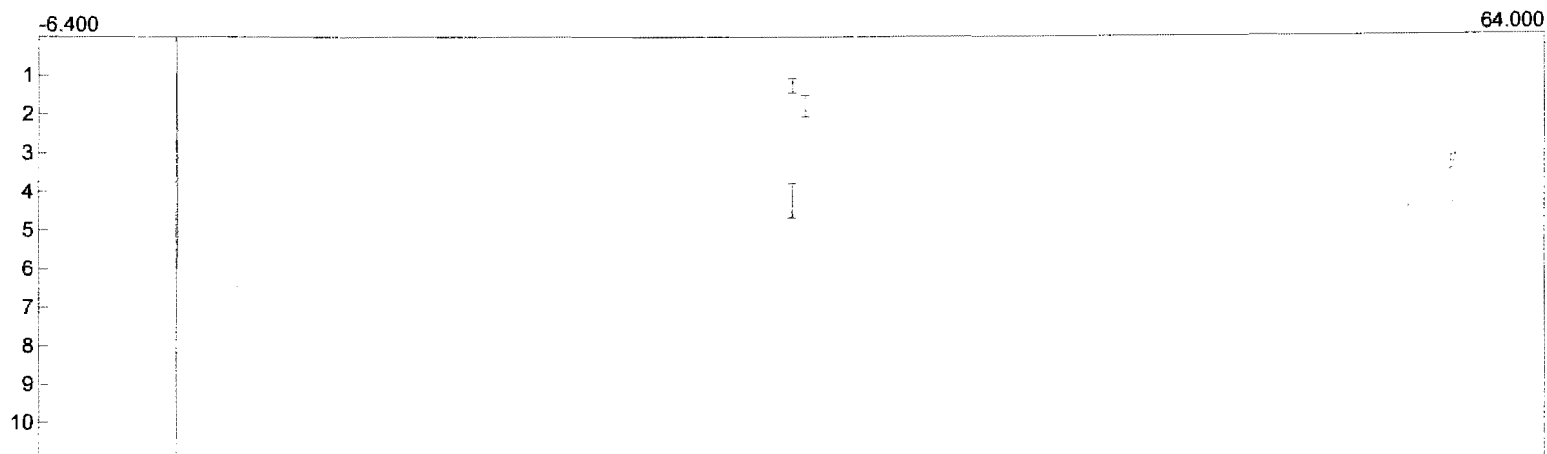


Client: Marathon Ashland
 Location: Texas City, Texas
 Source: SRU
 Date: 7/20/2007
 720calXX



Description	File Name	H ₂ S Area (mv)	Square Root H ₂ S Area	COS Area (mv)	Square Root COS Area	CS ₂ Area (mv)	Square Root CS ₂ Area
25 ppm	15	1861.84	43.15	3695.36	60.79	3743.49	61.18
	16	1918.17	43.80	3276.80	57.24	3097.38	55.65
	17	1869.17	43.23	3168.24	56.29	3004.91	54.82
Average		1883.06	43.39	3380.13	58.11	3281.93	57.22
50 ppm	9	6672.70	81.69	9880.55	99.40	15246.70	123.48
	12	6650.65	81.55	9645.27	98.21	15945.16	126.27
	13	6617.66	81.35	9469.66	97.31	15726.41	125.40
Average		6647.00	81.53	9665.16	98.31	15639.42	125.05
75 ppm	5	10234.55	101.17	16394.25	128.04	21939.40	148.12
	7	10333.50	101.65	14769.53	121.53	23376.46	152.89
	8	11487.33	107.18	15480.97	124.42	23933.60	154.70
Average		10685.13	103.33	15548.25	124.66	23083.15	151.91
0 ppm							
	1	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00	0.00
Average		0.00	0.00	0.00	0.00	0.00	0.00

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720tcal01.CHR ()
Sample: 0 ppm pre
Operator: SEY

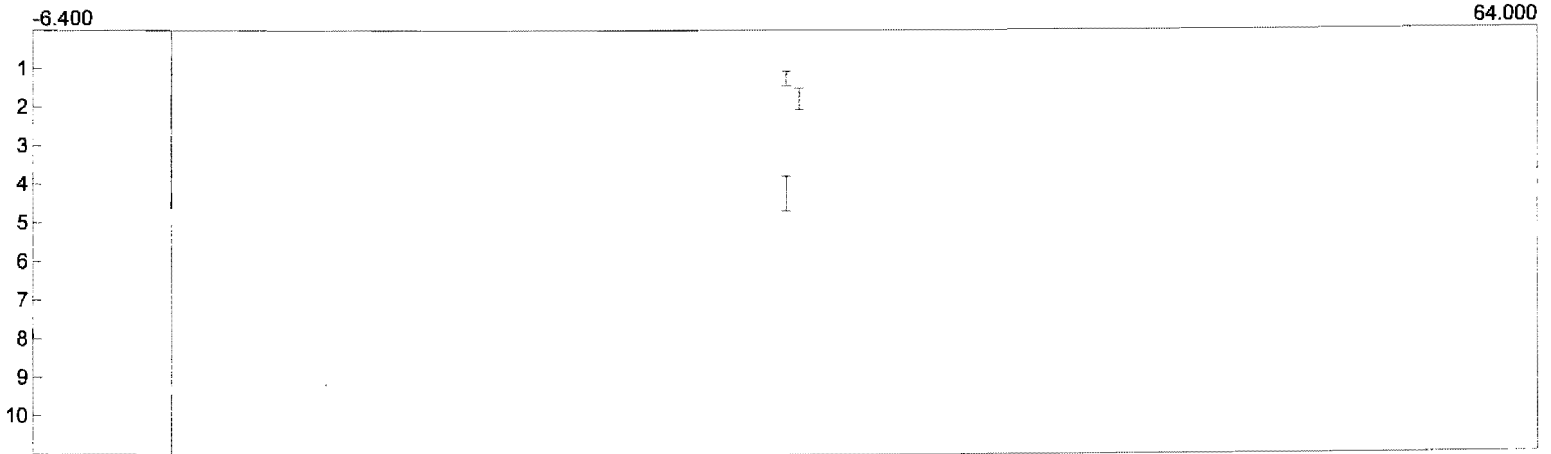


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720tcal02.CHR ()
Sample: 0 ppm pre
Operator: SEY



Component	Area
	0.0000

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

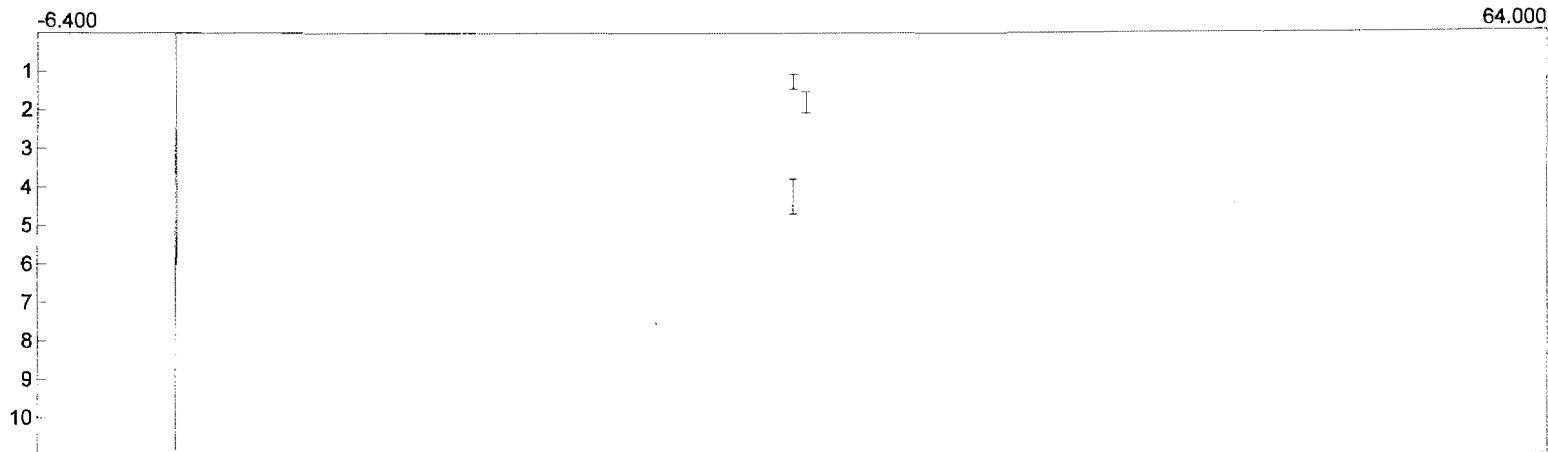
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal03.CHR ()

Sample: 0 ppm pre

Operator: SEY



Component

Area

0.0000

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

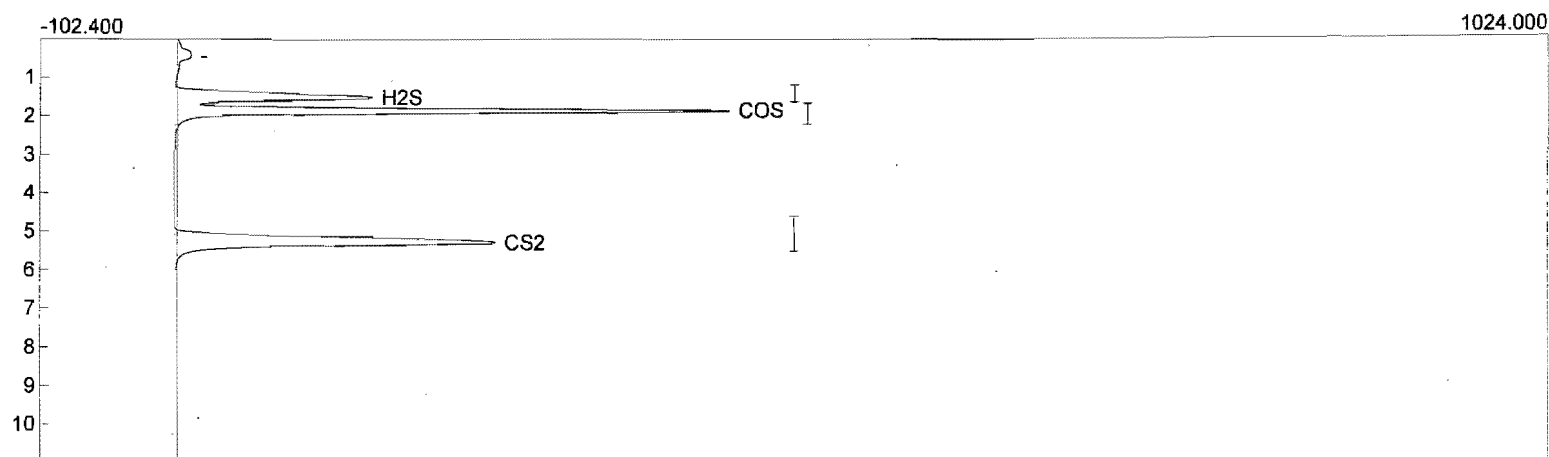
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal15.CHR ()

Sample: 25 ppm pre

Operator: SEY



Component	Area
H2S	1861.8435
COS	3695.3600
CS2	3743.4860
	9300.6895

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

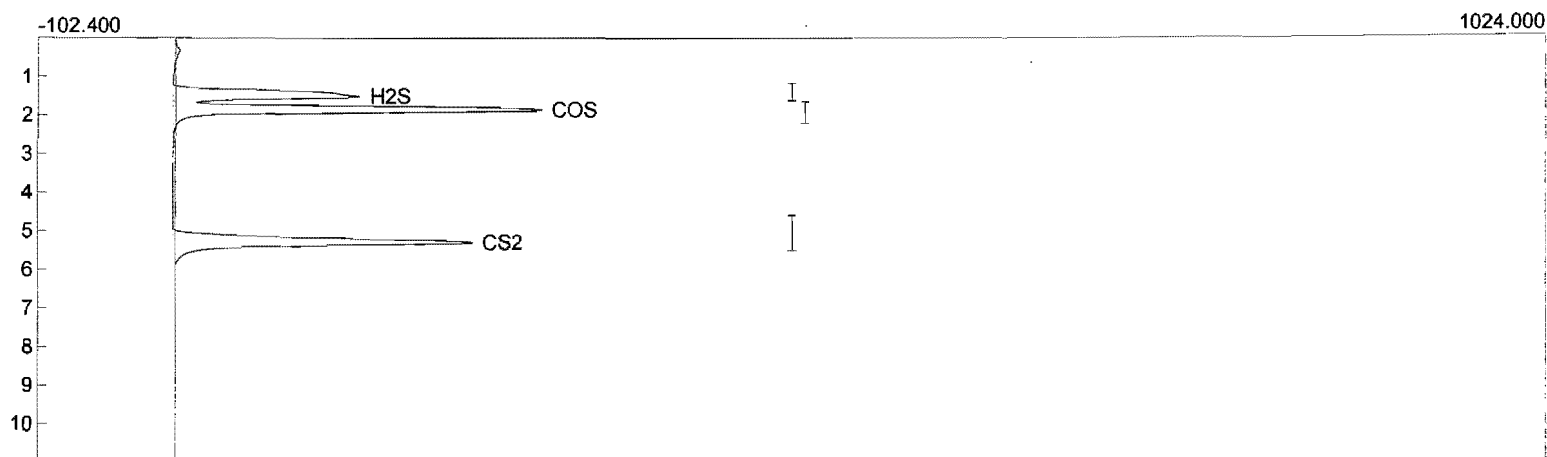
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal16.CHR ()

Sample: 25 ppm pre

Operator: SEY



Component	Area
H2S	1918.1675
COS	3276.7985
CS2	3097.3670
	8292.3330

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

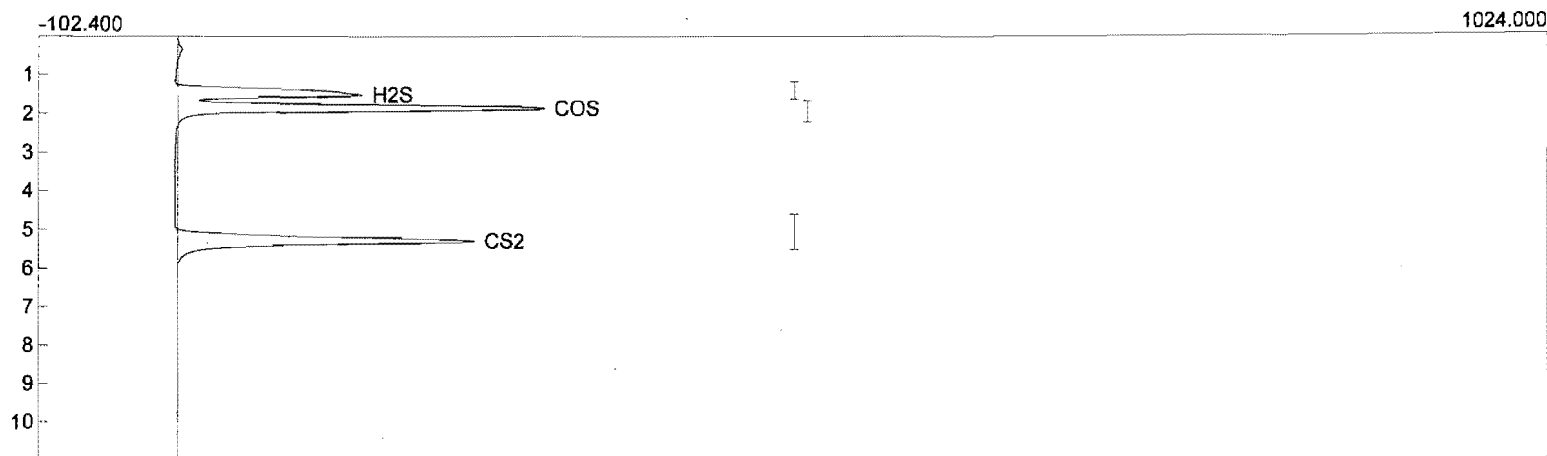
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal17.CHR ()

Sample: 25 ppm pre

Operator: SEY



Component	Area
H2S	1869.1685
COS	3168.2360
CS2	3004.9060
	8042.3105

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

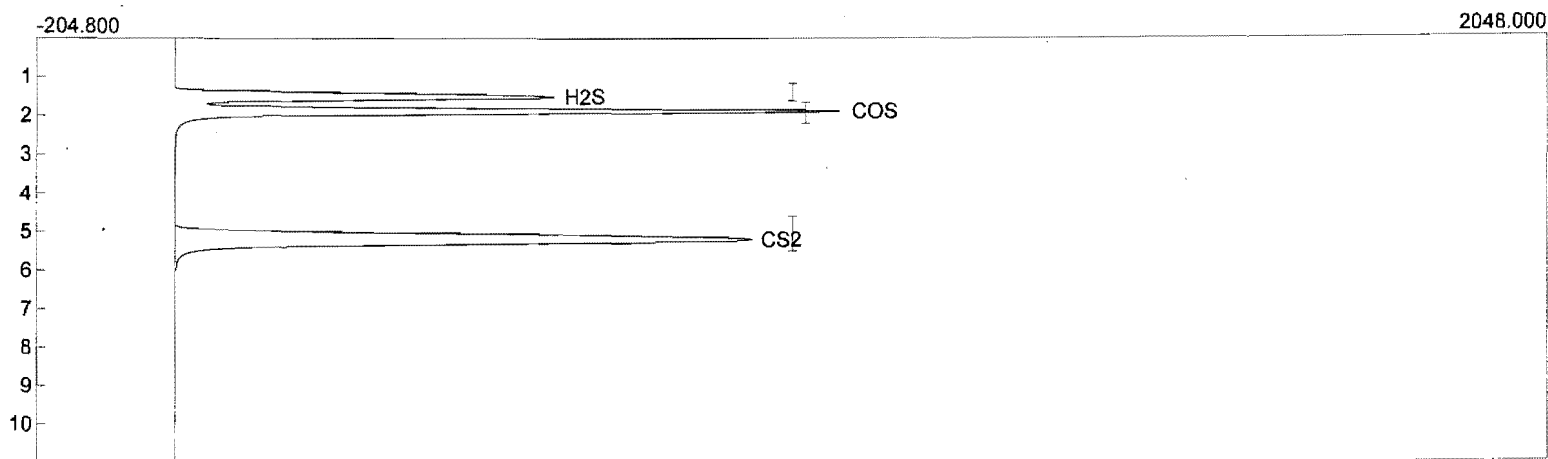
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal09.CHR ()

Sample: 50 ppm pre

Operator: SEY



Component	Area
H2S	6672.6975
COS	9880.5495
CS2	15246.7040
	31799.9510

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

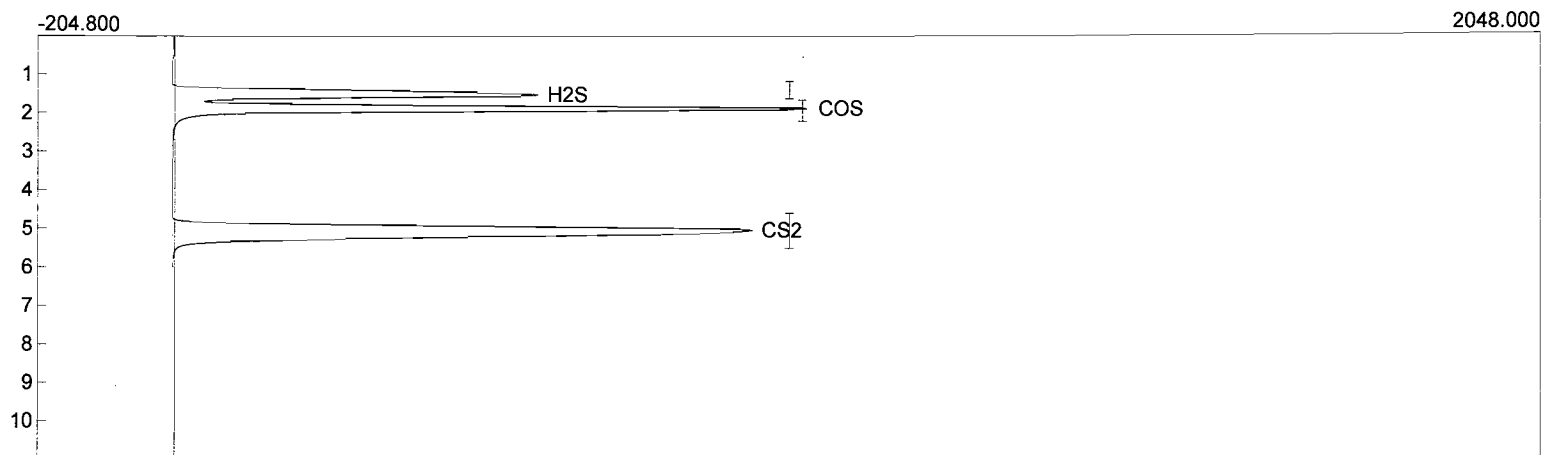
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal12.CHR ()

Sample: 50 ppm pre

Operator: SEY



Component	Area
H2S	6650.6490
COS	9645.2735
CS2	15945.1580
	32241.0805

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

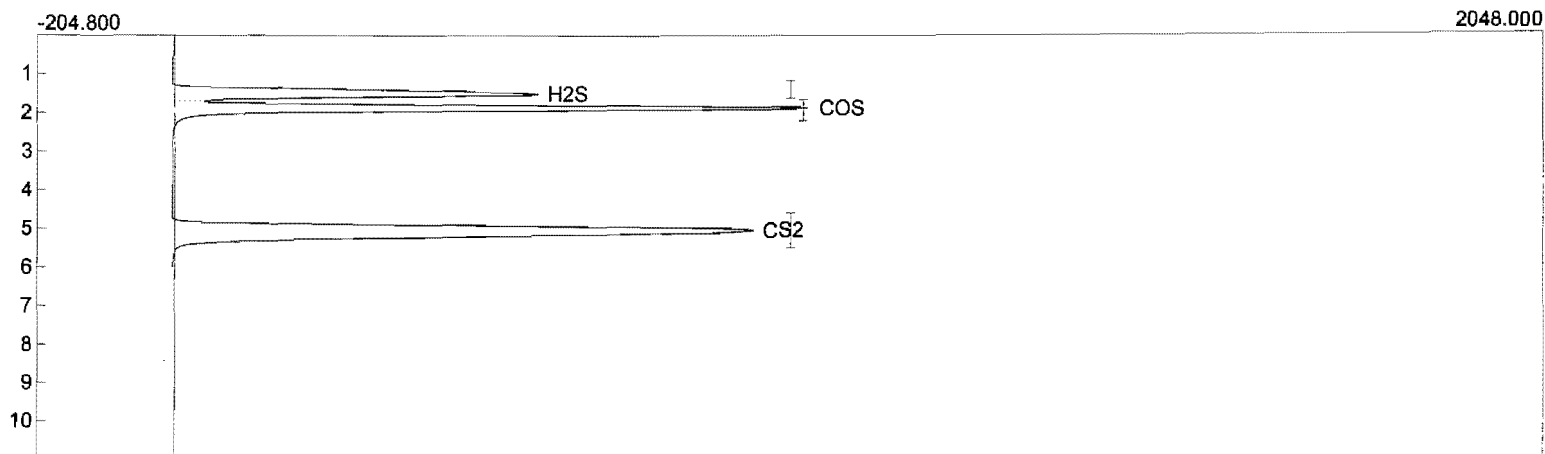
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720tcal13.CHR ()

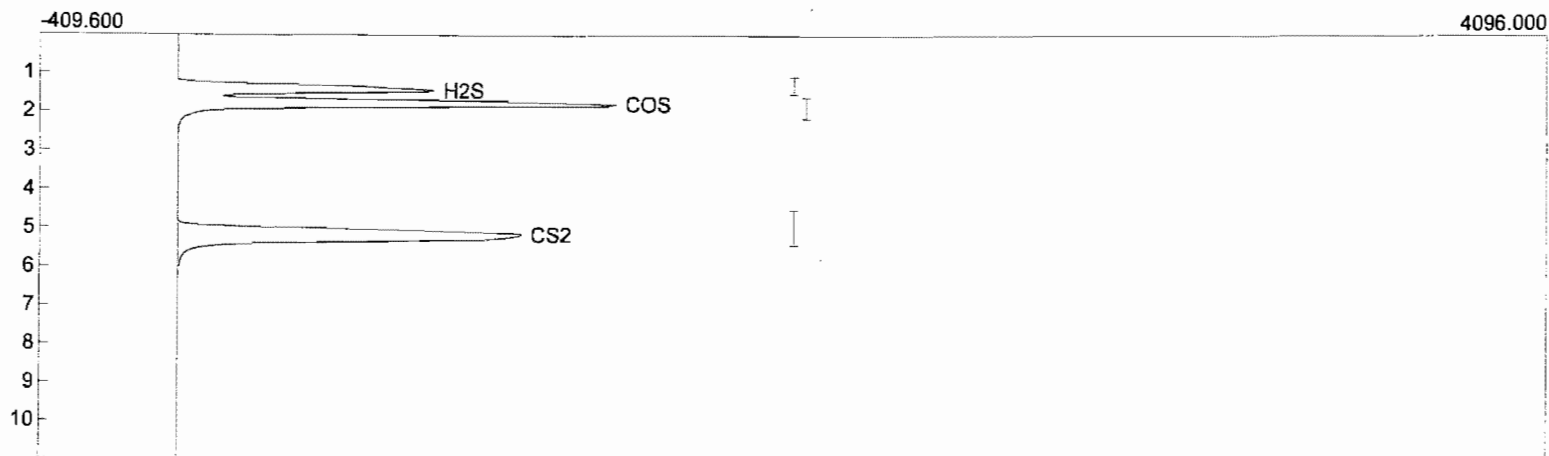
Sample: 50 ppm pre

Operator: SEY



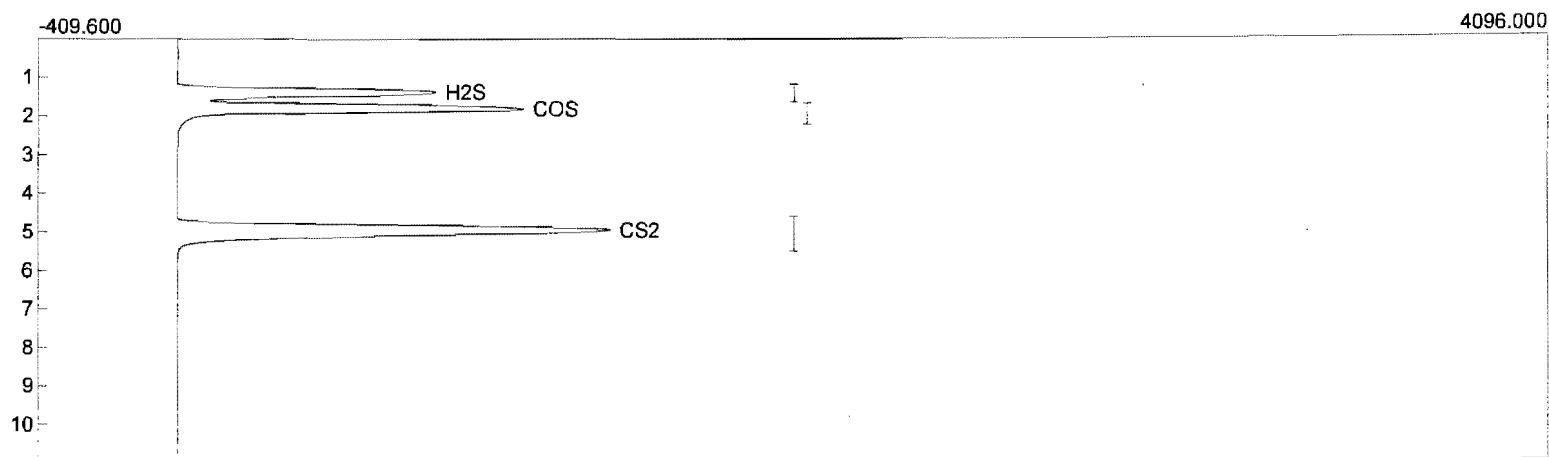
Component	Area
H2S	6617.6615
COS	9469.6615
CS2	15726.4100
	31813.7330

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720tcal05.CHR ()
Sample: 75 ppm pre
Operator: SEY



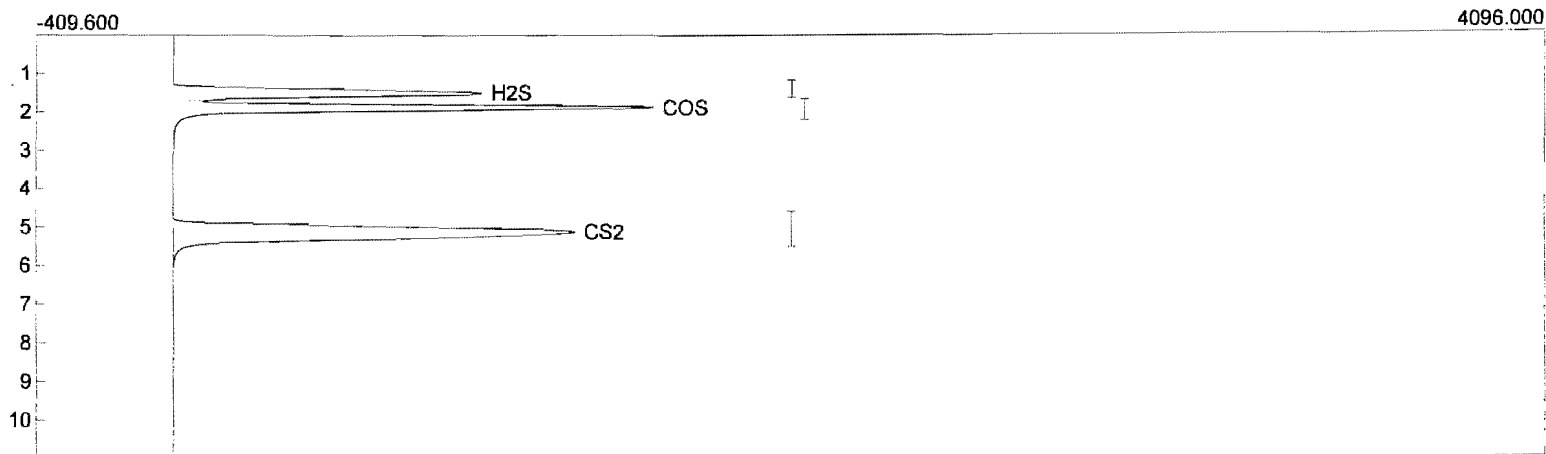
Component	Area
H2S	10234.5520
COS	16384.2480
CS2	21939.3980
	48558.1980

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720tcal08.CHR ()
Sample: 75 ppm pre
Operator: SEY



Component	Area
H2S	10333.5000
COS	14769.5260
CS2	23376.4580
	48479.4840

Lab name: ARI Environmental, Inc.
 Client: Marathon Texas City
 Client ID: SRU
 Collected: 7/20/2007
 Method: USEPA Method 15
 Description: FPD
 Column: 1 Meter Restek
 Carrier: Hydrogen @ 20 PSI
 Data file: 720tcal07.CHR ()
 Sample: 75 ppm pre
 Operator: SEY



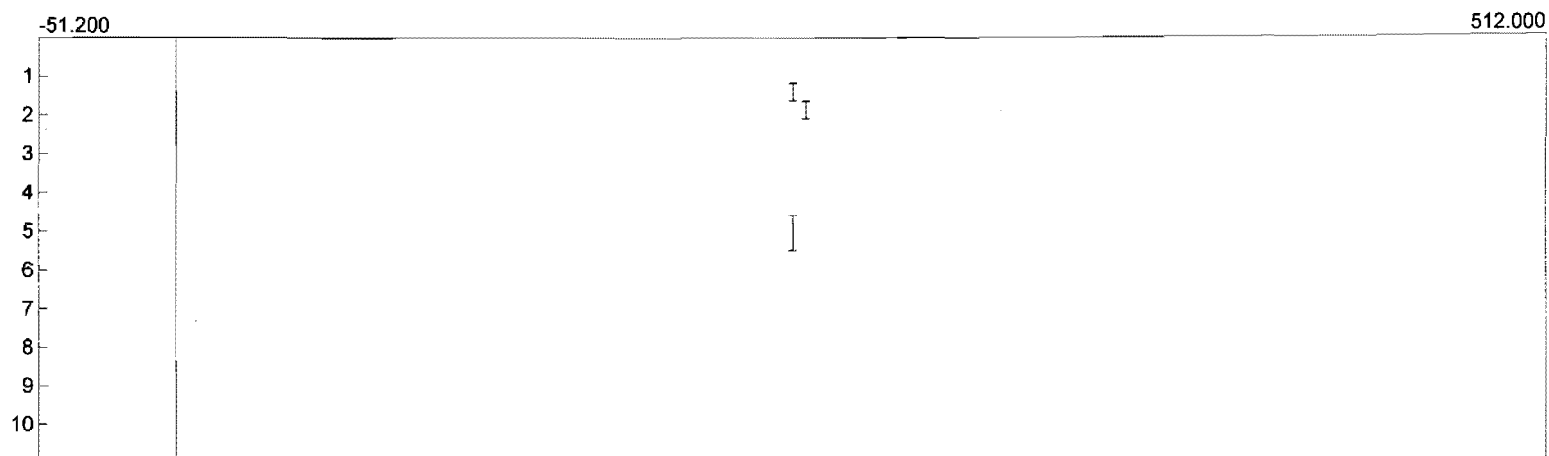
Component	Area
H ₂ S	11478.3260
COS	15480.9560
CS ₂	23933.6000
	50892.8820

Client: Marathon Ashland
 Location: Texas City, Texas
 Source: SRU
 Date: 7/20/2007
 720postXX



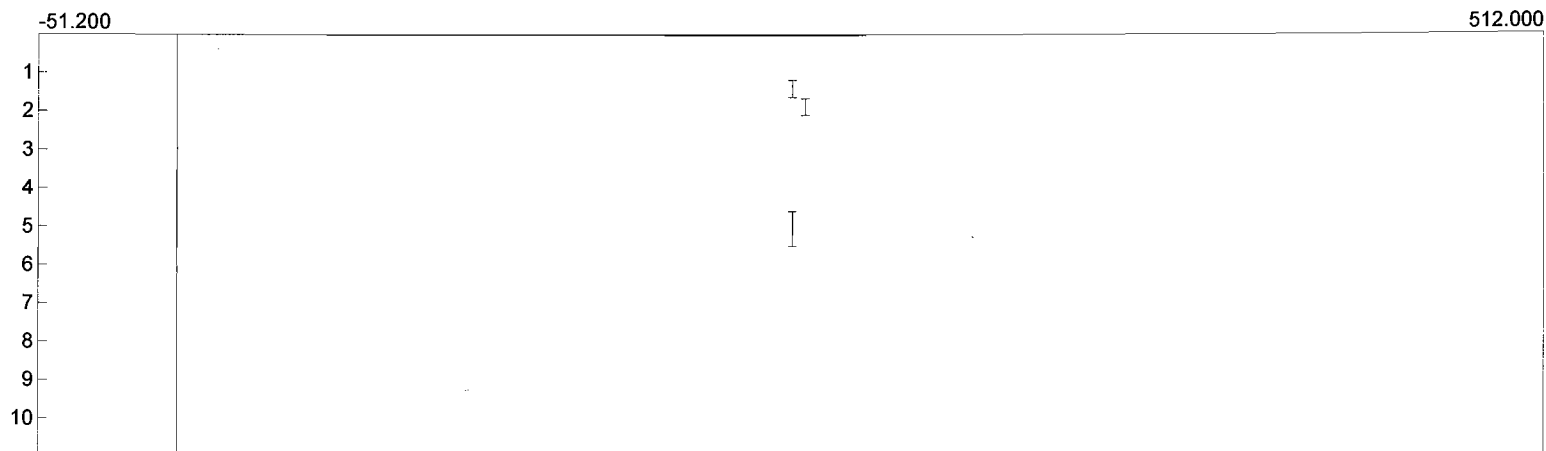
Description	File Name	H ₂ S Area (mv)	Square Root H ₂ S Area	COS Area (mv)	Square Root COS Area	CS ₂ Area (mv)	Square Root CS ₂ Area
25 ppm	12	1722.65	41.50	3202.83	56.59	3252.53	57.03
	13	1881.51	43.38	3402.97	58.33	3501.84	59.18
	14	1841.45	42.91	2276.79	47.72	3492.01	59.09
Average		1815.20	42.60	2960.86	54.21	3415.46	58.43
50 ppm	9	6590.49	81.18	9704.83	98.51	15944.67	126.27
	10	6418.03	80.11	9350.34	96.70	15501.96	124.51
	11	6455.77	80.35	9414.20	97.03	15752.36	125.51
Average		6488.10	80.55	9489.79	97.41	15733.00	125.43
75 ppm	6	10012.67	100.06	15976.96	126.40	21240.74	145.74
	7	10332.07	101.65	16059.68	126.73	21535.14	146.75
	8	10216.60	101.08	16401.61	128.07	21936.63	148.11
Average		10187.11	100.93	16146.08	127.07	21570.84	146.87
0 ppm							
	1	0.00	0.00	0.00	0.00	0.00	0.00
	2	0.00	0.00	0.00	0.00	0.00	0.00
	3	0.00	0.00	0.00	0.00	0.00	0.00
Average		0.00	0.00	0.00	0.00	0.00	0.00

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720post01.CHR ()
Sample: 0 ppm post
Operator: SEY



Component	Area
	0.0000

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720post02.CHR ()
Sample: 0 ppm post
Operator: SEY



Component	Area
	0.0000

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

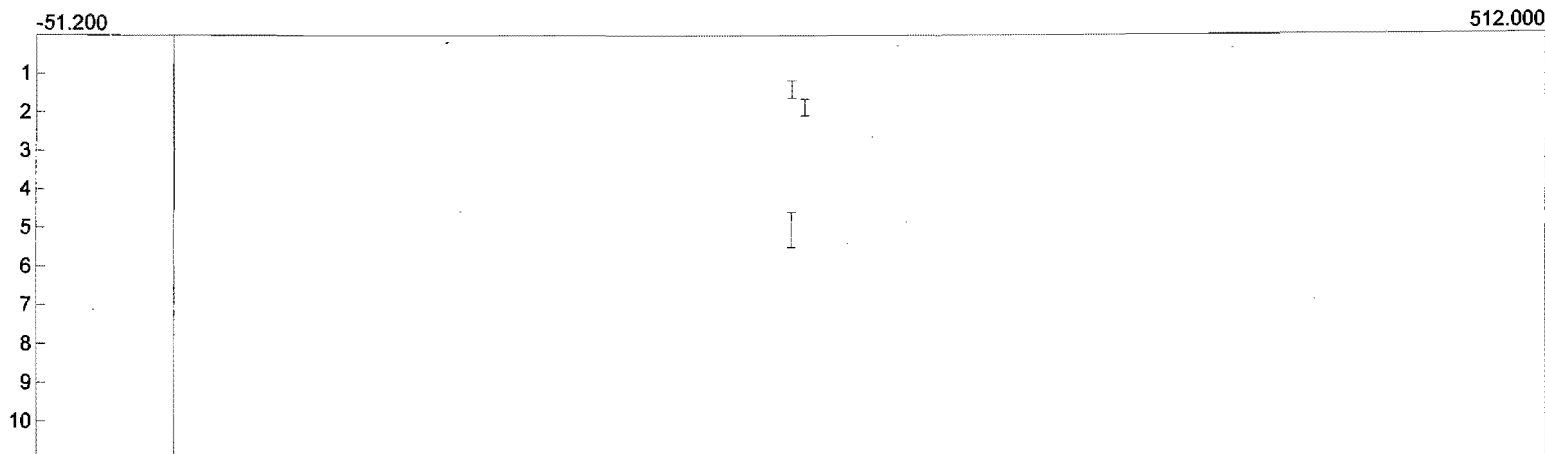
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post03.CHR ()

Sample: 0 ppm post

Operator: SEY

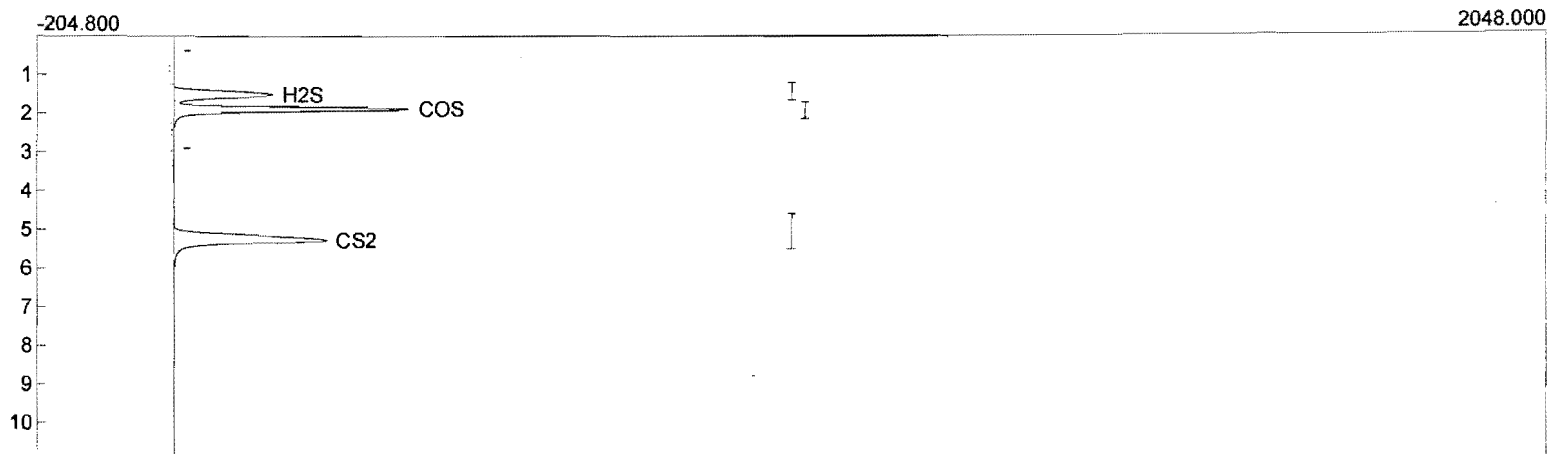


Component

Area

0.0000

Lab name: ARI Environmental, Inc.
 Client: Marathon Texas City
 Client ID: SRU
 Collected: 7/20/2007
 Method: USEPA Method 15
 Description: FPD
 Column: 1 Meter Restek
 Carrier: Hydrogen @ 20 PSI
 Data file: 720post12.CHR ()
 Sample: 25 ppm post
 Operator: SEY



Component	Area
H2S	1722.6540
COS	3202.8330
CS2	3252.5340
	8178.0210

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

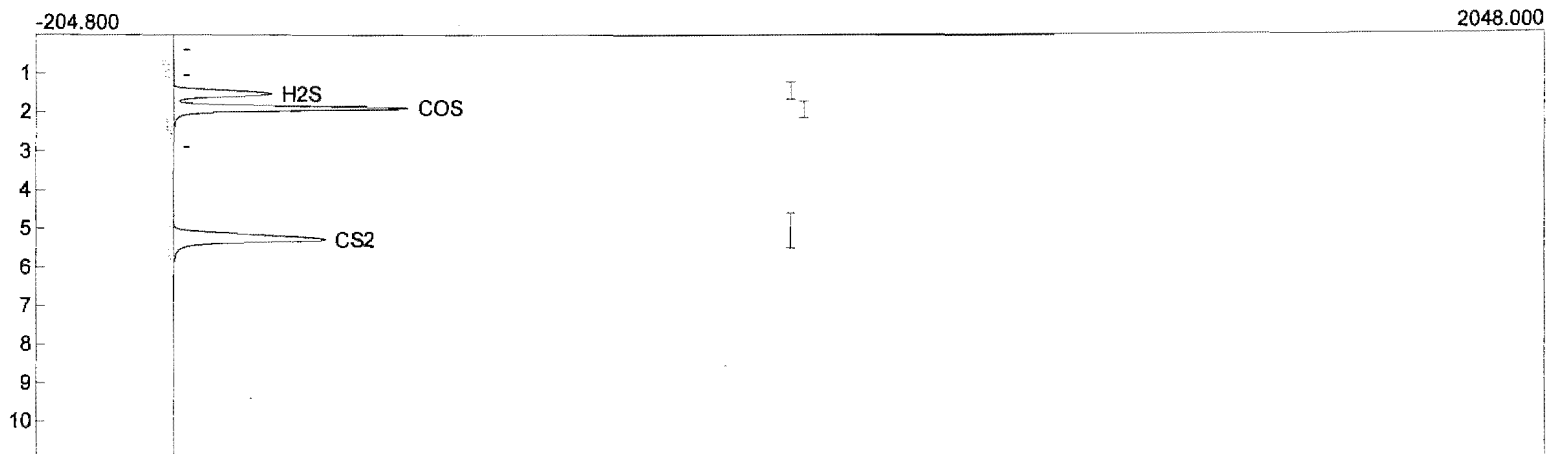
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post13.CHR ()

Sample: 25 ppm post

Operator: SEY



Component	Area
H2S	1881.5140
COS	3402.9740
CS2	3501.8440
	8786.3320

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

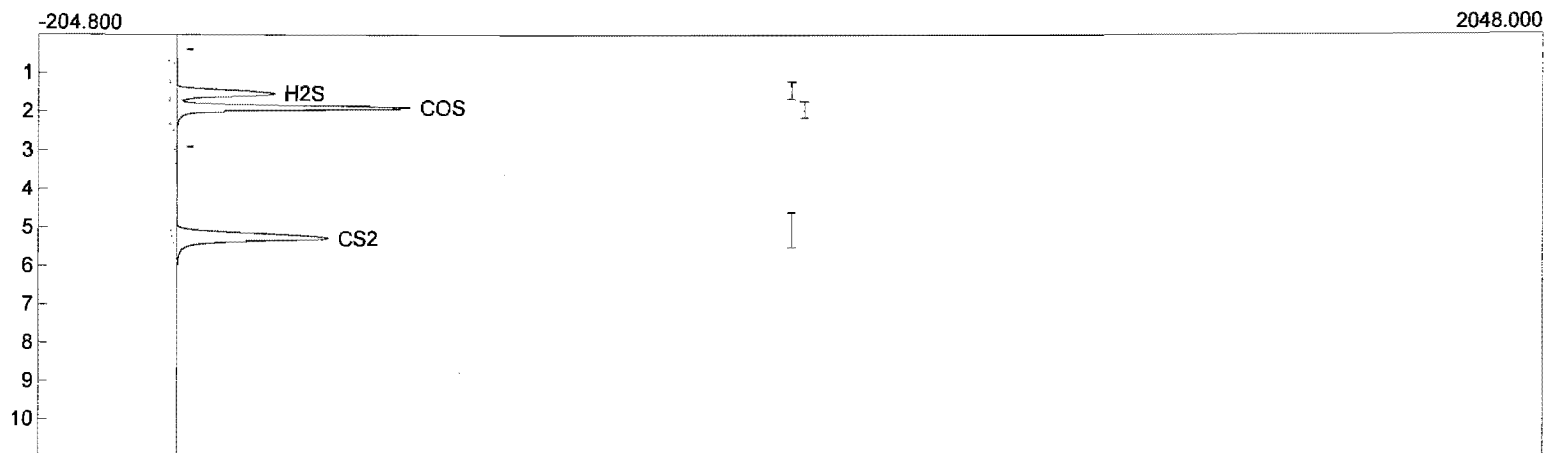
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post14.CHR ()

Sample: 25 ppm post

Operator: SEY



Component	Area
H2S	1841.4480
COS	3376.7940
CS2	3492.0060
	8710.2480

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

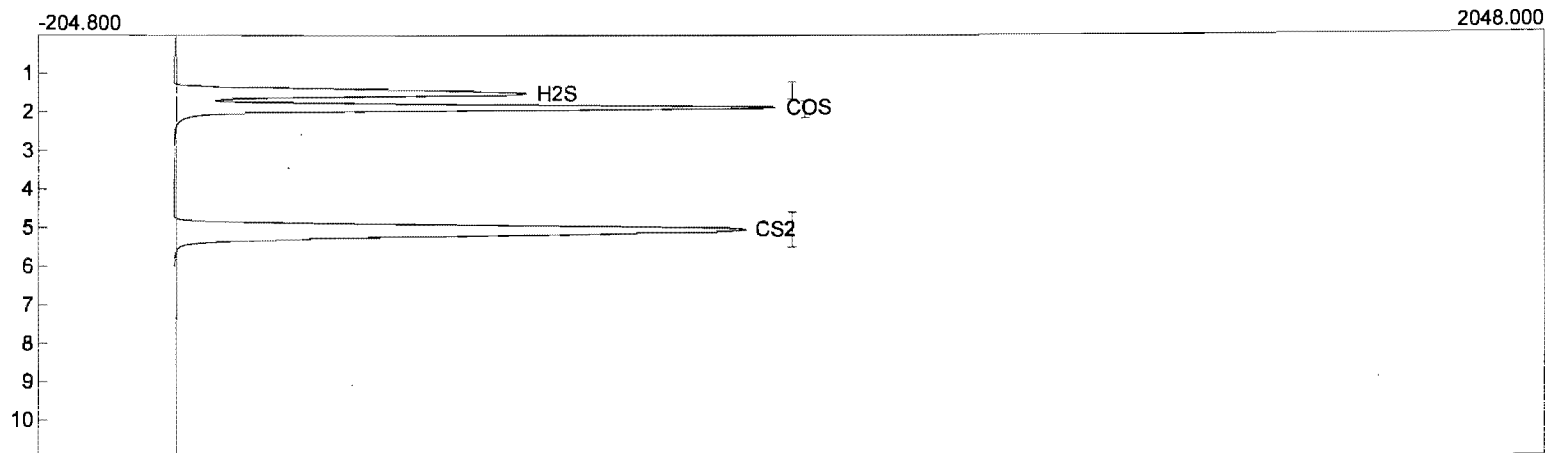
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post9.CHR ()

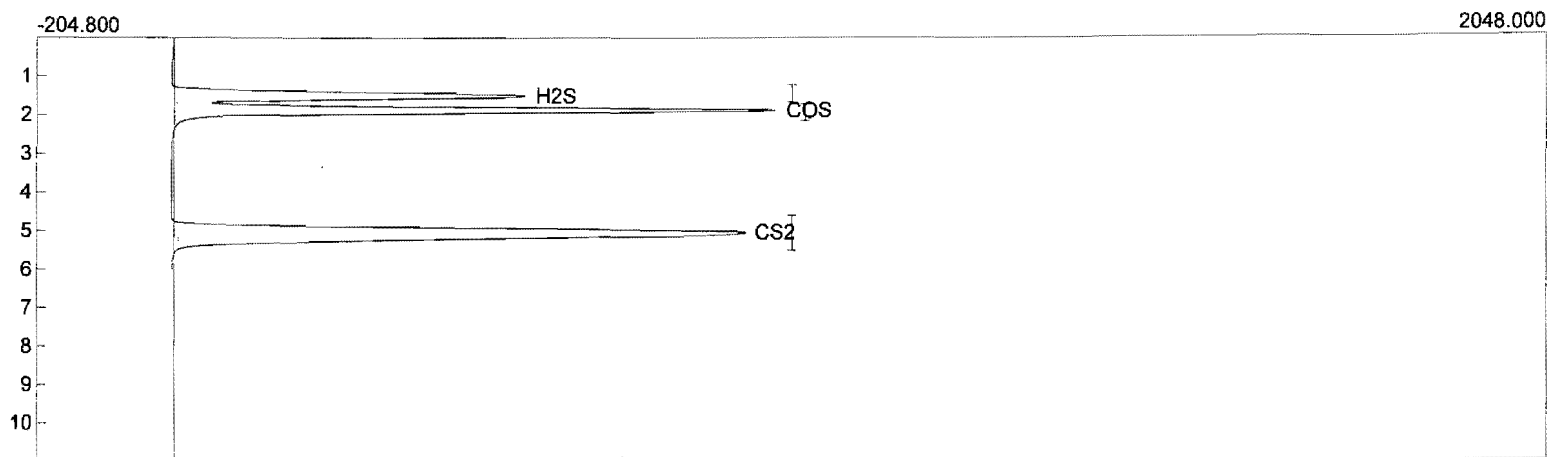
Sample: 50 ppm post

Operator: SEY



Component	Area
H2S	6590.4900
COS	9704.8340
CS2	15944.6685
	32239.9925

Lab name: ARI Environmental, Inc.
Client: Marathon Texas City
Client ID: SRU
Collected: 7/20/2007
Method: USEPA Method 15
Description: FPD
Column: 1 Meter Restek
Carrier: Hydrogen @ 20 PSI
Data file: 720post10.CHR ()
Sample: 50 ppm post
Operator: SEY



Component	Area
H2S	6418.0310
COS	9350.3350
CS2	15501.9590
	31270.3250

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

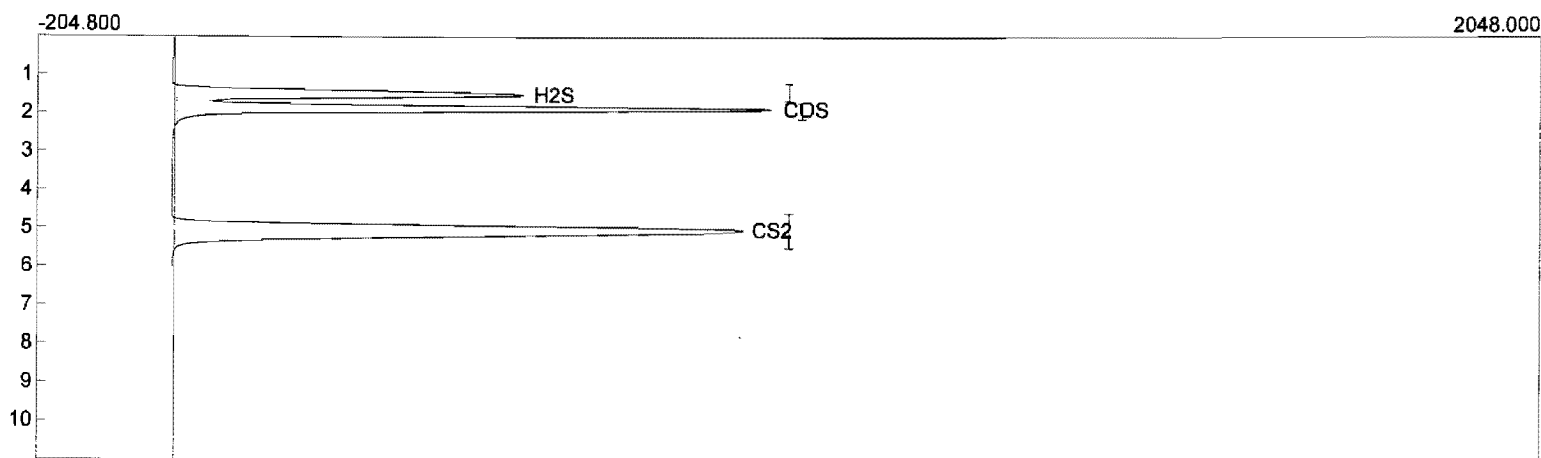
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post11.CHR ()

Sample: 50 ppm post

Operator: SEY



Component	Area
H2S	6455.7740
COS	9414.2030
CS2	15752.3580
	31622.3350

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

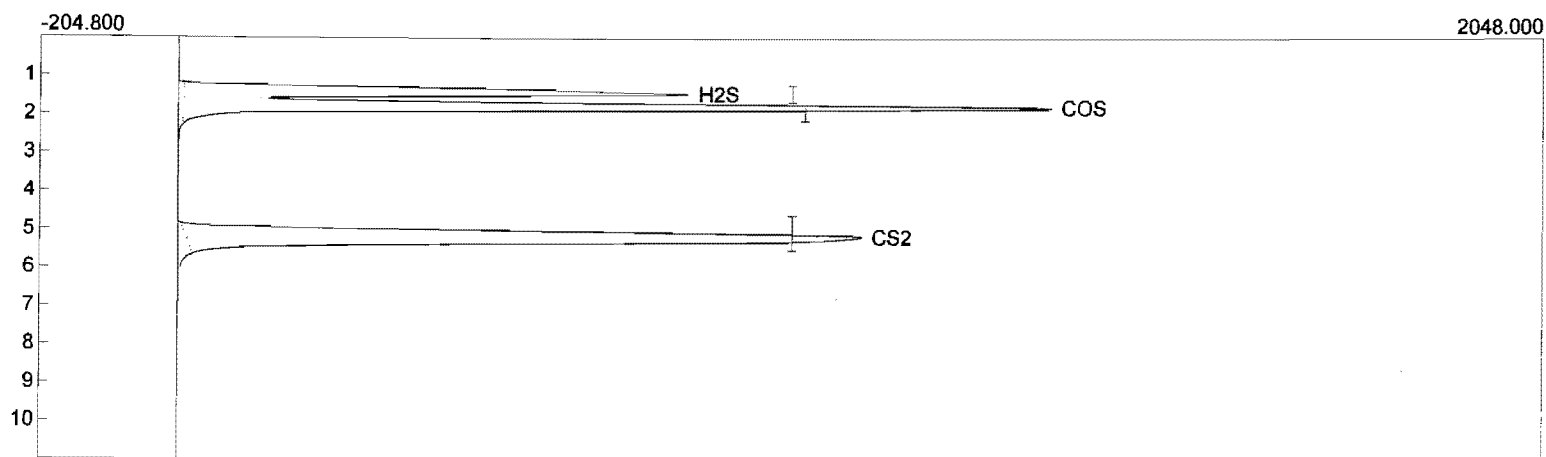
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post06.CHR ()

Sample: 75 ppm post

Operator: SEY



Component	Area
H2S	10012.6705
COS	15976.9635
CS2	21240.7405
	47230.3745

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post07.CHR ()

Sample: 75 ppm post

Operator: SEY



Component	Area
H2S	10332.0680
COS	16059.6810
CS2	21535.1400
	47926.8890

Lab name: ARI Environmental, Inc.

Client: Marathon Texas City

Client ID: SRU

Collected: 7/20/2007

Method: USEPA Method 15

Description: FPD

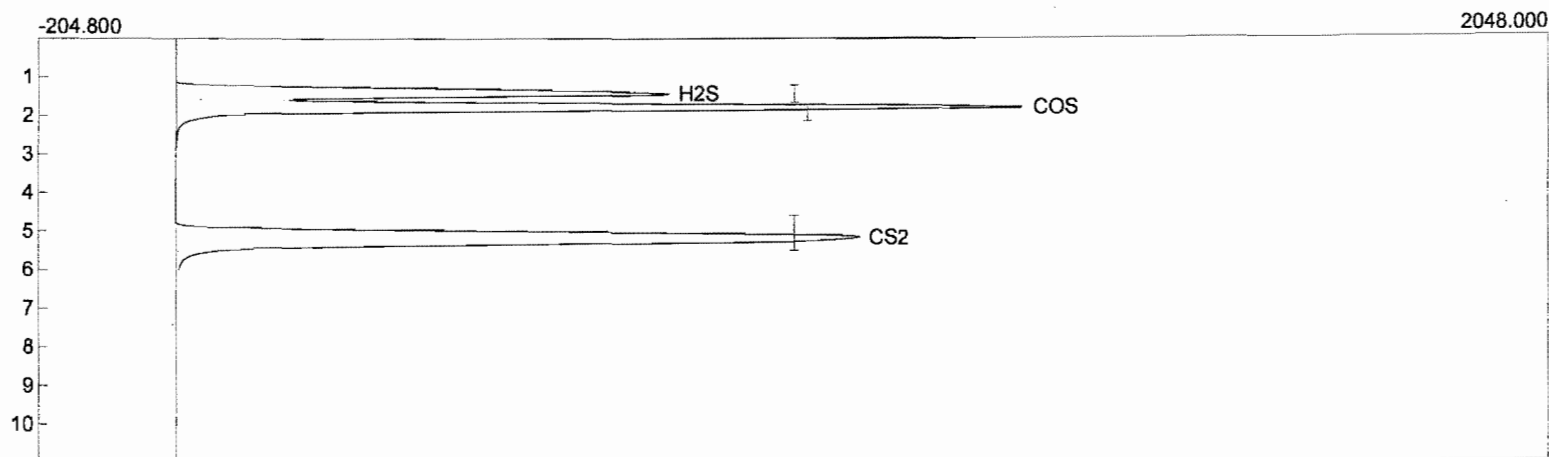
Column: 1 Meter Restek

Carrier: Hydrogen @ 20 PSI

Data file: 720post08.CHR ()

Sample: 75 ppm post

Operator: SEY



Component	Area
H2S	10216.5970
COS	16401.6055
CS2	21936.6265
	48554.8290



TRS STANDARDS POSTTEST DATA

Client: Marathon Ashland
Location: Texas City, Texas
Source: SRU
Date sampled: 7/20/2007
Run Number: M15 1-3
Compound Analyzed: TRS
Method: USEPA Method 15
Instrument: SRI-9300B
Detector: GC-FPD
Units of Detection: ppm

Hydrogen Sulfide Standards				Drift %
Standard No	Concentration	Area	Sq Rt Area Counts	
1	0.0	0.0	0.0	0.0
2	25.0	1,815.2	42.6	1.8
3	50.0	6,488.1	80.5	1.2
4	75.0	10,187.1	100.9	2.4

Carbonyl Sulfide Standards				Drift %
Standard No	Concentration	Area	Sq Rt Area Counts	
1	0.0	0.0	0.0	0.0
2	26.4	2,960.9	54.4	6.4
3	52.8	9,489.8	97.4	0.9
4	79.1	16,146.1	127.1	-1.9

Carbon Disulfide Standards				Drift %
Standard No	Concentration	Area	Sq Rt Area Counts	
1	0.0	0.0	0.0	0.0
2	25.4	3,415.5	58.4	-2.0
3	50.7	15,733.0	125.4	-0.3
4	76.1	21,570.8	146.9	3.3



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

APPENDIX D

ARI Reference Method Monitoring Data

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 9:32:15	0.06	3.86	-0.10	0.46	16.25	
7/19/07 9:32:30	0.06	13.85	-0.15	0.35	27.98	
7/19/07 9:32:45	0.06	12.43	-0.20	0.19	26.97	
7/19/07 9:33:00	0.06	9.35	-0.19	0.10	14.48	
7/19/07 9:33:15	0.06	13.25	-0.15	0.09	3.78	
7/19/07 9:33:30	0.06	14.30	-0.17	0.08	0.57	
7/19/07 9:33:45	0.06	11.75	-0.22	0.08	0.26	
7/19/07 9:34:00	0.06	4.86	-0.24	0.08	0.21	
7/19/07 9:34:15	0.06	16.02	-0.20	0.08	0.20	
7/19/07 9:34:30	0.06	12.75	-0.13	0.08	0.13	Calibration Error
7/19/07 9:34:45	0.06	5.26	-0.13	0.08	0.09	CO ₂ CE Zero = 0.09
7/19/07 9:35:00	0.06	16.45	-0.13	0.08	0.09	
7/19/07 9:35:15	0.06	14.43	-0.17	0.08	0.09	
7/19/07 9:35:30	0.06	9.70	-0.27	0.07	0.09	
7/19/07 9:35:45	0.06	9.85	-0.10	0.07	0.09	
7/19/07 9:36:00	0.06	12.66	-0.24	0.07	3.84	
7/19/07 9:36:15	0.06	7.88	-0.17	0.05	11.17	
7/19/07 9:36:30	0.06	8.13	-0.06	0.04	16.00	
7/19/07 9:36:45	0.06	10.45	-0.10	0.02	18.87	
7/19/07 9:37:00	0.06	11.18	-0.10	0.02	19.82	
7/19/07 9:37:15	0.06	9.53	-0.03	0.02	20.08	
7/19/07 9:37:30	0.06	3.43	-0.08	0.02	20.11	
7/19/07 9:37:45	0.06	12.73	-0.11	0.02	20.12	
7/19/07 9:38:00	0.06	8.98	-0.13	0.02	20.12	
7/19/07 9:38:15	0.06	2.01	-0.06	0.01	20.12	
7/19/07 9:38:30	0.06	13.78	-0.06	0.01	20.12	
7/19/07 9:38:45	0.06	12.28	-0.01	0.01	20.12	
7/19/07 9:39:00	0.06	5.88	-0.06	0.01	20.12	
7/19/07 9:39:15	0.06	10.53	-0.20	0.01	20.14	Calibration Error
7/19/07 9:39:30	0.06	12.68	-0.11	0.01	20.14	CO ₂ CE Span = 20.14
7/19/07 9:39:45	0.06	8.93	-0.22	0.01	20.13	
7/19/07 9:40:00	0.06	5.18	-0.17	0.01	20.14	
7/19/07 9:40:15	0.06	12.00	-0.11	0.01	20.14	
7/19/07 9:40:30	0.06	11.68	-0.04	0.01	20.14	
7/19/07 9:40:45	0.06	9.43	-0.11	0.01	20.14	
7/19/07 9:41:00	0.06	5.01	-0.31	0.01	20.16	
7/19/07 9:41:15	0.06	12.73	-0.13	0.01	18.72	
7/19/07 9:41:30	0.06	10.80	-0.04	0.02	14.07	
7/19/07 9:41:45	0.06	2.41	-0.11	0.03	10.97	
7/19/07 9:42:00	0.06	13.78	-0.01	0.03	10.08	
7/19/07 9:42:15	0.06	12.95	-0.11	0.03	9.99	
7/19/07 9:42:30	0.06	5.58	-0.11	0.03	9.98	
7/19/07 9:42:45	0.06	10.83	0.03	0.03	9.97	
7/19/07 9:43:00	0.06	12.55	0.10	0.03	9.97	
7/19/07 9:43:15	0.06	8.65	0.08	0.03	9.97	
7/19/07 9:43:30	0.06	3.86	0.08	0.02	9.97	
7/19/07 9:43:45	0.06	12.93	0.08	0.02	9.96	
7/19/07 9:44:00	0.06	12.63	0.08	0.02	9.96	Calibration Error
7/19/07 9:44:15	0.06	4.68	0.03	0.02	9.97	CO ₂ CE Mid = 9.97
7/19/07 9:44:30	0.06	10.20	0.06	0.02	9.97	
7/19/07 9:44:45	0.06	13.43	-0.04	0.02	9.96	
7/19/07 9:45:00	0.06	8.31	-0.08	0.02	9.96	
7/19/07 9:45:15	0.06	4.11	-0.04	0.02	9.97	
7/19/07 9:45:30	0.06	12.98	0.01	0.02	9.97	
7/19/07 9:45:45	0.06	9.68	0.05	0.02	9.99	
7/19/07 10:20:00	0.06	10.00	-0.25	20.70	0.28	
7/19/07 10:20:15	0.06	1.76	-0.16	20.62	0.49	
7/19/07 10:20:30	0.06	9.85	-0.30	15.70	5.15	
7/19/07 10:20:45	0.06	10.88	-0.34	7.20	10.69	
7/19/07 10:53:15	0.07	4.71	-0.69	0.01	7.38	
7/19/07 10:53:30	0.07	11.25	-0.72	0.86	5.53	
7/19/07 10:53:45	0.07	11.30	-0.51	2.37	1.93	
7/19/07 10:54:00	0.07	8.80	-0.60	0.85	0.41	
7/19/07 10:54:15	0.07	5.06	-0.65	0.15	0.15	
7/19/07 10:54:30	0.07	12.90	-0.58	0.06	0.11	
7/19/07 10:54:45	0.07	11.28	-0.58	0.04	0.10	
7/19/07 10:55:00	0.07	3.51	-0.67	0.04	0.10	
7/19/07 10:55:15	0.07	3.68	-0.67	0.04	0.09	
7/19/07 10:55:30	0.07	-1.09	-0.60	0.04	0.09	Calibration Error
7/19/07 10:55:45	0.07	-2.09	-0.67	0.04	0.09	O ₂ CE Zero = 0.04
7/19/07 10:56:00	0.07	-1.09	-0.60	0.04	0.09	CO CE Zero = -1.21
7/19/07 10:56:15	0.07	-0.36	-0.67	0.04	0.09	NO _x CE Zero = 0.07
7/19/07 10:56:30	0.07	-1.29	-0.56	0.04	0.09	SO ₂ CE Zero = -0.63
7/19/07 10:56:45	0.07	-2.29	-0.49	0.04	0.09	
7/19/07 10:57:00	0.07	-1.09	-0.49	0.04	0.09	
7/19/07 10:57:15	0.07	-0.74	-0.63	0.04	0.09	
7/19/07 10:57:30	0.07	-2.29	-0.76	1.79	0.11	
7/19/07 10:57:45	0.07	-1.66	-0.67	6.79	0.11	
7/19/07 10:58:00	0.07	0.01	-0.67	9.38	0.09	
7/19/07 10:58:15	0.07	-1.06	-0.58	10.02	0.09	
7/19/07 10:58:30	0.07	-2.29	-0.65	10.22	0.09	
7/19/07 10:58:45	0.07	-0.31	-0.60	10.29	0.09	
7/19/07 10:59:00	0.07	-0.34	-0.58	10.32	0.09	
7/19/07 10:59:15	0.07	-1.94	-0.67	10.33	0.09	
7/19/07 10:59:30	0.07	-2.29	-0.58	10.34	0.09	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 10:59:45	0.07	-0.76	-0.51	10.19	0.09	
7/19/07 11:00:00	0.07	-1.14	-0.60	10.06	0.08	
7/19/07 11:00:15	0.07	-2.14	-0.56	10.05	0.08	Calibration Error
7/19/07 11:00:30	0.07	-0.84	-0.67	10.05	0.08	O ₂ CE Span = 10.06
7/19/07 11:00:45	0.07	-0.69	-0.65	10.06	0.08	
7/19/07 11:01:00	0.07	-2.24	-0.56	10.06	0.08	
7/19/07 11:01:15	0.07	-1.79	-0.49	10.06	0.09	
7/19/07 11:01:30	0.07	0.16	-0.49	10.06	0.08	
7/19/07 11:01:45	0.07	-1.01	-0.58	10.07	0.08	
7/19/07 11:02:00	0.07	-2.29	-0.74	10.05	0.08	
7/19/07 11:02:15	0.07	-1.71	-0.69	8.53	0.08	
7/19/07 11:02:30	0.07	-0.09	-0.65	5.83	0.08	
7/19/07 11:02:45	0.07	-1.51	-0.56	5.17	0.08	Calibration Error
7/19/07 11:03:00	0.07	-2.29	-0.53	5.09	0.08	O ₂ CE Mid = 5.08
7/19/07 11:03:15	0.07	-0.29	-0.63	5.08	0.08	
7/19/07 11:03:30	0.07	-1.29	-0.63	5.08	0.08	
7/19/07 11:03:45	0.07	-2.29	-0.56	5.08	0.08	
7/19/07 11:04:00	0.07	-0.79	-0.67	5.08	0.08	
7/19/07 11:04:15	0.07	0.29	-0.76	5.08	0.08	
7/19/07 11:04:30	0.07	4.81	-0.65	4.71	0.08	
7/19/07 11:04:45	0.07	29.01	-0.53	2.37	0.09	
7/19/07 11:05:00	0.07	60.12	-0.56	0.87	0.09	
7/19/07 11:05:15	0.07	79.82	-0.63	0.48	0.09	
7/19/07 11:05:30	0.07	83.55	-0.58	0.37	0.08	
7/19/07 11:05:45	0.07	82.74	-0.58	0.29	0.08	
7/19/07 11:06:00	0.07	92.70	-0.53	0.19	0.08	
7/19/07 11:06:15	0.07	89.97	-0.44	0.11	0.08	
7/19/07 11:06:30	0.07	83.05	-0.49	0.08	0.08	
7/19/07 11:06:45	0.07	93.85	-0.56	0.07	0.08	
7/19/07 11:07:00	0.07	95.34	-0.58	0.06	0.08	
7/19/07 11:07:15	0.07	87.10	-0.58	0.06	0.08	
7/19/07 11:07:30	0.07	85.85	-0.58	0.06	0.08	
7/19/07 11:07:45	0.07	94.79	-0.63	0.06	0.08	
7/19/07 11:08:00	0.07	91.80	-0.53	0.05	0.08	
7/19/07 11:08:15	0.07	85.93	-0.51	0.05	0.08	
7/19/07 11:08:30	0.07	86.75	-0.51	0.05	0.08	
7/19/07 11:08:45	0.07	94.52	-0.56	0.05	0.08	
7/19/07 11:09:00	0.07	90.85	-0.51	0.05	0.08	
7/19/07 11:09:15	0.07	94.79	-0.60	0.05	0.08	
7/19/07 11:09:30	0.07	95.04	-0.65	0.05	0.08	
7/19/07 11:09:45	0.07	92.50	-0.74	0.05	0.08	
7/19/07 11:10:00	0.07	84.55	-0.60	0.04	0.08	
7/19/07 11:10:15	0.07	95.47	-0.56	0.04	0.08	Calibration Error
7/19/07 11:10:30	0.07	94.34	-0.46	0.04	0.08	CO CE Span = 94.82
7/19/07 11:10:45	0.07	95.04	-0.46	0.04	0.08	
7/19/07 11:11:00	0.07	95.34	-0.67	0.04	0.08	
7/19/07 11:11:15	0.07	94.54	-0.58	0.04	0.08	
7/19/07 11:11:30	0.07	93.95	-0.58	0.04	0.08	
7/19/07 11:11:45	0.07	70.16	-0.65	0.04	0.08	
7/19/07 11:12:00	0.07	49.48	-0.60	0.04	0.08	
7/19/07 11:12:15	0.07	42.91	-0.58	0.04	0.08	
7/19/07 11:12:30	0.07	40.13	-0.56	0.04	0.08	
7/19/07 11:12:45	0.07	34.41	-0.56	0.04	0.08	
7/19/07 11:13:00	0.07	43.63	-0.39	0.04	0.08	
7/19/07 11:13:15	0.07	42.66	-0.53	0.04	0.08	
7/19/07 11:13:30	0.07	40.23	-0.54	0.04	0.08	
7/19/07 11:13:45	0.07	33.06	-0.39	0.04	0.08	
7/19/07 11:14:00	0.07	44.03	-0.49	0.04	0.08	Calibration Error
7/19/07 11:14:15	0.07	44.03	-0.49	0.04	0.08	CO CE Mid = 44.23
7/19/07 11:14:30	0.07	43.63	-0.46	0.04	0.08	
7/19/07 11:14:45	0.07	44.80	-0.46	0.04	0.08	
7/19/07 11:15:00	0.07	44.48	-0.46	0.03	0.08	
7/19/07 11:15:15	0.07	36.91	-0.58	0.03	0.08	
7/19/07 11:15:30	0.07	37.23	-0.67	0.03	0.08	
7/19/07 11:29:45	0.07	-2.29	53.13	-0.04	0.13	
7/19/07 11:30:00	0.07	-2.29	53.89	-0.04	0.14	
7/19/07 11:30:15	0.07	0.36	54.47	-0.04	0.15	
7/19/07 11:30:30	0.07	-1.29	55.19	-0.04	0.15	
7/19/07 11:30:45	0.07	-2.29	55.72	-0.04	0.16	
7/19/07 11:31:00	0.07	-2.29	55.97	-0.03	0.16	
7/19/07 11:31:15	0.07	-0.61	75.62	-0.03	0.17	Calibration Error
7/19/07 11:31:30	0.07	-1.49	95.46	-0.03	0.17	SO ₂ CE Span = 95.65
7/19/07 11:31:45	0.07	-2.29	95.76	-0.03	0.17	
7/19/07 11:32:00	0.07	-0.94	96.50	-0.03	0.18	
7/19/07 11:32:15	0.07	-1.21	94.88	-0.03	0.18	
7/19/07 11:32:30	0.07	-1.64	58.64	-0.03	0.19	
7/19/07 11:32:45	0.07	-2.29	48.30	-0.02	0.19	
7/19/07 11:33:00	0.07	-1.14	47.98	-0.02	0.19	
7/19/07 11:33:15	0.07	-2.29	48.00	-0.02	0.20	
7/19/07 11:33:30	0.07	-2.29	48.22	-0.02	0.20	
7/19/07 11:33:45	0.07	-1.61	48.35	-0.02	0.20	
7/19/07 11:34:00	0.07	-0.44	48.63	-0.01	0.21	
7/19/07 11:34:15	0.07	-0.26	48.72	-0.01	0.21	
7/19/07 11:34:30	0.07	-2.29	48.89	-0.01	0.21	Calibration Error
7/19/07 11:34:45	0.07	-1.66	44.45	-0.01	0.22	SO ₂ CE Mid = 44.74

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 11:35:00	0.07	-0.44	44.77	-0.01	0.22	
7/19/07 11:35:15	0.07	-1.84	44.88	-0.01	0.23	
7/19/07 11:35:30	0.07	-2.29	44.84	0.00	0.23	
7/19/07 11:35:45	0.07	-0.41	38.46	0.00	0.23	
7/19/07 11:36:00	0.07	-0.79	59.82	0.00	0.24	
7/19/07 11:36:15	0.07	-2.29	48.95	0.00	0.24	
7/19/07 11:36:30	0.07	-1.44	8.10	0.01	0.24	
7/19/07 11:36:45	0.07	-1.54	1.79	0.01	0.25	
7/19/07 11:37:00	0.07	-2.29	1.08	0.01	0.25	
7/19/07 11:37:15	0.07	-2.29	0.87	0.01	0.26	
7/19/07 15:32:15	35.40	7.36	5.45	4.74	6.39	
7/19/07 15:32:30	35.33	13.00	6.05	4.72	6.39	
7/19/07 15:32:45	36.13	6.36	5.64	5.27	5.46	
7/19/07 15:33:00	38.61	-2.29	4.58	3.98	2.15	
7/19/07 15:33:15	92.99	-1.94	2.91	1.38	0.01	
7/19/07 15:33:30	100.12	-2.29	0.29	0.40	-0.79	
7/19/07 15:33:45	500.54	-2.28	-0.82	0.25	-0.98	
7/19/07 15:34:00	500.54	-2.28	-0.96	0.24	-0.98	
7/19/07 15:34:15	500.54	-2.28	-0.86	0.24	-0.73	
7/19/07 15:34:30	500.54	-2.28	-0.84	0.24	-0.15	
7/19/07 15:34:45	399.61	-2.28	-1.03	0.24	-0.16	
7/19/07 15:35:00	399.99	-2.28	-1.14	0.24	-0.16	
7/19/07 15:35:15	399.61	-2.28	-1.12	0.24	-0.16	Calibration Error
7/19/07 15:35:30	400.11	-2.28	-0.91	0.24	-0.16	NO _x CE Span = 400.49
7/19/07 15:35:45	400.49	-2.28	-1.03	0.23	-0.16	
7/19/07 15:36:00	400.49	-2.21	-1.21	0.23	-0.16	
7/19/07 15:36:15	400.86	-2.21	-1.23	0.23	-0.16	
7/19/07 15:36:30	374.24	-2.28	-1.30	0.23	-0.16	
7/19/07 15:36:45	300.10	-2.28	-1.35	0.22	-0.17	
7/19/07 15:37:00	232.67	-2.23	-1.24	0.22	-0.17	
7/19/07 15:37:15	206.64	-2.23	-1.33	0.22	-0.17	Calibration Error
7/19/07 15:37:30	204.39	-2.28	-1.33	0.22	-0.17	NO _x CE Mid = 204.39
7/19/07 15:37:45	204.39	-2.28	-1.24	0.21	-0.17	
7/19/07 15:38:00	204.39	-2.28	-1.26	0.22	-0.17	
7/19/07 15:38:15	204.39	-2.29	-1.16	0.21	-0.17	
7/19/07 15:38:30	203.89	-2.28	-1.28	0.21	-0.17	
7/19/07 15:38:45	195.54	-2.28	-1.37	0.29	-0.05	
7/19/07 15:39:00	162.37	-2.28	-1.24	0.44	0.01	
7/19/07 15:39:15	92.61	-2.29	-1.02	0.39	-0.11	
7/19/07 15:39:30	33.09	-2.29	-1.00	0.57	-0.11	
7/19/07 15:39:45	43.59	-2.29	-1.09	0.72	-0.07	
7/19/07 15:40:00	92.11	-2.28	-1.14	0.72	-0.05	
7/19/07 15:40:15	126.99	-2.28	-1.16	0.72	-0.02	
7/19/07 15:40:30	136.86	-2.29	-1.26	0.72	-0.03	
7/19/07 15:40:45	116.12	-2.28	-1.05	0.76	-0.05	
7/19/07 15:41:00	104.12	-2.29	-1.05	0.97	-0.06	
7/19/07 15:41:15	106.24	-2.29	-1.03	2.05	-0.06	
7/19/07 15:41:30	110.12	-2.29	-0.96	4.49	-0.06	
7/19/07 15:41:45	105.00	-2.29	-0.93	6.03	-0.05	
7/19/07 15:42:00	95.37	-2.29	-0.91	7.10	-0.06	
7/19/07 15:42:15	83.23	-2.29	-0.89	7.62	-0.07	
7/19/07 15:42:30	73.35	-2.29	-0.73	8.24	-0.08	
7/19/07 15:42:45	67.10	-2.29	-0.80	7.11	-0.09	
7/19/07 15:43:00	48.59	-2.29	-0.66	2.25	-0.14	
7/19/07 15:43:15	37.34	-2.29	-0.61	0.49	-0.16	
7/19/07 15:43:30	34.09	-2.29	-0.52	0.25	-0.17	NO ₂ converter test
7/19/07 15:43:45	39.71	-2.29	-0.59	0.21	-0.17	
7/19/07 15:44:00	42.59	-2.29	-0.38	0.20	-0.17	
7/19/07 15:44:15	44.22	-2.29	-0.24	0.20	-0.17	
7/19/07 15:44:30	45.09	-2.29	-0.24	0.20	-0.17	
7/19/07 15:44:45	45.84	-2.29	-0.36	0.19	-0.17	
7/19/07 15:45:00	46.59	-2.29	-0.20	0.19	-0.17	
7/19/07 15:45:15	46.96	-2.29	-0.19	0.19	-0.17	
7/19/07 15:45:30	47.34	-2.29	-0.03	0.19	-0.17	
7/19/07 15:45:45	47.78	-2.14	-0.13	0.19	-0.17	
7/19/07 15:46:00	48.09	-2.29	-0.24	0.19	-0.17	
7/19/07 15:46:15	47.87	-0.49	-0.08	0.19	-0.17	
7/19/07 15:46:30	47.84	2.51	-0.12	0.24	0.07	
7/19/07 15:46:45	49.59	5.13	1.12	1.57	3.08	
7/19/07 15:47:00	63.10	1.36	3.45	2.91	4.56	
7/19/07 15:47:15	64.85	-2.09	4.52	1.92	2.06	
7/19/07 15:47:30	57.35	-2.29	3.98	0.65	0.33	
7/19/07 15:47:45	37.46	-1.84	3.06	0.31	-0.05	
7/19/07 15:48:00	14.58	-2.29	2.25	0.27	-0.11	
7/19/07 15:48:15	3.33	-2.29	1.62	0.26	-0.13	
7/19/07 15:48:30	1.83	-2.29	1.37	0.26	-0.14	
7/19/07 15:48:45	1.33	-2.06	0.89	0.25	-0.14	
7/19/07 15:49:00	1.33	-1.71	0.52	0.25	-0.14	System Bias
7/19/07 15:49:15	1.33	-1.49	0.15	0.25	-0.15	NO _x Bias 1 Zero = 1.17
7/19/07 15:49:30	1.32	-2.29	0.01	0.25	-0.15	SO ₂ Bias 1 Zero = -0.09
7/19/07 15:49:45	1.20	0.11	-0.29	0.25	-0.15	CO Bias 1 Zero = -0.87
7/19/07 15:50:00	0.82	0.19	-0.24	0.25	-0.15	O ₂ Bias 1 Zero = 0.25
7/19/07 15:50:15	0.82	-1.61	-0.36	0.25	-0.15	CO ₂ Bias 1 Zero = -0.15
7/19/07 15:50:30	0.82	-1.61	-0.40	0.25	-0.15	
7/19/07 15:50:45	0.95	0.56	-0.45	0.25	-0.15	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 15:51:00	0.83	0.07	-0.45	0.25	-0.15	
7/19/07 15:51:15	56.47	-1.76	-0.31	0.25	-0.15	
7/19/07 15:51:30	107.86	-0.98	-0.17	0.26	-0.15	
7/19/07 15:51:45	177.76	0.61	-0.38	0.25	-0.15	
7/19/07 15:52:00	187.39	-0.14	-0.47	0.25	-0.15	
7/19/07 15:52:15	195.27	-1.81	-0.54	0.25	-0.15	
7/19/07 15:52:30	197.89	-0.54	-0.70	0.25	-0.16	System Bias
7/19/07 15:52:45	197.89	0.39	-0.98	0.25	-0.15	NO _x Bias 1 Mid = 197.76
7/19/07 15:53:00	197.89	0.01	-0.93	0.25	-0.15	
7/19/07 15:53:15	197.39	-1.71	-0.70	0.25	-0.16	
7/19/07 15:53:30	197.39	-0.69	-0.70	0.25	-0.15	
7/19/07 15:53:45	197.39	0.09	-0.82	0.25	-0.16	
7/19/07 15:54:00	197.64	-0.59	-0.96	0.25	-0.15	
7/19/07 15:54:15	197.39	-1.99	-0.80	0.25	-0.15	
7/19/07 15:54:30	197.64	-0.49	-0.91	0.26	-0.12	
7/19/07 15:54:45	196.51	0.56	-0.96	0.37	0.13	
7/19/07 15:55:00	189.89	-0.59	-0.93	0.33	0.00	
7/19/07 15:55:15	108.61	-0.89	-0.80	0.26	-0.12	
7/19/07 15:55:30	56.35	20.60	-0.87	0.24	-0.15	
7/19/07 15:55:45	39.59	35.41	-1.05	0.25	-0.15	
7/19/07 15:56:00	28.84	39.28	-1.12	0.25	-0.16	
7/19/07 15:56:15	14.45	30.66	-0.98	0.26	-0.15	System Bias
7/19/07 15:56:30	6.57	43.58	-0.98	0.26	-0.16	CO Bias 1 Mid = 44.76
7/19/07 15:56:45	3.70	45.53	-1.03	0.26	-0.16	
7/19/07 15:57:00	3.08	45.11	-0.98	0.26	-0.15	
7/19/07 15:57:15	2.70	44.81	-1.00	0.26	-0.15	
7/19/07 15:57:30	2.33	44.08	-1.07	0.26	-0.16	
7/19/07 15:57:45	2.20	53.38	-1.09	0.25	-0.16	
7/19/07 15:58:00	1.83	45.48	-1.12	0.25	-0.15	
7/19/07 15:58:15	1.83	34.19	-1.17	0.24	-0.16	
7/19/07 15:58:30	1.83	47.03	-1.19	0.24	-0.16	
7/19/07 15:58:45	1.70	46.73	-1.17	0.24	-0.16	
7/19/07 15:59:00	1.33	43.58	-1.03	0.24	-0.16	
7/19/07 15:59:15	1.33	31.69	-1.17	0.24	-0.16	
7/19/07 15:59:30	1.33	39.18	-1.21	0.24	-0.14	
7/19/07 15:59:45	1.83	31.96	-1.14	0.24	-0.15	
7/19/07 16:00:00	1.83	12.55	-1.21	0.24	-0.15	
7/19/07 16:00:15	4.83	-0.09	-0.89	0.24	-0.16	
7/19/07 16:00:30	6.07	2.96	-0.63	0.25	-0.16	
7/19/07 16:00:45	5.45	1.51	-1.17	0.26	-0.15	
7/19/07 16:01:00	3.83	-1.69	-1.03	0.26	-0.15	
7/19/07 16:01:15	2.70	-2.28	-1.17	0.26	-0.15	
7/19/07 16:01:30	2.33	1.16	-1.21	0.26	-0.16	
7/19/07 16:01:45	2.20	0.49	-0.89	0.25	-0.16	
7/19/07 16:02:00	1.83	-2.28	-0.63	0.25	-0.16	
7/19/07 16:02:15	1.83	0.79	-1.21	0.25	-0.16	
7/19/07 16:02:30	1.83	0.51	-1.14	0.25	-0.16	
7/19/07 16:02:45	1.83	-0.76	-1.21	0.24	-0.16	
7/19/07 16:03:00	1.83	-2.28	-0.89	0.24	-0.16	
7/19/07 16:03:15	1.70	0.56	-0.63	0.24	-0.16	
7/19/07 16:03:30	1.33	0.51	1.95	0.24	-0.16	
7/19/07 16:03:45	1.33	-0.16	7.63	0.24	-0.16	
7/19/07 16:04:00	1.33	-2.28	15.14	0.24	-0.16	
7/19/07 16:04:15	1.32	0.64	22.01	0.23	-0.16	
7/19/07 16:04:30	1.32	0.11	27.31	0.23	-0.16	
7/19/07 16:04:45	1.33	0.16	31.71	0.23	-0.16	
7/19/07 16:05:00	1.32	-2.28	34.96	0.24	-0.16	
7/19/07 16:05:15	1.32	0.34	44.94	0.24	-0.16	
7/19/07 16:05:30	1.32	0.21	45.26	0.24	-0.16	System Bias
7/19/07 16:05:45	1.32	-1.36	45.49	0.24	-0.16	SO ₂ Bias 1 Mid = 45.56
7/19/07 16:06:00	1.32	-2.28	45.47	0.23	-0.16	
7/19/07 16:06:15	1.32	-0.04	45.65	0.23	-0.16	
7/19/07 16:06:30	1.33	0.16	45.63	0.24	-0.15	
7/19/07 16:06:45	1.32	-1.51	45.53	0.23	-0.16	
7/19/07 16:07:00	1.33	-2.28	45.88	0.23	-0.14	
7/19/07 16:07:15	3.08	0.11	50.08	0.61	0.76	
7/19/07 16:07:30	10.83	-0.69	61.16	0.98	2.31	
7/19/07 16:07:45	29.71	-2.01	56.77	0.56	4.22	
7/19/07 16:08:00	17.33	-2.29	34.89	0.30	5.74	
7/19/07 16:08:15	6.95	-1.54	20.25	0.23	7.48	
7/19/07 16:08:30	2.33	-1.89	13.35	0.21	8.22	
7/19/07 16:08:45	0.82	-2.23	9.64	0.21	8.39	
7/19/07 16:09:00	0.83	-2.29	7.07	0.21	8.45	
7/19/07 16:09:15	0.82	-0.94	5.41	0.21	9.16	
7/19/07 16:09:30	0.82	-1.84	4.24	0.21	9.90	
7/19/07 16:09:45	0.70	-2.21	3.38	0.21	9.91	System Bias
7/19/07 16:10:00	0.33	-2.09	2.69	0.21	9.92	CO ₂ Bias 1 Mid = 9.92
7/19/07 16:10:15	0.33	-0.91	2.22	0.21	9.92	
7/19/07 16:10:30	0.33	-2.18	1.90	0.21	9.92	
7/19/07 16:10:45	0.32	-2.28	1.55	0.21	9.94	
7/19/07 16:11:00	0.33	-1.44	1.23	0.21	9.93	
7/19/07 16:11:15	0.32	-0.59	1.05	0.21	9.94	
7/19/07 16:11:30	0.33	-1.69	0.88	0.21	9.94	
7/19/07 16:11:45	0.57	-2.11	0.82	0.23	9.95	
7/19/07 16:12:00	1.70	-0.59	1.32	0.64	9.49	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 16:12:15	6.57	0.59	2.62	1.37	5.64	
7/19/07 16:12:30	7.32	-0.39	2.99	3.39	1.59	
7/19/07 16:12:45	2.58	-1.84	2.73	4.70	0.23	
7/19/07 16:13:00	1.07	-0.64	2.11	4.97	0.00	System Bias
7/19/07 16:13:15	0.83	0.64	1.49	5.01	-0.06	O ₂ Bias 1 Mid = 5.01
7/19/07 16:13:30	0.45	0.36	1.00	5.02	-0.09	
7/19/07 16:13:45	0.33	-1.56	0.66	5.03	-0.11	
7/19/07 16:14:00	0.32	-0.44	0.49	5.06	-0.12	
7/19/07 16:14:15	0.33	0.59	0.47	5.11	-0.13	
7/19/07 16:14:30	0.33	-0.04	0.22	5.15	-0.14	
7/19/07 16:14:45	0.32	-1.71	0.33	5.17	-0.14	
7/19/07 16:15:00	0.33	-1.04	0.15	5.18	-0.15	
7/19/07 16:15:15	0.20	-0.01	-0.01	5.18	0.77	
7/19/07 16:15:30	17.08	-0.74	0.13	5.20	4.98	
7/19/07 16:15:45	48.22	-1.91	1.26	5.22	8.09	
7/19/07 16:16:00	75.60	-0.69	2.82	5.21	9.49	
7/19/07 16:16:15	83.73	0.09	4.30	5.16	9.79	
7/19/07 16:16:30	86.37	-0.74	5.07	5.03	9.93	
7/19/07 16:16:45	86.87	-1.94	5.41	4.92	9.99	
7/19/07 16:17:00	86.49	-0.79	5.55	4.87	10.04	
7/19/07 16:17:15	86.37	-0.26	5.41	4.86	10.05	
7/19/07 16:17:30	86.37	-1.24	5.30	4.88	10.04	
7/19/07 16:17:45	86.24	-1.96	5.07	4.95	10.02	
7/19/07 16:18:00	85.87	-1.09	4.88	4.98	10.02	
7/19/07 16:18:15	85.74	-0.41	4.67	4.98	10.01	
7/19/07 16:18:30	85.37	-1.54	4.65	4.97	10.03	
7/19/07 16:18:45	84.87	-2.23	4.47	4.98	10.04	
7/19/07 16:19:00	84.87	-1.04	4.30	4.98	10.04	
7/19/07 16:19:15	84.87	-0.91	4.38	4.97	10.05	
7/19/07 16:19:30	84.49	-1.24	4.33	4.97	10.07	
7/19/07 16:19:45	84.36	-2.28	4.14	4.92	10.11	Begin Run 1
7/19/07 16:20:00	84.36	-0.74	3.86	4.82	10.17	
7/19/07 16:20:15	84.36	-0.54	3.75	4.74	10.24	
7/19/07 16:20:30	83.98	-1.69	4.05	4.70	10.25	
7/19/07 16:20:45	83.86	-2.29	3.98	4.69	10.27	
7/19/07 16:21:00	83.86	-0.84	3.93	4.69	10.28	
7/19/07 16:21:15	83.86	-0.21	3.84	4.72	10.24	
7/19/07 16:21:30	83.48	-1.34	3.72	4.75	10.23	
7/19/07 16:21:45	83.36	-2.23	3.59	4.75	10.23	
7/19/07 16:22:00	82.98	-0.89	3.63	4.76	10.24	
7/19/07 16:22:15	82.88	-0.16	3.56	4.76	10.25	
7/19/07 16:22:30	82.86	0.06	3.38	4.76	10.29	
7/19/07 16:22:45	82.86	-1.66	3.29	4.77	10.25	
7/19/07 16:23:00	82.86	-0.94	3.31	4.80	10.24	
7/19/07 16:23:15	82.73	0.26	3.15	4.75	10.30	
7/19/07 16:23:30	82.36	-0.69	2.94	4.63	10.39	
7/19/07 16:23:45	82.23	-2.21	2.90	4.53	10.45	
7/19/07 16:24:00	81.86	-0.19	2.83	4.50	10.43	
7/19/07 16:24:15	81.85	0.21	2.83	4.53	10.42	
7/19/07 16:24:30	81.85	-0.94	2.76	4.64	10.33	
7/19/07 16:24:45	81.85	-2.28	2.73	4.73	10.28	
7/19/07 16:25:00	81.86	0.61	2.73	4.78	10.22	
7/19/07 16:25:15	81.86	0.37	2.60	4.82	10.19	
7/19/07 16:25:30	81.48	0.31	2.55	4.81	10.19	
7/19/07 16:25:45	81.35	-1.83	2.60	4.70	10.28	
7/19/07 16:26:00	81.36	0.71	2.55	4.56	10.38	
7/19/07 16:26:15	81.35	1.87	2.43	4.49	10.36	
7/19/07 16:26:30	81.35	0.11	2.46	4.48	10.39	
7/19/07 16:26:45	81.35	-1.99	2.43	4.50	10.35	
7/19/07 16:27:00	81.36	0.01	2.43	4.57	10.33	
7/19/07 16:27:15	81.86	2.35	2.29	4.67	10.25	
7/19/07 16:27:30	81.86	2.26	2.25	4.73	10.22	
7/19/07 16:27:45	81.86	-1.21	2.22	4.77	10.20	
7/19/07 16:28:00	81.86	1.16	1.83	4.80	10.22	
7/19/07 16:28:15	81.86	4.23	1.85	4.81	10.23	
7/19/07 16:28:30	81.85	4.16	1.97	4.79	10.26	
7/19/07 16:28:45	81.73	0.61	1.92	4.77	10.31	
7/19/07 16:29:00	81.35	5.16	1.81	4.75	10.35	
7/19/07 16:29:15	81.23	8.43	1.60	4.71	10.43	
7/19/07 16:29:30	80.85	9.11	1.58	4.63	10.54	
7/19/07 16:29:45	80.73	3.54	1.62	4.52	10.61	
7/19/07 16:30:00	80.35	4.91	1.55	4.44	10.67	
7/19/07 16:30:15	79.73	11.40	1.53	4.39	10.72	
7/19/07 16:30:30	79.35	10.61	1.51	4.36	10.74	
7/19/07 16:30:45	79.23	4.06	1.32	4.39	10.72	
7/19/07 16:31:00	78.85	5.36	1.37	4.46	10.63	
7/19/07 16:31:15	78.85	12.20	1.35	4.50	10.62	
7/19/07 16:31:30	78.48	9.81	1.25	4.50	10.59	
7/19/07 16:31:45	78.35	5.71	1.25	4.50	10.58	
7/19/07 16:32:00	78.35	7.01	1.21	4.49	10.55	
7/19/07 16:32:15	78.23	15.48	1.09	4.49	10.56	
7/19/07 16:32:30	77.85	15.45	1.11	4.51	10.51	
7/19/07 16:32:45	77.86	11.08	5.13	4.51	10.51	
7/19/07 16:33:00	77.85	12.05	3.12	4.46	10.59	
7/19/07 16:33:15	77.35	20.75	1.16	4.39	10.62	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 16:33:30	77.35	20.80	1.02	4.34	10.65	
7/19/07 16:33:45	77.35	14.28	1.02	4.33	10.65	
7/19/07 16:34:00	77.35	14.70	1.11	4.37	10.59	
7/19/07 16:34:15	77.48	19.92	1.18	4.50	10.51	
7/19/07 16:34:30	77.85	18.95	1.16	4.61	10.42	
7/19/07 16:34:45	77.85	12.13	1.23	4.66	10.36	
7/19/07 16:35:00	77.85	11.46	1.21	4.68	10.34	
7/19/07 16:35:15	78.35	21.47	62.72	4.69	10.35	
7/19/07 16:35:30	78.35	20.30	90.02	4.69	10.32	
7/19/07 16:35:45	78.35	17.77	8.02	4.70	10.31	
7/19/07 16:36:00	78.35	21.30	1.67	4.70	10.31	
7/19/07 16:36:15	78.35	28.27	1.17	4.64	10.37	
7/19/07 16:36:30	78.35	26.54	59.48	4.56	10.43	
7/19/07 16:36:45	78.48	18.95	252.24	4.53	10.47	
7/19/07 16:37:00	78.85	19.90	159.44	4.52	10.44	
7/19/07 16:37:15	79.35	26.74	14.03	4.52	10.44	
7/19/07 16:37:30	79.35	25.54	2.22	4.55	10.42	
7/19/07 16:37:45	79.85	18.20	1.62	4.68	10.34	
7/19/07 16:38:00	79.85	18.90	1.37	4.80	10.25	
7/19/07 16:38:15	80.36	26.89	1.39	4.83	10.22	
7/19/07 16:38:30	80.36	25.09	1.44	4.84	10.20	
7/19/07 16:38:45	80.36	18.22	1.37	4.84	10.19	
7/19/07 16:39:00	80.36	17.00	1.34	4.82	10.20	
7/19/07 16:39:15	80.61	24.47	1.48	4.81	10.20	
7/19/07 16:39:30	80.86	22.50	1.44	4.81	10.18	
7/19/07 16:39:45	80.86	16.45	1.44	4.81	10.19	
7/19/07 16:40:00	80.87	13.15	1.35	4.81	10.19	
7/19/07 16:40:15	81.11	21.07	1.34	4.76	10.21	
7/19/07 16:40:30	81.36	19.50	1.34	4.70	10.24	
7/19/07 16:40:45	81.36	14.33	3.73	4.68	10.27	
7/19/07 16:41:00	81.73	7.11	2.27	4.68	10.25	
7/19/07 16:41:15	82.11	13.98	1.46	4.69	10.27	
7/19/07 16:41:30	82.36	14.20	1.48	4.77	10.25	
7/19/07 16:41:45	82.36	8.53	1.48	4.88	10.15	
7/19/07 16:42:00	82.73	4.71	1.51	4.94	10.13	
7/19/07 16:42:15	82.86	13.15	1.51	4.97	10.09	
7/19/07 16:42:30	82.86	12.10	1.51	4.98	10.09	
7/19/07 16:42:45	82.86	9.26	1.48	4.99	10.10	
7/19/07 16:43:00	82.86	1.51	1.37	4.99	10.10	
7/19/07 16:43:15	83.11	7.06	1.39	4.98	10.10	
7/19/07 16:43:30	83.36	9.16	1.44	4.97	10.15	
7/19/07 16:43:45	83.36	6.48	1.44	4.97	10.15	
7/19/07 16:44:00	83.36	-0.19	4.90	4.96	10.15	
7/19/07 16:44:15	83.36	5.63	5.24	4.92	10.18	
7/19/07 16:44:30	83.36	7.66	1.99	4.87	10.25	
7/19/07 16:44:45	83.61	5.18	1.24	4.86	10.26	
7/19/07 16:45:00	83.86	-0.54	1.55	4.84	10.29	
7/19/07 16:45:15	83.86	5.11	1.55	4.86	10.28	
7/19/07 16:45:30	83.86	7.11	1.48	4.95	10.22	
7/19/07 16:45:45	83.36	4.73	1.69	5.06	10.15	
7/19/07 16:46:00	82.98	-0.74	1.81	5.12	10.13	
7/19/07 16:46:15	83.11	4.36	1.85	5.15	10.09	
7/19/07 16:46:30	83.36	5.51	1.99	5.15	10.08	
7/19/07 16:46:45	82.86	3.16	2.06	5.15	10.08	
7/19/07 16:47:00	82.86	-0.99	2.11	5.10	10.11	
7/19/07 16:47:15	83.36	3.26	2.13	4.98	10.20	
7/19/07 16:47:30	83.36	4.21	4.94	4.86	10.29	
7/19/07 16:47:45	83.61	2.41	67.78	4.79	10.35	
7/19/07 16:48:00	83.86	-2.29	14.99	4.76	10.35	
7/19/07 16:48:15	83.86	2.91	3.07	4.74	10.35	
7/19/07 16:48:30	83.86	3.71	2.43	4.76	10.34	
7/19/07 16:48:45	83.36	2.79	2.40	4.88	10.26	
7/19/07 16:49:00	83.36	-1.34	2.50	4.99	10.19	
7/19/07 16:49:15	83.11	3.33	2.55	5.04	10.17	
7/19/07 16:49:30	82.86	4.26	2.61	5.04	10.17	
7/19/07 16:49:45	82.86	3.66	2.71	5.02	10.19	
7/19/07 16:50:00	82.86	-0.19	2.64	5.00	10.19	
7/19/07 16:50:15	82.61	0.64	2.59	4.97	10.22	
7/19/07 16:50:30	82.73	4.71	2.57	4.94	10.26	
7/19/07 16:50:45	82.86	3.31	2.61	4.84	10.33	
7/19/07 16:51:00	82.86	0.16	2.66	4.73	10.40	
7/19/07 16:51:15	82.86	-0.34	2.85	4.69	10.42	
7/19/07 16:51:30	82.86	5.06	2.89	4.68	10.43	
7/19/07 16:51:45	82.86	3.76	2.87	4.69	10.43	
7/19/07 16:52:00	82.48	0.96	3.01	4.71	10.41	
7/19/07 16:52:15	82.86	-0.06	2.94	4.82	10.32	
7/19/07 16:52:30	82.48	4.31	2.98	4.94	10.26	
7/19/07 16:52:45	82.36	3.73	3.01	4.99	10.22	
7/19/07 16:53:00	82.36	1.21	2.91	5.00	10.19	
7/19/07 16:53:15	82.36	-0.41	2.94	4.99	10.19	
7/19/07 16:53:30	82.36	4.86	3.14	4.97	10.18	
7/19/07 16:53:45	82.61	4.56	3.05	4.92	10.22	
7/19/07 16:54:00	82.86	2.16	3.16	4.81	10.30	
7/19/07 16:54:15	82.36	-0.16	3.09	4.70	10.35	
7/19/07 16:54:30	82.36	4.81	3.05	4.64	10.38	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 16:54:45	82.36	3.69	2.98	4.63	10.39	
7/19/07 16:55:00	82.73	0.71	3.12	4.64	10.37	
7/19/07 16:55:15	82.36	-0.39	3.12	4.69	10.33	
7/19/07 16:55:30	82.36	4.56	3.01	4.79	10.24	
7/19/07 16:55:45	82.86	3.93	3.01	4.87	10.16	
7/19/07 16:56:00	82.86	2.91	3.03	4.89	10.15	
7/19/07 16:56:15	82.86	1.14	2.92	4.89	10.16	
7/19/07 16:56:30	82.86	7.26	3.07	4.87	10.21	
7/19/07 16:56:45	82.86	6.93	3.03	4.86	10.28	
7/19/07 16:57:00	82.86	5.01	3.09	4.86	10.32	
7/19/07 16:57:15	82.36	1.71	3.03	4.86	10.38	
7/19/07 16:57:30	82.36	8.96	3.03	4.85	10.42	
7/19/07 16:57:45	82.36	9.18	3.09	4.81	10.47	
7/19/07 16:58:00	82.36	8.36	3.14	4.74	10.53	
7/19/07 16:58:15	82.11	1.39	3.07	4.67	10.57	
7/19/07 16:58:30	81.86	6.46	3.14	4.63	10.59	
7/19/07 16:58:45	81.36	8.28	3.26	4.60	10.61	
7/19/07 16:59:00	81.36	6.16	3.26	4.58	10.61	
7/19/07 16:59:15	81.36	0.86	3.19	4.64	10.55	
7/19/07 16:59:30	81.36	2.41	3.30	4.75	10.44	
7/19/07 16:59:45	81.86	6.51	3.33	4.81	10.36	
7/19/07 17:00:00	81.86	5.71	3.35	4.84	10.31	
7/19/07 17:00:15	81.86	0.76	3.28	4.86	10.25	
7/19/07 17:00:30	81.86	2.71	3.28	4.89	10.20	
7/19/07 17:00:45	81.86	6.86	3.30	4.90	10.15	
7/19/07 17:01:00	81.87	6.76	3.35	4.88	10.14	
7/19/07 17:01:15	82.37	0.70	3.39	4.78	10.21	
7/19/07 17:01:30	82.36	3.06	3.53	4.67	10.29	
7/19/07 17:01:45	82.39	7.66	3.54	4.63	10.31	
7/19/07 17:02:00	82.37	8.06	3.35	4.62	10.31	
7/19/07 17:02:15	82.87	-0.26	-7.49	4.63	10.31	
7/19/07 17:02:30	82.86	3.11	-6.50	4.67	10.29	
7/19/07 17:02:45	82.86	9.13	2.84	4.77	10.23	
7/19/07 17:03:00	82.86	7.71	3.67	4.85	10.16	
7/19/07 17:03:15	82.86	0.86	3.74	4.88	10.16	
7/19/07 17:03:30	82.88	3.51	3.56	4.88	10.16	
7/19/07 17:03:45	83.36	8.83	3.72	4.87	10.17	
7/19/07 17:04:00	83.36	8.56	3.83	4.85	10.18	
7/19/07 17:04:15	83.36	2.14	3.77	4.84	10.19	
7/19/07 17:04:30	83.36	3.91	3.67	4.86	10.19	
7/19/07 17:04:45	83.36	9.11	3.74	4.87	10.18	
7/19/07 17:05:00	83.36	8.71	3.87	4.86	10.20	
7/19/07 17:05:15	83.36	1.16	3.86	4.84	10.23	
7/19/07 17:05:30	83.36	3.66	3.91	4.81	10.25	
7/19/07 17:05:45	83.36	8.23	3.95	4.78	10.27	
7/19/07 17:06:00	83.49	6.96	3.98	4.76	10.28	
7/19/07 17:06:15	83.86	1.16	3.93	4.76	10.31	
7/19/07 17:06:30	83.99	2.96	3.90	4.78	10.28	
7/19/07 17:06:45	84.36	7.63	3.86	4.86	10.22	
7/19/07 17:07:00	84.24	7.11	3.93	4.95	10.17	
7/19/07 17:07:15	83.86	1.69	4.05	4.97	10.16	
7/19/07 17:07:30	83.86	2.81	4.02	4.98	10.14	
7/19/07 17:07:45	83.86	6.76	3.95	4.99	10.15	
7/19/07 17:08:00	83.86	6.31	4.03	5.00	10.14	
7/19/07 17:08:15	83.86	-0.19	4.02	5.01	10.14	
7/19/07 17:08:30	83.86	2.71	4.23	5.01	10.16	
7/19/07 17:08:45	83.86	5.56	4.30	5.00	10.18	
7/19/07 17:09:00	83.86	5.81	4.30	5.00	10.19	
7/19/07 17:09:15	83.86	-1.24	4.30	4.96	10.23	
7/19/07 17:09:30	83.99	1.91	4.37	4.88	10.30	
7/19/07 17:09:45	84.36	5.06	4.30	4.80	10.35	
7/19/07 17:10:00	84.36	4.36	4.26	4.78	10.36	
7/19/07 17:10:15	84.36	-0.26	4.51	4.78	10.39	
7/19/07 17:10:30	84.36	1.76	4.60	4.78	10.37	
7/19/07 17:10:45	84.36	4.41	4.81	4.87	10.32	
7/19/07 17:11:00	83.99	3.91	4.97	4.99	10.23	
7/19/07 17:11:15	83.86	0.49	4.97	5.05	10.20	
7/19/07 17:11:30	83.86	0.61	4.69	5.08	10.19	
7/19/07 17:11:45	83.86	3.54	4.60	5.09	10.17	
7/19/07 17:12:00	83.86	3.51	4.65	5.10	10.14	
7/19/07 17:12:15	83.86	0.49	4.72	5.09	10.13	
7/19/07 17:12:30	83.74	-2.29	4.77	5.03	10.17	
7/19/07 17:12:45	83.61	3.26	4.74	4.91	10.28	
7/19/07 17:13:00	83.86	2.21	4.81	4.82	10.35	
7/19/07 17:13:15	83.86	1.01	4.95	4.78	10.36	
7/19/07 17:13:30	83.86	-2.29	4.97	4.76	10.39	
7/19/07 17:13:45	83.86	3.01	5.04	4.77	10.40	
7/19/07 17:14:00	83.86	1.06	5.04	4.82	10.34	
7/19/07 17:14:15	83.86	2.36	5.09	4.94	10.28	
7/19/07 17:14:30	83.74	-2.29	5.13	5.03	10.24	
7/19/07 17:14:45	83.36	2.91	5.09	5.07	10.20	
7/19/07 17:15:00	83.36	1.96	5.23	5.09	10.19	
7/19/07 17:15:15	83.36	0.76	5.02	5.09	10.17	
7/19/07 17:15:30	83.24	-2.04	5.13	5.09	10.19	
7/19/07 17:15:45	82.86	2.01	5.18	5.06	10.24	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 17:16:00	82.86	1.61	5.18	4.97	10.34	
7/19/07 17:16:15	83.11	0.91	5.25	4.83	10.42	
7/19/07 17:16:30	83.36	-0.54	5.27	4.75	10.49	
7/19/07 17:16:45	83.36	-1.39	5.23	4.72	10.48	
7/19/07 17:17:00	83.36	1.46	5.25	4.71	10.51	
7/19/07 17:17:15	83.11	0.96	5.16	4.71	10.50	
7/19/07 17:17:30	82.86	-1.19	5.02	4.76	10.47	
7/19/07 17:17:45	82.86	-1.24	5.20	4.82	10.43	
7/19/07 17:18:00	82.73	1.56	5.09	4.85	10.38	
7/19/07 17:18:15	82.36	0.56	5.04	4.86	10.39	
7/19/07 17:18:30	82.24	-1.09	5.09	4.84	10.38	
7/19/07 17:18:45	82.11	-1.06	5.16	4.81	10.38	
7/19/07 17:19:00	82.23	2.06	5.34	4.79	10.40	
7/19/07 17:19:15	81.86	0.86	5.53	4.76	10.41	
7/19/07 17:19:30	81.86	-1.54	5.43	4.73	10.40	
7/19/07 17:19:45	81.86	-0.71	5.43	4.67	10.46	End Run 1
7/19/07 17:20:00	81.73	3.66	5.41	4.59	10.50	
7/19/07 17:20:15	81.36	2.41	5.32	4.51	10.54	
7/19/07 17:20:30	80.98	0.51	5.36	4.47	10.56	
7/19/07 17:20:45	80.66	0.24	5.29	4.46	10.60	
7/19/07 17:21:00	79.23	6.41	5.36	4.53	10.04	
7/19/07 17:21:15	72.35	1.59	5.30	5.12	5.68	
7/19/07 17:21:30	45.72	-1.14	4.39	4.93	1.71	
7/19/07 17:21:45	16.83	-2.16	3.17	5.01	0.21	
7/19/07 17:22:00	5.20	-0.84	2.29	5.10	-0.04	System Bias
7/19/07 17:22:15	1.83	-0.31	1.51	5.12	-0.10	O ₂ Bias 2 Mid = 5.13
7/19/07 17:22:30	0.96	-1.79	1.06	5.12	-0.12	
7/19/07 17:22:45	0.83	-2.29	0.54	5.13	-0.13	
7/19/07 17:23:00	0.83	-0.99	0.28	5.13	-0.14	
7/19/07 17:23:15	0.83	-0.74	0.03	5.14	-0.15	
7/19/07 17:23:30	0.83	-1.14	-0.15	5.16	-0.15	
7/19/07 17:23:45	0.83	-2.29	-0.22	5.17	-0.16	
7/19/07 17:24:00	0.83	-0.99	-0.41	5.18	-0.16	
7/19/07 17:24:15	0.82	-0.26	-0.45	5.18	-0.17	
7/19/07 17:24:30	0.83	-0.94	-0.64	4.94	-0.17	
7/19/07 17:24:45	0.58	-2.29	-0.80	2.68	-0.16	
7/19/07 17:25:00	0.33	-0.84	-0.87	0.77	-0.17	System Bias
7/19/07 17:25:15	0.33	-0.34	-0.80	0.36	-0.17	NO _x Bias 2 Zero = 0.33
7/19/07 17:25:30	0.33	-0.74	-0.85	0.29	-0.17	SO ₂ Bias 2 Zero = -0.84
7/19/07 17:25:45	0.33	-2.29	-0.78	0.27	-0.17	CO Bias 2 Zero = -1.04
7/19/07 17:26:00	0.33	-0.79	-0.94	0.27	-0.17	O ₂ Bias 2 Zero = 0.30
7/19/07 17:26:15	0.33	-0.29	-0.99	0.26	-0.17	CO ₂ Bias 2 Zero = -0.17
7/19/07 17:26:30	0.33	-0.84	-1.05	0.26	-0.18	
7/19/07 17:26:45	0.33	-2.29	-1.03	0.26	-0.17	
7/19/07 17:27:00	0.33	-2.29	-0.96	0.26	-0.18	
7/19/07 17:27:15	0.33	0.86	-1.17	0.39	0.34	
7/19/07 17:27:30	7.82	-1.39	-1.26	1.14	2.12	
7/19/07 17:27:45	12.83	-2.29	-1.38	1.26	5.44	
7/19/07 17:28:00	6.70	-2.29	-1.17	0.63	8.20	
7/19/07 17:28:15	2.58	-1.59	-1.10	0.30	9.49	
7/19/07 17:28:30	0.83	-2.24	-1.10	0.24	9.78	
7/19/07 17:28:45	0.33	-1.39	-1.22	0.23	9.86	System Bias
7/19/07 17:29:00	0.33	-2.29	-1.08	0.22	9.87	CO ₂ Bias 2 Mid = 9.90
7/19/07 17:29:15	0.33	-1.41	-1.29	0.22	9.90	
7/19/07 17:29:30	0.33	-2.19	-1.15	0.22	9.91	
7/19/07 17:29:45	0.33	-2.29	-1.15	0.22	9.93	
7/19/07 17:30:00	0.33	-2.29	-1.15	0.22	9.92	
7/19/07 17:30:15	0.33	-0.76	-1.15	0.22	9.93	
7/19/07 17:30:30	0.33	-1.24	-1.22	0.22	9.94	
7/19/07 17:30:45	1.83	-1.69	-1.22	0.42	9.77	
7/19/07 17:31:00	5.95	-2.29	-1.15	0.53	6.27	
7/19/07 17:31:15	4.33	-1.74	-1.06	0.39	2.08	
7/19/07 17:31:30	4.21	-0.44	-0.69	0.34	0.44	
7/19/07 17:31:45	7.58	-1.44	-0.34	0.29	0.09	
7/19/07 17:32:00	19.08	-2.09	-0.08	0.26	-0.03	
7/19/07 17:32:15	20.34	-1.64	0.10	0.25	0.10	
7/19/07 17:32:30	54.85	-0.09	0.63	0.26	0.08	
7/19/07 17:32:45	92.37	-0.96	1.00	0.26	-0.08	
7/19/07 17:33:00	148.62	-1.59	0.33	0.25	-0.13	
7/19/07 17:33:15	181.39	-1.56	-0.20	0.25	-0.14	
7/19/07 17:33:30	196.03	0.21	-0.55	0.25	-0.15	
7/19/07 17:33:45	196.65	-0.96	-0.66	0.25	-0.15	
7/19/07 17:34:00	193.40	-1.74	-0.78	0.24	-0.15	
7/19/07 17:34:15	190.90	-1.96	-0.78	0.24	-0.16	
7/19/07 17:34:30	194.27	-0.52	-0.76	0.24	-0.16	
7/19/07 17:34:45	198.90	-0.94	-0.82	0.24	-0.16	System Bias
7/19/07 17:35:00	198.40	-1.56	-0.87	0.24	-0.17	NO _x Bias 2 Mid = 198.22
7/19/07 17:35:15	198.41	-2.29	-0.96	0.24	-0.17	
7/19/07 17:35:30	197.15	-0.79	-1.01	0.24	-0.17	
7/19/07 17:35:45	198.90	-0.96	-1.01	0.24	-0.17	
7/19/07 17:36:00	195.78	0.09	-1.17	0.24	-0.17	
7/19/07 17:36:15	197.65	-2.29	-1.15	0.24	-0.17	
7/19/07 17:36:30	199.02	-0.19	-1.08	0.24	-0.15	
7/19/07 17:36:45	198.65	-0.46	-1.10	0.40	0.29	
7/19/07 17:37:00	184.64	-0.16	-1.10	0.42	0.20	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 17:37:15	121.37	4.03	-1.08	0.28	-0.09	
7/19/07 17:37:30	64.23	24.34	-1.15	0.25	-0.15	
7/19/07 17:37:45	35.34	40.26	-1.17	0.26	-0.16	
7/19/07 17:38:00	20.46	43.03	-1.24	0.25	-0.17	
7/19/07 17:38:15	10.82	44.36	-1.34	0.24	-0.17	System Bias CO Bias 2 Mid = 44.71
7/19/07 17:38:30	4.95	44.06	-1.43	0.24	-0.18	
7/19/07 17:38:45	3.58	45.43	-1.36	0.24	-0.18	
7/19/07 17:39:00	2.83	44.98	-1.43	0.24	-0.18	
7/19/07 17:39:15	2.58	43.76	-1.40	0.24	-0.18	
7/19/07 17:39:30	2.33	30.42	-1.38	0.24	-0.18	
7/19/07 17:39:45	2.08	46.60	-1.49	0.24	-0.18	
7/19/07 17:40:00	1.83	44.66	-1.47	0.23	-0.18	
7/19/07 17:40:15	1.83	42.63	-1.27	0.23	-0.17	
7/19/07 17:40:30	2.45	34.99	-1.45	0.32	0.09	
7/19/07 17:40:45	3.08	24.54	-1.45	0.35	0.06	
7/19/07 17:41:00	4.57	21.40	42.80	0.26	-0.13	
7/19/07 17:41:15	3.58	8.33	26.34	0.24	-0.17	
7/19/07 17:41:30	5.20	-0.44	1.43	0.25	-0.17	
7/19/07 17:41:45	5.82	-1.31	2.01	0.24	-0.18	
7/19/07 17:42:00	4.08	0.64	7.79	0.24	-0.18	
7/19/07 17:42:15	3.08	-0.16	16.78	0.24	-0.18	
7/19/07 17:42:30	2.33	-1.81	20.84	0.24	-0.18	
7/19/07 17:42:45	2.08	-1.44	24.59	0.23	-0.18	
7/19/07 17:43:00	1.83	0.21	27.82	0.23	-0.18	
7/19/07 17:43:15	1.83	-0.54	30.31	0.23	-0.18	
7/19/07 17:43:30	1.83	-1.74	32.41	0.23	-0.18	
7/19/07 17:43:45	1.83	-2.29	34.79	0.23	-0.18	
7/19/07 17:44:00	1.33	-0.41	36.96	0.23	-0.19	
7/19/07 17:44:15	1.33	-0.59	38.51	0.23	-0.18	
7/19/07 17:44:30	1.33	-0.89	39.52	0.23	-0.18	
7/19/07 17:44:45	1.33	-2.29	40.21	0.23	-0.18	
7/19/07 17:45:00	1.33	-0.26	40.72	0.23	-0.19	
7/19/07 17:45:15	1.33	-0.31	42.11	0.22	-0.18	
7/19/07 17:45:30	1.33	-0.91	42.64	0.23	-0.18	
7/19/07 17:45:45	1.33	-2.29	43.80	0.23	-0.18	System Bias SO ₂ Bias 2 Mid = 44.16
7/19/07 17:46:00	1.33	-0.34	44.01	0.23	-0.19	
7/19/07 17:46:15	1.33	-0.29	44.15	0.23	-0.19	
7/19/07 17:46:30	1.33	-0.89	44.21	0.23	-0.19	
7/19/07 17:46:45	1.33	-2.29	44.28	0.23	-0.18	
7/19/07 17:47:00	1.21	-2.29	43.57	0.23	-0.19	
7/19/07 17:47:15	0.83	0.01	27.55	0.23	-0.18	
7/19/07 17:47:30	0.83	-1.04	41.87	0.23	-0.18	
7/19/07 17:47:45	0.83	-1.54	42.61	0.23	-0.18	
7/19/07 17:48:00	0.83	-2.29	42.70	0.22	-0.19	
7/19/07 17:48:15	0.82	0.09	42.77	0.22	-0.18	
7/19/07 17:48:30	0.83	-0.51	53.41	0.22	-0.18	
7/19/07 17:48:45	0.83	-1.64	37.26	0.23	-0.18	
7/19/07 17:49:00	0.85	-2.23	83.53	0.23	-0.18	
7/19/07 17:49:15	0.83	-1.76	82.52	0.23	-0.18	
7/19/07 17:49:30	0.83	-0.56	46.39	0.23	-0.18	
7/19/07 17:49:45	0.83	-1.19	42.80	0.22	-0.19	
7/19/07 17:50:00	0.83	-1.94	44.15	0.22	-0.19	
7/19/07 17:50:15	0.83	-1.59	44.43	0.22	-0.19	
7/19/07 17:50:30	0.83	-0.31	44.29	0.22	-0.18	
7/19/07 17:50:45	0.83	-1.01	44.34	0.23	-0.18	
7/19/07 17:51:00	0.83	-0.86	44.38	0.23	-0.19	
7/19/07 17:51:15	0.83	-2.29	45.82	0.33	0.35	
7/19/07 17:51:30	15.20	3.71	47.25	1.85	4.32	
7/19/07 17:51:45	33.34	5.56	39.93	3.65	7.83	
7/19/07 17:52:00	69.49	6.76	28.53	4.57	9.67	
7/19/07 17:52:15	78.11	0.11	20.98	4.81	10.07	
7/19/07 17:52:30	82.36	5.06	17.01	4.83	10.16	
7/19/07 17:52:45	82.11	5.93	14.93	4.84	10.19	
7/19/07 17:53:00	80.98	5.33	13.29	4.84	10.21	
7/19/07 17:53:15	81.61	0.86	11.82	4.84	10.21	
7/19/07 17:53:30	81.86	4.53	10.72	4.84	10.22	
7/19/07 17:53:45	82.11	5.81	9.88	4.83	10.23	
7/19/07 17:54:00	82.36	5.51	9.28	4.78	10.29	
7/19/07 17:54:15	82.11	3.81	8.94	4.71	10.33	
7/19/07 17:54:30	82.36	-1.36	8.78	4.63	10.37	
7/19/07 17:54:45	82.36	6.96	8.54	4.61	10.41	
7/19/07 17:55:00	82.36	5.91	8.29	4.60	10.41	
7/19/07 17:55:15	82.11	4.88	7.97	4.62	10.40	
7/19/07 17:55:30	82.36	-1.79	7.76	4.67	10.35	
7/19/07 17:55:45	82.36	7.21	7.64	4.79	10.29	
7/19/07 17:56:00	82.36	6.08	7.37	4.85	10.24	
7/19/07 17:56:15	82.07	5.51	7.11	4.87	10.27	
7/19/07 17:56:30	82.36	-0.56	6.93	4.87	10.27	
7/19/07 17:56:45	81.73	0.16	6.97	4.86	10.30	Begin Run 2
7/19/07 17:57:00	80.86	6.91	7.02	4.85	10.33	
7/19/07 17:57:15	77.34	6.63	7.11	4.84	10.32	
7/19/07 17:57:30	76.24	3.11	6.74	4.84	10.32	
7/19/07 17:57:45	75.87	0.46	6.58	4.82	10.32	
7/19/07 17:58:00	75.87	7.28	6.51	4.75	10.38	
7/19/07 17:58:15	75.48	6.41	6.74	4.65	10.44	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 17:58:30	75.87	6.48	6.56	4.58	10.50	
7/19/07 17:58:45	76.23	-2.01	6.44	4.55	10.53	
7/19/07 17:59:00	76.36	5.33	6.35	4.52	10.53	
7/19/07 17:59:15	76.73	6.51	6.39	4.52	10.52	
7/19/07 17:59:30	76.98	7.18	6.32	4.58	10.49	
7/19/07 17:59:45	76.98	-0.86	6.14	4.69	10.39	
7/19/07 18:00:00	76.86	5.06	6.12	4.76	10.33	
7/19/07 18:00:15	76.86	6.01	6.21	4.80	10.30	
7/19/07 18:00:30	76.98	6.01	6.09	4.81	10.28	
7/19/07 18:00:45	76.98	2.36	6.00	4.83	10.29	
7/19/07 18:01:00	76.86	4.16	6.04	4.84	10.25	
7/19/07 18:01:15	76.86	6.11	6.05	4.85	10.24	
7/19/07 18:01:30	76.36	5.43	5.96	4.85	10.23	
7/19/07 18:01:45	75.98	3.01	5.96	4.85	10.21	
7/19/07 18:02:00	75.36	-1.71	5.91	4.82	10.23	
7/19/07 18:02:15	75.73	6.21	6.00	4.74	10.27	
7/19/07 18:02:30	75.86	5.38	5.96	4.66	10.30	
7/19/07 18:02:45	75.48	3.98	5.96	4.62	10.33	
7/19/07 18:03:00	75.36	-1.49	5.80	4.62	10.33	
7/19/07 18:03:15	75.73	6.41	5.77	4.64	10.32	
7/19/07 18:03:30	75.99	4.83	5.77	4.66	10.30	
7/19/07 18:03:45	75.98	5.33	5.77	4.73	10.28	
7/19/07 18:04:00	75.86	-0.51	5.61	4.83	10.19	
7/19/07 18:04:15	75.86	0.01	5.63	4.89	10.16	
7/19/07 18:04:30	75.86	6.16	5.61	4.91	10.16	
7/19/07 18:04:45	75.86	5.28	5.73	4.90	10.16	
7/19/07 18:05:00	76.36	1.91	5.59	4.89	10.20	
7/19/07 18:05:15	76.36	0.11	5.59	4.89	10.20	
7/19/07 18:05:30	76.98	6.56	5.64	4.88	10.21	
7/19/07 18:05:45	76.98	4.98	5.82	4.88	10.23	
7/19/07 18:06:00	76.86	4.53	44.38	4.89	10.22	
7/19/07 18:06:15	76.85	-0.79	20.75	4.86	10.20	
7/19/07 18:06:30	76.98	4.31	6.76	4.78	10.27	
7/19/07 18:06:45	77.36	5.56	5.67	4.72	10.32	
7/19/07 18:07:00	77.36	5.26	5.45	4.70	10.32	
7/19/07 18:07:15	77.36	1.09	5.40	4.70	10.33	
7/19/07 18:07:30	77.35	4.31	5.38	4.70	10.33	
7/19/07 18:07:45	77.36	5.56	5.17	4.76	10.28	
7/19/07 18:08:00	77.73	4.88	5.31	4.84	10.24	
7/19/07 18:08:15	77.36	2.24	5.35	4.87	10.21	
7/19/07 18:08:30	77.36	-1.59	5.22	4.89	10.19	
7/19/07 18:08:45	77.73	5.21	5.19	4.90	10.19	
7/19/07 18:09:00	77.86	4.83	5.19	4.91	10.19	
7/19/07 18:09:15	77.66	2.63	5.10	4.91	10.18	
7/19/07 18:09:30	77.86	-1.94	4.99	4.90	10.19	
7/19/07 18:09:45	78.23	5.42	4.85	4.90	10.20	
7/19/07 18:10:00	78.36	4.28	4.92	4.90	10.19	
7/19/07 18:10:15	78.36	4.05	4.78	4.87	10.18	
7/19/07 18:10:30	78.36	-0.96	4.85	4.80	10.22	
7/19/07 18:10:45	78.36	1.01	5.13	4.72	10.29	
7/19/07 18:11:00	78.86	3.78	5.26	4.67	10.32	
7/19/07 18:11:15	78.86	3.21	5.29	4.66	10.32	
7/19/07 18:11:30	78.86	-0.89	5.01	4.66	10.32	
7/19/07 18:11:45	78.86	1.11	4.96	4.69	10.27	
7/19/07 18:12:00	78.86	4.13	4.94	4.81	10.19	
7/19/07 18:12:15	78.86	3.21	4.83	4.92	10.12	
7/19/07 18:12:30	78.86	1.74	4.83	4.96	10.09	
7/19/07 18:12:45	78.86	-0.89	4.83	4.96	10.08	
7/19/07 18:13:00	78.98	2.61	4.85	4.96	10.10	
7/19/07 18:13:15	79.36	2.91	4.83	4.96	10.09	
7/19/07 18:13:30	79.36	3.61	4.89	4.96	10.11	
7/19/07 18:13:45	79.36	-2.29	4.89	4.96	10.11	
7/19/07 18:14:00	79.86	2.96	4.94	4.94	10.15	
7/19/07 18:14:15	79.86	3.66	5.13	4.87	10.20	
7/19/07 18:14:30	79.86	3.36	5.17	4.77	10.29	
7/19/07 18:14:45	79.86	-0.64	5.03	4.69	10.31	
7/19/07 18:15:00	79.86	-1.69	5.03	4.67	10.32	
7/19/07 18:15:15	79.86	3.61	4.94	4.67	10.33	
7/19/07 18:15:30	79.73	2.41	4.99	4.67	10.32	
7/19/07 18:15:45	79.73	0.01	4.80	4.69	10.29	
7/19/07 18:16:00	79.86	-2.29	4.76	4.77	10.24	
7/19/07 18:16:15	79.86	3.71	4.85	4.85	10.21	
7/19/07 18:16:30	79.86	2.71	4.76	4.88	10.18	
7/19/07 18:16:45	79.86	1.61	4.80	4.88	10.17	
7/19/07 18:17:00	79.86	-1.51	4.87	4.88	10.17	
7/19/07 18:17:15	79.86	1.06	4.85	4.88	10.18	
7/19/07 18:17:30	79.86	3.73	4.85	4.88	10.20	
7/19/07 18:17:45	79.86	3.56	4.71	4.88	10.21	
7/19/07 18:18:00	79.86	0.84	4.68	4.87	10.21	
7/19/07 18:18:15	79.86	1.91	4.92	4.84	10.25	
7/19/07 18:18:30	79.36	5.43	5.13	4.76	10.33	
7/19/07 18:18:45	79.36	4.66	5.10	4.67	10.42	
7/19/07 18:19:00	79.36	3.59	4.89	4.60	10.48	
7/19/07 18:19:15	79.36	-1.54	4.85	4.56	10.50	
7/19/07 18:19:30	79.36	3.41	4.90	4.55	10.54	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 18:19:45	78.98	4.16	4.82	4.55	10.54	
7/19/07 18:20:00	78.98	3.83	4.87	4.62	10.47	
7/19/07 18:20:15	79.36	-0.84	4.80	4.74	10.41	
7/19/07 18:20:30	79.36	3.86	4.76	4.83	10.32	
7/19/07 18:20:45	78.98	4.46	4.89	4.90	10.27	
7/19/07 18:21:00	78.73	4.31	4.89	4.90	10.28	
7/19/07 18:21:15	78.36	0.21	4.76	4.87	10.29	
7/19/07 18:21:30	78.36	-1.54	4.82	4.84	10.30	
7/19/07 18:21:45	78.36	5.01	4.87	4.80	10.33	
7/19/07 18:22:00	78.86	4.41	4.89	4.68	10.42	
7/19/07 18:22:15	78.48	1.96	4.80	4.56	10.51	
7/19/07 18:22:30	78.36	-2.29	4.78	4.49	10.55	
7/19/07 18:22:45	78.73	5.06	4.85	4.48	10.55	
7/19/07 18:23:00	78.86	4.31	4.78	4.47	10.56	
7/19/07 18:23:15	78.86	3.76	4.70	4.49	10.53	
7/19/07 18:23:30	78.86	-0.89	4.66	4.57	10.47	
7/19/07 18:23:45	78.86	1.56	4.66	4.69	10.39	
7/19/07 18:24:00	78.86	4.66	4.68	4.77	10.36	
7/19/07 18:24:15	78.86	3.81	4.73	4.79	10.33	
7/19/07 18:24:30	79.11	-0.01	4.64	4.78	10.33	
7/19/07 18:24:45	79.36	2.16	4.57	4.77	10.35	
7/19/07 18:25:00	79.36	5.86	4.59	4.77	10.37	
7/19/07 18:25:15	79.36	5.81	4.57	4.76	10.38	
7/19/07 18:25:30	79.36	4.98	4.52	4.69	10.44	
7/19/07 18:25:45	79.36	-1.34	4.39	4.58	10.51	
7/19/07 18:26:00	79.36	5.13	4.45	4.51	10.56	
7/19/07 18:26:15	78.98	6.21	4.89	4.48	10.58	
7/19/07 18:26:30	79.36	6.16	4.66	4.47	10.60	
7/19/07 18:26:45	78.98	-0.39	4.66	4.48	10.59	
7/19/07 18:27:00	78.86	3.63	4.61	4.54	10.52	
7/19/07 18:27:15	78.86	4.51	4.66	4.67	10.38	
7/19/07 18:27:30	79.11	4.21	4.68	4.79	10.28	
7/19/07 18:27:45	79.36	0.06	4.59	4.84	10.24	
7/19/07 18:28:00	79.36	0.71	4.57	4.86	10.22	
7/19/07 18:28:15	79.36	4.96	4.57	4.88	10.21	
7/19/07 18:28:30	79.36	4.71	4.85	4.89	10.19	
7/19/07 18:28:45	79.36	2.06	4.78	4.84	10.25	
7/19/07 18:29:00	79.36	-2.19	4.73	4.72	10.34	
7/19/07 18:29:15	79.36	5.21	4.76	4.64	10.37	
7/19/07 18:29:30	79.36	4.56	4.68	4.60	10.39	
7/19/07 18:29:45	79.36	3.16	4.85	4.61	10.40	
7/19/07 18:30:00	79.61	-1.16	4.61	4.61	10.40	
7/19/07 18:30:15	80.24	4.06	4.57	4.62	10.38	
7/19/07 18:30:30	80.36	4.01	4.66	4.71	10.31	
7/19/07 18:30:45	80.36	4.16	4.57	4.82	10.23	
7/19/07 18:31:00	80.36	-0.59	4.54	4.87	10.21	
7/19/07 18:31:15	80.36	1.61	4.57	4.89	10.22	
7/19/07 18:31:30	79.86	4.23	4.61	4.91	10.20	
7/19/07 18:31:45	79.86	3.81	4.59	4.91	10.21	
7/19/07 18:32:00	80.11	2.94	4.59	4.91	10.20	
7/19/07 18:32:15	80.36	-0.99	4.61	4.90	10.21	
7/19/07 18:32:30	80.36	4.36	4.59	4.81	10.29	
7/19/07 18:32:45	80.36	4.86	4.52	4.68	10.39	
7/19/07 18:33:00	79.86	4.81	4.34	4.60	10.44	
7/19/07 18:33:15	79.86	-1.49	4.52	4.58	10.47	
7/19/07 18:33:30	80.11	3.78	4.41	4.58	10.47	
7/19/07 18:33:45	80.36	4.61	4.38	4.62	10.43	
7/19/07 18:34:00	80.36	4.13	4.43	4.72	10.35	
7/19/07 18:34:15	80.36	0.26	4.48	4.82	10.29	
7/19/07 18:34:30	80.36	-2.29	4.43	4.86	10.24	
7/19/07 18:34:45	80.36	4.76	4.52	4.86	10.24	
7/19/07 18:35:00	80.36	3.61	4.57	4.85	10.26	
7/19/07 18:35:15	80.36	1.71	4.50	4.84	10.28	
7/19/07 18:35:30	80.36	-1.84	4.39	4.82	10.29	
7/19/07 18:35:45	80.36	4.86	4.43	4.81	10.28	
7/19/07 18:36:00	80.36	4.23	4.43	4.81	10.29	
7/19/07 18:36:15	80.74	4.01	4.36	4.79	10.33	
7/19/07 18:36:30	80.36	-0.04	4.31	4.72	10.37	
7/19/07 18:36:45	80.36	2.06	4.48	4.63	10.42	
7/19/07 18:37:00	80.36	5.36	4.52	4.58	10.47	
7/19/07 18:37:15	80.36	5.36	4.57	4.56	10.47	
7/19/07 18:37:30	80.36	3.63	4.68	4.57	10.45	
7/19/07 18:37:45	80.36	1.91	4.75	4.56	10.46	
7/19/07 18:38:00	80.36	6.03	4.75	4.61	10.45	
7/19/07 18:38:15	80.73	5.21	4.68	4.71	10.38	
7/19/07 18:38:30	80.86	5.68	4.75	4.77	10.33	
7/19/07 18:38:45	80.86	-1.99	4.50	4.79	10.35	
7/19/07 18:39:00	80.86	4.68	4.45	4.80	10.35	
7/19/07 18:39:15	80.86	6.81	4.50	4.80	10.35	
7/19/07 18:39:30	80.36	6.71	4.48	4.80	10.38	
7/19/07 18:39:45	80.36	1.01	4.41	4.80	10.38	
7/19/07 18:40:00	79.86	5.51	4.29	4.78	10.38	
7/19/07 18:40:15	79.86	7.01	4.34	4.75	10.39	
7/19/07 18:40:30	80.11	6.23	4.27	4.71	10.45	
7/19/07 18:40:45	79.98	3.51	4.34	4.61	10.50	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 18:41:00	80.11	-1.34	4.36	4.53	10.56	
7/19/07 18:41:15	80.36	8.11	4.31	4.50	10.57	
7/19/07 18:41:30	80.36	7.73	4.37	4.50	10.57	
7/19/07 18:41:45	80.36	6.21	4.29	4.52	10.56	
7/19/07 18:42:00	79.86	-0.36	4.24	4.58	10.50	
7/19/07 18:42:15	80.23	7.16	4.36	4.69	10.41	
7/19/07 18:42:30	80.36	7.58	4.36	4.76	10.39	
7/19/07 18:42:45	80.36	6.86	4.38	4.77	10.38	
7/19/07 18:43:00	80.36	4.28	4.27	4.77	10.38	
7/19/07 18:43:15	80.36	3.91	4.29	4.76	10.37	
7/19/07 18:43:30	80.36	8.98	4.24	4.76	10.38	
7/19/07 18:43:45	80.36	8.26	4.24	4.75	10.40	
7/19/07 18:44:00	80.36	6.63	4.29	4.75	10.39	
7/19/07 18:44:15	80.36	0.61	4.15	4.76	10.39	
7/19/07 18:44:30	80.61	6.92	4.04	4.74	10.42	
7/19/07 18:44:45	80.86	9.31	4.20	4.69	10.48	
7/19/07 18:45:00	80.36	8.81	4.29	4.61	10.52	
7/19/07 18:45:15	79.98	2.31	4.13	4.56	10.57	
7/19/07 18:45:30	80.36	7.19	4.20	4.52	10.58	
7/19/07 18:45:45	80.36	9.26	4.22	4.51	10.60	
7/19/07 18:46:00	80.36	8.73	4.17	4.52	10.57	
7/19/07 18:46:15	80.36	4.66	4.10	4.58	10.52	
7/19/07 18:46:30	80.86	1.34	4.24	4.71	10.45	
7/19/07 18:46:45	80.86	9.15	4.10	4.78	10.38	
7/19/07 18:47:00	80.86	8.31	4.13	4.81	10.37	
7/19/07 18:47:15	80.86	8.11	4.17	4.81	10.38	
7/19/07 18:47:30	80.86	0.76	4.17	4.82	10.37	
7/19/07 18:47:45	80.86	4.21	4.04	4.83	10.38	
7/19/07 18:48:00	80.86	9.48	4.22	4.83	10.37	
7/19/07 18:48:15	80.86	8.41	4.29	4.82	10.36	
7/19/07 18:48:30	80.86	3.43	4.22	4.79	10.40	
7/19/07 18:48:45	80.86	3.16	4.20	4.69	10.43	
7/19/07 18:49:00	80.86	7.68	4.15	4.60	10.48	
7/19/07 18:49:15	81.24	6.56	4.17	4.56	10.49	
7/19/07 18:49:30	81.36	3.18	4.27	4.56	10.51	
7/19/07 18:49:45	81.74	-2.29	4.59	4.57	10.50	
7/19/07 18:50:00	81.86	4.21	4.50	4.62	10.43	
7/19/07 18:50:15	81.86	5.81	4.43	4.75	10.32	
7/19/07 18:50:30	82.11	4.98	4.47	4.88	10.24	
7/19/07 18:50:45	81.99	-0.34	4.52	4.93	10.19	
7/19/07 18:51:00	81.86	4.51	4.31	4.95	10.15	
7/19/07 18:51:15	81.99	5.86	4.61	4.95	10.16	
7/19/07 18:51:30	82.36	5.28	4.85	4.94	10.17	
7/19/07 18:51:45	82.36	2.61	4.57	4.91	10.21	
7/19/07 18:52:00	82.36	0.91	4.45	4.82	10.29	
7/19/07 18:52:15	82.36	6.86	4.29	4.70	10.35	
7/19/07 18:52:30	82.36	5.73	4.50	4.63	10.42	
7/19/07 18:52:45	82.49	4.56	4.34	4.61	10.44	
7/19/07 18:53:00	82.86	1.01	4.20	4.62	10.42	
7/19/07 18:53:15	82.49	5.81	4.38	4.62	10.44	
7/19/07 18:53:30	82.36	6.18	4.45	4.65	10.44	
7/19/07 18:53:45	82.36	5.96	4.36	4.79	10.33	
7/19/07 18:54:00	82.36	1.34	4.32	4.89	10.24	
7/19/07 18:54:15	82.36	2.66	4.43	4.93	10.22	
7/19/07 18:54:30	82.36	6.81	4.51	4.94	10.22	
7/19/07 18:54:45	82.36	6.18	4.38	4.93	10.25	
7/19/07 18:55:00	82.36	4.08	4.43	4.91	10.28	
7/19/07 18:55:15	82.36	-0.94	4.38	4.90	10.32	
7/19/07 18:55:30	82.36	5.48	4.34	4.90	10.33	
7/19/07 18:55:45	81.99	7.56	4.22	4.90	10.33	
7/19/07 18:56:00	81.86	6.46	4.29	4.83	10.40	
7/19/07 18:56:15	81.49	1.81	4.38	4.71	10.47	
7/19/07 18:56:30	81.36	0.74	4.34	4.63	10.51	
7/19/07 18:56:45	81.36	7.11	4.36	4.57	10.55	End Run 2
7/19/07 18:57:00	81.36	6.06	4.52	4.55	10.57	
7/19/07 18:57:15	81.36	3.56	4.50	4.56	10.54	
7/19/07 18:57:30	81.61	0.84	4.24	4.65	10.48	
7/19/07 18:57:45	81.86	7.46	4.34	4.78	10.37	
7/19/07 18:58:00	81.86	6.71	4.50	4.86	10.31	
7/19/07 18:58:15	77.49	2.76	4.68	4.60	7.71	
7/19/07 18:58:30	53.35	-1.56	5.10	2.84	3.12	
7/19/07 18:58:45	26.34	-0.99	7.66	0.97	0.58	
7/19/07 18:59:00	7.32	-0.71	10.69	0.37	0.00	
7/19/07 18:59:15	6.44	-1.44	13.37	0.28	-0.09	
7/19/07 18:59:30	4.32	-2.14	18.34	0.26	-0.12	
7/19/07 18:59:45	2.83	-1.04	23.70	0.26	-0.14	
7/19/07 19:00:00	1.58	-0.69	27.78	0.25	-0.15	
7/19/07 19:00:15	1.33	-1.39	30.30	0.25	-0.16	
7/19/07 19:00:30	1.32	-2.06	31.85	0.25	-0.16	
7/19/07 19:00:45	1.20	-2.29	33.21	0.25	-0.17	
7/19/07 19:01:00	0.82	-1.01	34.30	0.25	-0.17	
7/19/07 19:01:15	0.82	-1.24	35.31	0.25	-0.17	
7/19/07 19:01:30	0.82	-1.79	36.47	0.25	-0.17	
7/19/07 19:01:45	0.82	-2.29	37.57	0.25	-0.18	
7/19/07 19:02:00	0.82	-0.76	38.64	0.25	-0.18	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 19:02:15	0.82	-1.04	39.36	0.24	-0.17	
7/19/07 19:02:30	0.83	-1.59	39.82	0.24	-0.16	
7/19/07 19:02:45	0.82	-2.29	40.16	0.24	-0.18	
7/19/07 19:03:00	0.82	-1.76	40.64	0.24	-0.18	
7/19/07 19:03:15	0.82	-0.79	41.11	0.24	-0.18	
7/19/07 19:03:30	0.82	-1.29	41.59	0.24	-0.18	
7/19/07 19:03:45	0.82	-1.84	41.84	0.24	-0.18	
7/19/07 19:04:00	0.82	-1.91	41.93	0.24	-0.19	
7/19/07 19:04:15	0.82	-0.84	42.22	0.24	-0.18	
7/19/07 19:04:30	0.82	-1.31	42.43	0.24	-0.19	
7/19/07 19:04:45	0.82	-1.09	42.66	0.23	-0.19	
7/19/07 19:05:00	0.82	-1.86	42.97	0.24	-0.18	
7/19/07 19:05:15	0.82	-1.24	43.22	0.24	-0.19	System Bias SO ₂ Bias 3 Mid = 43.17
7/19/07 19:05:30	0.82	-0.94	43.24	0.23	-0.19	
7/19/07 19:05:45	0.82	-1.34	43.06	0.23	-0.19	
7/19/07 19:06:00	0.82	-2.09	43.17	0.23	-0.19	
7/19/07 19:06:15	0.82	-2.29	43.38	0.23	-0.19	
7/19/07 19:06:30	0.82	-1.04	43.61	0.23	-0.19	
7/19/07 19:06:45	0.82	-1.34	43.72	0.23	-0.19	
7/19/07 19:07:00	0.82	-1.66	43.94	0.23	-0.19	
7/19/07 19:07:15	0.82	-2.29	43.91	0.23	-0.19	
7/19/07 19:07:30	0.82	-1.89	43.98	0.23	-0.19	
7/19/07 19:07:45	0.82	-0.99	44.26	0.23	-0.19	
7/19/07 19:08:00	0.82	-1.39	44.37	0.24	-0.19	
7/19/07 19:08:15	1.33	-1.79	46.50	0.38	0.29	
7/19/07 19:08:30	5.57	-1.66	49.06	0.53	0.43	
7/19/07 19:08:45	10.07	-0.44	43.33	0.32	-0.02	
7/19/07 19:09:00	35.34	-1.39	36.74	0.26	-0.16	
7/19/07 19:09:15	97.75	-1.19	25.91	0.25	-0.18	
7/19/07 19:09:30	130.37	-1.94	16.32	0.25	-0.18	
7/19/07 19:09:45	163.64	-1.24	10.27	0.24	-0.19	
7/19/07 19:10:00	189.41	-1.09	8.80	0.24	-0.19	
7/19/07 19:10:15	193.03	-1.54	4.52	0.24	-0.19	
7/19/07 19:10:30	191.66	-2.19	3.22	0.24	-0.19	
7/19/07 19:10:45	188.91	-2.29	2.35	0.24	-0.19	
7/19/07 19:11:00	202.16	-1.16	1.61	0.24	-0.19	
7/19/07 19:11:15	202.91	-1.39	1.17	0.24	-0.19	
7/19/07 19:11:30	198.91	-1.66	0.84	0.24	-0.19	
7/19/07 19:11:45	198.78	-2.29	0.57	0.24	-0.19	
7/19/07 19:12:00	199.16	-0.69	0.36	0.24	-0.19	
7/19/07 19:12:15	201.16	-1.09	-0.09	0.24	-0.19	
7/19/07 19:12:30	204.16	-1.06	-0.23	0.24	-0.19	
7/19/07 19:12:45	202.03	-0.94	-0.42	0.24	-0.19	
7/19/07 19:13:00	200.16	-1.71	-0.54	0.24	-0.19	
7/19/07 19:13:15	199.78	-0.54	-0.61	0.24	-0.19	
7/19/07 19:13:30	199.91	-1.51	-0.79	0.24	-0.19	System Bias NO _x Bias 3 Mid = 199.81
7/19/07 19:13:45	199.78	-2.04	-0.95	0.24	-0.19	
7/19/07 19:14:00	199.66	-2.29	-1.11	0.24	-0.19	
7/19/07 19:14:15	199.91	-1.24	-1.25	0.24	-0.19	
7/19/07 19:14:30	199.91	-1.31	-1.23	0.24	-0.19	
7/19/07 19:14:45	199.52	-1.59	-1.25	0.28	-0.06	
7/19/07 19:15:00	186.65	-2.09	-0.95	0.32	-0.03	
7/19/07 19:15:15	143.46	4.81	1.17	0.26	-0.15	
7/19/07 19:15:30	64.36	24.84	3.73	0.24	-0.18	
7/19/07 19:15:45	30.02	37.83	3.43	0.23	-0.19	
7/19/07 19:16:00	23.59	41.03	2.05	0.24	-0.19	
7/19/07 19:16:15	8.46	30.79	0.99	0.24	-0.19	
7/19/07 19:16:30	5.08	39.23	0.20	0.24	-0.19	
7/19/07 19:16:45	3.20	44.43	-0.14	0.24	-0.19	System Bias CO Bias 3 Mid = 43.64
7/19/07 19:17:00	2.58	44.05	-0.46	0.24	-0.19	
7/19/07 19:17:15	2.20	42.48	-0.74	0.24	-0.19	
7/19/07 19:17:30	1.83	43.59	-1.02	0.24	-0.19	
7/19/07 19:17:45	1.83	45.73	-1.07	0.24	-0.19	
7/19/07 19:18:00	1.58	44.40	-1.07	0.24	-0.19	
7/19/07 19:18:15	1.32	41.13	-1.16	0.23	-0.19	
7/19/07 19:18:30	1.33	36.62	-1.25	0.29	0.08	
7/19/07 19:18:45	9.20	28.09	-0.67	0.96	1.48	
7/19/07 19:19:00	18.08	14.79	0.50	1.46	0.85	
7/19/07 19:19:15	30.72	3.01	0.73	3.56	0.03	
7/19/07 19:19:30	15.58	-1.69	0.32	4.78	-0.15	
7/19/07 19:19:45	5.20	-2.29	-0.09	5.03	-0.18	System Bias O ₂ Bias 3 Mid = 5.06
7/19/07 19:20:00	1.83	0.00	-0.33	5.06	-0.18	
7/19/07 19:20:15	1.33	-0.99	-0.63	5.07	-0.19	
7/19/07 19:20:30	1.07	-1.46	-1.00	5.08	-0.19	
7/19/07 19:20:45	0.82	-2.29	-1.20	5.10	-0.19	
7/19/07 19:21:00	0.82	-1.01	-1.25	5.12	-0.19	
7/19/07 19:21:15	0.82	-0.59	-1.37	5.14	-0.19	
7/19/07 19:21:30	0.82	-0.96	-1.37	5.16	-0.19	
7/19/07 19:21:45	1.20	-1.44	-1.48	5.15	0.35	
7/19/07 19:22:00	3.57	-2.04	-1.34	4.92	2.12	
7/19/07 19:22:15	12.07	-1.79	-1.00	2.89	5.79	
7/19/07 19:22:30	5.83	-2.29	-1.00	0.97	8.47	
7/19/07 19:22:45	1.95	-2.29	-1.07	0.36	9.52	
7/19/07 19:23:00	0.82	-2.29	-0.97	0.26	9.78	System Bias CO ₂ Bias 3 Mid = 9.85
7/19/07 19:23:15	0.83	-2.19	-1.04	0.24	9.85	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 19:23:30	0.82	-2.29	-1.23	0.23	9.87	
7/19/07 19:23:45	0.32	-2.29	-1.57	0.23	9.89	
7/19/07 19:24:00	0.33	-2.29	-1.52	0.23	9.91	
7/19/07 19:24:15	0.32	-2.19	-1.52	0.22	9.92	
7/19/07 19:24:30	0.32	-1.66	-1.59	0.22	9.92	
7/19/07 19:24:45	0.32	0.41	-1.62	0.22	9.94	
7/19/07 19:25:00	2.82	3.48	-1.62	0.59	10.01	
7/19/07 19:25:15	14.95	-1.39	-1.32	2.68	10.35	
7/19/07 19:25:30	53.35	6.01	0.02	4.18	10.51	
7/19/07 19:25:45	76.68	3.11	1.70	4.62	10.49	
7/19/07 19:26:00	82.86	-0.94	3.20	4.72	10.36	
7/19/07 19:26:15	76.74	-2.29	3.87	2.97	7.98	
7/19/07 19:26:30	39.35	-1.86	3.20	1.04	3.39	
7/19/07 19:26:45	11.95	-1.04	2.02	0.40	0.65	
7/19/07 19:27:00	2.83	-1.84	0.87	0.27	0.04	
7/19/07 19:27:15	0.82	-1.99	0.13	0.25	-0.06	
7/19/07 19:27:30	0.83	-2.29	-0.14	0.24	-0.11	System Bias
7/19/07 19:27:45	0.32	-1.49	-0.40	0.24	-0.12	NO _x Bias 3 Zero = 0.32
7/19/07 19:28:00	0.32	-1.31	-0.74	0.24	-0.14	SO ₂ Bias 3 Zero = -0.77
7/19/07 19:28:15	0.32	-2.04	-0.93	0.24	-0.14	CO Bias 3 Zero = -1.78
7/19/07 19:28:30	0.33	-2.29	-1.02	0.24	-0.15	O ₂ Bias 3 Zero = 0.24
7/19/07 19:28:45	0.32	-1.19	-0.97	0.24	-0.16	CO ₂ Bias 3 Zero = -0.14
7/19/07 19:29:00	0.32	-0.99	-1.04	0.24	-0.16	
7/19/07 19:29:15	0.32	-1.74	-1.18	0.24	-0.17	
7/19/07 19:29:30	0.32	-1.24	-1.34	0.24	-0.13	
7/19/07 19:29:45	4.20	-2.29	-1.45	1.06	2.36	
7/19/07 19:30:00	18.58	2.39	-1.48	3.10	6.50	
7/19/07 19:30:15	61.11	1.51	-0.49	4.46	9.01	
7/19/07 19:30:30	76.11	0.76	1.31	4.95	9.87	
7/19/07 19:30:45	84.12	-0.99	2.69	5.04	10.05	
7/19/07 19:31:00	84.87	-1.14	3.57	5.05	10.10	
7/19/07 19:31:15	84.87	1.76	4.24	5.05	10.18	
7/19/07 19:31:30	84.87	1.34	4.70	5.04	10.23	
7/19/07 19:31:45	85.37	0.21	4.94	5.04	10.28	Begin Run 3
7/19/07 19:32:00	85.37	-1.99	5.30	5.02	10.35	
7/19/07 19:32:15	85.37	0.41	5.37	4.98	10.42	
7/19/07 19:32:30	85.37	0.84	5.44	4.90	10.49	
7/19/07 19:32:45	85.37	0.56	5.56	4.84	10.56	
7/19/07 19:33:00	85.37	-2.29	5.61	4.80	10.59	
7/19/07 19:33:15	85.37	0.16	5.91	4.78	10.60	
7/19/07 19:33:30	85.37	1.19	6.02	4.77	10.61	
7/19/07 19:33:45	85.37	1.01	6.02	4.79	10.59	
7/19/07 19:34:00	85.37	-0.04	6.09	4.87	10.53	
7/19/07 19:34:15	84.87	-2.29	6.13	4.90	10.51	
7/19/07 19:34:30	84.62	1.84	6.04	4.91	10.50	
7/19/07 19:34:45	84.37	0.66	5.95	4.90	10.48	
7/19/07 19:35:00	84.37	-0.91	6.00	4.90	10.46	
7/19/07 19:35:15	83.87	-2.24	6.02	4.88	10.44	
7/19/07 19:35:30	83.87	-1.41	5.88	4.87	10.41	
7/19/07 19:35:45	83.36	0.76	5.84	4.85	10.41	
7/19/07 19:36:00	83.36	0.04	6.04	4.81	10.44	
7/19/07 19:36:15	83.24	-1.24	5.93	4.72	10.53	
7/19/07 19:36:30	82.86	-1.19	5.95	4.61	10.59	
7/19/07 19:36:45	82.86	1.56	6.00	4.53	10.67	
7/19/07 19:37:00	82.86	0.31	6.00	4.51	10.69	
7/19/07 19:37:15	82.86	-0.54	5.97	4.54	10.66	
7/19/07 19:37:30	82.86	-2.29	5.93	4.64	10.57	
7/19/07 19:37:45	82.99	-0.19	5.84	4.75	10.50	
7/19/07 19:38:00	83.11	0.61	5.95	4.80	10.42	
7/19/07 19:38:15	82.86	0.41	6.02	4.80	10.39	
7/19/07 19:38:30	82.86	-0.79	5.97	4.79	10.39	
7/19/07 19:38:45	82.86	-2.04	5.95	4.80	10.36	
7/19/07 19:39:00	82.86	3.11	5.86	4.76	10.39	
7/19/07 19:39:15	82.86	2.96	5.86	4.64	10.51	
7/19/07 19:39:30	82.86	2.24	5.88	4.55	10.56	
7/19/07 19:39:45	82.36	-1.49	5.91	4.49	10.62	
7/19/07 19:40:00	82.36	6.43	5.95	4.48	10.64	
7/19/07 19:40:15	82.36	5.46	6.06	4.47	10.66	
7/19/07 19:40:30	82.36	5.36	5.81	4.46	10.67	
7/19/07 19:40:45	82.49	2.91	5.79	4.53	10.63	
7/19/07 19:41:00	82.86	0.29	5.79	4.64	10.54	
7/19/07 19:41:15	83.24	7.61	5.58	4.70	10.52	
7/19/07 19:41:30	82.86	8.08	5.63	4.71	10.47	
7/19/07 19:41:45	82.86	7.91	5.37	4.71	10.46	
7/19/07 19:42:00	82.86	-2.04	5.51	4.72	10.46	
7/19/07 19:42:15	82.36	3.71	5.42	4.72	10.42	
7/19/07 19:42:30	82.74	8.51	5.30	4.73	10.38	
7/19/07 19:42:45	82.86	8.36	5.47	4.74	10.36	
7/19/07 19:43:00	82.86	3.33	5.37	4.74	10.36	
7/19/07 19:43:15	82.86	5.21	5.26	4.71	10.40	
7/19/07 19:43:30	83.24	11.73	5.30	4.65	10.45	
7/19/07 19:43:45	83.24	10.85	5.19	4.59	10.49	
7/19/07 19:44:00	82.86	7.51	5.12	4.57	10.51	
7/19/07 19:44:15	82.99	0.96	5.33	4.57	10.53	
7/19/07 19:44:30	83.36	11.65	5.40	4.57	10.55	

Marathon Refining - Texas City, Texas
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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 19:44:45	83.49	10.71	5.37	4.60	10.50	
7/19/07 19:45:00	83.87	10.01	5.37	4.70	10.42	
7/19/07 19:45:15	83.87	3.26	5.37	4.80	10.36	
7/19/07 19:45:30	83.87	9.53	5.35	4.83	10.33	
7/19/07 19:45:45	83.87	11.35	5.24	4.84	10.33	
7/19/07 19:46:00	83.87	11.08	5.10	4.83	10.35	
7/19/07 19:46:15	84.24	8.26	4.94	4.83	10.35	
7/19/07 19:46:30	83.87	1.54	4.87	4.82	10.37	
7/19/07 19:46:45	83.87	13.00	4.94	4.82	10.36	
7/19/07 19:47:00	83.87	12.78	4.94	4.81	10.38	
7/19/07 19:47:15	83.87	13.70	4.94	4.79	10.38	
7/19/07 19:47:30	83.87	4.46	4.89	4.75	10.42	
7/19/07 19:47:45	83.87	6.51	4.84	4.66	10.49	
7/19/07 19:48:00	83.87	14.33	4.84	4.58	10.54	
7/19/07 19:48:15	83.87	14.10	4.80	4.54	10.58	
7/19/07 19:48:30	83.49	8.08	4.82	4.53	10.63	
7/19/07 19:48:45	83.87	-0.14	4.84	4.53	10.63	
7/19/07 19:49:00	83.87	12.53	4.75	4.60	10.57	
7/19/07 19:49:15	84.37	12.75	4.82	4.74	10.46	
7/19/07 19:49:30	84.37	11.63	4.80	4.82	10.41	
7/19/07 19:49:45	83.87	2.91	4.75	4.84	10.41	
7/19/07 19:50:00	83.87	13.80	4.75	4.83	10.42	
7/19/07 19:50:15	83.49	12.70	4.75	4.83	10.41	
7/19/07 19:50:30	83.87	12.13	4.73	4.82	10.41	
7/19/07 19:50:45	83.87	9.01	4.75	4.80	10.41	
7/19/07 19:51:00	83.87	1.79	4.71	4.79	10.42	
7/19/07 19:51:15	83.37	13.70	4.66	4.78	10.41	
7/19/07 19:51:30	83.74	13.60	4.66	4.74	10.42	
7/19/07 19:51:45	83.37	11.35	4.71	4.67	10.48	
7/19/07 19:52:00	83.38	1.66	4.81	4.60	10.53	
7/19/07 19:52:15	83.49	13.00	4.84	4.53	10.56	
7/19/07 19:52:30	83.87	12.43	4.68	4.49	10.57	
7/19/07 19:52:45	83.87	11.34	4.68	4.48	10.58	
7/19/07 19:53:00	83.87	3.86	4.73	4.47	10.55	
7/19/07 19:53:15	83.87	12.83	4.71	4.51	10.52	
7/19/07 19:53:30	84.24	12.54	4.71	4.63	10.43	
7/19/07 19:53:45	84.37	11.17	4.71	4.74	10.34	
7/19/07 19:54:00	84.37	2.70	4.61	4.79	10.30	
7/19/07 19:54:15	83.87	14.52	4.45	4.81	10.30	
7/19/07 19:54:30	83.87	13.18	4.54	4.81	10.30	
7/19/07 19:54:45	83.87	13.48	4.50	4.80	10.30	
7/19/07 19:55:00	84.24	11.23	4.41	4.77	10.34	
7/19/07 19:55:15	84.37	7.38	4.52	4.75	10.33	
7/19/07 19:55:30	84.37	16.85	4.59	4.74	10.35	
7/19/07 19:55:45	84.37	16.83	4.54	4.72	10.38	
7/19/07 19:56:00	84.37	16.00	4.47	4.67	10.42	
7/19/07 19:56:15	84.37	8.58	4.66	4.60	10.45	
7/19/07 19:56:30	84.37	9.38	4.73	4.53	10.51	
7/19/07 19:56:45	84.37	17.48	4.66	4.51	10.52	
7/19/07 19:57:00	84.37	16.85	4.61	4.50	10.52	
7/19/07 19:57:15	84.24	13.65	4.64	4.50	10.52	
7/19/07 19:57:30	83.87	2.41	4.43	4.51	10.51	
7/19/07 19:57:45	83.87	15.60	4.54	4.60	10.44	
7/19/07 19:58:00	83.87	14.15	4.48	4.72	10.36	
7/19/07 19:58:15	84.37	14.68	4.50	4.78	10.29	
7/19/07 19:58:30	84.37	5.73	4.66	4.80	10.28	
7/19/07 19:58:45	84.37	12.10	4.66	4.80	10.28	
7/19/07 19:59:00	84.37	15.50	4.45	4.81	10.27	
7/19/07 19:59:15	84.37	13.55	4.43	4.81	10.26	
7/19/07 19:59:30	84.37	8.13	4.52	4.82	10.25	
7/19/07 19:59:45	84.49	10.23	4.43	4.78	10.29	
7/19/07 20:00:00	84.87	18.03	4.52	4.68	10.35	
7/19/07 20:00:15	84.87	13.55	4.59	4.59	10.39	
7/19/07 20:00:30	84.87	10.58	4.50	4.53	10.42	
7/19/07 20:00:45	84.87	-0.14	4.48	4.51	10.44	
7/19/07 20:01:00	84.87	13.93	4.36	4.49	10.47	
7/19/07 20:01:15	85.37	12.20	4.39	4.51	10.46	
7/19/07 20:01:30	85.37	10.73	4.45	4.61	10.41	
7/19/07 20:01:45	85.37	7.06	4.27	4.72	10.29	
7/19/07 20:02:00	85.37	0.99	4.20	4.77	10.24	
7/19/07 20:02:15	85.87	10.73	4.08	4.80	10.21	
7/19/07 20:02:30	85.87	10.13	4.02	4.83	10.19	
7/19/07 20:02:45	85.87	6.83	4.08	4.86	10.20	
7/19/07 20:03:00	85.87	0.54	4.20	4.86	10.20	
7/19/07 20:03:15	85.87	8.56	4.01	4.86	10.22	
7/19/07 20:03:30	85.87	7.46	4.02	4.85	10.23	
7/19/07 20:03:45	86.00	7.31	4.02	4.85	10.27	
7/19/07 20:04:00	86.00	-0.64	4.11	4.82	10.28	
7/19/07 20:04:15	86.00	5.06	4.04	4.76	10.32	
7/19/07 20:04:30	86.38	6.23	4.06	4.72	10.34	
7/19/07 20:04:45	86.37	5.26	4.27	4.72	10.35	
7/19/07 20:05:00	86.38	1.84	4.34	4.73	10.34	
7/19/07 20:05:15	86.37	0.79	4.11	4.76	10.32	
7/19/07 20:05:30	86.75	4.43	3.85	4.84	10.27	
7/19/07 20:05:45	86.37	3.39	3.53	4.96	10.23	

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ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 20:06:00	86.37	2.51	3.09	5.01	10.19	
7/19/07 20:06:15	86.38	-2.29	2.74	5.03	10.16	
7/19/07 20:06:30	86.37	4.38	2.61	5.04	10.15	
7/19/07 20:06:45	86.38	2.74	2.49	5.05	10.16	
7/19/07 20:07:00	86.37	2.94	2.35	5.05	10.18	
7/19/07 20:07:15	86.38	-1.19	2.10	4.99	10.26	
7/19/07 20:07:30	86.38	-0.89	1.93	4.87	10.34	
7/19/07 20:07:45	86.38	2.71	1.77	4.77	10.41	
7/19/07 20:08:00	86.38	2.34	1.54	4.71	10.46	
7/19/07 20:08:15	85.88	-1.19	1.48	4.69	10.51	
7/19/07 20:08:30	85.88	-0.74	1.34	4.67	10.49	
7/19/07 20:08:45	85.87	3.09	1.41	4.67	10.49	
7/19/07 20:09:00	85.87	2.26	1.43	4.72	10.45	
7/19/07 20:09:15	86.12	1.96	1.29	4.80	10.41	
7/19/07 20:09:30	85.87	-2.29	1.23	4.84	10.39	
7/19/07 20:09:45	85.62	2.14	1.13	4.86	10.37	
7/19/07 20:10:00	85.37	2.19	1.15	4.87	10.34	
7/19/07 20:10:15	85.37	1.66	1.22	4.87	10.33	
7/19/07 20:10:30	85.37	-1.91	1.20	4.87	10.32	
7/19/07 20:10:45	85.37	2.06	1.29	4.86	10.33	
7/19/07 20:11:00	85.37	2.59	1.17	4.87	10.33	
7/19/07 20:11:15	85.37	1.61	1.31	4.85	10.32	
7/19/07 20:11:30	85.37	0.49	1.24	4.77	10.38	
7/19/07 20:11:45	85.37	-2.29	1.29	4.70	10.43	
7/19/07 20:12:00	85.37	2.51	1.20	4.68	10.44	
7/19/07 20:12:15	85.37	1.61	1.38	4.89	10.45	
7/19/07 20:12:30	85.37	0.49	1.52	4.70	10.45	
7/19/07 20:12:45	85.37	-2.06	1.50	4.74	10.42	
7/19/07 20:13:00	85.37	1.01	1.41	4.82	10.34	
7/19/07 20:13:15	85.37	1.01	1.41	4.89	10.30	
7/19/07 20:13:30	85.37	1.24	1.41	4.92	10.29	
7/19/07 20:13:45	85.37	-1.09	1.52	4.93	10.29	
7/19/07 20:14:00	85.37	-1.24	1.48	4.92	10.32	
7/19/07 20:14:15	85.37	1.24	1.50	4.93	10.27	
7/19/07 20:14:30	85.37	-0.04	1.61	4.93	10.27	
7/19/07 20:14:45	85.87	-1.01	1.63	4.95	10.26	
7/19/07 20:15:00	85.87	-2.29	1.68	4.95	10.28	
7/19/07 20:15:15	85.62	0.26	7.92	4.90	10.28	
7/19/07 20:15:30	85.37	0.46	10.40	4.81	10.35	
7/19/07 20:15:45	85.37	1.06	2.65	4.75	10.42	
7/19/07 20:16:00	85.37	-2.29	1.80	4.71	10.41	
7/19/07 20:16:15	85.37	0.49	1.80	4.71	10.42	
7/19/07 20:16:30	85.37	0.36	1.87	4.72	10.42	
7/19/07 20:16:45	85.62	-0.01	1.87	4.76	10.38	
7/19/07 20:17:00	85.50	-1.16	1.87	4.86	10.31	
7/19/07 20:17:15	85.37	-2.29	1.87	4.94	10.28	
7/19/07 20:17:30	85.37	1.24	1.91	4.98	10.27	
7/19/07 20:17:45	85.37	-0.04	1.80	5.00	10.27	
7/19/07 20:18:00	85.37	-0.04	1.75	5.00	10.24	
7/19/07 20:18:15	85.37	-2.06	1.91	5.00	10.23	
7/19/07 20:18:30	85.37	-1.39	1.80	4.99	10.28	
7/19/07 20:18:45	85.37	0.64	1.66	4.93	10.33	
7/19/07 20:19:00	85.37	0.09	1.89	4.81	10.41	
7/19/07 20:19:15	85.37	-1.64	1.93	4.71	10.46	
7/19/07 20:19:30	85.00	-1.24	1.93	4.66	10.50	
7/19/07 20:19:45	85.37	1.16	1.98	4.65	10.52	
7/19/07 20:20:00	85.37	0.09	1.89	4.66	10.52	
7/19/07 20:20:15	85.12	-0.89	1.80	4.69	10.48	
7/19/07 20:20:30	84.87	-2.29	1.91	4.78	10.42	
7/19/07 20:20:45	84.87	0.41	1.98	4.89	10.36	
7/19/07 20:21:00	84.87	0.51	2.05	4.95	10.30	
7/19/07 20:21:15	84.87	-0.01	2.07	4.96	10.31	
7/19/07 20:21:30	84.87	-2.29	2.00	4.95	10.30	
7/19/07 20:21:45	84.62	0.94	2.00	4.95	10.31	
7/19/07 20:22:00	84.37	0.66	1.89	4.96	10.31	
7/19/07 20:22:15	84.37	0.51	1.82	4.91	10.39	
7/19/07 20:22:30	83.99	-1.24	1.86	4.78	10.47	
7/19/07 20:22:45	83.87	-2.29	2.05	4.68	10.53	
7/19/07 20:23:00	84.24	1.09	1.86	4.64	10.58	
7/19/07 20:23:15	84.37	-0.11	1.98	4.62	10.60	
7/19/07 20:23:30	84.37	-1.01	2.00	4.62	10.60	
7/19/07 20:23:45	84.37	-2.29	2.05	4.64	10.58	
7/19/07 20:24:00	84.37	0.94	2.07	4.75	10.51	
7/19/07 20:24:15	84.62	-0.04	2.05	4.88	10.42	
7/19/07 20:24:30	84.37	-0.16	1.89	4.94	10.38	
7/19/07 20:24:45	84.37	-1.81	1.91	4.96	10.36	
7/19/07 20:25:00	84.37	-1.54	2.07	4.98	10.35	
7/19/07 20:25:15	84.37	0.34	2.03	4.99	10.33	
7/19/07 20:25:30	84.37	-0.44	1.98	4.93	10.38	
7/19/07 20:25:45	83.87	-1.71	1.98	4.80	10.45	
7/19/07 20:26:00	84.24	-1.44	2.10	4.70	10.53	
7/19/07 20:26:15	84.37	0.29	2.26	4.65	10.57	
7/19/07 20:26:30	84.37	-1.01	2.28	4.64	10.56	
7/19/07 20:26:45	84.37	-1.16	2.17	4.65	10.54	
7/19/07 20:27:00	83.99	-2.29	2.14	4.67	10.52	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 20:27:15	83.87	0.04	2.21	4.77	10.45	
7/19/07 20:27:30	84.24	-0.06	2.14	4.88	10.39	
7/19/07 20:27:45	84.37	-0.01	2.07	4.94	10.39	
7/19/07 20:28:00	84.37	-1.97	2.10	4.94	10.39	
7/19/07 20:28:15	83.87	-1.91	2.05	4.94	10.41	
7/19/07 20:28:30	83.87	0.71	2.12	4.94	10.39	
7/19/07 20:28:45	83.87	0.36	2.14	4.95	10.40	
7/19/07 20:29:00	83.87	-0.99	2.10	4.96	10.39	
7/19/07 20:29:15	83.87	-2.29	2.17	4.95	10.41	
7/19/07 20:29:30	83.49	1.16	2.17	4.93	10.43	
7/19/07 20:29:45	83.37	0.41	2.12	4.84	10.51	
7/19/07 20:30:00	83.38	0.26	2.19	4.73	10.60	
7/19/07 20:30:15	83.37	-1.79	2.28	4.65	10.64	
7/19/07 20:30:30	82.99	-0.24	2.19	4.61	10.68	
7/19/07 20:30:45	82.86	1.21	2.32	4.59	10.70	
7/19/07 20:31:00	82.86	0.46	2.37	4.57	10.71	
7/19/07 20:31:15	82.86	-1.56	2.28	4.63	10.66	
7/19/07 20:31:30	82.86	0.21	2.21	4.74	10.60	
7/19/07 20:31:45	82.61	1.89	2.28	4.80	10.57	End Run 3
7/19/07 20:32:00	82.36	1.31	2.39	4.82	10.54	
7/19/07 20:32:15	82.11	0.61	2.51	4.81	10.53	
7/19/07 20:32:30	81.66	-2.29	2.54	4.81	10.54	
7/19/07 20:32:45	81.86	4.68	2.46	4.81	10.55	
7/19/07 20:33:00	81.86	12.65	2.46	4.78	10.05	
7/19/07 20:33:15	71.36	17.23	2.39	3.92	5.80	
7/19/07 20:33:30	43.16	4.11	2.00	1.90	1.85	
7/19/07 20:33:45	14.58	1.16	1.40	0.61	0.34	
7/19/07 20:34:00	5.20	-0.24	1.26	0.35	0.09	
7/19/07 20:34:15	4.08	-1.46	3.55	0.30	-0.04	
7/19/07 20:34:30	3.21	-1.99	9.44	0.28	-0.10	
7/19/07 20:34:45	2.08	-2.29	16.34	0.27	-0.12	
7/19/07 20:35:00	1.45	-0.64	22.01	0.27	-0.13	
7/19/07 20:35:15	1.33	-1.54	25.83	0.26	-0.14	
7/19/07 20:35:30	1.20	-2.19	28.36	0.26	-0.15	
7/19/07 20:35:45	0.83	-2.29	30.06	0.26	-0.15	
7/19/07 20:36:00	0.83	-1.44	31.22	0.26	-0.16	
7/19/07 20:36:15	0.83	-1.34	32.51	0.25	-0.16	
7/19/07 20:36:30	0.83	-1.79	34.09	0.25	-0.16	
7/19/07 20:36:45	0.83	-2.14	35.52	0.25	-0.16	
7/19/07 20:37:00	0.83	-1.24	36.55	0.25	-0.17	
7/19/07 20:37:15	0.83	-0.79	37.52	0.25	-0.17	
7/19/07 20:37:30	0.83	-1.89	38.19	0.24	-0.16	
7/19/07 20:37:45	0.83	-0.94	38.63	0.24	-0.17	
7/19/07 20:38:00	0.83	-2.29	39.14	0.24	-0.17	
7/19/07 20:38:15	0.83	-0.79	39.44	0.24	-0.17	
7/19/07 20:38:30	0.83	-1.59	39.77	0.24	-0.17	
7/19/07 20:38:45	0.83	-1.94	39.99	0.24	-0.17	
7/19/07 20:39:00	0.83	-2.29	40.11	0.24	-0.17	
7/19/07 20:39:15	0.83	-2.29	40.42	0.24	-0.17	
7/19/07 20:39:30	0.83	-1.14	40.70	0.24	-0.18	
7/19/07 20:39:45	0.83	-1.69	40.87	0.24	-0.18	
7/19/07 20:40:00	0.83	-2.29	40.78	0.24	-0.17	
7/19/07 20:40:15	0.83	-2.29	40.75	0.24	-0.16	
7/19/07 20:40:30	0.83	-0.69	40.96	0.24	-0.17	
7/19/07 20:40:45	0.83	-1.66	40.89	0.24	-0.17	
7/19/07 20:41:00	0.83	-0.89	41.15	0.24	-0.18	
7/19/07 20:41:15	0.83	-1.74	41.31	0.24	-0.18	System Bias
7/19/07 20:41:30	0.83	-1.29	41.45	0.24	-0.18	SO ₂ Bias 4 Mid = 41.52
7/19/07 20:41:45	0.83	-1.26	41.49	0.24	-0.18	
7/19/07 20:42:00	0.83	-1.99	41.49	0.24	-0.18	
7/19/07 20:42:15	0.83	-2.24	41.65	0.24	-0.17	
7/19/07 20:42:30	0.83	-2.29	41.70	0.24	-0.18	
7/19/07 20:42:45	0.83	-1.31	41.81	0.24	-0.18	
7/19/07 20:43:00	0.70	-1.59	42.23	0.24	-0.12	
7/19/07 20:43:15	1.83	-1.94	46.14	0.45	0.38	
7/19/07 20:43:30	5.70	-2.29	46.04	0.42	0.23	
7/19/07 20:43:45	6.82	-0.94	39.76	0.28	0.12	
7/19/07 20:44:00	54.73	-1.69	32.34	0.26	-0.06	
7/19/07 20:44:15	113.88	-1.61	22.18	0.25	-0.16	
7/19/07 20:44:30	146.51	-2.29	13.91	0.25	-0.17	
7/19/07 20:44:45	183.65	-2.29	8.92	0.25	-0.18	System Bias
7/19/07 20:45:00	197.91	-1.14	6.14	0.24	-0.18	NO _x Bias 4 Mid = 198.19
7/19/07 20:45:15	200.16	-2.06	4.27	0.24	-0.18	
7/19/07 20:45:30	197.28	-1.94	3.39	0.24	-0.18	
7/19/07 20:45:45	197.41	-2.28	2.56	0.24	-0.18	
7/19/07 20:46:00	195.28	-1.14	1.82	0.24	-0.18	
7/19/07 20:46:15	192.91	-1.99	1.26	0.24	-0.18	
7/19/07 20:46:30	192.91	-1.14	0.81	0.25	-0.16	
7/19/07 20:46:45	193.16	-1.96	0.57	0.28	-0.08	
7/19/07 20:47:00	150.01	3.36	2.28	0.26	-0.14	
7/19/07 20:47:15	92.12	17.85	6.25	0.24	-0.17	
7/19/07 20:47:30	40.85	34.84	6.90	0.24	-0.17	
7/19/07 20:47:45	24.09	39.98	4.96	0.24	-0.18	
7/19/07 20:48:00	14.58	30.44	3.36	0.24	-0.16	
7/19/07 20:48:15	6.07	41.98	2.21	0.24	-0.18	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 20:48:30	3.70	43.73	1.38	0.24	-0.18	System Bias
7/19/07 20:48:45	2.58	43.36	0.82	0.24	-0.18	CO Bias 4 Mid = 44.19
7/19/07 20:49:00	2.33	44.39	0.46	0.24	-0.18	
7/19/07 20:49:15	2.08	44.68	0.05	0.24	-0.18	
7/19/07 20:49:30	1.83	44.33	-0.14	0.24	-0.18	
7/19/07 20:49:45	1.58	43.83	-0.39	0.24	-0.18	
7/19/07 20:50:00	1.33	37.39	-0.53	0.24	-0.18	
7/19/07 20:50:15	3.33	28.69	-0.67	0.47	0.67	
7/19/07 20:50:30	9.83	28.74	-0.22	1.14	1.84	
7/19/07 20:50:45	22.59	10.61	0.66	1.98	0.57	
7/19/07 20:51:00	21.21	-0.29	0.82	4.14	-0.04	
7/19/07 20:51:15	12.33	-2.24	0.41	4.92	-0.15	
7/19/07 20:51:30	3.95	-1.14	0.00	5.05	-0.17	System Bias
7/19/07 20:51:45	1.58	-0.89	-0.35	5.07	-0.18	O ₂ Bias 4 Mid = 5.09
7/19/07 20:52:00	1.20	-1.49	-0.46	5.08	-0.18	
7/19/07 20:52:15	0.83	-2.14	-0.72	5.09	-0.18	
7/19/07 20:52:30	0.83	-1.04	-0.93	5.11	-0.18	
7/19/07 20:52:45	0.83	-0.84	-1.04	5.13	-0.18	
7/19/07 20:53:00	0.83	-0.99	-1.25	5.15	-0.11	
7/19/07 20:53:15	2.58	-0.64	-1.43	5.11	0.80	
7/19/07 20:53:30	6.08	-2.29	-1.48	3.75	4.25	
7/19/07 20:53:45	4.33	-2.06	-1.32	1.50	7.66	
7/19/07 20:54:00	2.20	-2.29	-1.25	0.48	9.33	
7/19/07 20:54:15	0.83	-2.29	-1.25	0.28	9.74	System Bias
7/19/07 20:54:30	0.83	-2.29	-1.27	0.25	9.84	CO ₂ Bias 4 Mid = 9.88
7/19/07 20:54:45	0.58	-2.29	-1.46	0.24	9.87	
7/19/07 20:55:00	0.33	-2.29	-1.39	0.23	9.89	
7/19/07 20:55:15	0.33	-2.29	-1.49	0.23	9.91	
7/19/07 20:55:30	0.33	-2.29	-1.48	0.23	9.92	
7/19/07 20:55:45	0.33	-2.29	-1.57	0.23	9.92	
7/19/07 20:56:00	0.33	-1.54	-1.57	0.23	9.42	
7/19/07 20:56:15	0.33	-2.16	-1.30	0.24	5.29	
7/19/07 20:56:30	0.33	-1.44	-1.64	0.24	1.44	
7/19/07 20:56:45	0.33	-1.86	-1.78	0.24	0.19	System Bias
7/19/07 20:57:00	0.33	-1.39	-1.80	0.24	-0.02	NO _x Bias 4 Zero = 0.33
7/19/07 20:57:15	0.33	-1.54	-1.71	0.24	-0.08	SO ₂ Bias 4 Zero = -1.78
7/19/07 20:57:30	0.33	-2.09	-1.87	0.24	-0.11	CO Bias 4 Zero = -1.82
7/19/07 20:57:45	0.33	-2.29	-1.73	0.24	-0.13	O ₂ Bias 4 Zero = 0.24
7/19/07 20:58:00	0.33	-2.29	-1.78	0.24	-0.13	CO ₂ Bias 4 Zero = -0.08
7/19/07 20:58:15	0.33	-1.24	-1.66	0.24	-0.14	
7/19/07 20:58:30	0.33	-1.84	-1.78	0.24	-0.15	
7/19/07 20:58:45	0.33	-2.14	-1.87	0.24	-0.15	
7/19/07 20:59:00	0.33	-2.29	-1.80	0.24	-0.16	
7/19/07 20:59:15	0.33	2.81	-1.80	0.24	-0.15	
7/19/07 20:59:30	4.20	10.51	-1.97	0.78	1.79	
7/19/07 20:59:45	22.33	14.10	-1.60	2.67	6.18	
7/19/07 21:00:00	51.41	14.00	-0.51	4.03	9.02	
7/19/07 21:00:15	73.36	3.86	1.06	4.54	10.15	
7/19/07 21:00:30	81.55	20.90	2.60	4.62	10.36	
7/19/07 21:00:45	82.61	21.52	3.80	4.62	10.42	Begin Run 4
7/19/07 21:01:00	82.74	21.60	4.54	4.63	10.46	
7/19/07 21:01:15	82.36	11.13	4.61	4.63	10.50	
7/19/07 21:01:30	82.37	22.94	4.45	4.60	10.53	
7/19/07 21:01:45	82.11	26.17	4.43	4.54	10.58	
7/19/07 21:02:00	82.36	27.24	4.34	4.47	10.64	
7/19/07 21:02:15	82.36	25.92	4.24	4.42	10.67	
7/19/07 21:02:30	82.36	22.60	4.15	4.40	10.68	
7/19/07 21:02:45	82.11	32.21	4.15	4.39	10.68	
7/19/07 21:03:00	81.86	30.69	4.17	4.42	10.65	
7/19/07 21:03:15	81.86	30.61	4.13	4.55	10.57	
7/19/07 21:03:30	82.36	17.55	4.04	4.65	10.50	
7/19/07 21:03:45	82.37	25.71	4.08	4.69	10.49	
7/19/07 21:04:00	82.37	29.84	4.20	4.69	10.48	
7/19/07 21:04:15	82.36	29.27	4.11	4.68	10.45	
7/19/07 21:04:30	82.36	21.60	4.08	4.68	10.45	
7/19/07 21:04:45	82.36	22.22	4.01	4.67	10.44	
7/19/07 21:05:00	82.49	31.64	4.01	4.67	10.45	
7/19/07 21:05:15	82.86	31.94	3.87	4.67	10.45	
7/19/07 21:05:30	82.86	29.44	3.80	4.65	10.42	
7/19/07 21:05:45	82.86	22.37	3.75	4.60	10.45	
7/19/07 21:06:00	82.86	33.89	3.64	4.52	10.53	
7/19/07 21:06:15	82.86	32.69	3.57	4.44	10.57	
7/19/07 21:06:30	82.86	30.59	3.64	4.41	10.57	
7/19/07 21:06:45	82.86	21.27	3.64	4.39	10.59	
7/19/07 21:07:00	82.99	19.85	3.55	4.38	10.59	
7/19/07 21:07:15	83.36	26.09	3.50	4.43	10.54	
7/19/07 21:07:30	83.49	26.04	3.71	4.58	10.40	
7/19/07 21:07:45	83.87	19.17	5.17	4.72	10.32	
7/19/07 21:08:00	83.87	16.45	3.76	4.77	10.31	
7/19/07 21:08:15	83.87	25.44	3.46	4.79	10.28	
7/19/07 21:08:30	83.87	22.65	3.36	4.80	10.26	
7/19/07 21:08:45	83.87	17.73	3.41	4.79	10.26	
7/19/07 21:09:00	83.87	9.81	3.25	4.78	10.28	
7/19/07 21:09:15	83.87	18.05	3.25	4.77	10.26	
7/19/07 21:09:30	84.24	20.15	3.25	4.75	10.29	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 21:09:45	83.87	20.30	3.11	4.72	10.34	
7/19/07 21:10:00	84.37	10.16	3.18	4.65	10.36	
7/19/07 21:10:15	84.37	17.97	3.18	4.57	10.45	
7/19/07 21:10:30	84.37	21.65	3.04	4.50	10.49	
7/19/07 21:10:45	84.37	21.22	2.93	4.46	10.51	
7/19/07 21:11:00	84.37	17.55	2.97	4.44	10.53	
7/19/07 21:11:15	84.37	10.81	3.00	4.45	10.52	
7/19/07 21:11:30	84.49	20.35	3.06	4.52	10.48	
7/19/07 21:11:45	84.87	19.92	3.15	4.65	10.40	
7/19/07 21:12:00	84.87	19.45	3.06	4.74	10.35	
7/19/07 21:12:15	84.62	10.48	2.95	4.76	10.35	
7/19/07 21:12:30	84.37	21.00	3.00	4.76	10.38	
7/19/07 21:12:45	84.37	20.17	2.93	4.75	10.38	
7/19/07 21:13:00	84.37	18.95	2.81	4.74	10.39	
7/19/07 21:13:15	84.37	10.46	2.95	4.73	10.38	
7/19/07 21:13:30	84.37	9.66	2.79	4.72	10.41	
7/19/07 21:13:45	84.62	19.15	2.84	4.71	10.42	
7/19/07 21:14:00	84.87	18.55	2.97	4.69	10.41	
7/19/07 21:14:15	84.87	13.05	2.86	4.66	10.43	
7/19/07 21:14:30	84.88	9.26	2.97	4.60	10.47	
7/19/07 21:14:45	84.87	19.87	3.00	4.53	10.52	
7/19/07 21:15:00	84.87	19.05	3.02	4.50	10.55	
7/19/07 21:15:15	84.88	16.50	3.09	4.49	10.55	
7/19/07 21:15:30	84.87	2.98	3.13	4.48	10.54	
7/19/07 21:15:45	84.88	10.76	3.32	4.51	10.50	
7/19/07 21:16:00	85.00	14.10	3.41	4.61	10.41	
7/19/07 21:16:15	85.37	13.60	3.34	4.71	10.35	
7/19/07 21:16:30	85.37	5.11	3.20	4.77	10.34	
7/19/07 21:16:45	85.37	7.83	3.13	4.78	10.30	
7/19/07 21:17:00	85.38	12.40	3.09	4.79	10.30	
7/19/07 21:17:15	85.62	11.13	3.16	4.80	10.29	
7/19/07 21:17:30	85.88	6.26	3.36	4.81	10.26	
7/19/07 21:17:45	85.88	1.86	3.39	4.82	10.26	
7/19/07 21:18:00	86.00	10.56	3.25	4.82	10.26	
7/19/07 21:18:15	86.38	9.98	3.18	4.78	10.29	
7/19/07 21:18:30	86.25	8.26	3.09	4.69	10.34	
7/19/07 21:18:45	85.88	2.96	3.04	4.60	10.41	
7/19/07 21:19:00	86.38	9.66	3.06	4.54	10.46	
7/19/07 21:19:15	86.38	8.78	3.04	4.53	10.46	
7/19/07 21:19:30	86.38	6.86	3.18	4.52	10.45	
7/19/07 21:19:45	86.38	1.79	3.13	4.54	10.44	
7/19/07 21:20:00	86.50	2.91	2.95	4.62	10.38	
7/19/07 21:20:15	86.87	7.16	2.84	4.73	10.31	
7/19/07 21:20:30	86.87	7.36	2.84	4.79	10.28	
7/19/07 21:20:45	86.63	3.09	2.84	4.80	10.27	
7/19/07 21:21:00	86.38	3.41	2.63	4.79	10.28	
7/19/07 21:21:15	86.38	7.86	2.67	4.80	10.29	
7/19/07 21:21:30	86.38	7.01	2.60	4.81	10.26	
7/19/07 21:21:45	86.38	5.03	2.51	4.81	10.25	
7/19/07 21:22:00	86.38	-0.34	2.47	4.80	10.27	
7/19/07 21:22:15	86.38	7.03	2.63	4.78	10.33	
7/19/07 21:22:30	86.25	8.86	2.60	4.71	10.37	
7/19/07 21:22:45	85.87	7.76	2.41	4.61	10.43	
7/19/07 21:23:00	85.75	1.01	2.42	4.56	10.44	
7/19/07 21:23:15	85.38	7.11	2.49	4.55	10.46	
7/19/07 21:23:30	85.37	9.06	2.54	4.54	10.45	
7/19/07 21:23:45	85.38	8.78	2.63	4.56	10.44	
7/19/07 21:24:00	85.50	5.41	2.72	4.61	10.40	
7/19/07 21:24:15	85.88	1.54	2.74	4.66	10.37	
7/19/07 21:24:30	85.88	8.51	2.95	4.67	10.34	
7/19/07 21:24:45	85.88	7.46	3.00	4.69	10.31	
7/19/07 21:25:00	85.88	6.51	2.97	4.70	10.28	
7/19/07 21:25:15	85.88	1.31	2.97	4.71	10.27	
7/19/07 21:25:30	85.87	6.38	3.09	4.74	10.26	
7/19/07 21:25:45	85.87	7.51	3.23	4.75	10.27	
7/19/07 21:26:00	85.75	5.51	3.25	4.75	10.25	
7/19/07 21:26:15	85.68	0.71	3.18	4.74	10.26	
7/19/07 21:26:30	85.87	2.86	3.13	4.68	10.33	
7/19/07 21:26:45	85.87	6.86	3.20	4.61	10.41	
7/19/07 21:27:00	86.00	6.01	3.34	4.57	10.45	
7/19/07 21:27:15	86.38	1.84	3.30	4.56	10.42	
7/19/07 21:27:30	86.00	2.11	3.43	4.57	10.40	
7/19/07 21:27:45	86.37	6.01	3.46	4.61	10.37	
7/19/07 21:28:00	86.38	5.91	3.50	4.71	10.28	
7/19/07 21:28:15	86.37	4.16	3.60	4.77	10.22	
7/19/07 21:28:30	86.38	-0.79	3.43	4.79	10.22	
7/19/07 21:28:45	86.37	4.56	3.32	4.78	10.25	
7/19/07 21:29:00	86.38	5.96	3.41	4.77	10.25	
7/19/07 21:29:15	86.38	4.98	3.41	4.76	10.26	
7/19/07 21:29:30	86.38	0.11	3.50	4.76	10.25	
7/19/07 21:29:45	86.38	5.68	3.66	4.76	10.23	
7/19/07 21:30:00	86.25	8.16	3.83	4.76	10.23	
7/19/07 21:30:15	85.88	8.28	3.76	4.71	10.28	
7/19/07 21:30:30	85.87	2.76	3.80	4.62	10.36	
7/19/07 21:30:45	85.87	2.04	3.69	4.53	10.42	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 21:31:00	85.38	9.31	3.66	4.48	10.47	
7/19/07 21:31:15	85.37	9.48	3.73	4.45	10.50	
7/19/07 21:31:30	85.38	6.56	3.92	4.44	10.53	
7/19/07 21:31:45	85.37	2.21	3.97	4.47	10.54	
7/19/07 21:32:00	85.37	10.56	4.06	4.57	10.47	
7/19/07 21:32:15	85.38	9.78	3.87	4.66	10.41	
7/19/07 21:32:30	84.88	8.51	3.87	4.71	10.37	
7/19/07 21:32:45	84.87	3.39	3.90	4.72	10.33	
7/19/07 21:33:00	84.87	10.21	3.92	4.73	10.32	
7/19/07 21:33:15	84.87	8.81	4.04	4.73	10.34	
7/19/07 21:33:30	84.87	8.11	4.08	4.72	10.33	
7/19/07 21:33:45	84.87	2.61	4.04	4.72	10.33	
7/19/07 21:34:00	85.00	3.86	4.20	4.70	10.35	
7/19/07 21:34:15	85.00	9.68	4.11	4.84	10.40	
7/19/07 21:34:30	84.87	9.41	4.08	4.57	10.44	
7/19/07 21:34:45	84.50	3.06	4.18	4.51	10.49	
7/19/07 21:35:00	84.37	3.76	3.99	4.47	10.54	
7/19/07 21:35:15	84.75	9.13	4.06	4.46	10.54	
7/19/07 21:35:30	84.87	7.31	4.06	4.48	10.51	
7/19/07 21:35:45	85.25	4.61	4.13	4.59	10.42	
7/19/07 21:36:00	85.37	-2.28	4.13	4.72	10.32	
7/19/07 21:36:15	85.37	5.31	4.04	4.79	10.27	
7/19/07 21:36:30	85.38	5.96	4.18	4.81	10.25	
7/19/07 21:36:45	85.37	5.80	4.22	4.82	10.24	
7/19/07 21:37:00	85.37	-0.39	4.18	4.83	10.22	
7/19/07 21:37:15	85.37	6.00	4.06	4.83	10.23	
7/19/07 21:37:30	85.38	6.16	4.11	4.75	10.30	
7/19/07 21:37:45	85.38	4.87	4.18	4.66	10.35	
7/19/07 21:38:00	85.37	0.16	4.01	4.59	10.39	
7/19/07 21:38:15	85.37	0.86	4.08	4.56	10.40	
7/19/07 21:38:30	85.88	5.16	4.15	4.56	10.41	
7/19/07 21:38:45	85.88	-4.16	4.11	4.57	10.41	
7/19/07 21:39:00	85.87	0.81	4.22	4.62	10.38	
7/19/07 21:39:15	85.87	-0.31	4.25	4.73	10.31	
7/19/07 21:39:30	85.88	5.01	4.15	4.81	10.27	
7/19/07 21:39:45	85.88	3.39	4.04	4.85	10.23	
7/19/07 21:40:00	86.00	2.46	4.22	4.85	10.21	
7/19/07 21:40:15	86.00	-2.06	4.29	4.86	10.20	
7/19/07 21:40:30	86.00	0.81	4.36	4.86	10.20	
7/19/07 21:40:45	86.37	3.09	4.20	4.86	10.23	
7/19/07 21:41:00	86.37	2.86	4.20	4.86	10.24	
7/19/07 21:41:15	86.00	-0.79	4.22	4.85	10.25	
7/19/07 21:41:30	85.88	0.96	4.11	4.83	10.28	
7/19/07 21:41:45	85.88	2.89	4.13	4.77	10.29	
7/19/07 21:42:00	85.63	5.59	-44.34	3.33	8.87	
7/19/07 21:42:15	85.25	0.01	-27.39	4.62	10.31	
7/19/07 21:42:30	82.11	-0.14	8.73	4.60	10.42	
7/19/07 21:42:45	84.75	-1.44	6.16	4.59	10.44	
7/19/07 21:43:00	85.00	1.29	6.07	4.59	10.36	
7/19/07 21:43:15	84.62	1.56	5.96	4.63	10.15	
7/19/07 21:43:30	83.62	0.49	5.75	4.78	10.20	
7/19/07 21:43:45	84.75	-2.13	5.98	4.87	10.18	
7/19/07 21:44:00	85.00	1.41	5.91	4.91	10.17	
7/19/07 21:44:15	85.37	1.71	5.98	4.94	10.15	
7/19/07 21:44:30	85.38	1.46	5.91	4.96	10.15	
7/19/07 21:44:45	85.38	0.11	6.02	4.91	10.19	
7/19/07 21:45:00	84.87	-1.04	6.05	4.79	10.27	
7/19/07 21:45:15	84.87	2.31	6.28	4.68	10.35	
7/19/07 21:45:30	85.38	1.19	6.41	4.61	10.42	
7/19/07 21:45:45	85.00	0.81	6.16	4.59	10.43	
7/19/07 21:46:00	85.38	-2.11	6.28	4.58	10.44	
7/19/07 21:46:15	85.37	-0.09	6.11	4.57	10.47	
7/19/07 21:46:30	85.37	1.41	5.93	4.61	10.46	
7/19/07 21:46:45	85.38	1.46	6.35	4.70	10.40	
7/19/07 21:47:00	85.38	-1.76	6.21	4.77	10.36	
7/19/07 21:47:15	85.37	0.96	6.21	4.78	10.38	
7/19/07 21:47:30	84.88	2.91	6.07	4.77	10.43	
7/19/07 21:47:45	84.88	2.91	6.04	4.75	10.47	
7/19/07 21:48:00	84.37	1.31	6.02	4.73	10.51	
7/19/07 21:48:15	84.37	-2.28	6.00	4.69	10.55	
7/19/07 21:48:30	84.37	3.64	5.89	4.64	10.54	
7/19/07 21:48:45	84.37	3.08	6.05	4.60	10.55	
7/19/07 21:49:00	83.87	2.19	5.98	4.53	10.58	
7/19/07 21:49:15	83.87	-1.44	6.21	4.42	10.65	
7/19/07 21:49:30	83.37	4.93	6.25	4.31	10.70	
7/19/07 21:49:45	82.99	3.81	6.09	4.26	10.72	
7/19/07 21:50:00	82.74	3.01	6.09	4.24	10.72	
7/19/07 21:50:15	82.37	0.26	6.05	4.25	10.69	
7/19/07 21:50:30	82.37	-0.49	6.14	4.30	10.62	
7/19/07 21:50:45	82.36	4.51	6.07	4.39	10.57	
7/19/07 21:51:00	82.37	4.21	6.14	4.46	10.55	
7/19/07 21:51:15	82.36	3.61	6.00	4.50	10.50	
7/19/07 21:51:30	82.36	0.09	6.14	4.52	10.48	
7/19/07 21:51:45	82.37	6.91	5.98	4.53	10.48	
7/19/07 21:52:00	82.37	5.53	5.98	4.55	10.47	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 21:52:15	82.74	6.46	5.98	4.58	10.47	
7/19/07 21:52:30	82.87	-1.24	5.89	4.60	10.45	
7/19/07 21:52:45	82.86	3.31	6.16	4.58	10.48	
7/19/07 21:53:00	82.67	8.03	6.09	4.50	10.56	
7/19/07 21:53:15	82.37	9.56	6.09	4.42	10.64	
7/19/07 21:53:30	82.37	6.91	6.02	4.36	10.68	
7/19/07 21:53:45	82.36	0.81	6.14	4.34	10.70	
7/19/07 21:54:00	82.36	10.91	6.07	4.33	10.71	
7/19/07 21:54:15	82.37	9.41	6.05	4.34	10.68	
7/19/07 21:54:30	82.37	7.76	6.07	4.42	10.62	
7/19/07 21:54:45	82.36	0.26	6.02	4.53	10.55	
7/19/07 21:55:00	82.62	9.91	5.80	4.58	10.51	
7/19/07 21:55:15	82.87	8.86	6.16	4.61	10.49	
7/19/07 21:55:30	83.12	7.53	6.21	4.63	10.47	
7/19/07 21:55:45	83.37	4.86	6.05	4.64	10.45	
7/19/07 21:56:00	83.37	0.59	6.11	4.64	10.45	
7/19/07 21:56:15	83.37	8.76	6.11	4.66	10.43	
7/19/07 21:56:30	83.37	7.61	6.04	4.68	10.42	
7/19/07 21:56:45	83.37	5.91	6.07	4.68	10.43	
7/19/07 21:57:00	83.37	0.91	6.14	4.64	10.46	
7/19/07 21:57:15	83.37	10.16	6.02	4.56	10.54	
7/19/07 21:57:30	83.37	8.53	6.21	4.50	10.58	
7/19/07 21:57:45	83.37	6.96	6.32	4.49	10.57	
7/19/07 21:58:00	83.37	0.41	6.30	4.50	10.56	
7/19/07 21:58:15	83.37	2.26	6.02	4.52	10.54	
7/19/07 21:58:30	83.87	4.93	5.87	4.61	10.47	
7/19/07 21:58:45	83.87	5.91	5.89	4.73	10.40	
7/19/07 21:59:00	83.87	3.19	5.84	4.79	10.36	
7/19/07 21:59:15	83.87	0.91	6.14	4.81	10.33	
7/19/07 21:59:30	83.87	6.08	6.07	4.82	10.32	
7/19/07 21:59:45	83.87	5.21	6.00	4.84	10.31	
7/19/07 22:00:00	84.12	2.29	5.80	4.85	10.32	
7/19/07 22:00:15	84.37	-2.28	5.89	4.83	10.35	
7/19/07 22:00:30	84.37	5.73	5.93	4.75	10.41	
7/19/07 22:00:45	84.37	4.41	6.09	4.64	10.47	End Run 4
7/19/07 22:01:00	84.37	3.41	6.05	4.58	10.50	
7/19/07 22:01:15	84.37	-0.34	5.98	4.56	10.51	
7/19/07 22:01:30	84.62	4.98	5.89	4.57	10.54	
7/19/07 22:01:45	84.88	3.76	6.00	4.59	10.51	
7/19/07 22:02:00	84.87	3.51	6.05	4.66	10.47	
7/19/07 22:02:15	84.88	1.16	6.16	4.76	10.41	
7/19/07 22:02:30	84.88	-0.44	5.96	4.83	10.39	
7/19/07 22:02:45	84.88	4.56	5.89	4.85	10.36	
7/19/07 22:03:00	84.87	3.39	5.87	4.85	10.36	
7/19/07 22:03:15	84.87	1.41	5.75	4.84	10.37	
7/19/07 22:03:30	84.62	-0.44	5.87	4.83	10.37	
7/19/07 22:03:45	84.88	4.56	5.80	4.83	10.37	
7/19/07 22:04:00	84.62	3.31	5.91	4.82	10.39	
7/19/07 22:04:15	84.75	2.86	5.70	4.81	10.44	
7/19/07 22:04:30	84.88	-2.28	5.75	4.77	10.47	
7/19/07 22:04:45	84.88	1.11	5.75	4.69	10.52	
7/19/07 22:05:00	84.37	3.31	5.82	4.62	10.58	
7/19/07 22:05:15	84.37	2.91	5.89	4.59	10.62	
7/19/07 22:05:30	84.37	-1.83	6.05	4.58	10.66	
7/19/07 22:05:45	84.37	11.15	5.98	4.58	10.69	
7/19/07 22:06:00	84.87	22.65	6.16	4.50	9.20	
7/19/07 22:06:15	67.74	11.70	5.75	3.26	4.61	
7/19/07 22:06:30	33.09	-1.16	5.47	1.33	1.30	
7/19/07 22:06:45	13.46	-2.28	11.75	0.45	0.19	
7/19/07 22:07:00	4.33	-1.09	21.43	0.30	-0.03	
7/19/07 22:07:15	1.96	-1.59	27.04	0.27	-0.08	
7/19/07 22:07:30	1.33	-2.21	30.52	0.26	-0.10	
7/19/07 22:07:45	1.33	-2.28	33.12	0.26	-0.12	
7/19/07 22:08:00	1.33	-0.56	35.27	0.26	-0.12	
7/19/07 22:08:15	1.33	-1.39	36.93	0.25	-0.13	
7/19/07 22:08:30	1.08	-2.03	38.43	0.25	-0.14	
7/19/07 22:08:45	0.83	-2.23	40.88	0.24	-0.14	
7/19/07 22:09:00	0.83	-1.84	43.94	0.24	-0.14	
7/19/07 22:09:15	0.83	-1.19	46.41	0.24	-0.14	
7/19/07 22:09:30	0.83	-1.96	46.53	0.24	-0.15	
7/19/07 22:09:45	0.83	-2.08	46.06	0.24	-0.15	
7/19/07 22:10:00	0.83	-1.81	46.12	0.24	-0.15	
7/19/07 22:10:15	0.83	-0.84	46.93	0.23	-0.15	
7/19/07 22:10:30	0.83	-1.89	46.71	0.23	-0.16	
7/19/07 22:10:45	0.83	-2.08	46.25	0.23	-0.16	
7/19/07 22:11:00	0.83	-2.28	43.89	0.23	-0.16	System Bias
7/19/07 22:11:15	0.83	-1.74	44.50	0.23	-0.16	SO ₂ Bias 5 Mid = 43.64
7/19/07 22:11:30	0.83	-1.44	43.04	0.23	-0.16	CO ₂ Bias 5 Zero = -0.16
7/19/07 22:11:45	0.83	-1.74	43.13	0.23	-0.16	
7/19/07 22:12:00	0.58	-2.28	41.95	0.23	-0.11	
7/19/07 22:12:15	22.84	-1.39	39.68	0.24	-0.06	
7/19/07 22:12:30	78.37	-1.19	30.80	0.25	-0.13	
7/19/07 22:12:45	125.50	-1.84	27.16	0.24	-0.16	
7/19/07 22:13:00	171.65	-2.28	17.01	0.24	-0.16	
7/19/07 22:13:15	187.28	-2.28	11.01	0.24	-0.16	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/19/07 22:13:30	199.41	-1.09	7.69	0.24	-0.16	
7/19/07 22:13:45	198.03	-1.54	5.38	0.23	-0.17	
7/19/07 22:14:00	194.91	-2.28	3.76	0.24	-0.17	System Bias
7/19/07 22:14:15	196.41	-2.28	2.72	0.23	-0.17	NO _x Bias 5 Mid = 198.60
7/19/07 22:14:30	199.66	-0.66	1.87	0.23	-0.17	
7/19/07 22:14:45	199.41	-1.44	1.34	0.23	-0.17	
7/19/07 22:15:00	198.91	-1.91	0.87	0.23	-0.17	
7/19/07 22:15:15	179.78	-2.28	1.64	0.23	-0.17	
7/19/07 22:15:30	118.88	2.54	6.26	0.23	-0.17	
7/19/07 22:15:45	49.36	22.45	9.14	0.23	-0.16	
7/19/07 22:16:00	33.85	37.59	7.57	0.23	-0.16	
7/19/07 22:16:15	25.47	39.53	5.13	0.23	-0.16	
7/19/07 22:16:30	10.33	28.24	3.39	0.23	-0.17	
7/19/07 22:16:45	5.46	44.58	2.19	0.23	-0.17	System Bias
7/19/07 22:17:00	3.33	43.68	1.52	0.23	-0.17	CO Bias 5 Mid = 43.86
7/19/07 22:17:15	2.83	42.93	0.83	0.23	-0.17	
7/19/07 22:17:30	2.33	43.68	0.42	0.23	-0.17	
7/19/07 22:17:45	1.96	45.14	0.14	0.23	-0.17	
7/19/07 22:18:00	1.83	52.78	-0.27	0.23	-0.17	
7/19/07 22:18:15	1.79	48.38	-0.39	0.23	-0.14	
7/19/07 22:18:30	6.33	15.03	-0.83	0.24	2.23	
7/19/07 22:18:45	18.46	-0.34	-0.85	0.24	6.32	
7/19/07 22:19:00	11.83	-1.76	-1.04	0.22	8.80	
7/19/07 22:19:15	5.70	-2.28	-0.95	0.20	9.63	
7/19/07 22:19:30	1.58	-2.28	-1.06	0.20	9.80	System Bias
7/19/07 22:19:45	1.33	-2.28	-0.95	0.20	9.88	CO ₂ Bias 5 Mid = 9.90
7/19/07 22:20:00	1.08	-1.91	-1.08	0.20	9.90	SO ₂ Bias 5 Zero = -1.08
7/19/07 22:20:15	0.83	-2.28	-1.13	0.20	9.90	CO Bias 5 Zero = -2.19
7/19/07 22:20:30	0.83	-2.28	-1.18	0.20	9.92	O ₂ Bias 5 Zero = 0.20
7/19/07 22:20:45	0.83	-2.28	-1.29	0.20	9.93	NO _x Bias 5 Zero = 1.02
7/19/07 22:21:00	0.83	-1.83	-1.38	0.20	9.93	
7/19/07 22:21:15	0.83	-2.28	-1.47	0.20	9.93	
7/19/07 22:21:30	0.83	-2.28	-1.41	0.20	9.93	
7/19/07 22:21:45	0.96	-2.28	-1.34	0.25	9.24	
7/19/07 22:22:00	1.58	-1.94	-1.15	1.58	4.96	
7/19/07 22:22:15	1.96	-1.41	-1.25	3.93	1.22	
7/19/07 22:22:30	2.08	-1.31	-1.43	4.91	0.17	
7/19/07 22:22:45	1.46	-1.83	-1.61	5.06	-0.01	
7/19/07 22:23:00	1.33	-1.76	-1.66	5.08	-0.07	
7/19/07 22:23:15	1.20	-1.01	-1.66	5.08	-0.09	
7/19/07 22:23:30	0.83	-1.98	-1.64	5.09	-0.11	
7/19/07 22:23:45	0.83	-2.06	-1.75	5.11	-0.12	
7/19/07 22:24:00	0.83	-2.16	-1.68	5.13	-0.13	System Bias
7/19/07 22:24:15	0.83	-1.04	-1.91	5.14	-0.14	O ₂ Bias 5 Mid = 5.15
7/19/07 22:24:30	0.83	-1.73	-1.84	5.15	-0.14	
7/19/07 22:24:45	0.83	-2.26	-1.98	5.16	-0.14	
7/19/07 22:25:00	0.83	-2.28	-1.89	5.16	-0.14	
7/19/07 22:25:15	0.83	-0.86	-1.96	5.16	-0.15	
7/19/07 22:25:30	0.83	-1.39	-1.96	5.16	-0.15	
7/20/07 8:20:45	89.38	19.65	5.60	4.70	10.49	
7/20/07 8:21:00	84.25	0.22	5.87	5.55	7.17	
7/20/07 8:21:15	52.35	0.42	6.01	4.15	2.63	
7/20/07 8:21:30	23.07	-0.98	6.75	1.29	0.49	
7/20/07 8:21:45	5.45	-2.08	6.19	0.35	0.05	
7/20/07 8:22:00	1.12	-2.28	3.93	0.23	-0.03	
7/20/07 8:22:15	0.83	-0.78	1.73	0.21	-0.06	
7/20/07 8:22:30	0.83	-1.23	0.15	0.21	-0.08	
7/20/07 8:22:45	0.83	-2.13	-0.73	0.20	-0.08	
7/20/07 8:23:00	0.83	-2.28	-1.15	0.20	-0.10	
7/20/07 8:23:15	0.40	-0.71	-1.42	0.20	-0.10	
7/20/07 8:23:30	0.33	-1.83	-1.58	0.20	-0.11	
7/20/07 8:23:45	0.33	-2.26	-1.96	0.19	-0.11	
7/20/07 8:24:00	0.33	-2.28	-2.19	0.20	-0.11	
7/20/07 8:24:15	0.33	-1.46	-2.35	0.20	-0.13	
7/20/07 8:24:30	0.33	-1.58	-2.70	0.17	-0.15	
7/20/07 8:24:45	0.33	-2.28	-2.83	0.16	-0.16	
7/20/07 8:25:00	0.33	-0.38	-2.91	0.16	-0.16	
7/20/07 8:25:15	0.33	1.51	-0.32	0.16	-0.16	
7/20/07 8:25:30	0.33	-0.83	-0.22	0.16	-0.17	Calibration Error
7/20/07 8:25:45	0.33	-2.28	-0.22	0.15	-0.17	NO _x CE Zero = 0.33
7/20/07 8:26:00	0.33	-0.43	-0.25	0.15	-0.17	SO ₂ CE Zero = -0.37
7/20/07 8:26:15	0.33	0.81	-0.45	0.15	-0.17	CO CE Zero = -0.60
7/20/07 8:26:30	0.33	-0.48	-0.55	0.15	-0.17	O ₂ CE Zero = 0.15
7/20/07 8:26:45	0.33	-1.93	-0.43	0.15	-0.18	CO ₂ CE Zero = -0.17
7/20/07 8:27:00	0.33	6.36	-0.18	0.15	-0.18	
7/20/07 8:27:15	0.33	17.40	-0.31	0.15	-0.18	
7/20/07 8:27:30	0.33	9.46	1.30	0.23	-0.17	
7/20/07 8:27:45	3.34	-0.23	19.63	0.36	-0.16	
7/20/07 8:28:00	8.08	-0.33	54.44	0.29	-0.17	
7/20/07 8:28:15	6.20	0.12	75.73	0.23	-0.18	
7/20/07 8:28:30	3.09	-1.03	84.60	0.21	-0.18	
7/20/07 8:28:45	1.96	-2.28	90.71	0.20	-0.18	
7/20/07 8:29:00	1.33	-0.33	104.45	0.18	-0.18	
7/20/07 8:29:15	1.33	0.79	119.64	0.16	-0.19	
7/20/07 8:29:30	0.83	-0.93	127.26	0.15	-0.18	

Marathon Refining - Texas City, Texas
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ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 8:29:45	0.83	-2.28	130.05	0.15	-0.19	
7/20/07 8:30:00	0.83	-0.18	130.92	0.15	-0.19	
7/20/07 8:30:15	0.83	0.26	131.11	0.15	-0.18	
7/20/07 8:30:30	0.83	-0.98	110.26	0.15	-0.19	
7/20/07 8:30:45	0.83	-2.23	89.25	0.15	-0.19	
7/20/07 8:31:00	0.83	-0.43	89.07	0.15	-0.19	
7/20/07 8:31:15	0.83	0.74	91.61	0.15	-0.18	
7/20/07 8:31:30	0.83	-0.93	92.17	0.15	-0.19	
7/20/07 8:31:45	0.83	-2.28	93.78	0.15	-0.19	
7/20/07 8:32:00	0.83	-0.08	94.39	0.15	-0.19	
7/20/07 8:32:15	0.83	0.99	94.09	0.15	-0.19	
7/20/07 8:32:30	0.83	-0.58	94.72	0.15	-0.19	
7/20/07 8:32:45	0.83	-2.08	96.55	0.15	-0.19	
7/20/07 8:33:00	0.83	-0.28	96.47	0.15	-0.19	Calibration Error
7/20/07 8:33:15	0.83	0.96	94.77	0.15	-0.19	SO ₂ CE Span = 94.49
7/20/07 8:33:30	0.83	-0.93	94.52	0.15	-0.19	
7/20/07 8:33:45	0.83	-2.28	94.32	0.15	-0.19	
7/20/07 8:34:00	0.83	-0.58	94.35	0.15	-0.19	
7/20/07 8:34:15	0.83	0.74	94.41	0.15	-0.19	
7/20/07 8:34:30	0.83	-1.23	88.58	0.15	-0.19	
7/20/07 8:34:45	0.83	-2.28	75.77	0.15	-0.20	
7/20/07 8:35:00	0.58	1.41	55.83	0.14	-0.19	
7/20/07 8:35:15	0.33	0.61	47.07	0.14	-0.20	
7/20/07 8:35:30	0.33	-1.38	44.99	0.14	-0.20	Calibration Error
7/20/07 8:35:45	0.33	-2.28	44.25	0.14	-0.19	SO ₂ CE Mid = 44.08
7/20/07 8:36:00	0.83	1.46	44.20	0.14	-0.20	
7/20/07 8:36:15	0.83	0.86	44.00	0.14	-0.20	
7/20/07 8:36:30	0.83	-1.78	43.88	0.14	-0.20	
7/20/07 8:36:45	0.83	-2.28	43.83	0.14	-0.20	
7/20/07 8:37:00	0.83	1.51	43.76	0.14	-0.20	
7/20/07 8:37:15	0.46	0.86	44.32	0.16	-0.20	
7/20/07 8:37:30	0.83	-1.88	49.65	0.30	-0.19	
7/20/07 8:37:45	37.97	-2.28	39.77	0.41	-0.18	
7/20/07 8:38:00	128.88	1.21	17.66	0.28	-0.19	
7/20/07 8:38:15	203.29	0.51	9.89	0.19	-0.19	
7/20/07 8:38:30	242.95	-1.68	9.96	0.18	-0.20	
7/20/07 8:38:45	201.42	-2.28	5.68	0.16	-0.20	
7/20/07 8:39:00	101.62	1.06	1.85	0.15	-0.20	
7/20/07 8:39:15	26.09	0.74	0.53	0.14	-0.20	
7/20/07 8:39:30	4.58	-1.38	0.08	0.14	-0.20	
7/20/07 8:39:45	1.96	-2.28	0.03	0.14	-0.20	
7/20/07 8:40:00	1.33	0.96	0.01	0.14	-0.20	
7/20/07 8:40:15	1.33	0.26	0.05	0.14	-0.20	
7/20/07 8:40:30	1.33	-2.28	-0.08	0.14	-0.20	
7/20/07 8:40:45	1.71	-2.28	0.46	0.14	-0.20	
7/20/07 8:41:00	42.60	0.96	1.43	0.15	-0.20	
7/20/07 8:41:15	136.26	0.44	0.67	0.16	-0.20	
7/20/07 8:41:30	331.74	-2.28	0.15	0.16	-0.20	
7/20/07 8:41:45	401.51	0.72	0.06	0.16	-0.20	
7/20/07 8:42:00	416.02	0.67	0.06	0.16	-0.20	
7/20/07 8:42:15	416.40	0.42	-0.01	0.16	-0.20	
7/20/07 8:42:30	415.02	-2.28	0.03	0.16	-0.20	
7/20/07 8:42:45	414.90	0.69	-0.08	0.16	-0.20	
7/20/07 8:43:00	415.77	0.31	-0.01	0.16	-0.20	
7/20/07 8:43:15	416.40	-1.61	0.01	0.16	-0.20	
7/20/07 8:43:30	416.52	-2.28	-0.01	0.16	-0.20	
7/20/07 8:43:45	416.90	0.32	-0.04	0.15	-0.20	
7/20/07 8:44:00	417.53	0.51	-0.22	0.16	-0.20	
7/20/07 8:44:15	417.90	-1.02	-0.22	0.16	-0.20	
7/20/07 8:44:30	417.27	-2.28	-0.22	0.16	-0.20	
7/20/07 8:44:45	417.03	-0.08	-0.22	0.16	-0.20	
7/20/07 8:45:00	373.51	0.52	-0.15	0.16	-0.20	
7/20/07 8:45:15	393.76	-1.68	-0.15	0.16	-0.20	
7/20/07 8:45:30	399.76	-2.28	-0.22	0.16	-0.20	Calibration Error
7/20/07 8:45:45	399.88	-0.01	-0.34	0.16	-0.20	NO _x CE Span = 400.17
7/20/07 8:46:00	400.51	-0.24	-0.31	0.16	-0.20	
7/20/07 8:46:15	400.51	-1.88	-0.31	0.16	-0.20	
7/20/07 8:46:30	399.76	-2.28	-0.24	0.16	-0.20	
7/20/07 8:46:45	399.88	-0.16	-0.29	0.16	-0.20	
7/20/07 8:47:00	378.02	0.02	-0.24	0.15	-0.20	
7/20/07 8:47:15	326.88	-1.61	-0.29	0.15	-0.20	
7/20/07 8:47:30	237.94	-2.28	-0.29	0.15	-0.20	
7/20/07 8:47:45	207.00	0.39	-0.34	0.15	-0.21	
7/20/07 8:48:00	202.90	0.11	-0.38	0.15	-0.20	Calibration Error
7/20/07 8:48:15	202.85	-1.86	-0.34	0.15	-0.20	NO _x CE Mid = 202.52
7/20/07 8:48:30	202.40	-1.18	-0.38	0.15	-0.20	
7/20/07 8:48:45	202.40	0.64	-0.38	0.15	-0.20	
7/20/07 8:49:00	202.40	0.31	-0.31	0.15	-0.20	
7/20/07 8:49:15	202.41	-1.61	-0.31	0.15	-0.20	
7/20/07 8:49:30	202.15	-0.28	-0.34	0.15	-0.21	
7/20/07 8:49:45	202.28	0.76	-0.31	0.15	-0.20	
7/20/07 8:50:00	201.65	1.21	-0.22	0.15	-0.20	
7/20/07 8:50:15	200.03	-1.13	-0.31	0.15	-0.20	
7/20/07 8:50:30	201.15	-0.18	-0.22	0.24	-0.20	
7/20/07 8:50:45	208.16	0.91	-0.20	2.41	-0.20	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 8:51:00	173.65	0.76	-0.20	7.35	-0.20	
7/20/07 8:51:15	62.23	-1.41	-0.22	9.23	-0.20	
7/20/07 8:51:30	16.59	-0.33	-0.27	9.52	-0.21	
7/20/07 8:51:45	3.83	0.81	-0.34	9.77	-0.20	
7/20/07 8:52:00	2.33	-0.78	-0.41	10.00	-0.20	Calibration Error
7/20/07 8:52:15	1.96	-2.11	-0.31	10.09	-0.20	O ₂ CE Span = 10.12
7/20/07 8:52:30	1.83	-0.38	-0.38	10.12	-0.21	
7/20/07 8:52:45	1.46	0.51	-0.43	10.13	-0.21	
7/20/07 8:53:00	1.33	-0.88	-0.34	10.13	-0.21	
7/20/07 8:53:15	1.33	-2.28	-0.34	10.14	-0.20	
7/20/07 8:53:30	1.33	-0.58	-0.43	10.14	-0.20	
7/20/07 8:53:45	1.21	0.36	-0.59	10.15	-0.21	
7/20/07 8:54:00	0.83	-1.18	-0.55	9.87	-0.20	
7/20/07 8:54:15	0.83	-1.33	-0.36	7.16	-0.21	
7/20/07 8:54:30	0.83	1.26	-0.43	5.46	-0.20	
7/20/07 8:54:45	0.83	0.64	-0.34	5.22	-0.21	
7/20/07 8:55:00	0.83	-0.38	-0.41	5.19	-0.20	Calibration Error
7/20/07 8:55:15	0.83	-1.26	-0.50	5.18	-0.21	O ₂ CE Mid = 5.18
7/20/07 8:55:30	0.83	1.26	-0.46	5.18	-0.21	
7/20/07 8:55:45	0.83	0.14	-0.41	5.18	-0.20	
7/20/07 8:56:00	0.83	-1.83	-0.50	5.18	-0.21	
7/20/07 8:56:15	0.83	-1.53	-0.36	5.18	-0.21	
7/20/07 8:56:30	0.83	-0.23	-0.34	5.29	-0.20	
7/20/07 8:56:45	1.20	-2.01	-0.24	5.46	1.54	
7/20/07 8:57:00	2.06	-2.28	-0.31	3.77	9.12	
7/20/07 8:57:15	3.71	-1.96	-0.43	1.76	15.37	
7/20/07 8:57:30	2.58	-1.58	-0.55	0.62	19.09	
7/20/07 8:57:45	1.33	-2.26	-0.50	0.20	20.53	
7/20/07 8:58:00	0.83	-2.28	-0.36	0.13	20.76	
7/20/07 8:58:15	0.83	-1.93	-0.43	0.12	20.52	Calibration Error
7/20/07 8:58:30	0.58	-1.43	-0.45	0.12	20.04	CO ₂ CE Span = 20.03
7/20/07 8:58:45	0.33	-2.21	-0.55	0.11	20.01	
7/20/07 8:59:00	0.33	-2.28	-0.43	0.11	20.04	
7/20/07 8:59:15	0.33	-1.88	-0.52	0.11	20.03	
7/20/07 8:59:30	0.33	-0.88	-0.50	0.11	20.02	
7/20/07 8:59:45	0.33	-1.88	-0.29	0.11	19.14	
7/20/07 9:00:00	0.33	-2.28	-0.31	0.12	14.11	
7/20/07 9:00:15	0.33	-1.91	-0.27	0.12	10.22	
7/20/07 9:00:30	0.33	-1.18	-0.31	0.12	8.88	
7/20/07 9:00:45	0.33	-1.76	-0.38	0.12	8.71	Calibration Error
7/20/07 9:01:00	0.33	-2.28	-0.43	0.12	9.69	CO ₂ CE Mid = 9.68
7/20/07 9:01:15	0.33	-0.81	-0.52	0.12	9.67	
7/20/07 9:01:30	0.33	-1.03	-0.45	0.12	9.68	
7/20/07 9:01:45	0.33	-1.78	-0.52	0.12	9.68	
7/20/07 9:02:00	0.33	-2.28	-0.55	0.12	9.67	
7/20/07 9:02:15	0.33	-1.06	-0.45	0.12	9.67	
7/20/07 9:02:30	0.33	-1.48	-0.38	0.12	9.67	
7/20/07 9:02:45	0.33	-2.11	-0.52	0.12	9.67	
7/20/07 9:03:00	0.33	-2.28	-0.50	0.12	9.78	
7/20/07 9:03:15	0.46	10.73	0.91	0.17	8.65	
7/20/07 9:03:30	0.83	42.38	11.80	0.59	5.70	
7/20/07 9:03:45	4.46	70.37	13.61	0.44	1.81	
7/20/07 9:04:00	7.33	76.96	5.09	0.26	0.21	
7/20/07 9:04:15	4.21	86.28	0.95	0.22	-0.08	
7/20/07 9:04:30	2.08	93.00	-0.06	0.21	-0.14	
7/20/07 9:04:45	1.21	85.98	-0.22	0.19	-0.15	
7/20/07 9:05:00	0.83	84.40	-0.34	0.16	-0.16	
7/20/07 9:05:15	0.83	94.17	-0.34	0.15	-0.17	
7/20/07 9:05:30	0.83	95.59	-0.31	0.14	-0.17	
7/20/07 9:05:45	0.83	88.25	-0.38	0.14	-0.18	
7/20/07 9:06:00	0.58	88.95	-0.41	0.14	-0.18	
7/20/07 9:06:15	0.33	99.84	-0.45	0.14	-0.18	
7/20/07 9:06:30	0.33	99.94	-0.52	0.14	-0.18	
7/20/07 9:06:45	0.33	91.42	-0.38	0.14	-0.18	
7/20/07 9:07:00	0.33	90.10	-0.36	0.14	-0.19	
7/20/07 9:07:15	0.33	99.94	-0.38	0.14	-0.19	
7/20/07 9:07:30	0.33	99.94	-0.34	0.14	-0.19	
7/20/07 9:07:45	0.33	93.40	-0.52	0.14	-0.19	
7/20/07 9:08:00	0.33	94.22	-0.50	0.14	-0.19	
7/20/07 9:08:15	0.33	98.52	-0.34	0.14	-0.19	Calibration Error
7/20/07 9:08:30	0.33	93.40	-0.38	0.14	-0.19	CO CE Span = 95.24
7/20/07 9:08:45	0.33	96.30	-0.50	0.14	-0.19	
7/20/07 9:09:00	0.33	96.55	-0.57	0.14	-0.19	
7/20/07 9:09:15	0.33	94.72	-0.50	0.14	-0.19	
7/20/07 9:09:30	0.33	92.10	-0.50	0.14	-0.19	
7/20/07 9:09:45	0.33	80.68	-0.52	0.14	-0.19	
7/20/07 9:10:00	0.33	66.67	-0.43	0.14	-0.19	
7/20/07 9:10:15	0.33	53.00	-0.43	0.14	-0.19	
7/20/07 9:10:30	0.33	41.83	-0.64	0.14	-0.19	
7/20/07 9:10:45	0.33	33.54	-0.41	0.14	-0.19	Calibration Error
7/20/07 9:11:00	0.33	45.38	-0.38	0.14	-0.19	CO CE Mid = 43.70
7/20/07 9:11:15	0.33	44.63	-0.38	0.14	-0.20	
7/20/07 9:11:30	0.33	41.18	-0.38	0.14	-0.20	
7/20/07 9:11:45	0.33	43.61	-0.41	0.14	-0.19	
7/20/07 9:12:00	0.33	44.98	-0.48	0.14	-0.20	

Marathon Refining - Texas City, Texas
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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 9:12:15	0.33	43.53	-0.52	0.14	-0.20	
7/20/07 9:12:30	0.33	38.64	-0.57	0.14	-0.19	
7/20/07 9:12:45	0.33	20.45	-0.45	0.15	-0.20	
7/20/07 9:13:00	4.08	14.05	0.33	0.80	1.80	
7/20/07 9:13:15	18.33	4.84	2.34	2.90	6.03	
7/20/07 9:13:30	53.60	-1.08	3.93	4.38	8.95	
7/20/07 9:13:45	77.36	-0.86	4.99	4.88	10.19	
7/20/07 9:14:00	88.63	2.86	5.60	4.91	10.42	
7/20/07 9:14:15	89.65	1.21	5.76	4.90	10.45	
7/20/07 9:14:30	89.88	-1.58	5.80	4.90	10.49	
7/20/07 9:14:45	89.88	-1.01	5.94	4.91	10.49	
7/20/07 9:15:00	89.63	2.56	5.62	4.98	10.44	
7/20/07 9:15:15	89.25	1.48	5.57	5.07	10.41	
7/20/07 9:15:30	88.88	-1.08	5.67	5.12	10.36	
7/20/07 9:15:45	88.75	-0.56	5.71	5.13	10.36	
7/20/07 9:16:00	88.38	5.61	5.73	5.12	10.34	
7/20/07 9:16:15	84.25	13.53	5.67	4.42	7.81	
7/20/07 9:16:30	60.10	7.81	5.46	2.33	3.28	
7/20/07 9:16:45	30.85	6.31	5.57	0.76	0.72	
7/20/07 9:17:00	43.84	3.96	6.17	0.30	0.10	
7/20/07 9:17:15	132.00	1.66	6.38	0.23	-0.04	
7/20/07 9:17:30	157.38	-2.08	5.53	0.21	-0.08	
7/20/07 9:17:45	185.15	1.36	4.60	0.21	-0.10	
System Bias						
7/20/07 9:18:00	196.41	1.11	3.58	0.20	-0.11	NO _x Bias 5 Mid = 196.16
7/20/07 9:18:15	197.53	-0.63	2.85	0.20	-0.11	O ₂ Bias 5 Zero = 0.20
7/20/07 9:18:30	196.91	-2.28	2.43	0.20	-0.11	CO ₂ Bias 5 Zero = -0.11
7/20/07 9:18:45	194.78	2.01	2.08	0.20	-0.12	
7/20/07 9:19:00	194.41	1.31	1.71	0.20	-0.12	
7/20/07 9:19:15	194.41	-1.16	1.23	0.19	-0.13	
7/20/07 9:19:30	194.41	-2.28	0.90	0.19	-0.13	
7/20/07 9:19:45	195.03	2.34	0.88	0.19	-0.13	
7/20/07 9:20:00	195.66	2.26	0.74	0.19	-0.12	
7/20/07 9:20:15	195.78	12.53	0.54	0.39	0.41	
7/20/07 9:20:30	191.65	7.48	0.38	0.47	0.40	
7/20/07 9:20:45	113.24	9.21	0.31	0.24	-0.02	
7/20/07 9:21:00	61.36	3.71	0.21	0.19	-0.11	
7/20/07 9:21:15	29.72	0.27	0.17	0.19	-0.13	
7/20/07 9:21:30	24.35	-2.28	0.03	0.18	-0.13	
7/20/07 9:21:45	14.08	2.26	0.06	0.18	-0.14	
7/20/07 9:22:00	7.83	1.31	0.12	0.18	-0.14	
7/20/07 9:22:15	4.82	-1.31	0.03	0.18	-0.14	
7/20/07 9:22:30	4.83	-2.28	0.74	0.18	-0.14	
7/20/07 9:22:45	3.58	1.64	3.10	0.18	-0.15	
7/20/07 9:23:00	2.83	1.12	7.53	0.17	-0.15	
7/20/07 9:23:15	2.83	-2.28	13.14	0.17	-0.15	
7/20/07 9:23:30	2.83	-2.28	18.54	0.17	-0.15	
7/20/07 9:23:45	2.83	1.64	23.11	0.17	-0.15	
7/20/07 9:24:00	2.83	1.16	26.27	0.17	-0.15	
7/20/07 9:24:15	2.33	-2.28	28.79	0.17	-0.15	
7/20/07 9:24:30	2.33	-2.28	30.60	0.17	-0.15	
7/20/07 9:24:45	2.33	1.76	32.46	0.17	-0.15	
7/20/07 9:25:00	2.33	1.11	33.85	0.17	-0.15	
7/20/07 9:25:15	1.83	-2.28	34.80	0.17	-0.15	
7/20/07 9:25:30	1.83	-1.18	35.51	0.17	-0.15	
7/20/07 9:25:45	1.83	1.64	36.09	0.17	-0.15	
7/20/07 9:26:00	1.83	1.21	36.50	0.17	-0.15	
7/20/07 9:26:15	1.83	-2.28	37.10	0.17	-0.15	
7/20/07 9:26:30	1.83	0.12	37.70	0.17	-0.15	
7/20/07 9:26:45	1.83	1.79	38.12	0.17	-0.15	
7/20/07 9:27:00	1.83	0.01	38.60	0.17	-0.15	
7/20/07 9:27:15	1.33	-2.28	39.18	0.17	-0.15	
7/20/07 9:27:30	1.33	0.02	39.57	0.17	-0.16	
7/20/07 9:27:45	1.33	1.22	39.94	0.17	-0.15	
7/20/07 9:28:00	1.33	-0.08	40.17	0.17	-0.16	
7/20/07 9:28:15	1.33	-2.28	40.45	0.17	-0.15	
7/20/07 9:28:30	1.33	-0.43	40.66	0.17	-0.16	
7/20/07 9:28:45	1.33	1.07	40.86	0.17	-0.15	
7/20/07 9:29:00	1.33	-0.38	41.14	0.17	-0.16	
7/20/07 9:29:15	1.33	-2.28	41.49	0.17	-0.16	
7/20/07 9:29:30	1.33	-0.48	41.62	0.17	-0.15	
System Bias						
7/20/07 9:29:45	1.33	1.66	41.74	0.17	-0.16	SO ₂ Bias 5 Mid = 42.03
7/20/07 9:30:00	1.33	-0.23	41.90	0.17	-0.15	
7/20/07 9:30:15	1.21	-1.13	42.11	0.17	-0.15	
7/20/07 9:30:30	0.83	1.86	42.38	0.17	-0.16	
7/20/07 9:30:45	0.83	0.19	42.59	0.17	-0.16	
7/20/07 9:31:00	0.83	-2.28	42.87	0.17	-0.16	
7/20/07 9:31:15	0.83	-1.16	43.05	0.17	-0.15	
7/20/07 9:31:30	0.83	1.06	43.28	0.17	-0.18	
7/20/07 9:31:45	0.83	1.04	43.49	0.17	-0.15	
7/20/07 9:32:00	0.83	-1.03	43.58	0.17	-0.16	
7/20/07 9:32:15	0.96	4.36	43.47	0.17	-0.16	
7/20/07 9:32:30	1.58	28.39	42.73	0.17	-0.16	
7/20/07 9:32:45	2.46	36.51	41.26	0.17	-0.16	
7/20/07 9:33:00	2.33	35.24	38.49	0.17	-0.16	
7/20/07 9:33:15	1.21	27.10	34.22	0.17	-0.16	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 9:33:30	0.83	41.63	29.55	0.17	-0.16	
7/20/07 9:33:45	0.83	43.91	24.96	0.17	-0.15	
7/20/07 9:34:00	0.83	32.39	21.08	0.17	-0.16	
7/20/07 9:34:15	0.33	39.53	17.73	0.17	-0.16	
7/20/07 9:34:30	0.33	41.63	14.85	0.17	-0.16	
7/20/07 9:34:45	0.33	40.23	12.68	0.17	-0.16	
7/20/07 9:35:00	0.33	27.79	10.81	0.17	-0.16	
7/20/07 9:35:15	0.33	43.36	9.27	0.17	-0.15	
7/20/07 9:35:30	0.33	45.13	7.97	0.17	-0.16	
7/20/07 9:35:45	0.33	44.56	6.77	0.17	-0.16	System Bias CO Bias 5 Mid = 44.53
7/20/07 9:36:00	0.33	42.49	5.99	0.17	-0.16	
7/20/07 9:36:15	0.33	46.40	5.30	0.17	-0.16	
7/20/07 9:36:30	0.33	44.68	4.72	0.17	-0.16	
7/20/07 9:36:45	0.33	37.26	4.21	0.17	-0.15	
7/20/07 9:37:00	0.33	35.79	3.77	0.17	-0.16	
7/20/07 9:37:15	0.33	45.93	3.19	0.17	-0.16	
7/20/07 9:37:30	0.33	43.83	3.03	0.17	-0.16	
7/20/07 9:37:45	0.33	32.74	2.73	0.17	-0.13	
7/20/07 9:38:00	2.83	39.23	2.31	0.60	0.91	
7/20/07 9:38:15	10.95	26.84	2.36	1.01	1.10	
7/20/07 9:38:30	19.09	10.76	2.27	2.49	0.18	
7/20/07 9:38:45	13.71	-2.28	1.97	4.44	-0.10	
7/20/07 9:39:00	7.08	-0.03	1.90	4.95	-0.15	System Bias
7/20/07 9:39:15	1.21	2.54	1.76	5.03	-0.15	O ₂ Bias 5 Span = 5.06 NO _x Bias 5 Zero = 0.93 CO Bias 5 Zero = 0.43 SO ₂ Bias 5 Zero = 1.69
7/20/07 9:39:30	0.83	1.16	1.71	5.05	-0.16	
7/20/07 9:39:45	0.83	-2.28	1.67	5.07	-0.16	
7/20/07 9:40:00	0.83	0.32	1.62	5.08	-0.16	
7/20/07 9:40:15	0.71	1.19	1.42	5.09	-0.16	
7/20/07 9:40:30	0.33	0.52	1.44	5.11	-0.16	
7/20/07 9:40:45	0.33	-2.28	1.23	5.12	-0.16	
7/20/07 9:41:00	0.33	-0.13	1.30	5.12	-0.16	
7/20/07 9:41:15	0.56	2.49	1.44	5.13	-0.02	
7/20/07 9:41:30	1.71	-0.53	5.27	5.10	0.85	
7/20/07 9:41:45	3.71	-1.51	3.56	3.56	3.97	
7/20/07 9:42:00	3.71	1.06	0.97	1.32	6.98	
7/20/07 9:42:15	1.21	-1.01	0.84	0.39	8.31	
7/20/07 9:42:30	0.46	-2.28	0.86	0.22	9.63	
7/20/07 9:42:45	0.33	-1.33	0.72	0.20	9.70	System Bias
7/20/07 9:43:00	0.33	-0.18	0.70	0.19	9.73	CO ₂ Bias 5 Mid = 9.75
7/20/07 9:43:15	0.33	-0.71	0.72	0.18	9.76	
7/20/07 9:43:30	0.33	-2.13	0.72	0.18	9.75	
7/20/07 9:43:45	0.33	-1.46	0.79	0.18	9.75	
7/20/07 9:44:00	0.33	0.02	0.75	0.17	9.76	
7/20/07 9:44:15	0.33	-1.38	0.70	0.17	9.76	
7/20/07 9:44:30	0.33	-2.28	0.54	0.16	9.77	
7/20/07 9:44:45	0.33	-1.68	0.45	0.16	9.78	
7/20/07 9:45:00	0.33	-0.36	0.45	0.16	9.79	
7/20/07 9:45:15	0.33	-0.11	0.38	0.16	9.79	
7/20/07 9:45:30	-0.05	-2.28	0.38	0.80	9.13	
7/20/07 9:45:45	26.72	0.94	0.31	3.28	10.03	
7/20/07 9:46:00	53.73	-0.08	0.40	4.69	10.63	
7/20/07 9:46:15	76.61	-1.98	0.42	4.83	10.86	
7/20/07 9:46:30	78.86	-2.28	0.63	4.76	10.96	
7/20/07 9:46:45	79.36	0.84	0.72	4.72	11.02	
7/20/07 9:47:00	78.98	-0.13	1.04	4.71	11.02	
7/20/07 9:47:15	78.86	-1.61	1.81	4.71	11.01	
7/20/07 9:47:30	78.86	-2.28	2.52	4.72	11.00	
7/20/07 9:47:45	78.73	0.94	3.10	4.71	11.00	Begin Run 5
7/20/07 9:48:00	78.36	-0.38	3.65	4.71	10.99	
7/20/07 9:48:15	78.36	-0.41	4.09	4.70	10.98	
7/20/07 9:48:30	78.36	-2.28	4.42	4.68	10.99	
7/20/07 9:48:45	77.86	0.06	4.83	4.64	11.01	
7/20/07 9:49:00	77.86	-0.88	5.23	4.54	11.07	
7/20/07 9:49:15	77.36	-2.28	5.48	4.48	11.09	
7/20/07 9:49:30	77.36	-2.28	5.62	4.48	11.12	
7/20/07 9:49:45	77.36	-0.16	5.62	4.48	11.12	
7/20/07 9:50:00	76.98	0.22	5.60	4.51	11.09	
7/20/07 9:50:15	76.86	-2.28	5.67	4.56	11.05	
7/20/07 9:50:30	76.86	-1.98	5.83	4.59	11.02	
7/20/07 9:50:45	76.86	1.74	5.92	4.61	10.99	
7/20/07 9:51:00	76.86	0.86	6.03	4.62	11.00	
7/20/07 9:51:15	76.86	-2.28	6.12	4.63	10.98	
7/20/07 9:51:30	76.86	-0.56	5.99	4.64	10.97	
7/20/07 9:51:45	76.73	2.06	5.85	4.65	10.97	
7/20/07 9:52:00	76.36	0.22	5.62	4.63	10.95	
7/20/07 9:52:15	76.36	-2.28	5.20	4.53	11.01	
7/20/07 9:52:30	75.99	0.27	5.16	4.46	11.04	
7/20/07 9:52:45	75.86	1.39	5.18	4.44	11.04	
7/20/07 9:53:00	75.86	-0.26	5.04	4.46	11.02	
7/20/07 9:53:15	76.36	-2.28	4.95	4.58	10.90	
7/20/07 9:53:30	76.36	1.94	5.02	4.69	10.81	
7/20/07 9:53:45	76.86	2.79	4.97	4.75	10.76	
7/20/07 9:54:00	76.86	-0.58	4.79	4.79	10.75	
7/20/07 9:54:15	76.36	-2.28	4.74	4.83	10.70	
7/20/07 9:54:30	76.36	2.29	4.95	4.86	10.70	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 9:54:45	76.36	4.54	5.22	4.86	10.72	
7/20/07 9:55:00	76.36	1.91	5.48	4.79	10.80	
7/20/07 9:55:15	76.36	-0.03	5.48	4.68	10.91	
7/20/07 9:55:30	76.36	4.99	5.25	4.63	10.96	
7/20/07 9:55:45	76.49	5.34	5.23	4.61	11.00	
7/20/07 9:56:00	76.86	1.21	5.32	4.63	11.01	
7/20/07 9:56:15	76.86	0.27	5.30	4.71	10.98	
7/20/07 9:56:30	77.23	7.46	5.07	4.78	10.97	
7/20/07 9:56:45	77.36	6.24	4.77	4.81	10.95	
7/20/07 9:57:00	77.36	1.96	4.79	4.82	10.92	
7/20/07 9:57:15	76.86	0.54	4.70	4.82	10.93	
7/20/07 9:57:30	76.86	8.63	4.60	4.82	10.92	
7/20/07 9:57:45	76.86	7.01	4.44	4.81	10.95	
7/20/07 9:58:00	76.86	4.99	4.28	4.78	10.96	
7/20/07 9:58:15	76.98	0.79	4.14	4.76	11.01	
7/20/07 9:58:30	77.36	9.18	4.23	4.75	11.00	
7/20/07 9:58:45	77.36	8.53	4.26	4.75	11.00	
7/20/07 9:59:00	77.36	-0.46	4.21	4.78	11.00	
7/20/07 9:59:15	77.23	10.71	4.19	4.79	10.99	
7/20/07 9:59:30	76.86	10.71	4.19	4.79	11.01	
7/20/07 9:59:45	76.86	8.73	4.37	4.80	11.01	
7/20/07 10:00:00	76.86	-1.08	4.44	4.79	11.01	
7/20/07 10:00:15	76.86	11.41	4.42	4.77	11.01	
7/20/07 10:00:30	76.86	10.51	4.42	4.75	11.04	
7/20/07 10:00:45	76.86	6.94	4.40	4.74	11.04	
7/20/07 10:01:00	77.23	-1.01	4.40	4.80	10.99	
7/20/07 10:01:15	77.36	10.98	4.35	4.88	10.93	
7/20/07 10:01:30	77.73	9.86	4.58	4.91	10.90	
7/20/07 10:01:45	77.73	5.74	4.66	4.91	10.91	
7/20/07 10:02:00	77.36	-0.71	4.42	4.91	10.97	
7/20/07 10:02:15	77.36	11.48	4.16	4.89	11.00	
7/20/07 10:02:30	77.36	10.96	3.95	4.87	11.00	
7/20/07 10:02:45	77.86	3.86	4.00	4.84	11.00	
7/20/07 10:03:00	77.86	8.36	4.19	4.82	11.03	
7/20/07 10:03:15	77.86	10.61	4.53	4.78	11.07	
7/20/07 10:03:30	77.86	8.21	4.70	4.72	11.13	
7/20/07 10:03:45	77.86	3.64	4.77	4.64	11.15	
7/20/07 10:04:00	77.86	7.91	4.67	4.61	11.13	
7/20/07 10:04:15	77.86	9.93	4.51	4.61	11.13	
7/20/07 10:04:30	77.86	5.36	4.40	4.65	11.11	
7/20/07 10:04:45	77.86	1.09	4.51	4.76	11.00	
7/20/07 10:05:00	77.86	7.31	4.58	4.86	10.92	
7/20/07 10:05:15	77.86	10.18	4.58	4.90	10.84	
7/20/07 10:05:30	77.86	7.03	4.53	4.90	10.81	
7/20/07 10:05:45	77.98	0.27	4.58	4.91	10.82	
7/20/07 10:06:00	78.36	7.69	4.58	4.93	10.78	
7/20/07 10:06:15	78.36	9.13	4.63	4.97	10.75	
7/20/07 10:06:30	77.98	2.84	4.72	4.98	10.71	
7/20/07 10:06:45	78.36	0.97	4.76	4.96	10.73	
7/20/07 10:07:00	78.36	9.36	4.73	4.90	10.76	
7/20/07 10:07:15	78.86	9.03	4.58	4.81	10.87	
7/20/07 10:07:30	79.23	4.54	4.51	4.75	10.92	
7/20/07 10:07:45	79.36	0.69	4.30	4.73	10.90	
7/20/07 10:08:00	79.36	9.16	4.19	4.74	10.88	
7/20/07 10:08:15	79.86	6.81	4.14	4.81	10.82	
7/20/07 10:08:30	79.86	-0.53	4.05	4.94	10.77	
7/20/07 10:08:45	79.86	4.66	3.91	5.00	10.78	
7/20/07 10:09:00	79.86	10.43	3.63	5.02	10.76	
7/20/07 10:09:15	79.86	6.71	3.51	5.03	10.73	
7/20/07 10:09:30	79.86	-1.01	3.54	5.03	10.70	
7/20/07 10:09:45	80.11	9.98	3.35	5.02	10.72	
7/20/07 10:10:00	80.36	9.08	3.12	5.00	10.72	
7/20/07 10:10:15	80.36	5.46	3.01	5.02	10.74	
7/20/07 10:10:30	79.98	-2.03	3.12	5.00	10.76	
7/20/07 10:10:45	79.86	10.83	3.28	4.96	10.77	
7/20/07 10:11:00	80.24	9.48	3.44	4.86	10.80	
7/20/07 10:11:15	80.36	4.61	3.47	4.77	10.87	
7/20/07 10:11:30	80.36	-1.31	3.63	4.70	10.94	
7/20/07 10:11:45	80.61	9.28	3.70	4.66	10.99	
7/20/07 10:12:00	80.86	7.64	3.65	4.70	10.92	
7/20/07 10:12:15	81.11	-0.48	3.70	4.87	10.78	
7/20/07 10:12:30	80.86	8.06	3.61	5.00	10.71	
7/20/07 10:12:45	80.86	11.01	3.38	5.04	10.71	
7/20/07 10:13:00	80.86	10.48	3.31	5.03	10.74	
7/20/07 10:13:15	80.61	1.69	3.12	5.02	10.74	
7/20/07 10:13:30	80.36	8.88	2.96	5.01	10.75	
7/20/07 10:13:45	80.36	12.08	3.01	4.99	10.76	
7/20/07 10:14:00	80.36	9.61	2.99	4.95	10.79	
7/20/07 10:14:15	80.36	4.84	2.82	4.90	10.83	
7/20/07 10:14:30	80.36	14.28	2.59	4.83	10.89	
7/20/07 10:14:45	80.36	14.65	2.69	4.72	10.99	
7/20/07 10:15:00	80.36	7.53	2.57	4.67	11.02	
7/20/07 10:15:15	80.36	1.91	2.41	4.66	10.99	
7/20/07 10:15:30	80.74	13.46	2.22	4.67	10.95	
7/20/07 10:15:45	80.86	11.83	2.13	4.72	10.92	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 10:16:00	80.86	6.44	1.99	4.82	10.85	
7/20/07 10:16:15	80.86	1.59	2.01	4.89	10.79	
7/20/07 10:16:30	80.86	12.53	1.83	4.91	10.77	
7/20/07 10:16:45	81.11	9.76	1.83	4.90	10.77	
7/20/07 10:17:00	80.98	-0.81	1.85	4.90	10.77	
7/20/07 10:17:15	80.86	8.66	1.71	4.91	10.71	
7/20/07 10:17:30	80.86	11.43	1.84	4.93	10.68	
7/20/07 10:17:45	81.36	9.46	1.78	4.93	10.66	
7/20/07 10:18:00	81.36	-1.11	1.83	4.92	10.68	
7/20/07 10:18:15	81.86	11.96	1.88	4.91	10.71	
7/20/07 10:18:30	81.86	10.68	1.81	4.89	10.73	
7/20/07 10:18:45	82.11	6.49	1.64	4.84	10.76	
7/20/07 10:19:00	82.36	-1.01	1.64	4.77	10.77	
7/20/07 10:19:15	82.36	11.28	1.71	4.75	10.77	
7/20/07 10:19:30	82.74	10.01	1.76	4.75	10.76	
7/20/07 10:19:45	82.86	1.91	1.85	4.77	10.76	
7/20/07 10:20:00	82.86	5.59	1.69	4.88	10.66	
7/20/07 10:20:15	82.86	9.01	1.53	5.03	10.56	
7/20/07 10:20:30	82.86	7.36	1.55	5.10	10.50	
7/20/07 10:20:45	82.86	1.39	1.53	5.11	10.52	
7/20/07 10:21:00	82.86	6.94	1.51	5.11	10.55	
7/20/07 10:21:15	82.86	8.96	1.89	5.10	10.57	
7/20/07 10:21:30	82.86	6.49	1.55	5.10	10.55	
7/20/07 10:21:45	82.61	-0.63	1.62	5.13	10.51	
7/20/07 10:22:00	82.74	5.66	1.67	5.14	10.51	
7/20/07 10:22:15	82.86	6.78	1.81	5.13	10.51	
7/20/07 10:22:30	82.86	4.24	1.88	5.07	10.57	
7/20/07 10:22:45	83.36	-0.48	1.81	4.96	10.63	
7/20/07 10:23:00	83.36	4.09	1.85	4.87	10.66	
7/20/07 10:23:15	83.61	5.34	1.97	4.84	10.67	
7/20/07 10:23:30	83.86	-0.43	2.11	4.84	10.68	
7/20/07 10:23:45	84.12	-0.43	2.16	4.87	10.66	
7/20/07 10:24:00	84.37	5.34	2.25	4.97	10.61	
7/20/07 10:24:15	84.11	3.56	2.31	5.09	10.52	
7/20/07 10:24:30	83.86	-1.31	2.45	5.14	10.49	
7/20/07 10:24:45	83.86	-0.51	2.64	5.15	10.51	
7/20/07 10:25:00	83.86	5.04	2.85	5.14	10.53	
7/20/07 10:25:15	83.86	2.76	2.90	5.14	10.54	
7/20/07 10:25:30	83.86	-1.81	2.89	5.15	10.51	
7/20/07 10:25:45	83.86	-0.61	2.96	5.16	10.50	
7/20/07 10:26:00	83.86	3.04	2.90	5.17	10.50	
7/20/07 10:26:15	83.86	-0.12	3.01	5.17	10.50	
7/20/07 10:26:30	83.86	-2.28	3.17	5.12	10.55	
7/20/07 10:26:45	83.86	4.04	3.12	5.06	10.58	
7/20/07 10:27:00	83.86	2.16	3.05	5.02	10.62	
7/20/07 10:27:15	83.86	-0.88	3.15	5.01	10.65	
7/20/07 10:27:30	83.87	-2.28	3.15	5.03	10.63	
7/20/07 10:27:45	83.86	3.47	3.26	5.10	10.56	
7/20/07 10:28:00	83.86	3.26	3.35	5.22	10.48	
7/20/07 10:28:15	83.61	-2.28	3.29	5.29	10.48	
7/20/07 10:28:30	83.36	1.39	3.40	5.30	10.49	
7/20/07 10:28:45	83.36	2.81	3.56	5.28	10.51	
7/20/07 10:29:00	83.36	1.04	3.58	5.26	10.52	
7/20/07 10:29:15	83.36	-2.28	3.70	5.25	10.53	
7/20/07 10:29:30	83.36	2.66	3.70	5.24	10.56	
7/20/07 10:29:45	83.36	3.36	3.91	5.22	10.58	
7/20/07 10:30:00	83.36	1.09	4.09	5.13	10.65	
7/20/07 10:30:15	83.11	-2.28	4.33	4.97	10.77	
7/20/07 10:30:30	82.86	2.66	4.26	4.85	10.81	
7/20/07 10:30:45	83.11	3.51	4.30	4.78	10.84	
7/20/07 10:31:00	82.99	-0.63	4.31	4.74	10.87	
7/20/07 10:31:15	82.86	1.36	4.35	4.73	10.84	
7/20/07 10:31:30	82.86	4.26	4.33	4.78	10.80	
7/20/07 10:31:45	82.86	2.61	4.33	4.85	10.77	
7/20/07 10:32:00	82.86	0.14	4.30	4.88	10.74	
7/20/07 10:32:15	82.11	1.16	4.35	4.89	10.71	
7/20/07 10:32:30	81.86	2.81	4.42	4.89	10.70	
7/20/07 10:32:45	81.87	1.41	4.28	4.86	10.71	
7/20/07 10:33:00	81.88	-1.96	4.35	4.84	10.72	
7/20/07 10:33:15	81.88	4.01	4.26	4.85	10.69	
7/20/07 10:33:30	81.86	5.14	4.65	4.87	10.66	
7/20/07 10:33:45	81.61	-0.78	4.63	4.85	10.72	
7/20/07 10:34:00	81.36	-2.28	4.56	4.76	10.76	
7/20/07 10:34:15	81.36	4.66	4.42	4.70	10.76	
7/20/07 10:34:30	81.49	5.09	4.49	4.68	10.76	
7/20/07 10:34:45	81.86	0.82	4.49	4.67	10.75	
7/20/07 10:35:00	82.24	-1.68	4.63	4.72	10.76	
7/20/07 10:35:15	82.36	6.76	4.77	4.79	10.69	
7/20/07 10:35:30	82.36	6.88	4.54	4.84	10.65	
7/20/07 10:35:45	82.36	-2.28	4.47	4.86	10.61	
7/20/07 10:36:00	82.36	5.36	4.26	4.88	10.59	
7/20/07 10:36:15	82.36	7.31	4.38	4.89	10.58	
7/20/07 10:36:30	82.36	3.56	4.38	4.89	10.60	
7/20/07 10:36:45	82.36	-2.28	4.58	4.89	10.60	
7/20/07 10:37:00	82.74	5.81	4.61	4.89	10.59	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 10:37:15	82.86	6.86	4.65	4.87	10.58	
7/20/07 10:37:30	82.86	2.79	4.72	4.85	10.56	
7/20/07 10:37:45	82.86	-1.23	4.75	4.84	10.55	
7/20/07 10:38:00	82.99	4.99	4.77	4.84	10.57	
7/20/07 10:38:15	83.36	6.31	4.84	4.89	10.53	
7/20/07 10:38:30	83.74	-0.23	4.91	4.98	10.46	
7/20/07 10:38:45	83.86	2.91	4.81	5.03	10.43	
7/20/07 10:39:00	83.86	7.74	4.95	5.04	10.43	
7/20/07 10:39:15	83.87	4.06	4.81	5.04	10.41	
7/20/07 10:39:30	83.87	-0.16	4.77	5.03	10.39	
7/20/07 10:39:45	83.86	2.91	4.79	5.05	10.39	
7/20/07 10:40:00	84.24	7.43	4.86	5.05	10.37	
7/20/07 10:40:15	84.37	3.41	4.91	5.01	10.47	
7/20/07 10:40:30	84.37	-2.28	4.88	4.90	10.56	
7/20/07 10:40:45	84.12	7.76	5.07	4.80	10.59	
7/20/07 10:41:00	84.24	6.29	5.02	4.77	10.60	
7/20/07 10:41:15	84.37	1.12	4.88	4.76	10.60	
7/20/07 10:41:30	84.38	-2.28	5.00	4.77	10.60	
7/20/07 10:41:45	84.62	3.61	26.22	4.85	10.49	
7/20/07 10:42:00	85.01	1.52	88.61	4.99	10.38	
7/20/07 10:42:15	85.37	-2.23	15.60	5.12	10.25	
7/20/07 10:42:30	85.37	-2.26	5.58	5.26	10.08	
7/20/07 10:42:45	85.12	1.92	4.98	5.38	9.98	
7/20/07 10:43:00	84.87	3.09	4.86	5.45	9.98	
7/20/07 10:43:15	84.62	-2.28	4.88	5.48	10.07	
7/20/07 10:43:30	84.24	0.72	4.86	5.49	10.20	
7/20/07 10:43:45	83.86	1.76	4.86	5.49	10.32	
7/20/07 10:44:00	83.86	-0.76	4.84	5.44	10.45	
7/20/07 10:44:15	83.86	-2.28	4.72	5.35	10.56	
7/20/07 10:44:30	83.86	0.87	4.79	5.31	10.62	
7/20/07 10:44:45	83.86	0.67	4.75	5.30	10.69	
7/20/07 10:45:00	83.49	-1.46	4.82	5.32	10.71	
7/20/07 10:45:15	83.36	-2.28	4.88	5.40	10.67	
7/20/07 10:45:30	82.99	0.34	4.95	5.49	10.59	
7/20/07 10:45:45	82.91	-0.88	4.75	5.53	10.54	
7/20/07 10:46:00	82.49	-2.28	4.72	5.54	10.54	
7/20/07 10:46:15	82.36	-0.38	9.73	5.55	10.55	
7/20/07 10:46:30	82.16	-0.21	11.88	5.55	10.57	
7/20/07 10:46:45	82.38	-0.53	5.19	5.56	10.57	
7/20/07 10:47:00	82.00	-2.28	4.75	5.56	10.56	
7/20/07 10:47:15	81.86	-0.78	4.33	5.49	10.62	
7/20/07 10:47:30	81.86	0.79	4.51	5.34	10.74	
7/20/07 10:47:45	81.86	-1.23	4.58	5.19	10.83	End Run 5
7/20/07 10:48:00	81.49	6.64	4.84	5.12	10.86	
7/20/07 10:48:15	78.86	15.95	4.86	4.77	10.34	
7/20/07 10:48:30	67.36	14.06	5.30	2.60	6.64	
7/20/07 10:48:45	30.59	1.27	10.91	0.98	2.43	
7/20/07 10:49:00	9.83	-2.28	20.25	0.36	2.15	
7/20/07 10:49:15	2.58	0.82	19.66	0.25	5.67	
7/20/07 10:49:30	1.58	-0.33	16.73	0.20	7.83	
7/20/07 10:49:45	1.08	-2.28	18.01	0.18	8.61	
7/20/07 10:50:00	0.83	-2.28	21.37	0.18	9.75	
7/20/07 10:50:15	0.83	0.82	22.45	0.17	9.77	System Bias
7/20/07 10:50:30	0.71	0.09	22.27	0.17	9.80	CO ₂ Bias 6 Mid = 9.81
7/20/07 10:50:45	0.33	-2.28	21.11	0.17	9.80	
7/20/07 10:51:00	0.33	-0.56	18.57	0.16	9.81	
7/20/07 10:51:15	0.33	0.51	15.82	0.16	9.82	
7/20/07 10:51:30	0.33	-1.36	13.42	0.16	9.82	
7/20/07 10:51:45	0.33	-2.28	11.49	0.16	9.81	
7/20/07 10:52:00	0.33	0.04	9.92	0.16	9.82	
7/20/07 10:52:15	0.33	0.32	8.58	0.15	9.82	
7/20/07 10:52:30	0.33	-1.61	7.48	0.15	9.82	
7/20/07 10:52:45	0.33	-2.28	6.92	0.15	9.82	
7/20/07 10:53:00	0.33	0.57	6.68	0.15	9.83	
7/20/07 10:53:15	0.33	-1.23	5.21	0.15	9.84	
7/20/07 10:53:30	0.33	-2.28	4.51	0.15	9.83	
7/20/07 10:53:45	0.33	0.17	4.10	0.15	9.82	
7/20/07 10:54:00	0.33	2.31	3.79	0.15	6.85	
7/20/07 10:54:15	9.56	-0.38	3.70	0.18	2.90	
7/20/07 10:54:30	41.84	-2.28	4.28	0.19	0.61	
7/20/07 10:54:45	93.62	0.32	4.33	0.19	0.12	
7/20/07 10:55:00	137.12	2.31	3.47	0.18	0.01	
7/20/07 10:55:15	168.38	-0.13	2.57	0.18	-0.03	
7/20/07 10:55:30	193.89	-2.28	1.81	0.18	-0.05	System Bias
7/20/07 10:55:45	198.64	1.96	1.47	0.18	-0.06	NO _x Bias 6 Mid = 194.14
7/20/07 10:56:00	195.90	1.84	1.44	0.18	-0.07	O ₂ Bias 6 Zero = 0.18
7/20/07 10:56:15	192.15	-1.83	1.33	0.18	-0.07	CO ₂ Bias 6 Zero = -0.07
7/20/07 10:56:30	189.89	-2.28	1.16	0.18	-0.08	SO ₂ Bias 6 Zero = 1.35
7/20/07 10:56:45	189.39	2.26	1.14	0.18	-0.09	
7/20/07 10:57:00	189.52	3.26	0.95	0.18	-0.09	
7/20/07 10:57:15	190.14	-2.28	0.79	0.18	-0.10	
7/20/07 10:57:30	191.27	1.91	0.82	0.18	-0.10	
7/20/07 10:57:45	193.65	1.51	0.79	0.18	-0.10	
7/20/07 10:58:00	196.52	-1.58	0.45	0.18	-0.11	
7/20/07 10:58:15	197.15	-2.28	0.56	0.18	-0.11	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 10:58:30	177.77	2.81	0.61	0.18	-0.11	
7/20/07 10:58:45	85.86	17.45	0.50	0.17	-0.11	
7/20/07 10:59:00	43.70	28.37	0.61	0.17	-0.10	
7/20/07 10:59:15	31.60	35.39	0.63	0.18	-0.09	
7/20/07 10:59:30	18.71	47.38	0.77	0.18	-0.11	
7/20/07 10:59:45	9.33	46.33	0.95	0.18	-0.11	System Bias CO Bias 6 Mid = 46.06
7/20/07 11:00:00	4.95	44.36	1.19	0.18	-0.12	
7/20/07 11:00:15	3.84	45.79	1.35	0.18	-0.12	
7/20/07 11:00:30	3.21	47.76	1.35	0.18	-0.12	
7/20/07 11:00:45	2.83	43.08	1.42	0.18	-0.12	
7/20/07 11:01:00	2.71	33.02	1.42	0.18	-0.12	
7/20/07 11:01:15	2.34	49.23	1.30	0.17	-0.12	
7/20/07 11:01:30	2.33	48.33	1.16	0.17	-0.12	
7/20/07 11:01:45	2.08	43.88	1.14	0.17	-0.13	
7/20/07 11:02:00	1.83	36.53	1.12	0.17	-0.13	
7/20/07 11:02:15	1.83	52.83	1.10	0.17	-0.13	
7/20/07 11:02:30	1.83	54.77	1.12	0.17	-0.13	
7/20/07 11:02:45	1.58	26.15	0.91	0.17	0.51	
7/20/07 11:03:00	13.84	11.28	0.68	0.16	4.49	
7/20/07 11:03:15	17.84	3.46	0.57	0.15	7.79	
7/20/07 11:03:30	8.08	-1.21	0.63	0.15	9.33	
7/20/07 11:03:45	3.83	-2.28	0.82	0.14	9.63	
7/20/07 11:04:00	1.71	0.59	0.73	0.14	9.69	
7/20/07 11:04:15	1.33	0.47	0.66	0.14	9.73	
7/20/07 11:04:30	1.33	-1.53	0.52	0.14	9.75	
7/20/07 11:04:45	1.33	-0.98	0.57	0.14	9.76	
7/20/07 11:05:00	1.33	0.84	0.64	0.14	9.75	
7/20/07 11:05:15	1.33	0.02	0.47	0.14	9.77	
7/20/07 11:05:30	1.33	-1.76	0.52	0.14	9.78	
7/20/07 11:05:45	1.33	7.96	0.45	0.14	9.79	
7/20/07 11:06:00	0.83	18.15	0.38	0.14	9.77	
7/20/07 11:06:15	1.33	7.91	0.57	0.15	7.66	
7/20/07 11:06:30	2.09	-1.41	0.73	0.16	3.10	
7/20/07 11:06:45	3.59	0.52	2.78	0.17	0.58	
7/20/07 11:07:00	2.58	1.49	11.30	0.17	0.09	
7/20/07 11:07:15	1.83	-1.98	23.24	0.17	-0.01	
7/20/07 11:07:30	1.46	-0.81	32.33	0.17	-0.04	
7/20/07 11:07:45	1.83	2.81	37.64	0.17	-0.06	
7/20/07 11:08:00	1.83	0.62	40.39	0.17	-0.07	
7/20/07 11:08:15	1.83	-2.28	41.43	0.17	-0.08	
7/20/07 11:08:30	1.83	-0.93	42.09	0.17	-0.09	
7/20/07 11:08:45	1.83	1.96	42.53	0.17	-0.10	
7/20/07 11:09:00	1.71	0.19	42.67	0.17	-0.10	
7/20/07 11:09:15	1.33	-2.28	42.85	0.17	-0.10	System Bias
7/20/07 11:09:30	1.33	1.47	42.97	0.17	-0.11	SO ₂ Bias 6 Mid = 43.12
7/20/07 11:09:45	1.33	2.02	43.03	0.17	-0.11	
7/20/07 11:10:00	1.33	-0.83	43.15	0.17	-0.11	
7/20/07 11:10:15	1.33	-2.28	43.34	0.17	-0.11	
7/20/07 11:10:30	1.33	0.47	43.41	0.17	-0.12	
7/20/07 11:10:45	1.33	0.87	43.75	0.25	0.25	
7/20/07 11:11:00	9.33	-1.76	45.55	1.07	1.95	
7/20/07 11:11:15	12.83	0.62	50.38	1.28	1.33	
7/20/07 11:11:30	9.83	2.34	54.39	3.22	0.31	
7/20/07 11:11:45	4.33	-0.53	53.10	4.69	-0.03	System Bias
7/20/07 11:12:00	1.21	-2.28	47.40	4.99	-0.10	O ₂ Bias 6 Mid = 5.02 NO _x Bias 6 Zero = 0.93 CO Bias 6 Zero = -1.02
7/20/07 11:12:15	0.83	0.22	40.18	5.03	-0.11	
7/20/07 11:12:30	0.83	0.27	33.40	5.04	-0.12	
7/20/07 11:12:45	0.83	-2.28	27.85	5.04	-0.12	
7/20/07 11:13:00	0.83	-0.86	23.07	5.06	-0.13	
7/20/07 11:13:15	0.83	2.86	18.76	5.08	-0.13	
7/20/07 11:13:30	0.83	0.87	15.13	5.10	-0.13	
7/20/07 11:13:45	0.83	-2.28	12.27	5.11	-0.13	
7/20/07 11:14:00	0.83	-1.13	9.90	5.12	-0.13	
7/20/07 11:14:15	0.83	2.07	8.16	5.12	-0.13	
7/20/07 11:14:30	3.46	2.69	0.56	5.09	1.68	
7/20/07 11:14:45	17.59	-2.28	-35.03	4.98	6.30	
7/20/07 11:15:00	46.97	3.24	0.64	4.89	9.36	
7/20/07 11:15:15	64.86	3.56	6.11	4.84	10.64	
7/20/07 11:15:30	73.98	1.54	7.19	4.89	10.84	
7/20/07 11:15:45	74.61	-1.73	8.03	4.99	10.80	
7/20/07 11:16:00	74.98	3.31	8.51	5.04	10.80	
7/20/07 11:16:15	75.11	4.16	8.88	5.05	10.79	
7/20/07 11:16:30	74.86	-0.36	8.99	5.05	10.80	
7/20/07 11:16:45	74.86	1.96	8.93	5.03	10.82	Begin Run 6
7/20/07 11:17:00	74.86	5.01	8.81	5.02	10.83	
7/20/07 11:17:15	74.86	3.31	8.70	4.95	10.87	
7/20/07 11:17:30	74.86	0.49	8.42	4.87	10.94	
7/20/07 11:17:45	74.86	3.11	8.40	4.80	11.03	
7/20/07 11:18:00	74.86	7.01	8.26	4.75	11.14	
7/20/07 11:18:15	74.61	2.96	8.03	4.75	11.21	
7/20/07 11:18:30	74.48	0.77	7.77	4.87	11.17	
7/20/07 11:18:45	74.86	7.31	7.61	5.01	11.12	
7/20/07 11:19:00	74.86	6.59	7.43	5.10	11.07	
7/20/07 11:19:15	74.61	3.56	7.22	5.18	10.94	
7/20/07 11:19:30	73.86	0.74	7.01	5.16	10.88	

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ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 11:19:45	74.11	6.41	6.89	5.10	10.87	
7/20/07 11:20:00	74.36	4.41	6.75	5.03	10.88	
7/20/07 11:20:15	74.36	-2.28	6.57	4.92	10.92	
7/20/07 11:20:30	74.36	4.16	6.34	4.77	10.99	
7/20/07 11:20:45	74.36	5.66	6.32	4.65	11.04	
7/20/07 11:21:00	74.86	1.19	6.11	4.62	11.08	
7/20/07 11:21:15	74.86	-1.48	5.97	4.61	11.12	
7/20/07 11:21:30	74.86	5.24	5.93	4.66	11.12	
7/20/07 11:21:45	74.86	8.26	5.88	4.76	11.07	
7/20/07 11:22:00	74.86	1.96	5.90	4.81	11.08	
7/20/07 11:22:15	74.86	4.51	5.77	4.80	11.13	
7/20/07 11:22:30	74.73	11.33	5.63	4.77	11.16	
7/20/07 11:22:45	74.36	10.41	5.53	4.75	11.15	
7/20/07 11:23:00	74.36	5.51	5.47	4.74	11.13	
7/20/07 11:23:15	74.36	7.06	5.37	4.70	11.15	
7/20/07 11:23:30	74.36	13.41	5.39	4.64	11.19	
7/20/07 11:23:45	74.11	10.11	5.30	4.57	11.23	
7/20/07 11:24:00	73.86	4.69	5.23	4.53	11.23	
7/20/07 11:24:15	74.11	15.45	5.23	4.53	11.22	
7/20/07 11:24:30	74.36	13.73	5.14	4.55	11.18	
7/20/07 11:24:45	74.36	9.86	5.09	4.64	11.10	
7/20/07 11:25:00	74.86	5.34	5.12	4.69	11.06	
7/20/07 11:25:15	74.86	17.15	5.32	4.69	11.03	
7/20/07 11:25:30	74.86	15.70	5.19	4.67	11.00	
7/20/07 11:25:45	74.86	6.01	4.93	4.65	10.97	
7/20/07 11:26:00	74.86	16.13	4.89	4.63	10.97	
7/20/07 11:26:15	74.86	20.45	4.96	4.60	10.99	
7/20/07 11:26:30	74.98	14.20	4.82	4.59	10.98	
7/20/07 11:26:45	75.36	7.71	4.86	4.67	10.90	
7/20/07 11:27:00	75.36	16.20	4.93	4.79	10.82	
7/20/07 11:27:15	75.74	21.10	4.98	4.84	10.76	
7/20/07 11:27:30	75.86	14.33	4.86	4.85	10.74	
7/20/07 11:27:45	75.86	12.41	4.70	4.89	10.71	
7/20/07 11:28:00	75.86	23.47	4.75	4.90	10.70	
7/20/07 11:28:15	75.86	24.45	4.52	4.80	10.76	
7/20/07 11:28:30	75.98	18.13	4.72	4.63	10.88	
7/20/07 11:28:45	76.36	18.65	4.82	4.50	10.96	
7/20/07 11:29:00	76.36	26.92	4.70	4.45	11.00	
7/20/07 11:29:15	76.36	23.40	4.63	4.43	11.01	
7/20/07 11:29:30	76.86	15.40	4.56	4.49	10.94	
7/20/07 11:29:45	77.23	23.30	4.47	4.68	10.79	
7/20/07 11:30:00	77.36	25.47	4.52	4.82	10.71	
7/20/07 11:30:15	77.36	21.35	4.59	4.86	10.71	
7/20/07 11:30:30	76.98	12.31	4.52	4.87	10.73	
7/20/07 11:30:45	77.36	26.44	4.56	4.86	10.71	
7/20/07 11:31:00	77.36	22.75	4.63	4.83	10.71	
7/20/07 11:31:15	77.36	18.45	4.73	4.82	10.75	
7/20/07 11:31:30	77.86	15.05	4.79	4.80	10.78	
7/20/07 11:31:45	78.23	25.84	4.47	4.78	10.80	
7/20/07 11:32:00	77.86	22.67	4.40	4.73	10.83	
7/20/07 11:32:15	77.86	12.71	4.31	4.66	10.85	
7/20/07 11:32:30	78.36	20.87	4.45	4.62	10.87	
7/20/07 11:32:45	78.36	23.35	4.61	4.60	10.87	
7/20/07 11:33:00	78.36	17.88	4.77	4.59	10.87	
7/20/07 11:33:15	78.36	9.16	4.77	4.63	10.83	
7/20/07 11:33:30	78.36	16.15	4.91	4.75	10.73	
7/20/07 11:33:45	78.73	18.60	4.93	4.82	10.68	
7/20/07 11:34:00	78.86	11.61	5.07	4.85	10.67	
7/20/07 11:34:15	78.86	11.46	4.87	4.85	10.69	
7/20/07 11:34:30	78.86	21.95	4.54	4.85	10.71	
7/20/07 11:34:45	78.86	19.20	4.33	4.86	10.75	
7/20/07 11:35:00	78.86	14.04	4.03	4.82	10.78	
7/20/07 11:35:15	78.86	16.25	3.89	4.78	10.78	
7/20/07 11:35:30	79.36	21.64	3.84	4.75	10.79	
7/20/07 11:35:45	79.36	16.30	3.91	4.71	10.83	
7/20/07 11:36:00	79.36	8.15	3.84	4.68	10.84	
7/20/07 11:36:15	79.73	20.85	3.89	4.76	10.77	
7/20/07 11:36:30	79.86	18.70	3.98	4.86	10.68	
7/20/07 11:36:45	79.86	14.41	3.98	4.90	10.64	
7/20/07 11:37:00	79.86	6.22	3.98	4.91	10.62	
7/20/07 11:37:15	79.86	19.65	3.96	4.92	10.60	
7/20/07 11:37:30	79.86	14.48	3.94	4.90	10.62	
7/20/07 11:37:45	79.86	5.26	3.98	4.83	10.63	
7/20/07 11:38:00	79.86	20.98	4.10	4.75	10.69	
7/20/07 11:38:15	79.86	19.90	4.12	4.67	10.75	
7/20/07 11:38:30	79.86	14.18	4.29	4.60	10.80	
7/20/07 11:38:45	80.23	6.81	4.59	4.55	10.83	
7/20/07 11:39:00	80.36	19.25	4.49	4.54	10.79	
7/20/07 11:39:15	80.73	17.70	4.49	4.64	10.69	
7/20/07 11:39:30	80.86	7.49	4.54	4.78	10.82	
7/20/07 11:39:45	80.86	8.01	4.49	4.84	10.60	
7/20/07 11:40:00	80.86	17.45	4.47	4.85	10.60	
7/20/07 11:40:15	80.86	13.71	4.47	4.85	10.58	
7/20/07 11:40:30	80.88	7.41	4.73	4.86	10.56	
7/20/07 11:40:45	80.86	7.81	4.63	4.88	10.55	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 11:41:00	81.38	15.18	4.66	4.90	10.54	
7/20/07 11:41:15	81.36	9.61	4.56	4.89	10.57	
7/20/07 11:41:30	81.86	2.24	4.56	4.88	10.58	
7/20/07 11:41:45	82.23	14.96	4.43	4.86	10.58	
7/20/07 11:42:00	82.36	11.63	4.45	4.81	10.60	
7/20/07 11:42:15	82.36	6.91	4.45	4.77	10.61	
7/20/07 11:42:30	82.36	1.19	4.40	4.75	10.63	
7/20/07 11:42:45	82.74	11.16	4.47	4.73	10.63	
7/20/07 11:43:00	82.86	7.54	4.61	4.75	10.63	
7/20/07 11:43:15	82.88	1.17	4.73	4.85	10.54	
7/20/07 11:43:30	82.86	11.38	4.84	4.95	10.47	
7/20/07 11:43:45	82.86	10.41	4.82	4.99	10.46	
7/20/07 11:44:00	82.86	5.44	4.70	5.00	10.45	
7/20/07 11:44:15	82.86	0.87	4.86	5.00	10.46	
7/20/07 11:44:30	82.86	10.63	4.91	5.01	10.48	
7/20/07 11:44:45	82.86	8.11	5.33	5.01	10.44	
7/20/07 11:45:00	82.74	-0.41	5.84	5.01	10.43	
7/20/07 11:45:15	82.74	2.41	5.93	5.01	10.42	
7/20/07 11:45:30	82.86	8.33	5.86	5.01	10.44	
7/20/07 11:45:45	83.24	7.46	5.74	4.96	10.51	
7/20/07 11:46:00	83.36	1.02	5.88	4.86	10.60	
7/20/07 11:46:15	83.36	2.86	5.72	4.77	10.64	
7/20/07 11:46:30	83.36	5.14	5.44	4.73	10.66	
7/20/07 11:46:45	83.74	-0.78	5.51	4.72	10.66	
7/20/07 11:47:00	83.86	0.42	5.54	4.72	10.65	
7/20/07 11:47:15	83.86	7.16	5.65	4.77	10.60	
7/20/07 11:47:30	83.86	6.61	5.77	4.90	10.53	
7/20/07 11:47:45	83.86	2.52	5.86	4.98	10.49	
7/20/07 11:48:00	83.24	0.67	5.67	5.01	10.47	
7/20/07 11:48:15	82.86	8.76	5.44	5.01	10.45	
7/20/07 11:48:30	82.86	6.89	5.14	5.01	10.45	
7/20/07 11:48:45	82.86	-0.43	5.21	5.00	10.42	
7/20/07 11:49:00	82.86	8.14	5.23	5.00	10.42	
7/20/07 11:49:15	82.86	7.21	5.21	5.00	10.42	
7/20/07 11:49:30	83.36	1.77	5.21	4.98	10.44	
7/20/07 11:49:45	83.36	-0.63	5.21	4.95	10.49	
7/20/07 11:50:00	83.36	8.69	5.37	4.87	10.57	
7/20/07 11:50:15	83.36	6.41	5.47	4.76	10.62	
7/20/07 11:50:30	82.86	0.04	5.74	4.73	10.63	
7/20/07 11:50:45	82.86	3.86	6.04	4.71	10.62	
7/20/07 11:51:00	82.74	9.16	5.90	4.66	10.60	
7/20/07 11:51:15	82.36	5.36	5.54	4.64	10.60	
7/20/07 11:51:30	82.50	0.44	5.31	4.70	10.58	
7/20/07 11:51:45	82.86	9.71	5.26	4.75	10.59	
7/20/07 11:52:00	82.67	8.69	5.32	4.76	10.58	
7/20/07 11:52:15	82.36	6.71	5.37	4.76	10.57	
7/20/07 11:52:30	82.36	1.32	5.44	4.76	10.53	
7/20/07 11:52:45	82.36	11.71	5.67	4.75	10.51	
7/20/07 11:53:00	82.36	9.81	5.72	4.75	10.47	
7/20/07 11:53:15	82.36	6.86	5.97	4.73	10.49	
7/20/07 11:53:30	82.36	2.22	6.04	4.71	10.54	
7/20/07 11:53:45	82.36	15.35	5.86	4.66	10.60	
7/20/07 11:54:00	82.36	7.71	5.60	4.58	10.66	
7/20/07 11:54:15	82.36	3.31	5.28	4.53	10.65	
7/20/07 11:54:30	82.11	16.90	4.98	4.53	10.65	
7/20/07 11:54:45	81.86	16.05	4.80	4.53	10.64	
7/20/07 11:55:00	82.36	10.78	4.59	4.55	10.61	
7/20/07 11:55:15	82.36	9.26	4.43	4.63	10.57	
7/20/07 11:55:30	82.36	18.75	4.01	4.77	10.48	
7/20/07 11:55:45	82.36	14.36	3.82	4.84	10.45	
7/20/07 11:56:00	82.36	8.96	3.96	4.85	10.43	
7/20/07 11:56:15	82.36	8.71	3.96	4.84	10.41	
7/20/07 11:56:30	82.36	20.28	4.13	4.84	10.40	
7/20/07 11:56:45	82.36	14.41	4.36	4.82	10.40	
7/20/07 11:57:00	82.36	11.73	28.43	4.80	10.39	
7/20/07 11:57:15	82.36	14.50	12.71	4.71	10.43	
7/20/07 11:57:30	82.36	19.35	4.84	4.58	10.51	
7/20/07 11:57:45	82.36	14.66	5.21	4.50	10.54	
7/20/07 11:58:00	82.36	5.91	6.04	4.48	10.58	
7/20/07 11:58:15	82.36	22.05	4.70	4.48	10.59	
7/20/07 11:58:30	82.86	16.88	4.96	4.51	10.56	
7/20/07 11:58:45	82.86	13.36	5.28	4.63	10.46	
7/20/07 11:59:00	82.86	7.19	5.30	4.74	10.37	
7/20/07 11:59:15	83.24	21.45	5.30	4.79	10.34	
7/20/07 11:59:30	83.36	15.50	5.47	4.80	10.31	
7/20/07 11:59:45	83.36	5.56	5.60	4.80	10.30	
7/20/07 12:00:00	83.36	20.03	5.79	4.79	10.29	
7/20/07 12:00:15	83.36	18.80	5.86	4.78	10.28	
7/20/07 12:00:30	83.36	13.46	5.81	4.79	10.24	
7/20/07 12:00:45	83.74	6.51	5.63	4.81	10.18	
7/20/07 12:01:00	83.87	21.15	5.65	4.81	10.20	
7/20/07 12:01:15	83.86	20.15	5.77	4.78	10.22	
7/20/07 12:01:30	83.87	10.76	5.84	4.72	10.31	
7/20/07 12:01:45	83.86	10.01	5.93	4.63	10.38	
7/20/07 12:02:00	84.12	17.35	5.91	4.58	10.42	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 12:02:15	84.37	15.55	5.95	4.57	10.37	
7/20/07 12:02:30	84.87	6.04	6.18	4.58	10.36	
7/20/07 12:02:45	84.87	7.06	6.62	4.63	10.31	
7/20/07 12:03:00	85.12	15.06	7.29	4.75	10.25	
7/20/07 12:03:15	85.37	11.11	8.05	4.83	10.22	
7/20/07 12:03:30	85.37	1.99	8.12	4.87	10.21	
7/20/07 12:03:45	85.00	14.46	7.73	4.89	10.19	
7/20/07 12:04:00	84.62	11.81	6.97	4.90	10.11	
7/20/07 12:04:15	84.75	7.96	5.89	4.91	10.13	
7/20/07 12:04:30	84.62	1.54	4.54	4.82	10.26	
7/20/07 12:04:45	85.25	13.36	3.36	4.72	10.34	
7/20/07 12:05:00	85.37	9.98	2.53	4.67	10.35	
7/20/07 12:05:15	85.37	7.36	2.05	4.66	10.34	
7/20/07 12:05:30	85.63	1.12	1.70	4.67	10.34	
7/20/07 12:05:45	85.87	10.11	1.49	4.74	10.29	
7/20/07 12:06:00	85.87	8.44	1.45	4.86	10.23	
7/20/07 12:06:15	85.87	1.02	1.35	4.95	10.18	
7/20/07 12:06:30	85.87	11.78	1.26	4.98	10.15	
7/20/07 12:06:45	85.50	10.06	1.33	4.98	10.14	
7/20/07 12:07:00	85.37	5.11	1.38	4.98	10.13	
7/20/07 12:07:15	85.37	0.07	1.31	4.98	10.12	
7/20/07 12:07:30	85.37	10.53	1.45	4.97	10.12	
7/20/07 12:07:45	85.00	10.06	1.45	4.96	10.14	
7/20/07 12:08:00	85.37	-1.31	1.38	4.93	10.14	
7/20/07 12:08:15	85.37	4.01	1.42	4.83	10.22	
7/20/07 12:08:30	85.87	8.93	1.52	4.72	10.31	
7/20/07 12:08:45	85.87	8.36	1.72	4.65	10.35	
7/20/07 12:09:00	85.87	0.79	1.79	4.63	10.38	
7/20/07 12:09:15	85.87	4.27	1.86	4.63	10.38	
7/20/07 12:09:30	85.87	9.93	1.95	4.65	10.33	
7/20/07 12:09:45	85.87	3.37	2.23	4.75	10.25	
7/20/07 12:10:00	85.87	0.74	2.37	4.82	10.22	
7/20/07 12:10:15	85.50	9.81	2.46	4.84	10.21	
7/20/07 12:10:30	85.37	7.51	2.65	4.85	10.23	
7/20/07 12:10:45	85.37	4.06	2.81	4.89	10.22	
7/20/07 12:11:00	85.37	0.89	2.90	4.94	10.20	
7/20/07 12:11:15	85.37	8.78	3.06	4.93	10.21	
7/20/07 12:11:30	85.37	7.91	3.22	4.90	10.24	
7/20/07 12:11:45	85.37	-1.83	3.36	4.87	10.25	
7/20/07 12:12:00	85.87	9.41	3.47	4.85	10.27	
7/20/07 12:12:15	85.87	7.91	3.59	4.79	10.32	
7/20/07 12:12:30	85.87	5.29	3.75	4.69	10.39	
7/20/07 12:12:45	85.50	-1.23	4.01	4.61	10.45	
7/20/07 12:13:00	85.37	9.11	4.08	4.57	10.45	
7/20/07 12:13:15	85.37	8.21	4.06	4.57	10.46	
7/20/07 12:13:30	85.12	3.76	4.19	4.57	10.43	
7/20/07 12:13:45	84.87	-1.03	4.19	4.63	10.38	
7/20/07 12:14:00	84.87	8.63	4.29	4.75	10.30	
7/20/07 12:14:15	84.87	9.46	4.40	4.82	10.25	
7/20/07 12:14:30	84.87	-1.61	4.45	4.83	10.24	
7/20/07 12:14:45	84.87	5.96	4.56	4.83	10.20	
7/20/07 12:15:00	84.87	7.91	4.61	4.84	10.17	
7/20/07 12:15:15	84.87	7.84	4.61	4.87	10.14	
7/20/07 12:15:30	84.87	-0.86	4.73	4.91	10.13	
7/20/07 12:15:45	84.87	6.71	4.96	4.88	10.20	
7/20/07 12:16:00	84.87	8.48	4.98	4.75	10.30	
7/20/07 12:16:15	85.25	3.61	4.98	4.64	10.37	
7/20/07 12:16:30	85.37	-0.08	4.89	4.57	10.43	
7/20/07 12:16:45	85.37	5.99	5.12	4.60	9.50	End Run 6
7/20/07 12:17:00	68.61	3.54	5.97	4.39	4.90	
7/20/07 12:17:15	45.85	-1.48	22.04	2.35	1.33	
7/20/07 12:17:30	11.58	-0.78	74.78	0.68	0.17	
7/20/07 12:17:45	3.90	2.89	130.28	0.32	-0.01	
7/20/07 12:18:00	1.59	0.92	164.07	0.26	-0.05	
7/20/07 12:18:15	1.34	-2.08	180.98	0.25	-0.07	
7/20/07 12:18:30	1.34	-0.81	182.99	0.24	-0.09	
7/20/07 12:18:45	0.96	2.56	142.96	0.23	-0.09	
7/20/07 12:19:00	0.84	1.62	90.47	0.23	-0.10	
7/20/07 12:19:15	0.84	-2.28	62.94	0.22	-0.11	
7/20/07 12:19:30	0.84	3.29	52.02	0.22	-0.11	
7/20/07 12:19:45	0.84	2.92	47.55	0.22	-0.11	
7/20/07 12:20:00	0.84	-0.18	45.37	0.22	-0.12	
7/20/07 12:20:15	0.88	-2.28	44.50	0.22	-0.12	
7/20/07 12:20:30	0.84	3.34	43.95	0.22	-0.12	
7/20/07 12:20:45	0.84	2.21	43.55	0.21	-0.12	System Bias
7/20/07 12:21:00	0.84	-2.28	43.41	0.21	-0.12	SO ₂ Bias 7 Mid = 43.48
7/20/07 12:21:15	0.84	-2.28	43.45	0.21	-0.12	
7/20/07 12:21:30	0.83	3.01	43.52	0.21	-0.12	
7/20/07 12:21:45	0.84	0.62	43.59	0.21	-0.13	
7/20/07 12:22:00	0.84	-2.28	43.55	0.21	-0.13	
7/20/07 12:22:15	0.84	2.22	43.69	0.21	-0.13	
7/20/07 12:22:30	0.84	2.59	43.90	0.21	-0.13	
7/20/07 12:22:45	0.84	1.17	43.75	0.21	-0.13	
7/20/07 12:23:00	0.84	-2.28	43.57	0.21	-0.13	
7/20/07 12:23:15	0.84	2.07	43.74	0.21	-0.13	

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ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 12:23:30	0.84	2.62	43.92	0.21	-0.13	
7/20/07 12:23:45	2.21	-1.06	41.82	0.26	-0.13	
7/20/07 12:24:00	8.83	-2.28	39.36	0.44	-0.13	
7/20/07 12:24:15	60.11	1.84	33.48	0.31	-0.13	
7/20/07 12:24:30	119.37	1.62	23.23	0.24	-0.13	
7/20/07 12:24:45	147.62	-1.76	15.14	0.22	-0.14	
7/20/07 12:25:00	183.64	-0.71	10.31	0.22	-0.13	
7/20/07 12:25:15	197.77	2.89	7.68	0.22	-0.14	
7/20/07 12:25:30	199.14	0.89	6.11	0.22	-0.13	
7/20/07 12:25:45	196.02	-2.26	5.03	0.22	-0.13	
7/20/07 12:26:00	193.65	-1.06	4.45	0.21	-0.14	
System Bias						
7/20/07 12:26:15	192.40	2.02	3.69	0.21	-0.14	NO _x Bias 7 Mid = 192.08
7/20/07 12:26:30	191.89	1.99	3.11	0.22	-0.14	O ₂ Bias 7 Zero = 0.21
7/20/07 12:26:45	191.89	-2.28	2.97	0.21	-0.14	CO ₂ Bias 7 Zero = -0.14
7/20/07 12:27:00	192.15	3.14	2.78	0.21	-0.14	
7/20/07 12:27:15	193.77	2.09	2.37	0.21	-0.14	
7/20/07 12:27:30	167.63	0.29	3.68	0.21	-0.14	
7/20/07 12:27:45	95.24	1.12	8.10	0.21	-0.14	
7/20/07 12:28:00	49.86	33.44	9.54	0.21	-0.14	
7/20/07 12:28:15	28.97	43.86	7.83	0.22	-0.14	
7/20/07 12:28:30	19.59	35.99	5.97	0.21	-0.14	
7/20/07 12:28:45	9.08	42.36	4.61	0.21	-0.14	
7/20/07 12:29:00	4.84	48.71	3.73	0.21	-0.14	
System Bias						
7/20/07 12:29:15	3.34	47.13	3.08	0.21	-0.14	CO Bias 7 Mid = 46.67
7/20/07 12:29:30	2.59	46.14	2.53	0.21	-0.14	
7/20/07 12:29:45	2.34	44.51	2.24	0.21	-0.14	
7/20/07 12:30:00	2.09	48.91	1.95	0.21	-0.14	
7/20/07 12:30:15	1.84	45.90	1.81	0.21	-0.14	
7/20/07 12:30:30	1.59	40.58	1.54	0.21	-0.14	
7/20/07 12:30:45	1.34	45.98	1.45	0.21	-0.14	
7/20/07 12:31:00	1.34	49.43	1.38	0.21	-0.14	
7/20/07 12:31:15	1.34	43.06	1.42	0.21	-0.14	
7/20/07 12:31:30	1.34	47.85	1.28	0.20	-0.14	
7/20/07 12:31:45	2.59	46.06	1.05	0.21	0.07	
7/20/07 12:32:00	8.33	19.63	0.91	0.23	3.32	
7/20/07 12:32:15	12.21	0.44	1.05	0.22	7.00	
7/20/07 12:32:30	11.83	-1.08	1.10	0.19	9.00	
7/20/07 12:32:45	4.09	2.14	1.19	0.16	9.54	
7/20/07 12:33:00	1.35	-0.03	1.74	0.18	9.66	
7/20/07 12:33:15	0.85	-2.28	1.68	0.18	9.70	
System Bias						
7/20/07 12:33:30	0.84	-1.21	1.00	0.18	9.72	CO ₂ Bias 7 Mid = 9.73
7/20/07 12:33:45	0.84	1.27	1.05	0.18	9.73	
7/20/07 12:34:00	0.84	-1.31	0.94	0.18	9.72	
7/20/07 12:34:15	0.83	-2.28	0.98	0.18	9.74	
7/20/07 12:34:30	0.84	2.14	0.96	0.18	9.75	
7/20/07 12:34:45	0.83	1.32	0.89	0.18	9.75	
7/20/07 12:35:00	0.83	0.49	0.96	0.16	9.75	
7/20/07 12:35:15	0.83	-2.21	1.08	0.38	8.19	
7/20/07 12:35:30	1.08	3.49	1.08	2.29	3.56	
7/20/07 12:35:45	1.59	2.29	0.96	4.39	0.67	
7/20/07 12:36:00	1.08	-1.83	0.82	4.98	0.11	
System Bias						
7/20/07 12:36:15	0.83	-2.28	0.93	5.06	0.00	O ₂ Bias 7 Mid = 5.07
7/20/07 12:36:30	0.83	3.29	1.08	5.07	-0.05	NO _x Bias 7 Zero = 0.83
7/20/07 12:36:45	0.84	3.59	0.91	5.08	-0.07	CO Bias 7 Zero = 0.58
7/20/07 12:37:00	0.83	-2.28	0.89	5.09	-0.08	SO ₂ Bias 7 Zero = 0.95
7/20/07 12:37:15	0.71	2.51	0.86	5.10	-0.09	
7/20/07 12:37:30	0.33	2.74	0.82	5.12	-0.10	
7/20/07 12:37:45	0.34	1.62	0.86	5.13	-0.11	
7/20/07 12:38:00	0.34	-2.28	0.91	5.13	0.16	
7/20/07 12:38:15	11.21	6.34	2.12	4.98	3.77	
7/20/07 12:38:30	32.85	8.46	5.51	4.83	7.58	
7/20/07 12:38:45	65.73	5.24	8.77	4.80	9.58	
7/20/07 12:39:00	81.62	-0.76	10.48	4.81	10.12	
7/20/07 12:39:15	86.00	8.54	10.73	4.82	10.22	
7/20/07 12:39:30	86.37	8.26	10.46	4.81	10.25	
7/20/07 12:39:45	86.00	2.71	9.97	4.81	10.26	
Begin Run 7						
7/20/07 12:40:00	85.87	0.79	9.64	4.80	10.27	
7/20/07 12:40:15	85.75	9.34	9.21	4.80	10.28	
7/20/07 12:40:30	85.37	9.06	8.93	4.78	10.29	
7/20/07 12:40:45	85.37	4.34	8.70	4.73	10.33	
7/20/07 12:41:00	85.37	0.97	8.35	4.63	10.38	
7/20/07 12:41:15	85.25	9.06	8.28	4.53	10.44	
7/20/07 12:41:30	84.87	8.26	8.19	4.48	10.47	
7/20/07 12:41:45	84.87	4.06	8.01	4.47	10.50	
7/20/07 12:42:00	84.87	0.54	7.84	4.47	10.46	
7/20/07 12:42:15	85.25	9.23	7.66	4.51	10.43	
7/20/07 12:42:30	85.37	7.51	7.73	4.64	10.35	
7/20/07 12:42:45	85.75	-1.56	7.63	4.75	10.27	
7/20/07 12:43:00	85.62	9.63	7.54	4.80	10.25	
7/20/07 12:43:15	85.37	8.36	7.50	4.82	10.24	
7/20/07 12:43:30	85.62	5.44	7.68	4.82	10.25	
7/20/07 12:43:45	85.87	-0.93	7.77	4.82	10.28	
7/20/07 12:44:00	85.87	10.58	7.73	4.81	10.25	
7/20/07 12:44:15	85.75	10.96	7.59	4.74	10.31	
7/20/07 12:44:30	85.37	-0.48	7.52	4.61	10.38	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 12:44:45	85.37	7.31	7.31	4.52	10.44	
7/20/07 12:45:00	85.37	8.98	7.29	4.48	10.47	
7/20/07 12:45:15	85.37	6.81	7.43	4.46	10.46	
7/20/07 12:45:30	85.37	-1.37	7.45	4.50	10.44	
7/20/07 12:45:45	85.87	6.56	7.34	4.62	10.34	
7/20/07 12:46:00	85.87	8.83	7.15	4.74	10.27	
7/20/07 12:46:15	85.87	5.16	7.27	4.81	10.23	
7/20/07 12:46:30	85.87	1.77	7.34	4.84	10.19	
7/20/07 12:46:45	85.87	6.71	7.15	4.85	10.16	
7/20/07 12:47:00	85.87	8.76	7.15	4.85	10.13	
7/20/07 12:47:15	85.87	3.89	7.24	4.85	10.14	
7/20/07 12:47:30	85.87	3.71	7.27	4.82	10.18	
7/20/07 12:47:45	85.87	10.08	7.31	4.72	10.27	
7/20/07 12:48:00	85.87	7.51	7.34	4.61	10.33	
7/20/07 12:48:15	85.87	4.74	7.31	4.56	10.39	
7/20/07 12:48:30	85.87	4.16	7.38	4.54	10.40	
7/20/07 12:48:45	88.37	10.01	7.45	4.55	10.41	
7/20/07 12:49:00	86.37	7.61	7.52	4.58	10.38	
7/20/07 12:49:15	86.37	3.54	7.43	4.69	10.31	
7/20/07 12:49:30	86.37	3.71	7.52	4.79	10.24	
7/20/07 12:49:45	86.37	10.16	7.36	4.84	10.22	
7/20/07 12:50:00	86.37	6.01	7.41	4.84	10.20	
7/20/07 12:50:15	86.25	-0.86	7.45	4.81	10.23	
7/20/07 12:50:30	85.87	9.71	7.36	4.78	10.25	
7/20/07 12:50:45	85.87	9.58	7.41	4.75	10.25	
7/20/07 12:51:00	85.87	6.06	7.38	4.75	10.25	
7/20/07 12:51:15	85.87	-0.81	7.34	4.76	10.24	
7/20/07 12:51:30	85.87	10.96	7.27	4.74	10.26	
7/20/07 12:51:45	86.37	9.83	7.29	4.69	10.30	
7/20/07 12:52:00	86.37	6.11	7.34	4.62	10.35	
7/20/07 12:52:15	85.87	-0.46	7.45	4.58	10.37	
7/20/07 12:52:30	85.87	10.36	7.45	4.58	10.37	
7/20/07 12:52:45	85.87	9.21	7.66	4.60	10.37	
7/20/07 12:53:00	85.87	0.92	7.61	4.84	10.34	
7/20/07 12:53:15	86.37	7.69	7.54	4.74	10.29	
7/20/07 12:53:30	86.37	10.11	7.47	4.81	10.24	
7/20/07 12:53:45	86.37	7.64	7.38	4.83	10.21	
7/20/07 12:54:00	86.37	0.47	7.29	4.84	10.20	
7/20/07 12:54:15	86.37	7.81	7.38	4.87	10.18	
7/20/07 12:54:30	86.62	9.81	7.22	4.88	10.17	
7/20/07 12:54:45	86.87	6.29	7.27	4.88	10.17	
7/20/07 12:55:00	86.87	1.62	7.34	4.86	10.19	
7/20/07 12:55:15	86.37	10.16	7.34	4.82	10.22	
7/20/07 12:55:30	86.37	8.76	7.34	4.72	10.29	
7/20/07 12:55:45	86.37	4.51	7.29	4.63	10.37	
7/20/07 12:56:00	86.37	4.71	7.36	4.59	10.37	
7/20/07 12:56:15	86.37	10.81	7.45	4.58	10.39	
7/20/07 12:56:30	86.37	8.76	7.31	4.58	10.39	
7/20/07 12:56:45	86.37	4.71	7.34	4.64	10.35	
7/20/07 12:57:00	86.62	4.46	7.29	4.75	10.29	
7/20/07 12:57:15	86.87	10.08	7.36	4.81	10.24	
7/20/07 12:57:30	86.87	4.61	7.41	4.81	10.26	
7/20/07 12:57:45	86.87	-1.51	7.50	4.81	10.25	
7/20/07 12:58:00	86.87	9.81	7.45	4.80	10.26	
7/20/07 12:58:15	86.87	10.28	7.36	4.80	10.26	
7/20/07 12:58:30	86.87	5.01	7.27	4.79	10.26	
7/20/07 12:58:45	86.87	-1.16	7.34	4.82	10.24	
7/20/07 12:59:00	86.87	10.56	7.36	4.83	10.24	
7/20/07 12:59:15	86.87	10.73	7.29	4.83	10.27	
7/20/07 12:59:30	86.87	6.16	7.20	4.78	10.29	
7/20/07 12:59:45	86.87	-0.53	7.31	4.70	10.35	
7/20/07 13:00:00	88.87	11.01	7.38	4.62	10.41	
7/20/07 13:00:15	86.87	11.81	7.41	4.58	10.44	
7/20/07 13:00:30	86.87	0.17	7.47	4.56	10.46	
7/20/07 13:00:45	86.87	8.81	7.63	4.60	10.47	
7/20/07 13:01:00	86.87	11.21	7.59	4.71	10.37	
7/20/07 13:01:15	87.00	8.98	7.63	4.84	10.27	
7/20/07 13:01:30	87.12	0.92	7.56	4.90	10.21	
7/20/07 13:01:45	86.87	7.54	7.54	4.92	10.18	
7/20/07 13:02:00	86.87	9.16	7.52	4.93	10.18	
7/20/07 13:02:15	86.87	6.86	7.70	4.92	10.15	
7/20/07 13:02:30	87.12	0.22	7.59	4.92	10.13	
7/20/07 13:02:45	87.37	7.31	7.50	4.91	10.11	
7/20/07 13:03:00	87.62	9.36	7.47	4.91	10.12	
7/20/07 13:03:15	87.87	4.91	7.45	4.83	10.20	
7/20/07 13:03:30	87.87	4.01	7.45	4.71	10.27	
7/20/07 13:03:45	87.50	9.78	7.61	4.65	10.30	
7/20/07 13:04:00	87.87	7.36	7.73	4.63	10.30	
7/20/07 13:04:15	87.87	2.49	7.73	4.63	10.31	
7/20/07 13:04:30	87.87	3.76	7.73	4.65	10.31	
7/20/07 13:04:45	87.87	9.13	7.75	4.74	10.25	
7/20/07 13:05:00	88.12	7.51	7.82	4.83	10.19	
7/20/07 13:05:15	88.25	4.36	7.75	4.87	10.16	
7/20/07 13:05:30	87.87	3.76	7.73	4.89	10.14	
7/20/07 13:05:45	88.00	8.24	7.75	4.90	10.14	

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ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 13:06:00	88.37	6.01	7.66	4.91	10.12	
7/20/07 13:06:15	88.37	-1.38	7.73	4.90	10.11	
7/20/07 13:06:30	88.37	8.51	7.75	4.90	10.15	
7/20/07 13:06:45	88.37	8.73	7.88	4.88	10.17	
7/20/07 13:07:00	88.37	3.06	7.82	4.85	10.18	
7/20/07 13:07:15	88.37	-1.18	7.82	4.78	10.23	
7/20/07 13:07:30	88.37	10.76	7.80	4.71	10.28	
7/20/07 13:07:45	88.37	10.16	7.63	4.66	10.32	
7/20/07 13:08:00	88.37	5.76	7.61	4.64	10.37	
7/20/07 13:08:15	87.87	-0.28	7.54	4.64	10.39	
7/20/07 13:08:30	87.87	11.81	7.66	4.65	10.41	
7/20/07 13:08:45	87.87	11.53	7.70	4.74	10.36	
7/20/07 13:09:00	87.87	1.27	7.61	4.85	10.28	
7/20/07 13:09:15	87.87	9.26	7.54	4.90	10.27	
7/20/07 13:09:30	87.87	12.48	7.88	4.90	10.28	
7/20/07 13:09:45	87.87	9.81	7.61	4.91	10.27	
7/20/07 13:10:00	87.62	1.62	7.68	4.90	10.30	
7/20/07 13:10:15	87.37	9.11	7.66	4.87	10.34	
7/20/07 13:10:30	87.37	12.66	7.63	4.78	10.40	
7/20/07 13:10:45	87.37	8.46	7.63	4.65	10.49	
7/20/07 13:11:00	87.06	4.56	7.61	4.55	10.53	
7/20/07 13:11:15	86.87	12.38	7.77	4.50	10.56	
7/20/07 13:11:30	86.87	10.96	7.93	4.49	10.58	
7/20/07 13:11:45	86.87	6.59	7.91	4.50	10.57	
7/20/07 13:12:00	86.87	5.06	7.80	4.58	10.50	
7/20/07 13:12:15	86.99	11.66	7.73	4.73	10.38	
7/20/07 13:12:30	87.37	9.41	7.91	4.82	10.33	
7/20/07 13:12:45	87.37	6.26	7.86	4.85	10.31	
7/20/07 13:13:00	87.37	4.81	7.91	4.85	10.30	
7/20/07 13:13:15	87.37	10.71	7.80	4.85	10.30	
7/20/07 13:13:30	87.75	7.58	7.66	4.86	10.26	
7/20/07 13:13:45	87.87	-0.48	7.73	4.86	10.26	
7/20/07 13:14:00	87.87	9.46	7.40	4.81	10.27	
7/20/07 13:14:15	87.87	9.81	6.82	4.69	10.32	
7/20/07 13:14:30	87.87	5.81	6.29	4.62	10.33	
7/20/07 13:14:45	88.00	-0.86	5.97	4.59	10.33	
7/20/07 13:15:00	88.37	9.46	5.60	4.60	10.33	
7/20/07 13:15:15	88.37	8.48	5.42	4.62	10.29	
7/20/07 13:15:30	88.75	3.26	5.39	4.68	10.23	
7/20/07 13:15:45	89.37	-1.58	5.21	4.81	10.12	
7/20/07 13:16:00	89.75	8.66	5.17	4.92	10.04	
7/20/07 13:16:15	89.37	7.14	5.12	4.99	9.97	
7/20/07 13:16:30	89.37	1.37	5.39	5.05	9.92	
7/20/07 13:16:45	89.00	-1.66	5.44	5.05	9.93	
7/20/07 13:17:00	89.37	8.11	5.32	5.03	9.92	
7/20/07 13:17:15	89.87	7.89	5.39	5.02	9.90	
7/20/07 13:17:30	90.25	0.32	5.47	5.00	9.93	
7/20/07 13:17:45	90.37	0.57	5.67	4.90	10.00	
7/20/07 13:18:00	90.37	8.61	5.95	4.81	10.06	
7/20/07 13:18:15	90.50	9.38	6.18	4.77	10.07	
7/20/07 13:18:30	90.87	-1.48	6.27	4.75	10.09	
7/20/07 13:18:45	90.87	6.05	6.29	4.74	10.10	
7/20/07 13:19:00	90.87	7.06	6.27	4.75	10.10	
7/20/07 13:19:15	91.37	5.31	6.20	4.84	10.03	
7/20/07 13:19:30	91.38	-1.16	6.15	4.93	9.99	
7/20/07 13:19:45	91.37	5.36	5.86	4.95	9.97	
7/20/07 13:20:00	91.38	6.81	5.86	4.96	9.97	
7/20/07 13:20:15	91.50	4.26	6.08	4.97	9.92	
7/20/07 13:20:30	91.50	-0.58	6.15	4.98	9.91	
7/20/07 13:20:45	91.38	5.94	6.08	4.99	9.92	
7/20/07 13:21:00	91.37	7.71	6.02	4.99	9.94	
7/20/07 13:21:15	91.50	3.09	6.06	4.99	9.95	
7/20/07 13:21:30	91.88	1.51	5.97	4.98	9.96	
7/20/07 13:21:45	91.75	8.41	5.93	4.92	10.04	
7/20/07 13:22:00	91.38	9.11	6.04	4.83	10.16	
7/20/07 13:22:15	91.38	3.41	6.22	4.74	10.25	
7/20/07 13:22:30	91.00	4.71	6.15	4.71	10.30	
7/20/07 13:22:45	90.87	10.41	6.18	4.70	10.34	
7/20/07 13:23:00	90.88	8.41	6.15	4.70	10.40	
7/20/07 13:23:15	90.37	2.12	6.18	4.77	10.34	
7/20/07 13:23:30	90.37	3.51	6.29	4.88	10.23	
7/20/07 13:23:45	90.75	9.33	6.41	4.95	10.21	
7/20/07 13:24:00	90.38	5.36	6.52	4.97	10.21	
7/20/07 13:24:15	90.37	1.14	6.39	4.97	10.21	
7/20/07 13:24:30	90.37	8.31	6.41	4.97	10.20	
7/20/07 13:24:45	90.37	9.23	6.32	4.97	10.21	
7/20/07 13:25:00	90.38	7.11	6.27	4.97	10.22	
7/20/07 13:25:15	89.87	3.01	6.41	4.96	10.23	
7/20/07 13:25:30	89.87	10.61	6.52	4.92	10.27	
7/20/07 13:25:45	89.87	7.64	6.62	4.83	10.32	
7/20/07 13:26:00	89.50	3.26	6.55	4.72	10.39	
7/20/07 13:26:15	89.37	2.22	6.34	4.66	10.46	
7/20/07 13:26:30	89.37	9.66	6.32	4.62	10.48	
7/20/07 13:26:45	89.37	7.96	6.15	4.61	10.48	
7/20/07 13:27:00	89.37	0.67	6.04	4.63	10.47	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 13:27:15	89.37	6.41	6.11	4.72	10.39	
7/20/07 13:27:30	89.37	6.66	6.15	4.84	10.31	
7/20/07 13:27:45	89.37	6.66	6.15	4.89	10.27	
7/20/07 13:28:00	89.37	0.07	6.22	4.91	10.24	
7/20/07 13:28:15	89.37	5.79	6.25	4.91	10.24	
7/20/07 13:28:30	89.37	7.91	6.27	4.91	10.24	
7/20/07 13:28:45	89.37	5.09	6.29	4.91	10.24	
7/20/07 13:29:00	89.37	0.12	6.34	4.90	10.26	
7/20/07 13:29:15	89.37	5.89	6.52	4.88	10.25	
7/20/07 13:29:30	89.75	8.06	6.62	4.86	10.27	
7/20/07 13:29:45	89.87	4.51	6.50	4.78	10.34	
7/20/07 13:30:00	89.50	3.36	6.52	4.69	10.38	
7/20/07 13:30:15	89.50	8.21	6.59	4.64	10.36	
7/20/07 13:30:30	89.87	6.61	6.50	4.64	10.33	
7/20/07 13:30:45	89.87	1.44	6.29	4.66	10.33	
7/20/07 13:31:00	89.87	3.36	6.38	4.68	10.28	
7/20/07 13:31:15	90.00	8.16	6.50	4.75	10.22	
7/20/07 13:31:30	90.37	6.36	6.73	4.83	10.15	
7/20/07 13:31:45	90.87	1.06	6.78	4.88	10.12	
7/20/07 13:32:00	90.87	3.26	6.52	4.89	10.11	
7/20/07 13:32:15	90.87	7.84	6.48	4.89	10.10	
7/20/07 13:32:30	90.87	5.51	6.43	4.90	10.12	
7/20/07 13:32:45	91.37	1.67	6.41	4.90	10.13	
7/20/07 13:33:00	91.37	3.31	6.55	4.90	10.14	
7/20/07 13:33:15	91.37	8.09	6.62	4.90	10.14	
7/20/07 13:33:30	91.37	5.36	6.62	4.90	10.15	
7/20/07 13:33:45	90.87	1.72	6.62	4.85	10.20	
7/20/07 13:34:00	90.87	8.71	6.66	4.78	10.24	
7/20/07 13:34:15	90.87	8.46	6.62	4.74	10.28	
7/20/07 13:34:30	90.87	4.36	6.71	4.72	10.31	
7/20/07 13:34:45	90.87	1.42	6.85	4.73	10.30	
7/20/07 13:35:00	90.87	8.56	6.96	4.76	10.25	
7/20/07 13:35:15	91.37	7.61	7.08	4.86	10.22	
7/20/07 13:35:30	91.37	1.32	7.06	4.92	10.16	
7/20/07 13:35:45	91.00	0.62	7.01	4.94	10.15	
7/20/07 13:36:00	91.37	8.91	6.96	4.94	10.16	
7/20/07 13:36:15	91.37	6.61	6.89	4.94	10.16	
7/20/07 13:36:30	91.37	1.32	6.94	4.94	10.15	
7/20/07 13:36:45	90.87	1.54	7.19	4.94	10.14	
7/20/07 13:37:00	90.87	8.56	7.10	4.94	10.16	
7/20/07 13:37:15	90.87	6.46	7.20	4.92	10.16	
7/20/07 13:37:30	90.87	-0.38	7.06	4.89	10.19	
7/20/07 13:37:45	90.87	5.51	6.82	4.80	10.29	
7/20/07 13:38:00	90.87	8.61	6.71	4.72	10.32	
7/20/07 13:38:15	90.87	5.39	6.64	4.70	10.35	
7/20/07 13:38:30	90.87	-0.63	6.48	4.71	10.32	
7/20/07 13:38:45	90.87	6.19	6.55	4.71	10.31	
7/20/07 13:39:00	90.87	7.81	6.43	4.75	10.28	
7/20/07 13:39:15	90.87	6.41	6.25	4.84	10.23	
7/20/07 13:39:30	90.87	-0.53	6.20	4.90	10.23	
7/20/07 13:39:45	88.87	4.71	6.46	4.93	9.54	End Run 7
7/20/07 13:40:00	85.75	3.81	12.73	3.97	5.17	
7/20/07 13:40:15	41.85	-0.28	44.75	1.72	1.50	
7/20/07 13:40:30	19.46	-2.28	98.93	0.52	0.19	
7/20/07 13:40:45	3.84	1.69	140.88	0.31	-0.02	
7/20/07 13:41:00	2.59	2.66	154.80	0.27	-0.06	
7/20/07 13:41:15	1.58	-0.98	123.28	0.25	-0.08	
7/20/07 13:41:30	0.96	0.82	81.70	0.25	-0.09	
7/20/07 13:41:45	0.83	2.87	57.97	0.25	-0.10	
7/20/07 13:42:00	1.21	0.62	47.40	0.25	-0.11	
7/20/07 13:42:15	1.33	-1.88	42.74	0.24	-0.10	
7/20/07 13:42:30	0.96	0.52	43.80	0.24	-0.11	System Bias
7/20/07 13:42:45	0.83	2.84	42.86	0.24	-0.12	SO ₂ Bias 8 Mid = 42.90
7/20/07 13:43:00	0.83	1.42	42.81	0.24	-0.12	
7/20/07 13:43:15	0.83	-1.46	42.13	0.23	-0.12	
7/20/07 13:43:30	0.83	0.77	42.23	0.23	-0.12	
7/20/07 13:43:45	0.83	2.56	40.16	0.23	-0.12	
7/20/07 13:44:00	0.83	-0.13	39.95	0.23	-0.12	
7/20/07 13:44:15	0.58	-1.46	37.89	0.33	-0.12	
7/20/07 13:44:30	24.72	1.97	34.11	0.45	-0.12	
7/20/07 13:44:45	82.86	2.76	27.00	0.30	-0.12	
7/20/07 13:45:00	130.75	0.72	19.03	0.24	-0.13	
7/20/07 13:45:15	171.39	-0.81	13.06	0.23	-0.13	
7/20/07 13:45:30	186.77	3.16	9.27	0.23	-0.13	
7/20/07 13:45:45	200.14	1.74	7.01	0.23	-0.13	
7/20/07 13:46:00	158.52	-0.63	5.46	0.23	-0.13	
7/20/07 13:46:15	194.65	-0.81	4.47	0.23	-0.13	
7/20/07 13:46:30	193.02	3.01	3.66	0.23	-0.13	
7/20/07 13:46:45	191.64	1.14	3.10	0.22	-0.13	System Bias
7/20/07 13:47:00	191.39	-2.26	2.90	0.22	-0.13	NO _x Bias 8 Mid = 191.30
7/20/07 13:47:15	190.89	-0.91	2.43	0.22	-0.13	O ₂ Bias 8 Zero = 0.22
7/20/07 13:47:30	191.27	2.77	2.09	0.22	-0.13	CO ₂ Bias 8 Zero = -0.13
7/20/07 13:47:45	189.65	1.07	2.00	0.22	-0.13	
7/20/07 13:48:00	187.77	-2.28	2.50	0.22	-0.13	
7/20/07 13:48:15	82.86	13.98	4.79	0.22	-0.14	

Marathon Refining - Texas City, Texas

SRU Caustic Wet Gas Scrubber

ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 13:48:30	44.35	33.14	6.25	0.23	-0.13	
7/20/07 13:48:45	30.35	40.73	5.86	0.23	-0.13	
7/20/07 13:49:00	18.21	33.14	4.93	0.23	-0.14	
7/20/07 13:49:15	8.08	42.68	3.94	0.22	-0.14	
7/20/07 13:49:30	4.59	45.78	3.24	0.22	-0.14	System Bias
7/20/07 13:49:45	3.09	43.48	2.69	0.22	-0.14	CO ₂ Bias 8 Mid = 44.35
7/20/07 13:50:00	2.84	43.39	2.32	0.22	-0.13	
7/20/07 13:50:15	2.34	44.73	2.02	0.22	-0.14	
7/20/07 13:50:30	1.96	48.78	1.79	0.22	-0.14	
7/20/07 13:50:45	1.84	45.63	1.58	0.22	-0.14	
7/20/07 13:51:00	1.84	49.53	1.37	0.22	-0.14	
7/20/07 13:51:15	1.33	42.31	1.28	0.22	0.17	
7/20/07 13:51:30	9.21	18.40	0.93	0.24	3.70	
7/20/07 13:51:45	18.59	1.74	1.00	0.22	7.22	
7/20/07 13:52:00	10.83	0.22	1.03	0.20	9.07	
7/20/07 13:52:15	3.83	1.79	1.07	0.19	9.54	
7/20/07 13:52:30	1.46	1.27	0.98	0.19	9.63	
7/20/07 13:52:45	0.83	-1.38	0.95	0.19	9.67	
7/20/07 13:53:00	0.83	0.02	1.03	0.19	9.69	System Bias
7/20/07 13:53:15	0.83	1.24	0.98	0.19	9.71	CO ₂ Bias 8 Mid = 9.72
7/20/07 13:53:30	0.83	0.02	0.82	0.19	9.71	
7/20/07 13:53:45	0.83	-2.08	0.73	0.19	9.73	
7/20/07 13:54:00	0.83	-0.08	0.80	0.19	9.73	
7/20/07 13:54:15	0.83	2.42	0.77	0.19	9.65	
7/20/07 13:54:30	0.83	2.21	0.91	0.81	6.70	
7/20/07 13:54:45	1.33	-2.28	0.98	3.15	2.24	
7/20/07 13:55:00	1.71	0.72	0.66	4.72	0.36	
7/20/07 13:55:15	1.08	3.03	0.52	5.04	0.04	System Bias
7/20/07 13:55:30	0.83	1.17	0.61	5.08	-0.03	O ₂ Bias 8 Mid = 5.10
7/20/07 13:55:45	0.83	-2.28	0.83	5.09	-0.06	NO _x Bias 8 Zero = 0.83
7/20/07 13:56:00	0.83	0.62	0.68	5.11	-0.08	CO Bias 8 Zero = 0.35
7/20/07 13:56:15	0.83	1.89	0.59	5.12	-0.09	SO ₂ Bias 8 Zero = 0.62
7/20/07 13:56:30	0.83	-0.38	0.52	5.15	-0.10	
7/20/07 13:56:45	0.83	-1.33	0.59	5.22	-0.10	
7/20/07 13:57:00	0.63	3.51	0.47	5.29	-0.11	
7/20/07 13:57:15	0.33	6.96	0.36	5.31	0.90	
7/20/07 13:57:30	15.59	5.36	0.24	5.02	5.29	
7/20/07 13:57:45	49.10	0.82	0.57	4.75	8.52	
7/20/07 13:58:00	74.61	9.41	1.37	4.65	9.91	
7/20/07 13:58:15	86.12	7.09	2.69	4.72	10.14	
7/20/07 13:58:30	88.75	3.91	4.07	4.81	10.12	
7/20/07 13:58:45	89.37	0.82	5.23	4.84	10.14	
7/20/07 13:59:00	89.37	9.71	6.06	4.86	10.15	
7/20/07 13:59:15	89.87	8.46	6.54	4.86	10.15	
7/20/07 13:59:30	89.86	5.36	6.80	4.85	10.15	
7/20/07 13:59:45	89.37	0.72	6.87	4.86	10.19	Begin Run 8
7/20/07 14:00:00	89.37	9.96	7.08	4.84	10.20	
7/20/07 14:00:15	89.87	8.19	7.17	4.83	10.27	
7/20/07 14:00:30	89.88	2.01	7.15	4.81	10.28	
7/20/07 14:00:45	89.37	9.51	7.08	4.74	10.32	
7/20/07 14:01:00	89.37	11.36	6.96	4.66	10.39	
7/20/07 14:01:15	89.12	9.81	6.89	4.63	10.41	
7/20/07 14:01:30	88.87	0.02	6.91	4.62	10.44	
7/20/07 14:01:45	88.62	10.96	6.99	4.63	10.45	
7/20/07 14:02:00	88.87	9.31	6.89	4.67	10.42	
7/20/07 14:02:15	88.87	7.04	6.77	4.77	10.33	
7/20/07 14:02:30	88.87	0.32	6.68	4.84	10.28	
7/20/07 14:02:45	88.87	9.93	6.41	4.86	10.24	
7/20/07 14:03:00	88.87	8.66	6.41	4.87	10.25	
7/20/07 14:03:15	88.62	6.24	6.34	4.88	10.25	
7/20/07 14:03:30	88.37	0.22	6.25	4.89	10.24	
7/20/07 14:03:45	88.37	10.88	6.17	4.86	10.26	
7/20/07 14:04:00	88.38	9.91	5.95	4.76	10.32	
7/20/07 14:04:15	88.37	7.08	5.81	4.63	10.41	
7/20/07 14:04:30	88.00	0.82	5.93	4.56	10.46	
7/20/07 14:04:45	87.87	10.83	5.90	4.53	10.49	
7/20/07 14:05:00	87.87	9.41	5.95	4.51	10.50	
7/20/07 14:05:15	87.87	6.34	5.83	4.51	10.51	
7/20/07 14:05:30	87.87	-0.78	5.80	4.80	10.39	
7/20/07 14:05:45	88.12	9.08	5.76	4.72	10.32	
7/20/07 14:06:00	88.75	8.31	5.62	4.78	10.28	
7/20/07 14:06:15	88.87	4.59	5.60	4.81	10.26	
7/20/07 14:06:30	88.87	-0.08	5.56	4.84	10.24	
7/20/07 14:06:45	88.63	9.31	5.53	4.85	10.20	
7/20/07 14:07:00	88.38	8.66	5.37	4.84	10.16	
7/20/07 14:07:15	88.62	2.37	5.23	4.84	10.16	
7/20/07 14:07:30	88.87	2.81	5.30	4.83	10.18	
7/20/07 14:07:45	88.87	9.36	5.35	4.79	10.22	
7/20/07 14:08:00	88.87	7.31	5.28	4.70	10.26	
7/20/07 14:08:15	88.87	0.57	5.41	4.62	10.32	
7/20/07 14:08:30	88.87	3.76	5.34	4.58	10.36	
7/20/07 14:08:45	88.87	9.98	5.39	4.58	10.36	
7/20/07 14:09:00	88.87	8.46	5.35	4.59	10.33	
7/20/07 14:09:15	88.87	1.17	5.21	4.62	10.31	
7/20/07 14:09:30	89.00	4.31	5.21	4.70	10.26	

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ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 14:09:45	89.37	9.31	5.39	4.80	10.21	
7/20/07 14:10:00	89.37	9.06	5.32	4.83	10.18	
7/20/07 14:10:15	89.37	9.71	5.28	4.84	10.17	
7/20/07 14:10:30	89.37	4.61	5.23	4.82	10.19	
7/20/07 14:10:45	89.37	10.48	5.41	4.80	10.23	
7/20/07 14:11:00	89.37	9.71	5.42	4.79	10.24	
7/20/07 14:11:15	89.37	2.81	5.37	4.79	10.23	
7/20/07 14:11:30	89.37	5.06	5.21	4.79	10.23	
7/20/07 14:11:45	89.12	12.01	5.25	4.80	10.25	
7/20/07 14:12:00	88.37	10.51	5.35	4.79	10.28	
7/20/07 14:12:15	87.62	2.09	5.37	4.71	10.35	
7/20/07 14:12:30	87.25	7.31	5.41	4.62	10.40	
7/20/07 14:12:45	86.87	12.68	5.44	4.56	10.45	
7/20/07 14:13:00	86.50	9.01	5.58	4.53	10.45	
7/20/07 14:13:15	86.37	1.39	5.44	4.53	10.47	
7/20/07 14:13:30	86.37	12.11	5.41	4.56	10.46	
7/20/07 14:13:45	86.62	11.58	5.39	4.68	10.37	
7/20/07 14:14:00	87.12	8.26	5.28	4.79	10.29	
7/20/07 14:14:15	86.87	1.69	5.14	4.82	10.28	
7/20/07 14:14:30	86.87	13.36	5.11	4.82	10.28	
7/20/07 14:14:45	86.87	12.23	5.21	4.82	10.27	
7/20/07 14:15:00	86.87	7.76	5.18	4.82	10.27	
7/20/07 14:15:15	86.87	2.16	5.37	4.81	10.30	
7/20/07 14:15:30	86.87	12.76	5.34	4.81	10.28	
7/20/07 14:15:45	86.87	11.03	5.28	4.82	10.27	
7/20/07 14:16:00	86.87	7.26	5.23	4.81	10.27	
7/20/07 14:16:15	86.87	2.34	5.32	4.74	10.35	
7/20/07 14:16:30	86.75	15.50	5.35	4.65	10.39	
7/20/07 14:16:45	86.37	13.03	5.41	4.57	10.44	
7/20/07 14:17:00	86.37	9.71	5.32	4.54	10.43	
7/20/07 14:17:15	86.37	1.94	5.34	4.53	10.42	
7/20/07 14:17:30	86.50	13.71	5.32	4.53	10.42	
7/20/07 14:17:45	86.87	11.71	5.58	4.57	10.42	
7/20/07 14:18:00	87.00	7.91	5.83	4.69	10.36	
7/20/07 14:18:15	87.37	4.34	6.04	4.81	10.25	
7/20/07 14:18:30	87.37	13.36	6.38	4.86	10.20	
7/20/07 14:18:45	87.37	11.63	6.57	4.89	10.18	
7/20/07 14:19:00	87.75	2.61	6.45	4.89	10.16	
7/20/07 14:19:15	87.87	13.08	6.45	4.89	10.17	
7/20/07 14:19:30	87.88	13.06	6.43	4.88	10.18	
7/20/07 14:19:45	87.87	9.73	6.36	4.84	10.22	
7/20/07 14:20:00	87.87	0.47	6.43	4.74	10.28	
7/20/07 14:20:15	87.87	13.98	6.50	4.64	10.36	
7/20/07 14:20:30	87.87	12.81	6.52	4.57	10.38	
7/20/07 14:20:45	87.87	10.68	6.68	4.55	10.35	
7/20/07 14:21:00	87.88	1.91	6.87	4.55	10.34	
7/20/07 14:21:15	87.88	12.13	6.68	4.57	10.34	
7/20/07 14:21:30	88.38	11.26	6.66	4.66	10.29	
7/20/07 14:21:45	88.88	8.14	6.64	4.79	10.21	
7/20/07 14:22:00	88.88	1.32	6.70	4.85	10.17	
7/20/07 14:22:15	88.88	12.51	6.73	4.87	10.18	
7/20/07 14:22:30	88.88	11.76	6.77	4.86	10.20	
7/20/07 14:22:45	88.88	7.44	6.84	4.85	10.22	
7/20/07 14:23:00	88.88	0.37	6.91	4.85	10.20	
7/20/07 14:23:15	88.88	12.41	7.12	4.85	10.17	
7/20/07 14:23:30	88.88	11.98	7.05	4.83	10.20	
7/20/07 14:23:45	88.88	7.84	6.96	4.82	10.22	
7/20/07 14:24:00	88.88	0.87	7.05	4.80	10.24	
7/20/07 14:24:15	88.88	12.36	7.05	4.75	10.27	
7/20/07 14:24:30	88.88	11.21	7.12	4.69	10.31	
7/20/07 14:24:45	88.88	7.73	7.22	4.66	10.32	
7/20/07 14:25:00	88.88	1.42	7.29	4.66	10.36	
7/20/07 14:25:15	88.88	13.23	7.31	4.65	10.37	
7/20/07 14:25:30	88.75	11.56	7.38	4.67	10.34	
7/20/07 14:25:45	88.63	4.61	7.56	4.76	10.26	
7/20/07 14:26:00	88.88	4.06	7.58	4.83	10.22	
7/20/07 14:26:15	88.88	10.91	7.63	4.85	10.20	
7/20/07 14:26:30	88.88	11.11	7.63	4.86	10.21	
7/20/07 14:26:45	88.88	-1.76	7.68	4.86	10.21	
7/20/07 14:27:00	88.88	4.71	7.86	4.85	10.22	
7/20/07 14:27:15	88.88	10.66	7.70	4.84	10.20	
7/20/07 14:27:30	88.75	10.36	7.61	4.85	10.19	
7/20/07 14:27:45	88.63	1.02	7.58	4.86	10.20	
7/20/07 14:28:00	88.88	4.31	31.93	4.85	10.22	
7/20/07 14:28:15	88.88	11.08	24.48	4.80	10.25	
7/20/07 14:28:30	88.88	7.40	9.11	4.72	10.29	
7/20/07 14:28:45	88.88	1.17	7.77	4.84	10.37	
7/20/07 14:29:00	88.62	5.35	7.72	4.59	10.40	
7/20/07 14:29:15	88.88	8.88	7.75	4.57	10.38	
7/20/07 14:29:30	88.88	6.67	7.65	4.58	10.38	
7/20/07 14:29:45	89.13	-0.93	7.70	4.65	10.32	
7/20/07 14:30:00	89.38	6.76	7.63	4.76	10.26	
7/20/07 14:30:15	89.38	8.11	7.60	4.81	10.22	
7/20/07 14:30:30	89.38	6.54	7.70	4.84	10.21	
7/20/07 14:30:45	89.38	0.19	7.70	4.85	10.20	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 14:31:00	89.38	6.79	7.81	4.86	10.19	
7/20/07 14:31:15	89.38	8.09	7.86	4.86	10.20	
7/20/07 14:31:30	89.38	6.89	7.91	4.85	10.21	
7/20/07 14:31:45	89.38	-1.31	7.93	4.83	10.23	
7/20/07 14:32:00	89.38	8.14	7.77	4.82	10.24	
7/20/07 14:32:15	89.13	8.63	7.72	4.82	10.23	
7/20/07 14:32:30	89.38	6.76	7.70	4.78	10.25	
7/20/07 14:32:45	89.13	0.54	7.63	4.74	10.31	
7/20/07 14:33:00	88.88	9.83	7.75	4.70	10.32	
7/20/07 14:33:15	88.88	9.03	7.77	4.67	10.33	
7/20/07 14:33:30	88.88	3.86	7.84	4.64	10.35	
7/20/07 14:33:45	89.13	0.57	7.84	4.63	10.38	
7/20/07 14:34:00	89.38	9.71	7.86	4.68	10.31	
7/20/07 14:34:15	89.38	8.31	7.84	4.77	10.26	
7/20/07 14:34:30	89.88	3.59	7.88	4.83	10.23	
7/20/07 14:34:45	89.88	0.72	7.72	4.85	10.21	
7/20/07 14:35:00	89.88	9.11	7.70	4.86	10.22	
7/20/07 14:35:15	89.88	8.33	7.86	4.86	10.20	
7/20/07 14:35:30	89.88	2.64	8.00	4.86	10.18	
7/20/07 14:35:45	89.88	0.69	7.88	4.85	10.22	
7/20/07 14:36:00	89.75	10.36	7.86	4.84	10.20	
7/20/07 14:36:15	89.38	9.88	7.88	4.76	10.25	
7/20/07 14:36:30	89.25	1.94	7.81	4.65	10.32	
7/20/07 14:36:45	88.88	0.99	7.95	4.58	10.37	
7/20/07 14:37:00	88.88	9.83	8.14	4.55	10.41	
7/20/07 14:37:15	89.13	8.76	7.95	4.55	10.42	
7/20/07 14:37:30	89.25	2.01	8.05	4.55	10.39	
7/20/07 14:37:45	88.88	0.84	8.07	4.59	10.38	
7/20/07 14:38:00	89.00	9.83	7.97	4.70	10.29	
7/20/07 14:38:15	89.38	8.56	8.04	4.78	10.27	
7/20/07 14:38:30	89.38	1.44	8.16	4.81	10.24	
7/20/07 14:38:45	89.38	0.87	8.16	4.84	10.21	
7/20/07 14:39:00	89.38	9.26	8.25	4.84	10.20	
7/20/07 14:39:15	89.38	9.06	8.99	4.83	10.23	
7/20/07 14:39:30	89.25	3.29	10.61	4.81	10.28	
7/20/07 14:39:45	88.88	1.34	8.39	4.80	10.30	
7/20/07 14:40:00	88.88	11.46	8.23	4.75	10.30	
7/20/07 14:40:15	88.63	10.13	8.28	4.63	10.41	
7/20/07 14:40:30	88.25	4.59	8.07	4.53	10.48	
7/20/07 14:40:45	87.88	1.07	8.00	4.48	10.50	
7/20/07 14:41:00	87.88	10.51	8.16	4.47	10.51	
7/20/07 14:41:15	87.88	8.71	8.18	4.48	10.52	
7/20/07 14:41:30	87.88	4.36	8.27	4.50	10.48	
7/20/07 14:41:45	88.13	0.97	8.37	4.59	10.39	
7/20/07 14:42:00	88.38	10.11	8.37	4.68	10.32	
7/20/07 14:42:15	88.38	9.83	8.23	4.70	10.30	
7/20/07 14:42:30	87.88	3.24	8.16	4.71	10.30	
7/20/07 14:42:45	87.88	1.14	8.11	4.71	10.30	
7/20/07 14:43:00	88.25	11.11	8.11	4.71	10.32	
7/20/07 14:43:15	87.88	10.43	8.09	4.69	10.30	
7/20/07 14:43:30	87.88	3.69	8.09	4.68	10.31	
7/20/07 14:43:45	87.88	1.32	8.16	4.67	10.34	
7/20/07 14:44:00	88.00	12.18	8.16	4.67	10.37	
7/20/07 14:44:15	88.38	11.88	8.25	4.63	10.38	
7/20/07 14:44:30	88.25	7.61	8.09	4.54	10.43	
7/20/07 14:44:45	87.88	1.66	8.07	4.47	10.46	
7/20/07 14:45:00	87.37	11.93	7.97	4.45	10.47	
7/20/07 14:45:15	87.37	11.26	7.95	4.45	10.45	
7/20/07 14:45:30	88.00	7.73	7.88	4.46	10.43	
7/20/07 14:45:45	88.38	0.22	7.95	4.52	10.39	
7/20/07 14:46:00	88.50	9.81	7.93	4.63	10.31	
7/20/07 14:46:15	88.88	9.46	8.00	4.71	10.25	
7/20/07 14:46:30	89.38	4.66	8.09	4.74	10.21	
7/20/07 14:46:45	89.63	1.22	8.00	4.75	10.19	
7/20/07 14:47:00	89.88	11.48	7.88	4.76	10.18	
7/20/07 14:47:15	90.13	10.68	7.77	4.79	10.17	
7/20/07 14:47:30	90.38	7.83	7.79	4.80	10.16	
7/20/07 14:47:45	90.38	1.42	7.81	4.80	10.15	
7/20/07 14:48:00	90.38	12.51	7.88	4.80	10.17	
7/20/07 14:48:15	90.38	13.11	8.23	4.77	10.20	
7/20/07 14:48:30	90.38	8.83	8.30	4.69	10.27	
7/20/07 14:48:45	90.13	1.32	8.04	4.60	10.34	
7/20/07 14:49:00	89.88	13.01	7.86	4.56	10.34	
7/20/07 14:49:15	89.88	10.36	7.91	4.55	10.33	
7/20/07 14:49:30	89.88	6.69	7.91	4.56	10.33	
7/20/07 14:49:45	90.13	1.02	7.86	4.60	10.29	
7/20/07 14:50:00	90.88	10.98	7.72	4.71	10.21	
7/20/07 14:50:15	91.13	9.81	7.74	4.80	10.18	
7/20/07 14:50:30	90.88	5.01	7.72	4.84	10.17	
7/20/07 14:50:45	90.88	1.19	7.60	4.83	10.16	
7/20/07 14:51:00	90.88	10.86	7.70	4.82	10.16	
7/20/07 14:51:15	90.88	10.98	7.70	4.81	10.15	
7/20/07 14:51:30	90.88	6.49	7.53	4.81	10.17	
7/20/07 14:51:45	90.88	1.42	7.63	4.80	10.20	
7/20/07 14:52:00	90.88	11.76	7.67	4.80	10.23	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 14:52:15	90.88	11.56	7.72	4.79	10.28	
7/20/07 14:52:30	90.88	6.18	7.63	4.74	10.30	
7/20/07 14:52:45	90.88	1.59	7.60	4.66	10.37	
7/20/07 14:53:00	90.75	12.46	7.60	4.59	10.40	
7/20/07 14:53:15	90.38	11.83	7.47	4.56	10.42	
7/20/07 14:53:30	90.38	5.39	7.53	4.55	10.44	
7/20/07 14:53:45	90.13	1.34	7.47	4.55	10.43	
7/20/07 14:54:00	89.88	11.08	7.63	4.59	10.38	
7/20/07 14:54:15	90.13	10.28	7.58	4.69	10.30	
7/20/07 14:54:30	90.38	5.79	7.49	4.75	10.28	
7/20/07 14:54:45	90.63	1.22	7.63	4.77	10.29	
7/20/07 14:55:00	90.88	10.06	7.63	4.77	10.29	
7/20/07 14:55:15	90.88	10.56	7.56	4.78	10.28	
7/20/07 14:55:30	90.88	5.91	7.60	4.78	10.29	
7/20/07 14:55:45	90.57	0.74	7.53	4.79	10.29	
7/20/07 14:56:00	90.38	10.11	7.49	4.78	10.31	
7/20/07 14:56:15	90.38	9.68	7.56	4.77	10.29	
7/20/07 14:56:30	90.38	5.26	7.49	4.75	10.31	
7/20/07 14:56:45	90.01	1.12	7.51	4.88	10.38	
7/20/07 14:57:00	88.88	11.68	7.65	4.69	10.43	
7/20/07 14:57:15	89.88	9.98	7.63	4.51	10.52	
7/20/07 14:57:30	89.25	8.63	7.72	4.47	10.50	
7/20/07 14:57:45	88.88	0.89	7.70	4.46	10.50	
7/20/07 14:58:00	88.88	9.28	7.79	4.47	10.49	
7/20/07 14:58:15	89.25	9.81	7.65	4.51	10.46	
7/20/07 14:58:30	89.38	3.74	7.65	4.62	10.40	
7/20/07 14:58:45	89.38	0.94	7.65	4.71	10.31	
7/20/07 14:59:00	89.38	10.08	7.63	4.76	10.29	
7/20/07 14:59:15	89.38	8.14	7.79	4.77	10.30	
7/20/07 14:59:30	89.38	15.78	7.74	4.77	10.30	
7/20/07 14:59:45	88.25	17.30	7.72	4.89	9.33	End Run 8
7/20/07 15:00:00	81.12	19.10	8.14	5.00	4.82	
7/20/07 15:00:15	37.98	5.01	33.36	2.78	1.33	
7/20/07 15:00:30	17.09	-0.76	111.66	0.81	0.18	
7/20/07 15:00:45	5.83	-0.86	149.89	0.36	-0.02	
7/20/07 15:01:00	2.71	2.59	186.88	0.28	-0.06	
7/20/07 15:01:15	1.96	2.36	208.03	0.26	-0.08	
7/20/07 15:01:30	1.83	-0.78	214.33	0.25	-0.09	
7/20/07 15:01:45	1.46	-0.83	174.76	0.25	-0.10	
7/20/07 15:02:00	0.83	2.99	110.86	0.24	-0.10	
7/20/07 15:02:15	0.83	1.03	76.45	0.24	-0.11	
7/20/07 15:02:30	0.96	-1.93	53.68	0.24	-0.12	
7/20/07 15:02:45	1.33	-0.96	48.98	0.24	-0.12	
7/20/07 15:03:00	1.33	2.64	47.34	0.24	-0.12	
7/20/07 15:03:15	1.33	1.92	47.04	0.23	-0.12	
7/20/07 15:03:30	0.83	-1.31	47.62	0.23	-0.13	
7/20/07 15:03:45	0.83	-0.72	48.34	0.23	-0.12	
7/20/07 15:04:00	0.83	2.54	49.15	0.23	-0.13	
7/20/07 15:04:15	0.83	1.26	50.28	0.23	-0.13	
7/20/07 15:04:30	0.83	-1.51	51.25	0.22	-0.13	
7/20/07 15:04:45	0.83	0.57	48.28	0.26	-0.13	
7/20/07 15:05:00	12.34	1.99	54.32	0.52	-0.13	
7/20/07 15:05:15	82.50	2.21	46.70	0.40	-0.13	
7/20/07 15:05:30	158.38	-1.13	32.23	0.27	-0.13	
7/20/07 15:05:45	225.17	0.07	20.55	0.24	-0.13	
7/20/07 15:06:00	269.35	2.86	13.44	0.24	-0.14	
7/20/07 15:06:15	296.74	0.61	9.55	0.23	-0.14	
7/20/07 15:06:30	301.86	-1.58	7.21	0.23	-0.14	
7/20/07 15:06:45	302.61	-0.33	5.94	0.23	-0.14	
7/20/07 15:07:00	302.86	2.14	5.09	0.23	-0.14	
7/20/07 15:07:15	304.74	1.06	4.37	0.23	-0.14	
7/20/07 15:07:30	308.62	-0.61	3.90	0.23	-0.14	
7/20/07 15:07:45	312.75	-0.93	3.47	0.23	-0.14	
7/20/07 15:08:00	317.00	0.64	3.19	0.23	-0.14	
7/20/07 15:08:15	323.00	2.21	3.05	0.23	-0.14	
7/20/07 15:08:30	322.37	2.34	4.88	0.23	-0.14	
7/20/07 15:08:45	239.05	10.16	13.61	0.22	-0.14	
7/20/07 15:09:00	90.63	23.72	16.65	0.26	-0.01	
7/20/07 15:09:15	75.99	19.10	13.65	0.96	2.18	
7/20/07 15:09:30	71.86	11.98	12.50	2.66	6.17	
7/20/07 15:09:45	76.36	6.41	12.84	3.82	8.68	
7/20/07 15:10:00	87.63	14.58	13.12	4.22	9.59	
7/20/07 15:10:15	89.50	13.41	13.05	4.29	9.73	
7/20/07 15:10:30	89.88	10.11	12.77	4.35	9.73	
7/20/07 15:10:45	90.25	4.26	12.17	4.47	9.68	
7/20/07 15:11:00	90.38	11.63	11.79	4.58	9.67	
7/20/07 15:11:15	90.38	15.31	11.48	4.65	9.74	
7/20/07 15:11:30	91.00	19.03	11.21	4.73	9.87	
7/20/07 15:11:45	89.50	55.62	10.86	4.48	9.17	
7/20/07 15:12:00	86.00	95.62	10.49	4.09	8.41	
7/20/07 15:12:15	79.99	99.94	10.17	4.03	8.31	
7/20/07 15:12:30	82.11	99.94	9.89	4.03	8.30	
7/20/07 15:12:45	86.62	59.77	9.47	4.00	8.83	
7/20/07 15:13:00	87.37	19.58	8.76	3.70	12.48	
7/20/07 15:13:15	71.62	7.46	8.32	2.34	16.84	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 15:13:30	38.11	14.23	13.70	0.83	14.66	
7/20/07 15:13:45	13.72	3.41	8.81	0.32	10.32	
7/20/07 15:14:00	3.10	4.84	22.31	0.24	5.06	
7/20/07 15:14:15	4.58	3.21	78.84	0.23	1.33	
7/20/07 15:14:30	3.59	2.16	141.08	0.23	0.21	
7/20/07 15:14:45	2.83	-2.28	175.58	0.23	0.03	
7/20/07 15:15:00	2.22	1.02	192.69	0.22	-0.03	
7/20/07 15:15:15	1.83	2.91	196.20	0.22	-0.06	
7/20/07 15:15:30	1.72	1.94	155.53	0.22	-0.07	
7/20/07 15:15:45	1.35	-2.28	99.20	0.22	-0.09	
7/20/07 15:16:00	0.83	1.84	69.88	0.22	-0.10	
7/20/07 15:16:15	0.83	2.11	57.56	0.22	-0.10	
7/20/07 15:16:30	1.33	2.19	51.17	0.22	-0.11	
7/20/07 15:16:45	1.33	-2.28	48.77	0.21	-0.11	
7/20/07 15:17:00	1.33	1.84	46.57	0.21	-0.12	System Bias
7/20/07 15:17:15	1.33	1.91	45.09	0.21	-0.12	SO ₂ Bias 9 Mid = 45.37
7/20/07 15:17:30	1.33	3.04	45.88	0.21	-0.12	
7/20/07 15:17:45	1.33	-2.28	45.42	0.21	-0.12	
7/20/07 15:18:00	1.33	1.99	45.31	0.21	-0.12	
7/20/07 15:18:15	1.33	1.86	45.24	0.21	-0.12	
7/20/07 15:18:30	1.21	1.54	42.82	0.21	-0.03	
7/20/07 15:18:45	19.97	-2.28	39.22	0.21	0.12	
7/20/07 15:19:00	60.86	2.06	31.77	0.22	-0.04	
7/20/07 15:19:15	153.14	1.91	20.69	0.22	-0.12	
7/20/07 15:19:30	183.53	1.54	13.28	0.22	-0.13	
7/20/07 15:19:45	194.03	-2.28	9.50	0.22	-0.14	System Bias
7/20/07 15:20:00	196.41	1.54	7.30	0.22	-0.14	NO _x Bias 9 Mid = 196.07 O ₂ Bias 9 Zero = 0.22 CO ₂ Bias 9 Zero = -0.14
7/20/07 15:20:15	196.41	2.06	5.87	0.22	-0.14	
7/20/07 15:20:30	195.91	3.14	4.76	0.22	-0.14	
7/20/07 15:20:45	195.53	-2.28	4.12	0.21	-0.14	
7/20/07 15:21:00	195.03	1.84	3.47	0.21	-0.14	
7/20/07 15:21:15	195.41	2.11	3.05	0.22	-0.14	
7/20/07 15:21:30	195.25	1.69	2.78	0.21	-0.14	
7/20/07 15:21:45	194.91	-2.28	2.38	0.22	-0.14	
7/20/07 15:22:00	193.09	1.32	2.06	0.22	-0.14	
7/20/07 15:22:15	191.65	4.26	2.94	0.21	-0.14	
7/20/07 15:22:30	92.86	12.96	6.31	0.21	-0.14	
7/20/07 15:22:45	47.35	18.85	7.51	0.21	-0.14	
7/20/07 15:23:00	30.86	36.39	6.22	0.21	-0.14	System Bias
7/20/07 15:23:15	19.09	47.23	4.69	0.21	-0.14	CO Bias 9 Mid = 46.24
7/20/07 15:23:30	8.08	47.45	3.67	0.21	-0.14	
7/20/07 15:23:45	4.08	45.69	3.16	0.21	-0.15	
7/20/07 15:24:00	2.83	44.58	2.54	0.21	-0.15	
7/20/07 15:24:15	2.46	48.78	2.29	0.21	-0.15	
7/20/07 15:24:30	2.08	47.98	2.08	0.21	-0.15	
7/20/07 15:24:45	1.83	40.08	1.85	0.21	-0.15	
7/20/07 15:25:00	1.83	38.31	1.64	0.21	-0.15	
7/20/07 15:25:15	1.46	59.92	1.51	0.21	-0.15	
7/20/07 15:25:30	1.33	47.10	1.34	0.21	0.08	
7/20/07 15:25:45	8.83	13.21	1.23	0.20	3.47	
7/20/07 15:26:00	18.09	-0.88	1.30	0.19	7.17	
7/20/07 15:26:15	10.71	0.87	1.37	0.18	9.07	
7/20/07 15:26:30	3.58	0.89	1.37	0.18	9.53	
7/20/07 15:26:45	1.33	-2.28	1.30	0.18	9.62	
7/20/07 15:27:00	0.83	-2.28	1.21	0.18	9.66	
7/20/07 15:27:15	0.83	0.77	1.11	0.18	9.68	System Bias
7/20/07 15:27:30	0.83	-0.63	1.14	0.18	9.69	CO ₂ Bias 9 Mid = 9.71
7/20/07 15:27:45	0.83	-1.33	0.95	0.18	9.70	
7/20/07 15:28:00	0.83	-2.28	0.99	0.18	9.72	
7/20/07 15:28:15	0.83	1.57	0.95	0.18	9.72	
7/20/07 15:28:30	0.83	0.89	1.23	0.18	9.62	
7/20/07 15:28:45	1.21	-1.48	1.20	0.80	6.66	
7/20/07 15:29:00	1.58	-2.28	1.09	3.13	2.22	
7/20/07 15:29:15	1.83	2.51	0.92	4.70	0.35	
7/20/07 15:29:30	1.08	2.19	0.95	5.01	0.04	
7/20/07 15:29:45	0.83	-0.58	0.90	5.05	-0.03	System Bias
7/20/07 15:30:00	0.83	-2.28	0.90	5.06	-0.07	O ₂ Bias 9 Mid = 5.07 NO _x Bias 9 Zero = 0.83 CO Bias 9 Zero = 0.59 SO ₂ Bias 9 Zero = 0.83
7/20/07 15:30:15	0.83	2.81	0.88	5.06	-0.09	
7/20/07 15:30:30	0.83	1.92	0.72	5.08	-0.10	
7/20/07 15:30:45	0.83	-0.08	0.81	5.10	-0.11	
7/20/07 15:31:00	0.83	-2.16	0.77	5.11	-0.11	
7/20/07 15:31:15	0.46	3.86	0.74	5.12	-0.12	
7/20/07 15:31:30	0.08	6.19	2.24	5.10	0.86	
7/20/07 15:31:45	17.09	2.86	8.25	4.94	5.19	
7/20/07 15:32:00	53.36	-1.66	13.99	4.82	8.37	
7/20/07 15:32:15	79.50	9.36	15.93	4.79	9.76	
7/20/07 15:32:30	90.88	8.71	15.47	4.80	10.03	
7/20/07 15:32:45	93.38	6.55	14.39	4.79	10.09	
7/20/07 15:33:00	93.38	-0.78	13.49	4.78	10.15	
7/20/07 15:33:15	93.00	10.96	12.75	4.78	10.19	
7/20/07 15:33:30	93.13	10.46	12.13	4.78	10.21	
7/20/07 15:33:45	93.00	11.31	11.58	4.78	10.24	Begin Run 9
7/20/07 15:34:00	92.88	0.99	11.14	4.77	10.27	
7/20/07 15:34:15	92.88	12.21	10.77	4.71	10.33	
7/20/07 15:34:30	92.38	12.03	10.51	4.62	10.39	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 15:34:45	92.01	10.36	10.49	4.53	10.45	
7/20/07 15:35:00	91.63	2.91	10.42	4.46	10.49	
7/20/07 15:35:15	91.38	7.01	10.19	4.43	10.50	
7/20/07 15:35:30	91.38	11.31	9.89	4.43	10.49	
7/20/07 15:35:45	91.38	8.21	9.89	4.45	10.47	
7/20/07 15:36:00	91.63	3.69	9.75	4.56	10.38	
7/20/07 15:36:15	91.88	3.46	9.68	4.71	10.29	
7/20/07 15:36:30	92.38	9.51	9.63	4.79	10.24	
7/20/07 15:36:45	92.75	7.16	9.49	4.83	10.18	
7/20/07 15:37:00	92.88	3.55	9.68	4.86	10.13	
7/20/07 15:37:15	92.88	3.66	9.80	4.86	10.10	
7/20/07 15:37:30	92.88	8.75	9.91	4.85	10.09	
7/20/07 15:37:45	92.88	7.21	9.80	4.76	10.14	
7/20/07 15:38:00	92.88	1.54	9.84	4.63	10.20	
7/20/07 15:38:15	92.51	3.71	9.89	4.55	10.24	
7/20/07 15:38:30	92.88	8.73	9.87	4.52	10.25	
7/20/07 15:38:45	92.88	8.36	9.89	4.52	10.25	
7/20/07 15:39:00	92.88	0.89	9.89	4.54	10.23	
7/20/07 15:39:15	92.88	3.31	9.82	4.58	10.20	
7/20/07 15:39:30	93.63	8.11	9.84	4.69	10.11	
7/20/07 15:39:45	93.88	8.66	9.84	4.80	10.05	
7/20/07 15:40:00	94.38	0.69	9.77	4.85	10.02	
7/20/07 15:40:15	94.38	4.21	9.91	4.85	10.03	
7/20/07 15:40:30	94.38	10.28	9.87	4.84	10.05	
7/20/07 15:40:45	94.38	9.66	9.65	4.82	10.09	
7/20/07 15:41:00	94.38	4.96	9.54	4.80	10.11	
7/20/07 15:41:15	94.00	4.76	9.36	4.79	10.14	
7/20/07 15:41:30	93.88	12.01	9.33	4.79	10.19	
7/20/07 15:41:45	93.88	11.51	9.40	4.76	10.24	
7/20/07 15:42:00	93.63	5.84	9.56	4.70	10.31	
7/20/07 15:42:15	93.38	5.31	9.59	4.62	10.39	
7/20/07 15:42:30	93.38	12.11	9.59	4.55	10.44	
7/20/07 15:42:45	93.38	11.26	9.29	4.50	10.46	
7/20/07 15:43:00	93.13	7.31	9.05	4.48	10.46	
7/20/07 15:43:15	92.51	-0.53	9.29	4.47	10.46	
7/20/07 15:43:30	92.88	7.96	9.33	4.48	10.43	
7/20/07 15:43:45	92.88	9.96	9.15	4.59	10.36	
7/20/07 15:44:00	93.38	6.36	9.10	4.71	10.27	
7/20/07 15:44:15	93.75	-0.33	9.20	4.77	10.21	
7/20/07 15:44:30	93.88	6.34	9.06	4.81	10.14	
7/20/07 15:44:45	93.88	8.31	8.85	4.83	10.12	
7/20/07 15:45:00	93.63	5.44	8.94	4.83	10.10	
7/20/07 15:45:15	93.38	1.11	8.85	4.83	10.06	
7/20/07 15:45:30	93.88	5.61	8.90	4.83	10.04	
7/20/07 15:45:45	93.88	6.91	8.83	4.83	10.01	
7/20/07 15:46:00	94.38	6.56	8.73	4.83	10.00	
7/20/07 15:46:15	94.38	-1.58	8.71	4.78	10.01	
7/20/07 15:46:30	94.38	6.26	8.64	4.71	10.06	
7/20/07 15:46:45	94.38	8.21	8.76	4.63	10.11	
7/20/07 15:47:00	94.38	6.16	8.81	4.59	10.13	
7/20/07 15:47:15	94.75	0.42	8.85	4.57	10.15	
7/20/07 15:47:30	94.63	6.66	8.94	4.58	10.16	
7/20/07 15:47:45	94.38	9.11	8.92	4.60	10.13	
7/20/07 15:48:00	94.63	7.43	8.78	4.69	10.07	
7/20/07 15:48:15	95.25	1.48	8.76	4.80	10.00	
7/20/07 15:48:30	95.38	6.74	8.81	4.85	9.98	
7/20/07 15:48:45	95.38	9.31	8.80	4.86	9.97	
7/20/07 15:49:00	95.38	8.06	8.55	4.85	9.99	
7/20/07 15:49:15	95.38	0.67	8.67	4.85	10.02	
7/20/07 15:49:30	95.38	7.46	8.71	4.84	10.05	
7/20/07 15:49:45	95.38	10.36	8.60	4.82	10.11	
7/20/07 15:50:00	95.38	8.88	8.60	4.80	10.12	
7/20/07 15:50:15	95.25	2.01	8.48	4.77	10.15	
7/20/07 15:50:30	94.88	3.44	8.46	4.76	10.17	
7/20/07 15:50:45	94.88	11.66	8.62	4.71	10.23	
7/20/07 15:51:00	94.63	11.11	8.80	4.63	10.32	
7/20/07 15:51:15	94.25	8.56	9.01	4.57	10.36	
7/20/07 15:51:30	93.88	3.59	9.10	4.55	10.39	
7/20/07 15:51:45	93.88	12.16	9.10	4.55	10.40	
7/20/07 15:52:00	93.88	10.33	8.94	4.55	10.40	
7/20/07 15:52:15	93.88	5.41	8.92	4.60	10.35	
7/20/07 15:52:30	93.88	2.16	8.83	4.71	10.28	
7/20/07 15:52:45	94.25	10.01	8.81	4.78	10.21	
7/20/07 15:53:00	94.38	9.23	8.69	4.80	10.21	
7/20/07 15:53:15	94.38	6.11	8.60	4.79	10.24	
7/20/07 15:53:30	94.13	2.71	8.53	4.78	10.28	
7/20/07 15:53:45	94.25	9.86	8.50	4.76	10.28	
7/20/07 15:54:00	94.38	8.71	8.67	4.75	10.26	
7/20/07 15:54:15	94.25	6.46	8.60	4.74	10.27	
7/20/07 15:54:30	93.88	3.01	8.57	4.67	10.34	
7/20/07 15:54:45	93.50	11.16	8.41	4.56	10.43	
7/20/07 15:55:00	93.13	10.28	8.29	4.49	10.47	
7/20/07 15:55:15	92.88	7.61	8.46	4.46	10.47	
7/20/07 15:55:30	92.63	2.76	8.53	4.45	10.49	
7/20/07 15:55:45	92.38	9.96	8.41	4.44	10.51	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 15:56:00	92.63	8.91	8.55	4.48	10.46	
7/20/07 15:56:15	93.00	5.31	8.41	4.61	10.38	
7/20/07 15:56:30	93.38	1.84	8.13	4.71	10.30	
7/20/07 15:56:45	93.38	9.51	7.99	4.75	10.27	
7/20/07 15:57:00	93.63	8.16	7.83	4.77	10.28	
7/20/07 15:57:15	93.88	4.71	7.83	4.77	10.28	
7/20/07 15:57:30	93.88	1.56	7.74	4.76	10.26	
7/20/07 15:57:45	93.88	9.21	7.62	4.77	10.27	
7/20/07 15:58:00	93.88	8.61	7.58	4.75	10.27	
7/20/07 15:58:15	93.88	5.51	7.51	4.65	10.31	
7/20/07 15:58:30	93.63	1.76	7.48	4.53	10.36	
7/20/07 15:58:45	93.38	7.91	7.51	4.47	10.37	
7/20/07 15:59:00	93.38	6.93	7.58	4.45	10.38	
7/20/07 15:59:15	93.38	2.26	7.46	4.46	10.35	
7/20/07 15:59:30	93.38	-0.91	7.53	4.48	10.32	
7/20/07 15:59:45	93.75	4.81	7.67	4.55	10.27	
7/20/07 16:00:00	94.13	5.99	7.62	4.69	10.15	
7/20/07 16:00:15	95.13	4.56	7.53	4.79	10.07	
7/20/07 16:00:30	95.38	0.17	7.58	4.83	10.04	
7/20/07 16:00:45	95.50	2.76	7.60	4.86	10.01	
7/20/07 16:01:00	95.63	6.98	7.46	4.87	10.00	
7/20/07 16:01:15	95.38	7.61	7.28	4.87	9.99	
7/20/07 16:01:30	95.63	2.01	7.39	4.86	9.99	
7/20/07 16:01:45	95.88	2.96	7.44	4.80	10.04	
7/20/07 16:02:00	95.63	7.71	7.44	4.70	10.11	
7/20/07 16:02:15	95.38	7.31	7.35	4.61	10.17	
7/20/07 16:02:30	95.38	2.79	7.33	4.57	10.21	
7/20/07 16:02:45	95.50	3.36	7.35	4.57	10.21	
7/20/07 16:03:00	95.88	7.91	7.33	4.59	10.20	
7/20/07 16:03:15	95.88	6.86	7.39	4.61	10.20	
7/20/07 16:03:30	96.13	3.36	7.37	4.68	10.16	
7/20/07 16:03:45	96.51	3.11	7.35	4.75	10.12	
7/20/07 16:04:00	96.88	7.96	7.28	4.78	10.11	
7/20/07 16:04:15	96.88	7.41	7.23	4.77	10.13	
7/20/07 16:04:30	96.88	3.71	7.25	4.77	10.15	
7/20/07 16:04:45	96.88	-0.98	7.25	4.76	10.17	
7/20/07 16:05:00	96.88	6.24	7.30	4.75	10.20	
7/20/07 16:05:15	96.88	8.41	7.44	4.74	10.21	
7/20/07 16:05:30	96.88	5.01	7.51	4.74	10.19	
7/20/07 16:05:45	96.51	-0.93	7.62	4.69	10.24	
7/20/07 16:06:00	96.13	5.66	7.62	4.63	10.29	
7/20/07 16:06:15	95.88	7.76	7.67	4.60	10.32	
7/20/07 16:06:30	95.88	5.09	7.69	4.80	10.33	
7/20/07 16:06:45	95.75	-0.48	7.64	4.61	10.30	
7/20/07 16:07:00	95.63	4.99	7.60	4.64	10.29	
7/20/07 16:07:15	95.88	6.31	7.65	4.72	10.22	
7/20/07 16:07:30	96.13	1.99	7.69	4.80	10.18	
7/20/07 16:07:45	96.38	-2.28	7.83	4.82	10.16	
7/20/07 16:08:00	96.38	5.01	7.88	4.83	10.17	
7/20/07 16:08:15	96.38	6.81	7.90	4.83	10.17	
7/20/07 16:08:30	96.38	6.04	7.85	4.82	10.16	
7/20/07 16:08:45	96.01	1.06	7.78	4.82	10.18	
7/20/07 16:09:00	95.88	5.19	7.78	4.82	10.17	
7/20/07 16:09:15	95.88	7.16	7.64	4.79	10.17	
7/20/07 16:09:30	95.88	6.48	7.60	4.75	10.21	
7/20/07 16:09:45	95.50	0.96	7.67	4.66	10.27	
7/20/07 16:10:00	95.13	2.09	7.74	4.56	10.33	
7/20/07 16:10:15	94.88	7.26	7.77	4.51	10.37	
7/20/07 16:10:30	94.63	6.34	7.88	4.49	10.40	
7/20/07 16:10:45	94.38	2.16	7.61	4.51	10.40	
7/20/07 16:11:00	94.63	0.54	7.92	4.59	10.35	
7/20/07 16:11:15	95.00	6.66	7.88	4.67	10.31	
7/20/07 16:11:30	95.38	5.66	7.81	4.71	10.28	
7/20/07 16:11:45	95.38	2.41	7.81	4.72	10.27	
7/20/07 16:12:00	95.38	0.35	7.81	4.71	10.27	
7/20/07 16:12:15	95.00	7.16	7.64	4.72	10.25	
7/20/07 16:12:30	94.88	6.32	7.69	4.71	10.25	
7/20/07 16:12:45	94.88	3.16	7.72	4.69	10.28	
7/20/07 16:13:00	94.88	0.27	7.76	4.67	10.31	
7/20/07 16:13:15	94.88	7.31	7.88	4.66	10.30	
7/20/07 16:13:30	94.88	6.39	7.81	4.66	10.31	
7/20/07 16:13:45	94.50	4.36	7.83	4.62	10.33	
7/20/07 16:14:00	94.13	0.24	7.76	4.55	10.39	
7/20/07 16:14:15	93.75	6.96	7.78	4.49	10.41	
7/20/07 16:14:30	93.38	7.04	7.62	4.47	10.42	
7/20/07 16:14:45	93.38	4.56	7.72	4.48	10.41	
7/20/07 16:15:00	93.38	-2.28	7.76	4.49	10.39	
7/20/07 16:15:15	93.50	2.01	7.69	4.54	10.34	
7/20/07 16:15:30	94.13	5.66	7.72	4.64	10.27	
7/20/07 16:15:45	94.50	4.91	7.67	4.70	10.22	
7/20/07 16:16:00	94.88	-2.28	7.78	4.73	10.21	
7/20/07 16:16:15	94.50	2.31	7.88	4.74	10.19	
7/20/07 16:16:30	94.88	5.91	7.69	4.74	10.18	
7/20/07 16:16:45	94.88	6.06	7.64	4.74	10.16	
7/20/07 16:17:00	94.88	-1.91	7.72	4.73	10.17	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 16:17:15	94.88	2.31	7.72	4.73	10.17	
7/20/07 16:17:30	94.88	5.24	7.55	4.72	10.19	
7/20/07 16:17:45	94.88	6.06	7.55	4.66	10.24	
7/20/07 16:18:00	94.88	0.94	7.39	4.58	10.31	
7/20/07 16:18:15	94.38	2.76	7.23	4.49	10.40	
7/20/07 16:18:30	94.13	7.36	7.18	4.45	10.41	
7/20/07 16:18:45	93.88	6.21	7.04	4.44	10.43	
7/20/07 16:19:00	93.63	2.81	6.95	4.43	10.44	
7/20/07 16:19:15	93.50	-1.03	7.02	4.44	10.42	
7/20/07 16:19:30	93.88	6.91	7.02	4.53	10.35	
7/20/07 16:19:45	94.00	6.01	6.83	4.65	10.29	
7/20/07 16:20:00	94.38	3.74	7.07	4.69	10.26	
7/20/07 16:20:15	94.38	-1.48	7.07	4.70	10.28	
7/20/07 16:20:30	94.38	7.58	6.93	4.71	10.28	
7/20/07 16:20:45	94.38	6.56	6.88	4.72	10.26	
7/20/07 16:21:00	94.38	4.66	7.02	4.72	10.26	
7/20/07 16:21:15	94.50	-1.13	7.07	4.72	10.27	
7/20/07 16:21:30	94.88	7.03	7.02	4.71	10.27	
7/20/07 16:21:45	94.88	6.46	7.07	4.70	10.27	
7/20/07 16:22:00	94.63	5.11	7.16	4.62	10.30	
7/20/07 16:22:15	94.25	0.22	7.14	4.51	10.34	
7/20/07 16:22:30	93.63	6.11	7.04	4.44	10.39	
7/20/07 16:22:45	93.38	7.11	7.05	4.42	10.39	
7/20/07 16:23:00	93.38	4.96	7.16	4.43	10.38	
7/20/07 16:23:15	93.38	2.06	7.18	4.48	10.30	
7/20/07 16:23:30	93.63	0.07	7.39	4.63	10.20	
7/20/07 16:23:45	94.50	6.26	7.23	4.73	10.14	
7/20/07 16:24:00	94.88	5.56	7.32	4.78	10.11	
7/20/07 16:24:15	94.88	2.61	7.28	4.79	10.10	
7/20/07 16:24:30	94.88	0.17	7.32	4.80	10.12	
7/20/07 16:24:45	95.38	7.68	7.25	4.77	10.15	
7/20/07 16:25:00	95.13	4.89	7.25	4.64	10.24	
7/20/07 16:25:15	94.75	5.01	7.23	4.50	10.34	
7/20/07 16:25:30	94.13	0.04	7.16	4.42	10.38	
7/20/07 16:25:45	93.75	7.26	7.07	4.38	10.40	
7/20/07 16:26:00	93.63	7.24	7.04	4.39	10.42	
7/20/07 16:26:15	93.88	5.66	7.02	4.39	10.41	
7/20/07 16:26:30	93.63	-2.28	7.14	4.41	10.38	
7/20/07 16:26:45	94.00	2.76	7.07	4.53	10.31	
7/20/07 16:27:00	94.38	6.16	7.07	4.64	10.26	
7/20/07 16:27:15	94.88	6.61	7.02	4.70	10.23	
7/20/07 16:27:30	94.88	0.49	7.00	4.72	10.24	
7/20/07 16:27:45	94.88	2.91	7.00	4.72	10.24	
7/20/07 16:28:00	94.88	6.41	7.02	4.72	10.26	
7/20/07 16:28:15	94.88	7.06	6.95	4.72	10.28	
7/20/07 16:28:30	94.88	1.09	6.65	4.71	10.28	
7/20/07 16:28:45	94.88	3.06	6.28	4.69	10.29	
7/20/07 16:29:00	94.88	7.98	6.01	4.66	10.31	
7/20/07 16:29:15	94.75	7.91	5.89	4.59	10.36	
7/20/07 16:29:30	94.13	1.69	5.86	4.49	10.41	
7/20/07 16:29:45	93.75	3.66	5.64	4.43	10.45	
7/20/07 16:30:00	93.38	8.76	5.59	4.40	10.46	
7/20/07 16:30:15	93.00	7.76	5.66	4.40	10.47	
7/20/07 16:30:30	93.38	3.34	5.55	4.42	10.47	
7/20/07 16:30:45	93.50	1.11	5.64	4.49	10.39	
7/20/07 16:31:00	93.88	7.73	5.59	4.62	10.31	
7/20/07 16:31:15	94.50	6.71	5.43	4.69	10.28	
7/20/07 16:31:30	94.88	3.81	5.59	4.73	10.22	
7/20/07 16:31:45	94.88	-1.48	5.78	4.74	10.22	
7/20/07 16:32:00	94.88	7.29	5.85	4.74	10.20	
7/20/07 16:32:15	95.00	6.46	5.68	4.75	10.17	
7/20/07 16:32:30	95.38	4.41	5.75	4.75	10.16	
7/20/07 16:32:45	95.38	-0.13	5.80	4.73	10.20	
7/20/07 16:33:00	95.13	9.28	5.92	4.84	10.28	
7/20/07 16:33:15	94.75	11.76	5.78	4.52	10.35	
7/20/07 16:33:30	94.88	-1.48	5.78	4.74	10.22	
7/20/07 16:33:45	94.75	11.76	5.78	4.52	10.35	End Run 9
7/20/07 16:34:00	94.88	-1.48	5.78	4.74	10.22	
7/20/07 16:34:15	94.88	7.29	5.85	2.74	7.20	
7/20/07 16:34:30	59.36	3.61	22.62	1.97	1.91	
7/20/07 16:34:45	16.71	1.96	71.73	0.60	0.28	
7/20/07 16:35:00	2.08	2.06	116.19	0.24	-0.08	
7/20/07 16:35:15	0.83	2.61	76.51	0.24	-0.09	
7/20/07 16:35:30	0.83	0.77	55.21	0.23	-0.10	
7/20/07 16:35:45	1.33	-0.98	46.23	0.23	-0.12	
7/20/07 16:36:00	1.33	-1.13	42.65	0.23	-0.12	
7/20/07 16:36:15	1.33	1.51	43.09	0.23	-0.12	System Bias
7/20/07 16:36:30	1.08	1.71	43.71	0.22	-0.13	SO ₂ Bias 10 Mid = 43.62
7/20/07 16:36:45	0.83	-1.33	43.60	0.22	-0.12	
7/20/07 16:37:00	0.83	-1.06	43.88	0.22	-0.13	
7/20/07 16:37:15	0.83	2.21	43.30	0.21	-0.13	
7/20/07 16:37:30	0.83	1.56	43.64	0.21	-0.13	
7/20/07 16:37:45	0.83	-0.28	43.73	0.21	-0.14	
7/20/07 16:38:00	0.83	-0.98	41.66	0.21	-0.13	
7/20/07 16:38:15	0.83	2.06	41.89	0.21	-0.14	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 16:38:30	0.83	1.79	42.10	0.21	-0.13	
7/20/07 16:38:45	0.83	-0.08	42.12	0.21	-0.13	
7/20/07 16:39:00	1.58	-1.58	40.12	0.29	-0.13	
7/20/07 16:39:15	14.84	1.31	37.93	0.43	-0.14	
7/20/07 16:39:30	74.37	1.04	32.29	0.29	-0.14	
7/20/07 16:39:45	127.50	-0.48	23.43	0.23	-0.14	
7/20/07 16:40:00	156.88	-2.28	15.86	0.22	-0.14	
7/20/07 16:40:15	191.91	0.17	10.72	0.21	-0.14	
7/20/07 16:40:30	197.40	1.46	7.78	0.21	-0.14	
7/20/07 16:40:45	197.03	1.11	6.07	0.21	-0.15	
7/20/07 16:41:00	194.66	-2.28	4.92	0.21	-0.14	
System Bias						
7/20/07 16:41:15	191.78	0.22	4.02	0.21	-0.15	NO _x Bias 10 Mid = 191.16
7/20/07 16:41:30	191.04	1.69	3.51	0.21	-0.15	O ₂ Bias 10 Zero = 0.21
7/20/07 16:41:45	190.91	2.06	3.03	0.21	-0.15	CO ₂ Bias 10 Zero = -0.15
7/20/07 16:42:00	190.91	-2.28	2.68	0.21	-0.15	
7/20/07 16:42:15	191.03	0.32	2.40	0.21	-0.15	
7/20/07 16:42:30	192.16	1.86	2.17	0.21	-0.15	
7/20/07 16:42:45	166.02	2.21	2.36	0.20	-0.15	
7/20/07 16:43:00	112.01	8.08	4.85	0.20	-0.15	
7/20/07 16:43:15	35.85	21.20	6.79	0.21	-0.14	
7/20/07 16:43:30	32.10	43.91	6.42	0.21	-0.15	
System Bias						
7/20/07 16:43:45	18.59	46.03	5.43	0.21	-0.15	CO Bias 10 Mid = 46.45
7/20/07 16:44:00	8.45	45.46	4.25	0.20	-0.15	
7/20/07 16:44:15	4.21	45.99	3.51	0.20	-0.15	
7/20/07 16:44:30	3.08	48.33	2.93	0.20	-0.15	
7/20/07 16:44:45	2.71	47.63	2.52	0.20	-0.15	
7/20/07 16:45:00	2.33	43.51	2.24	0.20	-0.15	
7/20/07 16:45:15	1.83	38.84	2.04	0.20	-0.15	
7/20/07 16:45:30	1.83	49.75	1.96	0.20	-0.15	
7/20/07 16:45:45	1.71	56.88	1.68	0.20	-0.15	
7/20/07 16:46:00	1.71	40.11	1.27	0.20	0.08	
7/20/07 16:46:15	3.58	8.57	1.18	0.22	3.41	
7/20/07 16:46:30	17.84	4.54	1.02	0.21	7.05	
7/20/07 16:46:45	10.95	0.42	1.13	0.18	9.02	
7/20/07 16:47:00	3.83	-2.28	1.09	0.17	9.51	
7/20/07 16:47:15	1.33	-2.28	1.06	0.17	9.62	
7/20/07 16:47:30	0.96	0.94	1.04	0.17	9.68	
7/20/07 16:47:45	0.83	0.11	0.97	0.17	9.68	
System Bias						
7/20/07 16:48:00	0.83	-0.11	0.97	0.17	9.71	CO ₂ Bias 10 Mid = 9.72
7/20/07 16:48:15	0.83	-2.28	0.94	0.17	9.73	
7/20/07 16:48:30	0.83	1.24	0.94	0.17	9.72	
7/20/07 16:48:45	0.83	0.71	0.85	0.17	9.74	
7/20/07 16:49:00	0.83	-0.41	0.78	0.17	9.63	
7/20/07 16:49:15	0.96	-2.28	0.90	0.80	6.67	
7/20/07 16:49:30	1.71	2.74	1.04	3.14	2.24	
7/20/07 16:49:45	1.33	1.54	0.70	4.70	0.36	
7/20/07 16:50:00	0.96	1.01	0.70	5.00	0.04	
System Bias						
7/20/07 16:50:15	0.83	-1.83	0.76	5.04	-0.04	O ₂ Bias 10 Mid = 5.06
7/20/07 16:50:30	0.83	-1.08	0.63	5.06	-0.07	NO _x Bias 10 Zero = 0.83
7/20/07 16:50:45	0.83	2.06	0.70	5.06	-0.09	CO Bias 10 Zero = 0.00
7/20/07 16:51:00	0.83	0.86	0.62	5.08	-0.10	SO ₂ Bias 10 Zero = 0.68
7/20/07 16:51:15	0.83	-1.83	0.58	5.09	-0.11	
7/20/07 16:51:30	0.83	-0.96	0.56	5.11	-0.12	
7/20/07 16:51:45	0.33	3.39	0.51	5.12	-0.12	
7/20/07 16:52:00	1.46	6.39	0.37	5.10	0.79	
7/20/07 16:52:15	8.71	3.76	0.40	4.91	5.13	
7/20/07 16:52:30	52.23	1.14	0.90	4.72	8.41	
7/20/07 16:52:45	77.87	11.18	2.07	4.56	9.95	
7/20/07 16:53:00	91.01	10.01	3.54	4.45	10.33	
7/20/07 16:53:15	93.38	8.88	4.76	4.40	10.43	
7/20/07 16:53:30	93.38	0.57	5.34	4.38	10.47	
7/20/07 16:53:45	92.88	11.36	6.12	4.38	10.46	
Begin Run 10						
7/20/07 16:54:00	92.88	10.58	7.05	4.43	10.41	
7/20/07 16:54:15	93.38	9.31	7.67	4.54	10.35	
7/20/07 16:54:30	93.75	3.49	8.11	4.59	10.33	
7/20/07 16:54:45	93.88	9.26	8.17	4.61	10.34	
7/20/07 16:55:00	93.88	10.81	8.24	4.60	10.36	
7/20/07 16:55:15	93.88	11.03	8.20	4.59	10.34	
7/20/07 16:55:30	93.88	3.19	8.11	4.58	10.34	
7/20/07 16:55:45	93.88	9.26	8.08	4.57	10.33	
7/20/07 16:56:00	93.88	11.68	7.94	4.58	10.33	
7/20/07 16:56:15	93.88	13.26	7.99	4.59	10.36	
7/20/07 16:56:30	93.88	1.69	7.97	4.59	10.36	
7/20/07 16:56:45	94.00	9.78	7.83	4.57	10.35	
7/20/07 16:57:00	94.00	12.71	7.83	4.51	10.38	
7/20/07 16:57:15	93.88	11.88	7.90	4.46	10.39	
7/20/07 16:57:30	93.50	5.36	7.81	4.44	10.40	
7/20/07 16:57:45	93.88	7.61	7.76	4.45	10.36	
7/20/07 16:58:00	93.88	10.38	7.67	4.49	10.33	
7/20/07 16:58:15	94.38	8.88	7.60	4.59	10.25	
7/20/07 16:58:30	94.75	1.01	7.67	4.69	10.19	
7/20/07 16:58:45	95.00	5.29	9.63	4.73	10.14	
7/20/07 16:59:00	95.38	8.63	8.71	4.75	10.14	
7/20/07 16:59:15	95.88	9.38	7.53	4.75	10.14	
7/20/07 16:59:30	95.88	6.04	7.18	4.74	10.16	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 16:59:45	96.00	-1.31	7.16	4.74	10.18	
7/20/07 17:00:00	96.38	9.58	7.30	4.74	10.18	
7/20/07 17:00:15	96.38	8.68	7.18	4.74	10.20	
7/20/07 17:00:30	96.00	6.64	7.16	4.75	10.23	
7/20/07 17:00:45	96.38	-0.56	7.09	4.75	10.24	
7/20/07 17:01:00	96.38	11.96	7.02	4.69	10.31	
7/20/07 17:01:15	95.88	9.86	7.07	4.59	10.43	
7/20/07 17:01:30	95.50	10.11	7.07	4.53	10.52	
7/20/07 17:01:45	95.25	-1.06	7.11	4.51	10.60	
7/20/07 17:02:00	94.88	10.18	7.07	4.50	10.64	
7/20/07 17:02:15	94.88	8.68	7.18	4.51	10.66	
7/20/07 17:02:30	94.88	6.71	7.25	4.62	10.61	
7/20/07 17:02:45	95.00	-0.63	7.23	4.75	10.55	
7/20/07 17:03:00	95.38	5.19	7.11	4.79	10.55	
7/20/07 17:03:15	94.88	6.46	6.95	4.80	10.57	
7/20/07 17:03:30	94.88	4.44	7.11	4.80	10.55	
7/20/07 17:03:45	94.88	-1.03	7.14	4.78	10.53	
7/20/07 17:04:00	94.50	-0.28	7.11	4.76	10.54	
7/20/07 17:04:15	94.25	4.44	7.25	4.68	10.59	
7/20/07 17:04:30	93.50	2.76	7.21	4.54	10.70	
7/20/07 17:04:45	92.75	0.06	7.28	4.42	10.76	
7/20/07 17:05:00	92.38	-0.46	7.32	4.36	10.81	
7/20/07 17:05:15	91.88	3.81	7.35	4.34	10.81	
7/20/07 17:05:30	91.88	1.56	7.39	4.33	10.78	
7/20/07 17:05:45	91.38	-1.21	7.37	4.35	10.78	
7/20/07 17:06:00	91.75	-0.93	7.44	4.44	10.71	
7/20/07 17:06:15	92.38	2.44	7.46	4.54	10.62	
7/20/07 17:06:30	92.75	1.27	7.57	4.59	10.57	
7/20/07 17:06:45	92.88	0.66	7.48	4.62	10.56	
7/20/07 17:07:00	92.88	-2.13	7.44	4.64	10.51	
7/20/07 17:07:15	92.88	0.79	7.44	4.68	10.46	
7/20/07 17:07:30	92.88	-0.06	7.39	4.69	10.44	
7/20/07 17:07:45	92.88	-0.13	7.50	4.82	10.47	
7/20/07 17:08:00	92.51	-2.28	7.55	4.49	10.56	
7/20/07 17:08:15	91.63	1.09	7.57	4.41	10.60	
7/20/07 17:08:30	91.38	0.61	7.37	4.38	10.62	
7/20/07 17:08:45	91.38	0.46	7.39	4.39	10.60	
7/20/07 17:09:00	91.38	-2.28	7.32	4.42	10.58	
7/20/07 17:09:15	91.63	0.64	7.48	4.51	10.52	
7/20/07 17:09:30	92.26	1.46	7.55	4.64	10.44	
7/20/07 17:09:45	93.13	0.64	7.48	4.72	10.40	
7/20/07 17:10:00	93.00	-0.11	7.28	4.75	10.40	
7/20/07 17:10:15	92.88	0.19	7.25	4.75	10.39	
7/20/07 17:10:30	92.88	1.91	7.37	4.76	10.37	
7/20/07 17:10:45	92.88	1.17	7.48	4.77	10.38	
7/20/07 17:11:00	92.51	-1.01	7.46	4.67	10.44	
7/20/07 17:11:15	92.13	-2.28	7.46	4.52	10.56	
7/20/07 17:11:30	91.51	2.11	7.55	4.44	10.83	
7/20/07 17:11:45	90.88	1.06	7.53	4.42	10.65	
7/20/07 17:12:00	90.88	0.27	7.60	4.45	10.61	
7/20/07 17:12:15	91.13	-2.28	7.81	4.57	10.53	
7/20/07 17:12:30	91.76	2.56	7.83	4.66	10.47	
7/20/07 17:12:45	91.88	1.59	7.83	4.71	10.43	
7/20/07 17:13:00	91.88	1.01	7.88	4.73	10.42	
7/20/07 17:13:15	91.88	-2.28	7.76	4.73	10.41	
7/20/07 17:13:30	91.88	2.96	7.83	4.63	10.51	
7/20/07 17:13:45	90.83	2.96	7.76	4.47	10.63	
7/20/07 17:14:00	90.00	1.49	7.71	4.36	10.70	
7/20/07 17:14:15	89.13	-2.11	7.67	4.30	10.75	
7/20/07 17:14:30	88.50	3.91	7.76	4.28	10.79	
7/20/07 17:14:45	88.38	2.28	7.74	4.29	10.79	
7/20/07 17:15:00	88.75	1.26	7.74	4.40	10.71	
7/20/07 17:15:15	89.13	-0.83	7.67	4.54	10.62	
7/20/07 17:15:30	89.75	-0.78	7.41	4.61	10.57	
7/20/07 17:15:45	90.13	3.11	7.37	4.63	10.57	
7/20/07 17:16:00	90.00	2.84	7.48	4.64	10.58	
7/20/07 17:16:15	89.83	-1.06	7.35	4.62	10.62	
7/20/07 17:16:30	89.38	-0.38	7.30	4.51	10.69	
7/20/07 17:16:45	88.63	3.89	7.28	4.39	10.77	
7/20/07 17:17:00	88.00	2.89	7.39	4.31	10.80	
7/20/07 17:17:15	87.38	0.04	7.39	4.27	10.81	
7/20/07 17:17:30	87.38	-0.91	7.30	4.27	10.82	
7/20/07 17:17:45	87.63	2.84	7.16	4.31	10.80	
7/20/07 17:18:00	87.88	1.49	7.18	4.41	10.74	
7/20/07 17:18:15	88.83	-0.08	7.04	4.55	10.65	
7/20/07 17:18:30	89.25	-2.28	6.74	4.65	10.61	
7/20/07 17:18:45	89.63	0.49	6.51	4.70	10.57	
7/20/07 17:19:00	89.88	1.91	6.33	4.75	10.55	
7/20/07 17:19:15	89.88	0.94	6.33	4.77	10.54	
7/20/07 17:19:30	89.88	-2.28	6.16	4.78	10.54	
7/20/07 17:19:45	89.88	1.84	6.28	4.79	10.53	
7/20/07 17:20:00	89.88	1.49	6.21	4.78	10.55	
7/20/07 17:20:15	89.63	1.19	6.16	4.72	10.61	
7/20/07 17:20:30	89.38	-2.28	5.98	4.83	10.69	
7/20/07 17:20:45	89.13	1.99	6.07	4.56	10.76	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 17:21:00	88.88	2.04	6.09	4.54	10.77	
7/20/07 17:21:15	88.88	0.99	6.14	4.56	10.76	
7/20/07 17:21:30	88.88	-2.28	6.07	4.68	10.68	
7/20/07 17:21:45	89.38	0.04	6.14	4.79	10.84	
7/20/07 17:22:00	89.75	1.64	6.05	4.83	10.63	
7/20/07 17:22:15	89.88	0.69	5.98	4.84	10.63	
7/20/07 17:22:30	89.88	-1.56	5.94	4.83	10.63	
7/20/07 17:22:45	89.38	-2.28	6.00	4.78	10.67	
7/20/07 17:23:00	89.38	1.76	6.00	4.64	10.78	
7/20/07 17:23:15	88.63	1.34	6.07	4.50	10.84	
7/20/07 17:23:30	88.00	0.12	6.07	4.42	10.88	
7/20/07 17:23:45	87.12	-2.28	6.14	4.41	10.90	
7/20/07 17:24:00	87.25	1.71	6.16	4.45	10.86	
7/20/07 17:24:15	87.63	1.09	6.05	4.59	10.78	
7/20/07 17:24:30	88.25	-0.63	6.26	4.69	10.75	
7/20/07 17:24:45	88.13	-2.28	6.23	4.72	10.70	
7/20/07 17:25:00	87.88	2.26	6.03	4.72	10.72	
7/20/07 17:25:15	87.13	2.54	6.12	4.63	10.84	
7/20/07 17:25:30	86.50	-0.03	6.12	4.45	10.97	
7/20/07 17:25:45	85.63	-1.98	6.33	4.32	11.09	
7/20/07 17:26:00	85.00	0.02	6.39	4.23	11.13	
7/20/07 17:26:15	84.12	1.49	6.44	4.19	11.17	
7/20/07 17:26:30	83.87	1.91	6.44	4.19	11.17	
7/20/07 17:26:45	83.87	-1.16	6.63	4.22	11.15	
7/20/07 17:27:00	84.24	0.07	6.65	4.34	11.06	
7/20/07 17:27:15	84.62	1.66	6.63	4.45	11.00	
7/20/07 17:27:30	85.25	1.21	6.42	4.50	10.94	
7/20/07 17:27:45	85.38	-1.53	6.42	4.52	10.94	
7/20/07 17:28:00	85.00	0.42	6.63	4.53	10.93	
7/20/07 17:28:15	84.62	3.04	6.72	4.53	10.96	
7/20/07 17:28:30	84.37	2.36	6.60	4.45	11.02	
7/20/07 17:28:45	83.62	-1.11	6.67	4.29	11.13	
7/20/07 17:29:00	82.62	0.12	6.69	4.16	11.22	
7/20/07 17:29:15	81.61	2.74	6.53	4.10	11.23	
7/20/07 17:29:30	81.36	1.96	6.07	4.08	11.22	
7/20/07 17:29:45	80.86	1.69	5.64	4.10	11.19	
7/20/07 17:30:00	81.24	-2.28	5.17	4.19	11.11	
7/20/07 17:30:15	81.61	1.54	4.80	4.32	11.01	
7/20/07 17:30:30	82.24	2.61	4.62	4.39	10.99	
7/20/07 17:30:45	82.87	1.19	4.62	4.43	10.95	
7/20/07 17:31:00	82.87	-2.28	4.46	4.46	10.92	
7/20/07 17:31:15	82.87	2.44	4.41	4.48	10.91	
7/20/07 17:31:30	82.87	3.71	4.48	4.50	10.91	
7/20/07 17:31:45	82.87	4.69	4.39	4.52	10.92	
7/20/07 17:32:00	82.87	-0.03	4.27	4.48	10.98	
7/20/07 17:32:15	82.11	5.14	4.27	4.36	11.09	
7/20/07 17:32:30	81.11	6.21	4.30	4.26	11.18	
7/20/07 17:32:45	80.61	5.39	4.20	4.21	11.25	
7/20/07 17:33:00	80.74	1.36	4.27	4.23	11.27	
7/20/07 17:33:15	81.36	-1.68	4.46	4.34	11.18	
7/20/07 17:33:30	82.24	4.96	4.53	4.45	11.03	
7/20/07 17:33:45	82.62	4.29	4.80	4.50	10.96	
7/20/07 17:34:00	82.99	2.01	5.43	4.52	10.92	
7/20/07 17:34:15	83.37	-1.71	5.89	4.53	10.92	
7/20/07 17:34:30	83.37	5.91	6.16	4.54	10.88	
7/20/07 17:34:45	83.37	5.48	6.16	4.56	10.84	
7/20/07 17:35:00	83.37	5.11	6.37	4.59	10.83	
7/20/07 17:35:15	83.37	2.71	6.63	4.59	10.87	
7/20/07 17:35:30	82.87	3.06	6.63	4.53	10.94	
7/20/07 17:35:45	82.37	8.03	6.88	4.46	11.03	
7/20/07 17:36:00	82.37	7.46	7.11	4.42	11.06	
7/20/07 17:36:15	82.37	3.24	7.23	4.43	11.07	
7/20/07 17:36:30	82.49	2.76	7.32	4.45	11.04	
7/20/07 17:36:45	82.87	7.06	7.37	4.52	10.98	
7/20/07 17:37:00	83.37	6.76	7.44	4.61	10.94	
7/20/07 17:37:15	83.87	4.64	7.46	4.66	10.91	
7/20/07 17:37:30	83.99	2.66	7.57	4.69	10.90	
7/20/07 17:37:45	84.37	7.68	7.50	4.70	10.90	
7/20/07 17:38:00	84.75	6.26	7.48	4.71	10.92	
7/20/07 17:38:15	84.88	5.01	7.59	4.73	10.93	
7/20/07 17:38:30	85.00	-0.88	7.53	4.74	10.92	
7/20/07 17:38:45	85.38	4.54	7.46	4.75	10.92	
7/20/07 17:39:00	85.50	5.56	7.78	4.76	10.91	
7/20/07 17:39:15	85.88	4.34	7.71	4.80	10.89	
7/20/07 17:39:30	85.88	-2.28	7.87	4.88	10.83	
7/20/07 17:39:45	85.88	3.71	7.71	4.92	10.81	
7/20/07 17:40:00	86.00	4.31	7.50	4.93	10.80	
7/20/07 17:40:15	86.38	3.49	7.62	4.92	10.80	
7/20/07 17:40:30	86.38	0.02	7.67	4.92	10.80	
7/20/07 17:40:45	86.38	-0.33	7.64	4.92	10.81	
7/20/07 17:41:00	86.38	4.01	7.62	4.92	10.80	
7/20/07 17:41:15	86.38	3.34	7.57	4.91	10.81	
7/20/07 17:41:30	86.38	-0.28	7.44	4.90	10.82	
7/20/07 17:41:45	86.38	-2.28	7.44	4.84	10.88	
7/20/07 17:42:00	86.38	3.56	7.60	4.78	10.92	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 17:42:15	86.38	2.71	7.67	4.76	10.94	
7/20/07 17:42:30	86.38	-0.03	7.53	4.76	10.94	
7/20/07 17:42:45	86.38	-2.28	7.30	4.81	10.91	
7/20/07 17:43:00	86.88	3.26	7.27	4.96	10.81	
7/20/07 17:43:15	87.38	2.59	7.25	5.07	10.76	
7/20/07 17:43:30	87.37	1.66	7.25	5.12	10.74	
7/20/07 17:43:45	87.37	-1.43	7.37	5.14	10.73	
7/20/07 17:44:00	87.37	0.27	7.32	5.15	10.74	
7/20/07 17:44:15	87.38	1.99	7.37	5.13	10.74	
7/20/07 17:44:30	87.38	1.16	7.32	5.04	10.80	
7/20/07 17:44:45	87.12	-1.46	7.23	4.91	10.86	
7/20/07 17:45:00	86.87	-0.13	7.23	4.83	10.88	
7/20/07 17:45:15	87.12	1.94	7.20	4.79	10.87	
7/20/07 17:45:30	87.37	0.11	7.25	4.80	10.84	
7/20/07 17:45:45	87.37	-1.68	7.23	4.89	10.77	
7/20/07 17:46:00	87.37	-0.78	7.23	5.00	10.70	
7/20/07 17:46:15	87.37	0.94	7.27	5.08	10.64	
7/20/07 17:46:30	87.63	0.01	7.23	5.11	10.64	
7/20/07 17:46:45	87.37	-0.91	7.20	5.13	10.63	
7/20/07 17:47:00	87.37	-2.28	7.30	5.15	10.63	
7/20/07 17:47:15	87.38	0.04	7.34	5.15	10.64	
7/20/07 17:47:30	87.38	0.41	7.23	5.13	10.69	
7/20/07 17:47:45	87.37	-0.21	7.09	5.06	10.77	
7/20/07 17:48:00	87.38	-2.28	7.02	5.01	10.82	
7/20/07 17:48:15	87.37	0.34	6.97	5.02	10.83	
7/20/07 17:48:30	87.38	0.26	6.95	5.04	10.80	
7/20/07 17:48:45	87.37	-0.28	7.13	5.09	10.75	
7/20/07 17:49:00	87.88	-2.03	7.18	5.26	10.62	
7/20/07 17:49:15	88.38	-2.28	7.11	5.39	10.57	
7/20/07 17:49:30	88.38	0.46	7.09	5.44	10.60	
7/20/07 17:49:45	88.38	-0.24	6.90	5.46	10.63	
7/20/07 17:50:00	88.50	-1.48	6.97	5.45	10.66	
7/20/07 17:50:15	88.63	-2.28	7.02	5.40	10.74	
7/20/07 17:50:30	88.25	0.71	8.95	5.24	10.89	
7/20/07 17:50:45	87.88	-0.09	6.88	5.08	11.02	
7/20/07 17:51:00	87.38	-0.88	6.88	4.95	11.09	
7/20/07 17:51:15	86.87	-2.03	6.93	4.86	11.11	
7/20/07 17:51:30	86.38	-0.88	6.81	4.77	11.11	
7/20/07 17:51:45	85.63	-0.16	6.88	4.71	11.09	
7/20/07 17:52:00	85.38	-0.73	7.16	4.70	11.04	
7/20/07 17:52:15	85.13	-1.91	6.92	4.68	11.00	
7/20/07 17:52:30	84.75	-0.73	6.74	4.63	11.01	
7/20/07 17:52:45	84.37	0.29	6.74	4.59	11.01	
7/20/07 17:53:00	83.99	-0.98	6.67	4.59	10.98	
7/20/07 17:53:15	83.62	-1.91	6.62	4.58	10.99	
7/20/07 17:53:30	83.24	-0.88	6.65	4.56	10.99	
7/20/07 17:53:45	82.62	4.19	6.67	4.51	11.03	End Run 10
7/20/07 17:54:00	81.86	18.55	6.74	4.42	10.95	
7/20/07 17:54:15	73.36	14.33	6.95	4.59	7.26	
7/20/07 17:54:30	50.35	-0.83	14.61	3.11	2.73	
7/20/07 17:54:45	23.59	1.39	54.88	1.07	0.49	
7/20/07 17:55:00	8.95	0.86	113.25	0.38	0.02	
7/20/07 17:55:15	3.08	1.39	150.83	0.28	-0.06	
7/20/07 17:55:30	2.33	-2.08	138.16	0.25	-0.08	
7/20/07 17:55:45	1.58	1.16	92.88	0.24	-0.10	
7/20/07 17:56:00	0.96	1.41	63.39	0.23	-0.11	
7/20/07 17:56:15	1.08	0.19	51.21	0.23	-0.11	
7/20/07 17:56:30	1.33	-2.28	46.22	0.23	-0.12	
7/20/07 17:56:45	1.33	-1.36	43.96	0.23	-0.12	
7/20/07 17:57:00	1.20	1.76	42.94	0.22	-0.13	
7/20/07 17:57:15	0.83	1.11	42.74	0.22	-0.13	
7/20/07 17:57:30	0.83	-0.38	42.62	0.22	-0.13	
7/20/07 17:57:45	0.83	-1.08	42.69	0.22	-0.13	
7/20/07 17:58:00	0.83	1.96	42.92	0.21	-0.13	System Bias
7/20/07 17:58:15	0.83	1.24	43.06	0.21	-0.14	SO ₂ Bias 11 Mid = 43.20
7/20/07 17:58:30	0.83	0.31	43.06	0.21	-0.13	
7/20/07 17:58:45	0.83	-1.78	43.18	0.21	-0.14	
7/20/07 17:59:00	0.83	-0.18	43.50	0.21	-0.14	
7/20/07 17:59:15	0.83	1.24	43.52	0.21	-0.14	
7/20/07 17:59:30	1.08	0.46	42.00	0.22	-0.15	
7/20/07 17:59:45	1.83	-1.73	39.19	0.42	-0.14	
7/20/07 18:00:00	56.88	-0.09	35.29	0.36	-0.14	
7/20/07 18:00:15	109.38	1.24	25.94	0.25	-0.14	
7/20/07 18:00:30	152.74	1.11	17.10	0.22	-0.14	
7/20/07 18:00:45	181.15	-1.51	11.24	0.22	-0.14	
7/20/07 18:01:00	195.41	0.12	7.99	0.21	-0.15	
7/20/07 18:01:15	198.66	1.61	5.95	0.21	-0.15	
7/20/07 18:01:30	195.91	0.96	4.80	0.21	-0.15	
7/20/07 18:01:45	193.41	-0.56	4.06	0.21	-0.14	
7/20/07 18:02:00	191.16	-2.28	3.46	0.21	-0.15	System Bias
7/20/07 18:02:15	190.41	0.71	2.95	0.21	-0.15	NO _x Bias 11 Mid = 190.44
7/20/07 18:02:30	190.41	1.11	2.65	0.21	-0.15	O ₂ Bias 11 Zero = 0.21
7/20/07 18:02:45	190.41	0.31	2.33	0.21	-0.15	CO ₂ Bias 11 Zero = -0.15
7/20/07 18:03:00	190.53	-2.28	2.03	0.21	-0.15	
7/20/07 18:03:15	178.15	1.99	2.26	0.21	-0.15	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 18:03:30	133.13	9.06	5.47	0.20	-0.15	
7/20/07 18:03:45	64.36	25.65	8.38	0.20	-0.15	
7/20/07 18:04:00	32.22	36.34	7.73	0.21	-0.15	
7/20/07 18:04:15	25.34	35.64	5.89	0.21	-0.15	
7/20/07 18:04:30	9.20	47.18	4.55	0.21	-0.15	
7/20/07 18:04:45	5.83	46.83	3.62	0.20	-0.15	
7/20/07 18:05:00	3.20	45.98	2.86	0.20	-0.15	
7/20/07 18:05:15	2.83	45.21	2.44	0.20	-0.15	
System Bias						
7/20/07 18:05:30	2.33	48.23	2.12	0.20	-0.15	CO Bias 11 Mid = 47.65
7/20/07 18:05:45	2.08	47.53	1.77	0.20	-0.15	
7/20/07 18:06:00	1.83	47.08	1.59	0.20	-0.15	
7/20/07 18:06:15	1.58	47.78	1.41	0.20	-0.15	
7/20/07 18:06:30	1.45	43.08	1.31	0.20	-0.14	
7/20/07 18:06:45	1.58	25.70	1.10	0.21	1.92	
7/20/07 18:07:00	12.70	6.41	0.87	0.22	6.05	
7/20/07 18:07:15	16.08	-0.76	0.99	0.19	8.58	
7/20/07 18:07:30	4.45	-0.73	0.94	0.18	9.45	
7/20/07 18:07:45	2.33	0.44	0.89	0.17	9.59	
7/20/07 18:08:00	1.20	-0.73	0.89	0.17	9.65	
7/20/07 18:08:15	0.83	-1.11	0.92	0.17	9.67	
7/20/07 18:08:30	0.83	-2.28	0.96	0.17	9.69	
System Bias						
7/20/07 18:08:45	0.83	-0.11	0.87	0.17	9.70	CO ₂ Bias 11 Mid = 9.71
7/20/07 18:09:00	0.83	-0.24	0.80	0.17	9.71	
7/20/07 18:09:15	0.83	-1.31	0.69	0.17	9.72	
7/20/07 18:09:30	0.83	-2.13	0.69	0.17	9.72	
7/20/07 18:09:45	0.83	0.72	0.76	0.40	8.09	
7/20/07 18:10:00	1.45	1.37	0.78	2.35	3.49	
7/20/07 18:10:15	1.58	0.96	0.60	4.39	0.66	
7/20/07 18:10:30	1.20	-0.53	0.60	4.97	0.09	
7/20/07 18:10:45	0.83	-1.08	0.65	5.04	-0.02	
System Bias						
7/20/07 18:11:00	0.83	2.01	0.58	5.06	-0.06	O ₂ Bias 11 Mid = 5.07
7/20/07 18:11:15	0.83	1.24	0.46	5.08	-0.09	NO _x Bias 11 Zero = 0.83
7/20/07 18:11:30	0.83	-0.18	0.46	5.07	-0.10	CO Bias 11 Zero = 0.55
7/20/07 18:11:45	0.83	-0.86	0.48	5.09	-0.11	SO ₂ Bias 11 Zero = 0.49
7/20/07 18:12:00	0.83	2.21	0.55	5.11	-0.11	
7/20/07 18:12:15	0.58	9.28	0.48	5.12	-0.12	
7/20/07 18:12:30	1.08	26.64	0.48	5.12	0.13	
7/20/07 18:12:45	3.58	31.34	0.62	4.95	3.82	
7/20/07 18:13:00	38.72	33.04	1.94	4.76	7.74	
7/20/07 18:13:15	65.36	39.93	4.15	4.71	9.89	
7/20/07 18:13:30	85.25	37.69	6.02	4.72	10.46	
7/20/07 18:13:45	87.12	30.02	7.06	4.75	10.52	
Begin Run 11						
7/20/07 18:14:00	87.87	27.64	7.55	4.77	10.54	
7/20/07 18:14:15	88.13	34.69	7.69	4.78	10.56	
7/20/07 18:14:30	88.38	31.54	7.69	4.76	10.60	
7/20/07 18:14:45	88.63	28.34	7.85	4.72	10.63	
7/20/07 18:15:00	89.00	18.65	7.80	4.68	10.68	
7/20/07 18:15:15	89.38	24.55	7.66	4.66	10.68	
7/20/07 18:15:30	89.50	25.44	7.78	4.64	10.70	
7/20/07 18:15:45	89.88	23.57	7.87	4.64	10.67	
7/20/07 18:16:00	90.00	13.80	8.08	4.72	10.60	
7/20/07 18:16:15	90.38	19.53	8.03	4.79	10.56	
7/20/07 18:16:30	90.88	23.35	8.06	4.82	10.56	
7/20/07 18:16:45	90.88	22.42	8.13	4.82	10.54	
7/20/07 18:17:00	90.88	18.50	8.10	4.83	10.54	
7/20/07 18:17:15	90.88	10.68	7.87	4.82	10.54	
7/20/07 18:17:30	91.00	19.25	7.69	4.81	10.57	
7/20/07 18:17:45	91.38	18.68	7.66	4.79	10.59	
7/20/07 18:18:00	91.50	16.60	7.73	4.77	10.61	
7/20/07 18:18:15	91.88	7.76	7.57	4.75	10.63	
7/20/07 18:18:30	91.88	18.65	7.50	4.74	10.63	
7/20/07 18:18:45	91.88	17.18	7.66	4.73	10.63	
7/20/07 18:19:00	92.38	16.25	7.62	4.68	10.65	
7/20/07 18:19:15	92.38	8.71	7.62	4.61	10.70	
7/20/07 18:19:30	92.38	9.96	7.64	4.58	10.71	
7/20/07 18:19:45	92.38	13.91	7.76	4.57	10.71	
7/20/07 18:20:00	92.38	11.71	7.73	4.56	10.69	
7/20/07 18:20:15	92.38	7.23	7.71	4.62	10.63	
7/20/07 18:20:30	93.00	1.51	7.62	4.76	10.55	
7/20/07 18:20:45	93.63	8.96	7.55	4.85	10.45	
7/20/07 18:21:00	93.88	9.31	7.57	4.88	10.40	
7/20/07 18:21:15	93.88	7.98	7.48	4.89	10.40	
7/20/07 18:21:30	94.00	1.26	7.46	4.90	10.36	
7/20/07 18:21:45	94.38	7.26	7.25	4.92	10.37	
7/20/07 18:22:00	94.38	9.71	7.30	4.93	10.39	
7/20/07 18:22:15	94.38	9.36	7.34	4.93	10.41	
7/20/07 18:22:30	94.38	6.96	7.41	4.89	10.49	
7/20/07 18:22:45	94.13	3.04	7.37	4.86	10.56	
7/20/07 18:23:00	94.00	11.41	7.30	4.82	10.64	
7/20/07 18:23:15	94.13	11.08	7.25	4.75	10.76	
7/20/07 18:23:30	93.38	10.26	7.34	4.64	10.88	
7/20/07 18:23:45	93.13	3.64	7.41	4.59	10.97	
7/20/07 18:24:00	92.88	10.46	7.46	4.58	11.00	
7/20/07 18:24:15	92.88	10.26	7.46	4.57	11.00	
7/20/07 18:24:30	92.75	8.61	7.37	4.59	11.00	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 18:24:45	92.38	1.86	7.25	4.70	10.91	
7/20/07 18:25:00	92.51	2.41	7.32	4.82	10.81	
7/20/07 18:25:15	92.88	6.41	7.25	4.88	10.77	
7/20/07 18:25:30	93.25	4.71	7.25	4.89	10.74	
7/20/07 18:25:45	92.88	2.16	7.27	4.90	10.69	
7/20/07 18:26:00	92.88	-2.28	7.25	4.91	10.65	
7/20/07 18:26:15	92.88	2.34	7.13	4.93	10.60	
7/20/07 18:26:30	92.88	3.06	7.06	4.95	10.54	
7/20/07 18:26:45	92.51	1.31	6.95	4.92	10.53	
7/20/07 18:27:00	92.38	-2.28	6.95	4.80	10.58	
7/20/07 18:27:15	92.38	1.64	7.04	4.71	10.61	
7/20/07 18:27:30	92.38	1.86	6.95	4.68	10.59	
7/20/07 18:27:45	92.75	0.74	6.97	4.69	10.56	
7/20/07 18:28:00	93.00	-1.33	7.06	4.71	10.52	
7/20/07 18:28:15	93.38	-1.21	6.99	4.76	10.48	
7/20/07 18:28:30	93.50	1.66	6.97	4.90	10.36	
7/20/07 18:28:45	94.25	0.86	7.02	5.05	10.25	
7/20/07 18:29:00	94.88	-0.68	7.02	5.12	10.19	
7/20/07 18:29:15	94.88	-1.38	7.11	5.16	10.17	
7/20/07 18:29:30	94.88	1.06	7.09	5.18	10.17	
7/20/07 18:29:45	95.25	0.69	7.11	5.20	10.13	
7/20/07 18:30:00	95.38	-0.88	7.00	5.22	10.13	
7/20/07 18:30:15	95.38	-2.28	6.90	5.17	10.21	
7/20/07 18:30:30	95.38	-0.53	7.00	5.05	10.27	
7/20/07 18:30:45	95.38	0.92	7.07	4.97	10.32	
7/20/07 18:31:00	95.38	0.06	7.11	4.95	10.34	
7/20/07 18:31:15	95.38	-0.71	7.06	4.95	10.34	
7/20/07 18:31:30	95.38	-2.28	6.97	4.97	10.34	
7/20/07 18:31:45	95.38	0.54	6.90	5.08	10.25	
7/20/07 18:32:00	95.88	0.61	6.95	5.24	10.15	
7/20/07 18:32:15	95.88	0.49	6.88	5.30	10.14	
7/20/07 18:32:30	95.88	-1.23	6.90	5.32	10.17	
7/20/07 18:32:45	95.88	1.91	6.97	5.32	10.19	
7/20/07 18:33:00	95.38	0.46	6.83	5.22	10.30	
7/20/07 18:33:15	95.00	-0.58	6.85	5.04	10.44	
7/20/07 18:33:30	94.75	-2.18	6.85	4.92	10.55	
7/20/07 18:33:45	94.38	-1.51	6.88	4.86	10.60	
7/20/07 18:34:00	94.38	0.51	6.85	4.84	10.62	
7/20/07 18:34:15	94.38	-0.31	6.62	4.84	10.60	
7/20/07 18:34:30	94.38	-1.18	6.69	4.90	10.55	
7/20/07 18:34:45	94.38	-1.36	6.71	5.00	10.48	
7/20/07 18:35:00	93.88	0.31	6.74	5.07	10.43	
7/20/07 18:35:15	93.88	0.46	6.70	5.08	10.44	
7/20/07 18:35:30	93.38	-1.18	6.48	5.07	10.42	
7/20/07 18:35:45	93.38	-2.28	6.41	5.07	10.44	
7/20/07 18:36:00	93.38	-0.78	6.48	5.07	10.47	
7/20/07 18:36:15	93.00	-0.51	6.60	5.06	10.48	
7/20/07 18:36:30	92.75	-0.58	6.65	4.98	10.53	
7/20/07 18:36:45	92.38	-2.28	6.62	4.85	10.65	
7/20/07 18:37:00	91.76	-1.13	6.53	4.76	10.72	
7/20/07 18:37:15	91.38	0.14	6.53	4.73	10.74	
7/20/07 18:37:30	91.38	-1.03	6.44	4.70	10.76	
7/20/07 18:37:45	91.00	0.57	6.44	4.72	10.74	
7/20/07 18:38:00	90.88	-2.28	6.46	4.79	10.70	
7/20/07 18:38:15	90.88	0.51	6.46	4.83	10.68	
7/20/07 18:38:30	90.88	-0.33	6.51	4.85	10.66	
7/20/07 18:38:45	90.88	-1.23	6.32	4.86	10.64	
7/20/07 18:39:00	90.75	-2.28	6.39	4.88	10.63	
7/20/07 18:39:15	90.38	-1.51	6.48	4.89	10.61	
7/20/07 18:39:30	90.25	-0.04	6.48	4.84	10.63	
7/20/07 18:39:45	89.50	-0.53	6.37	4.70	10.73	
7/20/07 18:40:00	88.88	-1.48	6.39	4.58	10.81	
7/20/07 18:40:15	88.50	-1.46	6.46	4.53	10.81	
7/20/07 18:40:30	88.38	0.56	6.44	4.55	10.81	
7/20/07 18:40:45	88.38	-0.66	6.44	4.58	10.81	
7/20/07 18:41:00	88.38	-1.18	6.44	4.63	10.75	
7/20/07 18:41:15	88.38	-2.28	6.41	4.66	10.73	
7/20/07 18:41:30	87.88	-0.58	6.48	4.70	10.70	
7/20/07 18:41:45	87.88	-0.58	6.53	4.73	10.69	
7/20/07 18:42:00	87.88	-0.98	6.55	4.76	10.65	
7/20/07 18:42:15	87.88	-2.21	6.35	4.78	10.64	
7/20/07 18:42:30	87.88	-2.28	6.32	4.80	10.84	
7/20/07 18:42:45	87.88	0.24	6.37	4.79	10.64	
7/20/07 18:43:00	87.88	-0.88	6.37	4.74	10.70	
7/20/07 18:43:15	87.50	-0.71	6.35	4.73	10.68	
7/20/07 18:43:30	87.38	-2.28	6.41	4.77	10.65	
7/20/07 18:43:45	87.38	0.34	6.37	4.81	10.64	
7/20/07 18:44:00	87.38	-1.23	6.48	4.87	10.57	
7/20/07 18:44:15	87.38	-0.78	6.44	4.96	10.53	
7/20/07 18:44:30	87.50	-2.28	6.41	5.03	10.50	
7/20/07 18:44:45	87.88	-1.38	6.39	5.07	10.46	
7/20/07 18:45:00	87.88	-0.03	6.35	5.11	10.45	
7/20/07 18:45:15	87.88	-0.46	6.41	5.13	10.46	
7/20/07 18:45:30	87.88	-1.18	6.30	5.15	10.44	
7/20/07 18:45:45	87.50	-2.28	6.25	5.08	10.52	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 18:46:00	87.38	-0.93	6.21	4.95	10.64	
7/20/07 18:46:15	87.00	-1.56	6.16	4.84	10.70	
7/20/07 18:46:30	86.88	-0.03	6.25	4.77	10.74	
7/20/07 18:46:45	86.87	-2.28	6.32	4.76	10.78	
7/20/07 18:47:00	86.88	-0.63	6.39	4.78	10.79	
7/20/07 18:47:15	86.88	-0.58	6.28	4.86	10.71	
7/20/07 18:47:30	87.38	-0.93	6.18	4.98	10.65	
7/20/07 18:47:45	87.38	-1.61	6.18	5.06	10.60	
7/20/07 18:48:00	87.25	-2.28	6.28	5.09	10.60	
7/20/07 18:48:15	86.88	0.71	6.25	5.10	10.61	
7/20/07 18:48:30	86.88	-0.09	6.09	5.09	10.62	
7/20/07 18:48:45	86.88	-1.31	6.16	5.07	10.66	
7/20/07 18:49:00	86.38	-2.28	6.09	5.04	10.70	
7/20/07 18:49:15	86.38	0.89	6.09	5.00	10.76	
7/20/07 18:49:30	86.38	0.41	6.04	4.90	10.86	
7/20/07 18:49:45	86.00	0.04	6.14	4.78	10.95	
7/20/07 18:50:00	85.38	-0.63	6.11	4.71	11.01	
7/20/07 18:50:15	85.38	-1.23	6.16	4.67	11.04	
7/20/07 18:50:30	84.88	1.06	6.18	4.64	11.05	
7/20/07 18:50:45	84.88	0.21	6.07	4.67	11.04	
7/20/07 18:51:00	84.88	-1.03	6.07	4.72	10.98	
7/20/07 18:51:15	84.50	-2.28	6.09	4.73	10.97	
7/20/07 18:51:30	84.37	-0.68	6.25	4.70	10.98	
7/20/07 18:51:45	84.00	0.54	6.25	4.67	11.00	
7/20/07 18:52:00	83.87	0.66	6.18	4.65	11.02	
7/20/07 18:52:15	83.49	-2.28	6.25	4.63	11.02	
7/20/07 18:52:30	82.87	-0.23	6.41	4.60	11.04	
7/20/07 18:52:45	82.87	1.19	6.41	4.47	11.11	
7/20/07 18:53:00	81.87	0.21	6.41	4.32	11.20	
7/20/07 18:53:15	80.99	-0.56	6.46	4.25	11.23	
7/20/07 18:53:30	80.37	-2.28	6.25	4.22	11.25	
7/20/07 18:53:45	79.99	1.64	6.39	4.28	11.18	
7/20/07 18:54:00	80.61	0.71	6.46	4.41	11.09	
7/20/07 18:54:15	80.87	0.19	6.46	4.47	11.06	
7/20/07 18:54:30	80.87	-2.28	6.60	4.48	11.05	
7/20/07 18:54:45	80.87	3.34	6.60	4.50	11.04	
7/20/07 18:55:00	80.86	2.21	6.55	4.46	11.07	
7/20/07 18:55:15	80.49	2.96	6.44	4.35	11.15	
7/20/07 18:55:30	79.61	0.12	6.51	4.25	11.22	
7/20/07 18:55:45	78.99	-0.83	6.53	4.22	11.22	
7/20/07 18:56:00	79.11	2.91	6.60	4.24	11.20	
7/20/07 18:56:15	79.36	1.69	6.51	4.26	11.13	
7/20/07 18:56:30	79.36	-0.78	6.58	4.33	11.06	
7/20/07 18:56:45	79.74	-0.66	6.69	4.49	10.94	
7/20/07 18:57:00	80.86	3.41	6.48	4.62	10.84	
7/20/07 18:57:15	81.36	3.01	6.48	4.70	10.82	
7/20/07 18:57:30	81.37	2.66	6.51	4.76	10.80	
7/20/07 18:57:45	81.37	-2.01	6.39	4.80	10.78	
7/20/07 18:58:00	81.61	2.16	6.32	4.82	10.77	
7/20/07 18:58:15	81.87	4.56	6.37	4.79	10.82	
7/20/07 18:58:30	81.87	4.91	6.37	4.66	10.92	
7/20/07 18:58:45	81.86	-1.01	6.39	4.56	10.99	
7/20/07 18:59:00	81.36	2.01	6.41	4.51	11.02	
7/20/07 18:59:15	81.36	6.51	6.48	4.52	11.02	
7/20/07 18:59:30	81.62	6.16	6.44	4.56	11.00	
7/20/07 18:59:45	81.87	4.74	6.39	4.67	10.93	
7/20/07 19:00:00	82.62	0.07	6.35	4.78	10.88	
7/20/07 19:00:15	82.87	8.43	6.35	4.81	10.90	
7/20/07 19:00:30	82.87	9.01	6.48	4.80	10.92	
7/20/07 19:00:45	82.87	7.88	6.28	4.79	10.97	
7/20/07 19:01:00	82.37	1.11	6.32	4.78	10.97	
7/20/07 19:01:15	82.37	10.26	6.48	4.79	10.97	
7/20/07 19:01:30	82.62	9.61	6.48	4.79	10.99	
7/20/07 19:01:45	82.87	9.21	6.44	4.76	11.03	
7/20/07 19:02:00	82.87	6.56	6.55	4.71	11.07	
7/20/07 19:02:15	82.49	0.76	6.55	4.62	11.13	
7/20/07 19:02:30	82.37	9.56	6.48	4.56	11.18	
7/20/07 19:02:45	82.37	9.41	6.44	4.55	11.20	
7/20/07 19:03:00	82.37	7.96	6.51	4.55	11.20	
7/20/07 19:03:15	82.74	-1.43	6.55	4.61	11.15	
7/20/07 19:03:30	82.87	5.31	6.60	4.72	11.09	
7/20/07 19:03:45	83.24	8.61	6.41	4.77	11.05	
7/20/07 19:04:00	83.37	8.31	6.41	4.77	11.07	
7/20/07 19:04:15	83.37	2.14	6.53	4.75	11.06	
7/20/07 19:04:30	83.12	4.41	6.51	4.74	11.07	
7/20/07 19:04:45	83.37	9.96	6.64	4.73	11.06	
7/20/07 19:05:00	83.37	8.21	6.71	4.72	11.05	
7/20/07 19:05:15	82.99	5.21	6.76	4.71	11.04	
7/20/07 19:05:30	82.87	-0.49	6.78	4.70	11.04	
7/20/07 19:05:45	83.24	8.08	6.69	4.68	11.03	
7/20/07 19:06:00	83.37	7.06	6.58	4.71	10.99	
7/20/07 19:06:15	83.74	5.49	6.58	4.75	10.94	
7/20/07 19:06:30	83.87	-1.33	6.55	4.76	10.89	
7/20/07 19:06:45	83.87	7.78	6.67	4.77	10.86	
7/20/07 19:07:00	83.87	6.58	6.78	4.78	10.83	

Marathon Refining - Texas City, Texas

SRU Caustic Wet Gas Scrubber

ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 19:07:15	83.87	5.51	6.69	4.76	10.82	
7/20/07 19:07:30	83.87	0.49	6.74	4.74	10.84	
7/20/07 19:07:45	83.87	0.29	6.69	4.73	10.86	
7/20/07 19:08:00	84.37	7.56	6.78	4.71	10.87	
7/20/07 19:08:15	84.37	7.41	6.76	4.70	10.88	
7/20/07 19:08:30	84.37	5.46	6.76	4.69	10.89	
7/20/07 19:08:45	84.37	0.61	6.74	4.71	10.89	
7/20/07 19:09:00	84.62	8.78	6.71	4.75	10.88	
7/20/07 19:09:15	84.88	8.51	6.67	4.79	10.85	
7/20/07 19:09:30	84.88	8.13	8.48	4.78	10.86	
7/20/07 19:09:45	84.88	1.47	6.58	4.77	10.85	
7/20/07 19:10:00	85.38	6.86	6.83	4.77	10.83	
7/20/07 19:10:15	85.38	8.18	6.78	4.77	10.82	
7/20/07 19:10:30	85.38	7.96	6.83	4.77	10.83	
7/20/07 19:10:45	85.38	4.01	6.62	4.75	10.84	
7/20/07 19:11:00	85.63	1.84	6.69	4.74	10.86	
7/20/07 19:11:15	85.88	8.81	6.88	4.70	10.87	
7/20/07 19:11:30	85.88	8.21	6.74	4.67	10.88	
7/20/07 19:11:45	85.88	6.64	6.67	4.67	10.87	
7/20/07 19:12:00	86.13	-1.31	6.69	4.76	10.81	
7/20/07 19:12:15	86.38	10.73	6.85	4.85	10.75	
7/20/07 19:12:30	86.88	9.76	6.65	4.90	10.73	
7/20/07 19:12:45	86.50	9.91	6.67	4.91	10.74	
7/20/07 19:13:00	86.38	6.08	6.67	4.92	10.71	
7/20/07 19:13:15	86.38	1.16	6.69	4.90	10.73	
7/20/07 19:13:30	86.13	10.16	6.55	4.88	10.75	
7/20/07 19:13:45	86.36	14.68	6.64	4.84	10.79	End Run 11
7/20/07 19:14:00	86.38	27.34	6.67	4.83	10.58	
7/20/07 19:14:15	77.37	5.49	6.78	5.08	8.79	
7/20/07 19:14:30	54.11	7.66	14.15	3.58	2.47	
7/20/07 19:14:45	24.46	2.41	59.11	1.24	0.42	
7/20/07 19:15:00	8.33	-0.28	121.60	0.42	0.01	
7/20/07 19:15:15	3.96	-2.28	160.59	0.29	-0.06	
7/20/07 19:15:30	2.33	0.86	152.07	0.25	-0.09	
7/20/07 19:15:45	1.46	0.81	101.86	0.24	-0.10	
7/20/07 19:16:00	1.08	0.96	66.62	0.23	-0.11	
7/20/07 19:16:15	0.83	-2.28	52.17	0.23	-0.12	
7/20/07 19:16:30	1.33	1.16	46.64	0.23	-0.12	
7/20/07 19:16:45	1.33	1.49	44.49	0.23	-0.13	System Bias
7/20/07 19:17:00	1.33	0.44	43.38	0.23	-0.13	SO ₂ Bias 12 Mid = 43.21
7/20/07 19:17:15	1.32	-0.48	43.15	0.22	-0.14	
7/20/07 19:17:30	0.83	-2.28	43.13	0.22	-0.14	
7/20/07 19:17:45	0.83	2.06	43.17	0.22	-0.13	
7/20/07 19:18:00	0.83	0.64	43.44	0.21	-0.13	
7/20/07 19:18:15	0.83	0.12	43.57	0.21	-0.14	
7/20/07 19:18:30	0.83	-2.28	43.80	0.21	-0.14	
7/20/07 19:18:45	0.83	2.04	43.77	0.21	-0.14	
7/20/07 19:19:00	0.83	0.69	43.82	0.21	-0.14	
7/20/07 19:19:15	0.83	1.56	44.05	0.21	-0.14	
7/20/07 19:19:30	0.83	-1.43	42.58	0.22	-0.14	
7/20/07 19:19:45	9.21	-1.28	39.79	0.41	-0.14	
7/20/07 19:20:00	51.86	1.79	35.68	0.37	-0.14	
7/20/07 19:20:15	105.75	0.49	25.61	0.25	-0.14	
7/20/07 19:20:30	154.14	-0.03	16.75	0.22	-0.14	
7/20/07 19:20:45	180.41	-2.26	10.99	0.22	-0.14	
7/20/07 19:21:00	194.91	1.01	7.76	0.21	-0.15	
7/20/07 19:21:15	198.26	1.06	5.86	0.21	-0.15	
7/20/07 19:21:30	195.91	0.84	4.70	0.21	-0.15	System Bias
7/20/07 19:21:45	193.16	-2.28	3.89	0.21	-0.15	NO _x Bias 12 Mid = 191.60
7/20/07 19:22:00	191.41	1.31	3.53	0.21	-0.15	O ₂ Bias 12 Zero = 0.21
7/20/07 19:22:15	190.91	1.24	3.02	0.21	-0.15	CO ₂ Bias 12 Zero = -0.15
7/20/07 19:22:30	190.91	0.94	2.56	0.21	-0.15	
7/20/07 19:22:45	190.91	-1.38	2.42	0.21	-0.15	
7/20/07 19:23:00	190.91	-2.28	2.28	0.21	-0.15	
7/20/07 19:23:15	183.78	2.11	2.67	0.21	-0.15	
7/20/07 19:23:30	145.90	7.73	8.62	0.20	-0.15	
7/20/07 19:23:45	59.48	23.82	9.42	0.20	-0.15	
7/20/07 19:24:00	37.10	21.65	7.99	0.21	-0.15	
7/20/07 19:24:15	23.84	46.11	5.95	0.21	-0.15	
7/20/07 19:24:30	11.33	46.41	4.32	0.21	-0.15	
7/20/07 19:24:45	5.70	46.66	3.41	0.20	-0.15	
7/20/07 19:25:00	3.59	40.43	2.58	0.20	-0.15	System Bias
7/20/07 19:25:15	2.83	45.96	1.94	0.20	-0.15	CO Bias 12 Mid = 46.74
7/20/07 19:25:30	2.33	47.65	1.70	0.20	-0.15	
7/20/07 19:25:45	1.96	47.13	1.57	0.20	-0.15	
7/20/07 19:26:00	1.83	46.23	1.24	0.20	-0.15	
7/20/07 19:26:15	1.71	39.04	1.01	0.20	-0.15	
7/20/07 19:26:30	1.33	51.70	0.76	0.20	-0.15	
7/20/07 19:26:45	3.21	26.64	0.51	0.21	1.69	
7/20/07 19:27:00	14.33	7.01	0.39	0.22	5.84	
7/20/07 19:27:15	12.58	-2.28	0.62	0.19	8.44	
7/20/07 19:27:30	5.58	0.27	0.53	0.17	9.40	
7/20/07 19:27:45	2.08	0.31	0.57	0.17	9.60	
7/20/07 19:28:00	1.08	-0.74	0.51	0.17	9.64	
7/20/07 19:28:15	0.83	-1.68	0.37	0.17	9.66	

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Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 19:28:30	0.83	-2.28	0.37	0.17	9.69	System Bias
7/20/07 19:28:45	0.83	0.36	0.46	0.17	9.71	CO ₂ Bias 12 Mid = 9.73
7/20/07 19:29:00	0.83	-0.54	0.39	0.17	9.72	
7/20/07 19:29:15	0.83	-1.31	0.44	0.17	9.74	
7/20/07 19:29:30	0.83	-2.28	0.34	0.17	9.73	
7/20/07 19:29:45	0.95	-0.98	0.55	0.37	8.24	
7/20/07 19:30:00	1.58	1.26	0.62	2.25	3.67	
7/20/07 19:30:15	1.46	0.56	0.37	4.34	0.73	
7/20/07 19:30:30	1.33	-1.46	0.32	4.96	0.10	System Bias
7/20/07 19:30:45	0.96	-1.03	0.37	5.04	-0.02	O ₂ Bias 12 Mid = 5.05
7/20/07 19:31:00	0.83	1.96	0.32	5.05	-0.06	NO _x Bias 12 Zero = 0.86
7/20/07 19:31:15	0.83	1.14	0.41	5.06	-0.08	CO Bias 12 Zero = 0.61
7/20/07 19:31:30	0.83	0.39	0.27	5.07	-0.10	SO ₂ Bias 12 Zero = 0.34
7/20/07 19:31:45	0.83	-2.28	0.32	5.09	-0.11	
7/20/07 19:32:00	0.83	1.09	0.07	5.11	-0.11	
7/20/07 19:32:15	0.83	1.06	0.25	5.12	-0.12	
7/20/07 19:32:30	0.83	2.04	0.20	5.12	0.08	
7/20/07 19:32:45	6.58	-0.49	1.24	5.08	3.56	
7/20/07 19:33:00	37.85	3.79	3.92	5.04	7.53	
7/20/07 19:33:15	66.86	5.16	6.86	5.02	9.71	
7/20/07 19:33:30	66.13	4.79	8.63	5.02	10.32	
7/20/07 19:33:45	90.13	1.16	9.14	5.01	10.44	Begin Run 12
7/20/07 19:34:00	91.63	-2.13	9.26	4.98	10.48	
7/20/07 19:34:15	91.88	5.29	9.16	4.96	10.50	
7/20/07 19:34:30	91.88	4.54	9.16	4.94	10.51	
7/20/07 19:34:45	91.88	3.41	9.12	4.90	10.53	
7/20/07 19:35:00	91.63	-1.53	8.96	4.83	10.57	
7/20/07 19:35:15	91.76	5.46	8.84	4.76	10.62	
7/20/07 19:35:30	91.88	4.11	8.66	4.71	10.65	
7/20/07 19:35:45	91.88	3.39	8.77	4.70	10.68	
7/20/07 19:36:00	91.88	-0.96	8.73	4.69	10.70	
7/20/07 19:36:15	91.88	-0.41	8.63	4.74	10.68	
7/20/07 19:36:30	92.13	4.01	8.52	4.88	10.56	
7/20/07 19:36:45	92.39	1.86	8.43	4.97	10.48	
7/20/07 19:37:00	92.63	2.01	8.17	4.99	10.48	
7/20/07 19:37:15	92.51	-2.28	8.08	4.98	10.49	
7/20/07 19:37:30	92.13	2.36	7.87	4.96	10.50	
7/20/07 19:37:45	91.88	4.46	7.87	4.95	10.52	
7/20/07 19:38:00	91.88	3.56	7.87	4.95	10.50	
7/20/07 19:38:15	91.88	0.71	7.78	4.95	10.49	
7/20/07 19:38:30	91.88	2.81	7.78	4.95	10.49	
7/20/07 19:38:45	92.26	3.39	7.87	4.95	10.50	
7/20/07 19:39:00	92.38	3.24	7.89	4.92	10.53	
7/20/07 19:39:15	92.26	2.95	7.82	4.86	10.57	
7/20/07 19:39:30	91.88	-1.86	7.80	4.82	10.60	
7/20/07 19:39:45	91.88	4.46	7.71	4.80	10.62	
7/20/07 19:40:00	91.88	3.24	7.69	4.80	10.63	
7/20/07 19:40:15	92.01	1.11	7.66	4.85	10.57	
7/20/07 19:40:30	92.38	-1.48	7.73	4.97	10.48	
7/20/07 19:40:45	92.76	1.02	7.78	5.05	10.43	
7/20/07 19:41:00	92.63	4.01	7.78	5.08	10.42	
7/20/07 19:41:15	92.38	3.21	7.78	5.08	10.43	
7/20/07 19:41:30	92.13	1.46	7.78	5.06	10.47	
7/20/07 19:41:45	91.88	1.16	7.62	5.04	10.49	
7/20/07 19:42:00	92.13	4.31	7.61	5.01	10.53	
7/20/07 19:42:15	92.01	3.21	7.43	5.00	10.54	
7/20/07 19:42:30	91.88	5.39	7.43	4.96	10.60	
7/20/07 19:42:45	91.88	-2.28	7.34	4.90	10.66	
7/20/07 19:43:00	91.63	2.96	7.34	4.83	10.71	
7/20/07 19:43:15	91.26	3.71	7.27	4.76	10.75	
7/20/07 19:43:30	90.88	3.39	7.27	4.71	10.77	
7/20/07 19:43:45	90.88	-1.08	7.22	4.66	10.80	
7/20/07 19:44:00	90.88	-2.28	7.25	4.63	10.79	
7/20/07 19:44:15	91.32	3.71	7.20	4.69	10.72	
7/20/07 19:44:30	91.63	2.89	7.22	4.84	10.61	
7/20/07 19:44:45	91.88	0.32	7.16	4.87	10.54	
7/20/07 19:45:00	91.88	-2.21	7.25	5.02	10.47	
7/20/07 19:45:15	91.88	3.91	7.18	5.02	10.44	
7/20/07 19:45:30	91.88	2.46	7.16	5.03	10.42	
7/20/07 19:45:45	91.88	1.96	7.09	5.03	10.41	
7/20/07 19:46:00	91.88	-1.16	7.06	5.03	10.40	
7/20/07 19:46:15	92.38	0.81	7.06	5.02	10.42	
7/20/07 19:46:30	92.38	2.34	6.95	4.95	10.46	
7/20/07 19:46:45	91.88	2.01	6.81	4.85	10.53	
7/20/07 19:47:00	91.88	2.59	6.87	4.80	10.55	
7/20/07 19:47:15	91.88	0.47	6.85	4.80	10.55	
7/20/07 19:47:30	92.13	2.16	6.92	4.80	10.57	
7/20/07 19:47:45	92.38	2.01	6.97	4.82	10.57	
7/20/07 19:48:00	92.63	3.16	7.06	4.92	10.46	
7/20/07 19:48:15	92.88	-2.28	6.97	5.05	10.36	
7/20/07 19:48:30	93.13	1.76	6.81	5.12	10.33	
7/20/07 19:48:45	93.38	1.91	6.95	5.14	10.32	
7/20/07 19:49:00	93.13	1.56	6.97	5.14	10.33	
7/20/07 19:49:15	92.88	-1.58	6.99	5.14	10.32	
7/20/07 19:49:30	92.88	-2.28	6.99	5.14	10.30	

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SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 19:49:45	93.25	2.16	6.88	5.12	10.35	
7/20/07 19:50:00	92.88	1.74	6.76	5.02	10.43	
7/20/07 19:50:15	92.88	-0.28	6.69	4.90	10.53	
7/20/07 19:50:30	92.88	-2.28	6.69	4.82	10.59	
7/20/07 19:50:45	92.88	2.46	6.81	4.78	10.64	
7/20/07 19:51:00	92.88	0.94	6.74	4.76	10.65	
7/20/07 19:51:15	92.88	0.81	6.67	4.77	10.66	
7/20/07 19:51:30	92.88	-0.73	6.60	4.84	10.61	
7/20/07 19:51:45	92.88	0.07	6.58	4.98	10.51	
7/20/07 19:52:00	93.13	1.89	6.64	5.08	10.43	
7/20/07 19:52:15	92.88	0.76	6.60	5.10	10.40	
7/20/07 19:52:30	92.88	-1.68	6.51	5.10	10.42	
7/20/07 19:52:45	92.88	-0.28	6.51	5.10	10.38	
7/20/07 19:53:00	92.88	1.19	6.53	5.11	10.39	
7/20/07 19:53:15	92.88	1.51	6.34	5.11	10.39	
7/20/07 19:53:30	92.88	0.11	6.34	5.12	10.37	
7/20/07 19:53:45	92.88	-2.28	6.30	5.10	10.37	
7/20/07 19:54:00	92.88	1.09	6.37	5.02	10.43	
7/20/07 19:54:15	92.76	1.46	6.37	4.91	10.52	
7/20/07 19:54:30	92.38	1.39	6.34	4.80	10.60	
7/20/07 19:54:45	91.88	-2.28	6.23	4.75	10.65	
7/20/07 19:55:00	91.88	1.61	6.46	4.74	10.67	
7/20/07 19:55:15	91.76	2.21	6.34	4.74	10.68	
7/20/07 19:55:30	91.63	1.31	6.32	4.76	10.70	
7/20/07 19:55:45	91.88	-1.08	6.18	4.84	10.62	
7/20/07 19:56:00	91.88	-2.28	6.11	4.82	10.57	
7/20/07 19:56:15	91.88	2.91	6.32	4.94	10.54	
7/20/07 19:56:30	91.63	2.19	6.25	4.93	10.54	
7/20/07 19:56:45	91.26	0.27	6.18	4.91	10.53	
7/20/07 19:57:00	90.92	-2.11	6.17	4.89	10.54	
7/20/07 19:57:15	90.88	1.21	61.64	4.88	10.55	
7/20/07 19:57:30	90.88	1.51	20.68	4.84	10.55	
7/20/07 19:57:45	90.76	2.41	7.06	4.78	10.57	
7/20/07 19:58:00	90.38	-1.18	6.18	4.65	10.67	
7/20/07 19:58:15	89.88	2.31	6.09	4.53	10.76	
7/20/07 19:58:30	89.63	5.86	6.14	4.48	10.81	
7/20/07 19:58:45	89.38	5.01	6.21	4.47	10.78	
7/20/07 19:59:00	88.14	3.66	7.29	4.48	10.77	
7/20/07 19:59:15	88.88	0.62	6.85	4.50	10.75	
7/20/07 19:59:30	89.13	5.76	6.09	4.60	10.66	
7/20/07 19:59:45	89.38	5.06	5.95	4.68	10.58	
7/20/07 20:00:00	89.38	6.33	5.79	4.73	10.55	
7/20/07 20:00:15	89.38	-2.23	5.77	4.75	10.54	
7/20/07 20:00:30	89.38	5.59	5.84	4.76	10.53	
7/20/07 20:00:45	89.88	7.76	5.84	4.75	10.53	
7/20/07 20:01:00	89.88	6.98	5.84	4.74	10.55	
7/20/07 20:01:15	89.88	2.81	5.86	4.73	10.57	
7/20/07 20:01:30	89.88	-0.49	5.91	4.74	10.52	
7/20/07 20:01:45	89.88	10.56	5.89	4.73	10.54	
7/20/07 20:02:00	89.88	11.13	5.95	4.65	10.59	
7/20/07 20:02:15	89.38	10.86	5.84	4.55	10.66	
7/20/07 20:02:30	89.38	0.81	5.73	4.47	10.69	
7/20/07 20:02:45	88.88	12.91	5.68	4.44	10.72	
7/20/07 20:03:00	88.88	11.81	5.77	4.44	10.71	
7/20/07 20:03:15	89.38	10.86	5.93	4.47	10.68	
7/20/07 20:03:30	89.63	0.81	5.87	4.59	10.59	
7/20/07 20:03:45	89.88	10.76	5.77	4.71	10.53	
7/20/07 20:04:00	90.13	15.25	5.77	4.74	10.50	
7/20/07 20:04:15	90.38	15.90	5.77	4.74	10.51	
7/20/07 20:04:30	90.13	10.16	5.68	4.72	10.55	
7/20/07 20:04:45	89.76	8.71	5.61	4.71	10.58	
7/20/07 20:05:00	89.38	20.87	5.52	4.70	10.59	
7/20/07 20:05:15	89.38	21.25	5.54	4.68	10.60	
7/20/07 20:05:30	89.13	18.90	5.52	4.64	10.64	
7/20/07 20:05:45	88.88	10.66	5.66	4.63	10.60	
7/20/07 20:06:00	88.88	23.10	5.63	4.61	10.60	
7/20/07 20:06:15	88.75	22.70	5.66	4.54	10.64	
7/20/07 20:06:30	88.13	20.77	5.40	4.46	10.68	
7/20/07 20:06:45	87.88	4.11	5.42	4.42	10.68	
7/20/07 20:07:00	88.13	13.20	5.50	4.43	10.62	
7/20/07 20:07:15	88.50	14.10	5.66	4.45	10.57	
7/20/07 20:07:30	89.13	13.53	5.75	4.50	10.53	
7/20/07 20:07:45	90.01	4.16	5.70	4.61	10.46	
7/20/07 20:08:00	90.38	2.31	5.68	4.75	10.40	
7/20/07 20:08:15	91.00	11.71	5.59	4.84	10.38	
7/20/07 20:08:30	91.38	10.61	5.61	4.87	10.39	
7/20/07 20:08:45	91.88	6.96	5.68	4.88	10.37	
7/20/07 20:09:00	91.88	-1.33	5.61	4.89	10.36	
7/20/07 20:09:15	92.01	9.41	5.66	4.90	10.36	
7/20/07 20:09:30	92.38	7.71	5.59	4.89	10.37	
7/20/07 20:09:45	92.51	6.46	5.61	4.88	10.34	
7/20/07 20:10:00	92.88	-0.21	5.54	4.88	10.35	
7/20/07 20:10:15	93.01	4.66	5.54	4.85	10.38	
7/20/07 20:10:30	93.07	7.71	5.61	4.78	10.43	
7/20/07 20:10:45	92.88	6.41	5.63	4.71	10.49	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 20:11:00	92.88	2.34	5.47	4.68	10.51	
7/20/07 20:11:15	92.88	2.91	5.40	4.66	10.53	
7/20/07 20:11:30	92.88	8.91	5.47	4.65	10.52	
7/20/07 20:11:45	92.88	5.51	5.42	4.67	10.51	
7/20/07 20:12:00	93.25	4.34	5.49	4.77	10.43	
7/20/07 20:12:15	93.38	-1.03	5.45	4.83	10.38	
7/20/07 20:12:30	93.75	4.84	5.38	4.86	10.36	
7/20/07 20:12:45	93.88	6.36	5.47	4.87	10.34	
7/20/07 20:13:00	93.88	6.13	5.47	4.87	10.34	
7/20/07 20:13:15	93.38	0.32	5.28	4.87	10.35	
7/20/07 20:13:30	93.38	4.03	5.38	4.86	10.35	
7/20/07 20:13:45	93.38	5.86	5.42	4.85	10.36	
7/20/07 20:14:00	93.78	5.49	5.40	4.84	10.36	
7/20/07 20:14:15	93.88	4.16	5.40	4.82	10.36	
7/20/07 20:14:30	93.88	0.24	5.35	4.79	10.40	
7/20/07 20:14:45	93.75	7.46	5.42	4.72	10.47	
7/20/07 20:15:00	93.00	6.27	5.45	4.64	10.52	
7/20/07 20:15:15	92.88	5.86	5.45	4.60	10.56	
7/20/07 20:15:30	92.88	0.57	5.49	4.59	10.57	
7/20/07 20:15:45	92.51	2.81	5.42	4.59	10.56	
7/20/07 20:16:00	92.88	6.11	5.42	4.61	10.55	
7/20/07 20:16:15	92.88	6.56	5.40	4.69	10.50	
7/20/07 20:16:30	93.25	2.54	5.45	4.76	10.47	
7/20/07 20:16:45	93.38	2.16	5.40	4.80	10.41	
7/20/07 20:17:00	93.38	7.03	5.35	4.81	10.37	
7/20/07 20:17:15	93.38	6.16	5.45	4.82	10.35	
7/20/07 20:17:30	93.38	4.66	5.45	4.83	10.36	
7/20/07 20:17:45	93.38	-1.13	5.45	4.82	10.39	
7/20/07 20:18:00	93.00	4.91	5.47	4.80	10.41	
7/20/07 20:18:15	93.38	6.71	5.61	4.78	10.43	
7/20/07 20:18:30	93.38	6.03	5.61	4.76	10.44	
7/20/07 20:18:45	93.38	2.96	5.49	4.74	10.47	
7/20/07 20:19:00	93.00	1.44	5.52	4.68	10.53	
7/20/07 20:19:15	92.76	7.56	5.52	4.62	10.59	
7/20/07 20:19:30	92.38	6.96	5.35	4.59	10.63	
7/20/07 20:19:45	92.38	5.76	5.34	4.57	10.63	
7/20/07 20:20:00	92.38	1.01	5.49	4.57	10.64	
7/20/07 20:20:15	92.51	5.81	5.52	4.60	10.62	
7/20/07 20:20:30	92.88	6.44	5.49	4.71	10.57	
7/20/07 20:20:45	92.88	7.01	5.49	4.79	10.52	
7/20/07 20:21:00	92.88	0.76	5.28	4.82	10.48	
7/20/07 20:21:15	92.38	2.31	5.28	4.82	10.48	
7/20/07 20:21:30	92.38	6.01	5.38	4.82	10.44	
7/20/07 20:21:45	92.88	5.11	5.31	4.82	10.44	
7/20/07 20:22:00	92.88	3.41	5.28	4.82	10.43	
7/20/07 20:22:15	92.76	-2.28	5.22	4.83	10.41	
7/20/07 20:22:30	92.76	4.56	5.19	4.84	10.41	
7/20/07 20:22:45	92.88	6.01	5.26	4.83	10.43	
7/20/07 20:23:00	92.51	4.59	5.28	4.78	10.47	
7/20/07 20:23:15	92.38	-0.83	5.22	4.68	10.56	
7/20/07 20:23:30	92.38	4.64	5.14	4.59	10.64	
7/20/07 20:23:45	91.88	5.96	4.77	4.55	10.67	
7/20/07 20:24:00	91.88	5.61	4.41	4.55	10.67	
7/20/07 20:24:15	91.88	2.01	4.20	4.55	10.67	
7/20/07 20:24:30	91.51	0.51	4.04	4.57	10.66	
7/20/07 20:24:45	91.50	5.86	3.92	4.64	10.61	
7/20/07 20:25:00	91.88	5.34	3.80	4.73	10.56	
7/20/07 20:25:15	92.38	3.06	3.64	4.78	10.54	
7/20/07 20:25:30	92.38	0.81	3.60	4.79	10.50	
7/20/07 20:25:45	92.38	6.01	3.48	4.80	10.49	
7/20/07 20:26:00	92.01	4.86	3.46	4.80	10.49	
7/20/07 20:26:15	91.88	3.51	3.41	4.80	10.48	
7/20/07 20:26:30	91.88	-0.86	3.50	4.79	10.47	
7/20/07 20:26:45	92.01	1.81	3.39	4.79	10.46	
7/20/07 20:27:00	92.38	4.96	3.50	4.79	10.43	
7/20/07 20:27:15	92.38	4.16	3.32	4.78	10.41	
7/20/07 20:27:30	92.01	0.09	3.41	4.72	10.43	
7/20/07 20:27:45	91.88	1.46	3.53	4.66	10.48	
7/20/07 20:28:00	91.88	4.11	3.50	4.63	10.50	
7/20/07 20:28:15	92.01	3.56	3.43	4.63	10.51	
7/20/07 20:28:30	92.38	1.16	3.55	4.63	10.50	
7/20/07 20:28:45	92.38	-1.98	3.73	4.66	10.48	
7/20/07 20:29:00	92.75	2.71	3.73	4.77	10.41	
7/20/07 20:29:15	92.88	4.01	3.90	4.88	10.35	
7/20/07 20:29:30	92.88	2.66	3.85	4.92	10.29	
7/20/07 20:29:45	92.88	-1.58	3.90	4.93	10.29	
7/20/07 20:30:00	92.88	3.14	4.04	4.92	10.31	
7/20/07 20:30:15	93.00	4.21	3.90	4.91	10.33	
7/20/07 20:30:30	93.38	4.24	3.85	4.90	10.33	
7/20/07 20:30:45	93.38	1.71	4.08	4.88	10.36	
7/20/07 20:31:00	93.38	-0.31	4.13	4.78	10.46	
7/20/07 20:31:15	92.75	5.11	4.15	4.66	10.54	
7/20/07 20:31:30	92.38	4.16	4.18	4.60	10.53	
7/20/07 20:31:45	92.38	3.06	4.20	4.57	10.54	
7/20/07 20:32:00	92.38	-1.18	4.34	4.57	10.55	

Marathon Refining - Texas City, Texas
SRU Caustic Wet Gas Scrubber
ARI Reference Method Monitoring Data

Date/Time	NO _x ppmv db	CO ppmv db	SO ₂ ppmv db	O ₂ % db by vol.	CO ₂ % db by vol.	Comments
7/20/07 20:32:15	92.38	1.56	4.52	4.57	10.56	
7/20/07 20:32:30	92.38	4.19	4.36	4.61	10.53	
7/20/07 20:32:45	92.38	4.11	4.45	4.71	10.46	
7/20/07 20:33:00	92.75	0.91	4.80	4.79	10.40	
7/20/07 20:33:15	92.88	1.76	4.73	4.80	10.38	
7/20/07 20:33:30	92.88	5.21	4.73	4.80	10.39	
7/20/07 20:33:45	92.88	8.66	4.76	4.78	10.43	End Run 12
7/20/07 20:34:00	92.88	13.98	4.80	4.76	10.41	
7/20/07 20:34:15	90.38	3.96	5.05	4.81	7.65	
7/20/07 20:34:30	68.24	2.44	9.00	3.26	3.11	
7/20/07 20:34:45	28.84	1.36	37.32	1.13	0.61	
7/20/07 20:35:00	9.33	0.51	91.38	0.39	0.04	
7/20/07 20:35:15	3.96	-1.28	134.27	0.28	-0.05	
7/20/07 20:35:30	2.46	0.76	132.11	0.25	-0.09	
7/20/07 20:35:45	1.33	1.11	94.51	0.24	-0.10	
7/20/07 20:36:00	0.95	0.31	65.58	0.23	-0.11	
7/20/07 20:36:15	1.33	-0.88	51.36	0.23	-0.12	
7/20/07 20:36:30	1.33	-1.23	45.44	0.23	-0.12	
7/20/07 20:36:45	1.33	1.71	42.71	0.23	-0.13	
7/20/07 20:37:00	1.33	0.94	41.54	0.22	-0.13	
7/20/07 20:37:15	1.33	-0.83	41.15	0.22	-0.14	
7/20/07 20:37:30	0.95	-1.23	41.08	0.22	-0.14	
7/20/07 20:37:45	0.83	1.71	41.26	0.21	-0.14	
7/20/07 20:38:00	0.83	1.04	41.45	0.21	-0.14	
7/20/07 20:38:15	0.83	0.51	41.79	0.21	-0.14	
7/20/07 20:38:30	0.83	-1.66	41.98	0.21	-0.14	System Bias
7/20/07 20:38:45	0.83	-0.03	42.05	0.21	-0.14	SO ₂ Bias 13 Mid = 42.19
7/20/07 20:39:00	0.83	1.16	42.20	0.21	-0.14	
7/20/07 20:39:15	0.83	1.01	42.53	0.21	-0.15	
7/20/07 20:39:30	0.83	-1.51	41.32	0.23	-0.15	
7/20/07 20:39:45	14.59	0.02	38.73	0.43	-0.14	
7/20/07 20:40:00	47.85	1.36	35.39	0.35	-0.14	
7/20/07 20:40:15	117.36	0.61	27.31	0.24	-0.15	
7/20/07 20:40:30	154.89	-1.43	18.61	0.22	-0.15	
7/20/07 20:40:45	182.41	-2.28	12.60	0.21	-0.15	
7/20/07 20:41:00	195.41	0.64	8.93	0.21	-0.14	
7/20/07 20:41:15	195.92	0.81	6.81	0.21	-0.15	
7/20/07 20:41:30	193.91	-0.06	5.33	0.21	-0.15	
7/20/07 20:41:45	190.91	-2.28	4.34	0.21	-0.15	
7/20/07 20:42:00	189.66	0.99	3.48	0.21	-0.15	System Bias
7/20/07 20:42:15	189.41	1.26	3.07	0.21	-0.15	NO _x Bias 13 Mid = 189.06
7/20/07 20:42:30	189.03	0.09	2.54	0.21	-0.15	O ₂ Bias 13 Zero = 0.21
7/20/07 20:42:45	188.91	-2.13	2.35	0.21	-0.15	CO ₂ Bias 13 Zero = -0.15
7/20/07 20:43:00	188.91	-1.21	2.14	0.21	-0.15	
7/20/07 20:43:15	188.66	1.91	1.98	0.21	-0.15	
7/20/07 20:43:30	137.76	8.83	3.78	0.20	-0.15	
7/20/07 20:43:45	48.10	23.65	6.21	0.20	-0.15	
7/20/07 20:44:00	37.35	26.92	6.41	0.21	-0.15	
7/20/07 20:44:15	20.59	45.28	5.58	0.21	-0.15	
7/20/07 20:44:30	12.08	46.21	4.45	0.21	-0.15	System Bias
7/20/07 20:44:45	4.83	47.23	3.60	0.20	-0.16	CO Bias 13 Mid = 46.54
7/20/07 20:45:00	3.58	45.26	2.70	0.20	-0.15	
7/20/07 20:45:15	2.83	46.09	2.44	0.20	-0.15	
7/20/07 20:45:30	2.46	47.58	2.10	0.20	-0.15	
7/20/07 20:45:45	2.08	46.93	1.82	0.20	-0.15	
7/20/07 20:46:00	1.83	41.36	1.63	0.20	-0.15	
7/20/07 20:46:15	1.83	43.38	1.47	0.20	-0.16	
7/20/07 20:46:30	1.46	50.51	1.36	0.20	-0.14	
7/20/07 20:46:45	6.58	26.10	0.94	0.21	1.93	
7/20/07 20:47:00	19.72	7.71	0.96	0.22	6.03	
7/20/07 20:47:15	13.08	-2.28	0.96	0.19	8.54	
7/20/07 20:47:30	7.33	0.19	0.87	0.17	9.41	
7/20/07 20:47:45	1.58	-0.18	0.89	0.17	9.59	System Bias
7/20/07 20:48:00	0.95	-0.97	0.83	0.17	9.66	CO ₂ Bias 13 Mid = 9.68
7/20/07 20:48:15	0.83	-2.28	0.76	0.17	9.67	
7/20/07 20:48:30	0.83	-1.63	0.67	0.17	9.68	
7/20/07 20:48:45	0.83	-0.04	0.57	0.17	9.69	
7/20/07 20:49:00	0.83	-1.38	0.55	0.17	9.70	
7/20/07 20:49:15	0.83	-1.23	0.44	0.17	9.71	
7/20/07 20:49:30	0.83	-1.03	0.44	0.17	9.71	
7/20/07 20:49:45	0.83	2.11	0.64	0.39	8.09	
7/20/07 20:50:00	1.21	1.04	0.69	2.31	3.49	
7/20/07 20:50:15	1.58	0.16	0.50	4.37	0.67	
7/20/07 20:50:30	1.46	-2.28	0.50	4.96	0.09	
7/20/07 20:50:45	0.83	-0.13	0.41	5.04	-0.02	System Bias
7/20/07 20:51:00	0.83	1.39	0.41	5.05	-0.06	O ₂ Bias 13 Mid = 5.06
7/20/07 20:51:15	0.83	0.91	0.44	5.06	-0.08	NO _x Bias 13 Zero = 0.83
7/20/07 20:51:30	0.83	-2.28	0.41	5.07	-0.10	CO Bias 13 Zero = 0.03
7/20/07 20:51:45	0.83	0.12	0.41	5.08	-0.11	SO ₂ Bias 13 Zero = 0.42
7/20/07 20:52:00	0.83	1.56	0.46	5.10	-0.12	
7/20/07 20:52:15	0.83	0.81	0.37	5.11	-0.12	
7/20/07 20:52:30	0.83	0.27	0.27	5.12	0.08	
7/20/07 20:52:45	10.59	-2.28	0.11	5.04	3.51	
7/20/07 20:53:00	35.60	5.16	0.18	4.95	7.39	
7/20/07 20:53:15	72.87	4.36	0.80	4.89	9.51	



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

APPENDIX E

Calibration Data

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/19/2007**
 Run Number **Run 1**
 Start Time **7/19/07 16:20**
 Stop Time **7/19/07 17:20**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400.0	ppm
SO ₂	95.0	ppm

	CALIBRATION ERROR - 9:34 hrs				SYSTEM BIAS CHECK					Calibration
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 15:49		Posttest: 17:22 hrs			Correction Factors
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-1.2	-1.3	-0.9	0.4	-1.0	0.2	-0.2	Co=
CO Low		Diluted from								-0.95
CO Mid	45.0	CC93770	44.2	-0.8	44.8	0.5	44.7	0.5	-0.1	Cm=
CO High	95.0	1988 ppm	94.8	-0.2						44.73
CO ₂ Zero	0.00		0.09	0.5	-0.15	-1.2	-0.17	-1.3	-0.1	Co=
CO ₂ Low		Diluted from								-0.161
CO ₂ Mid	10.00	CC26035	9.97	-0.2	9.92	-0.2	9.90	-0.3	-0.1	Cm=
CO ₂ High	20.00	25.1	20.14	0.7						9.914
O ₂ Zero	0.00		0.04	0.4	0.3	2.1	0.3	2.6	0.5	Co=
O ₂ Low		Diluted from								0.273
O ₂ Mid	5.00	EB0003428	5.08	0.8	5.01	-0.8	5.13	0.4	1.2	Cm=
O ₂ High	10.00	25.0%	10.06	0.6						5.066
NO _x Zero	0.0		0.1	0.0	1.2	0.3	0.3	0.1	-0.2	Co=
NO _x Low		Diluted from								0.75
NO _x Mid	200.0	CC55554	204.4	1.1	197.8	-1.7	198.2	-1.5	0.1	Cm=
NO _x High	400.0	1940 ppm	400.5	0.1						197.99
SO ₂ Zero	0.0		-0.6	-0.7	-0.1	0.6	-0.8	-0.2	-0.8	Co=
SO ₂ Low		Diluted from								-0.47
SO ₂ Mid	45.0	CC8757	44.7	-0.3	45.6	0.9	44.2	-0.6	-1.5	Cm=
SO ₂ High	95.0	2105 ppm	95.6	0.7						44.86

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/19/2007**
 Run Number **2**
 Start Time **7/19/07 17:57**
 Stop Time **7/19/07 18:57**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 9:34 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 17:22		Posttest: 19:05 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0	Diluted from CC93770 1988 ppm	-1.2	-1.3	-1.0	0.2	-1.8	-0.6	-0.8	Co=
CO Low										-1.41
CO Mid	45.0		44.2	-0.8	44.7	0.5	43.6	-0.6	-1.1	Cm=
CO High	95.0		94.8	-0.2						44.17
CO ₂ Zero	0.00	Diluted from CC26035 25.1	0.09	0.5	-0.17	-1.3	-0.14	-1.2	0.2	Co=
CO ₂ Low										-0.155
CO ₂ Mid	10.00		9.97	-0.2	9.90	-0.3	9.85	-0.6	-0.3	Cm=
CO ₂ High	20.00		20.14	0.7						9.877
O ₂ Zero	0.00	Diluted from EB0003428 25.0%	0.04	0.4	0.30	2.6	0.24	2.0	-0.5	Co=
O ₂ Low										0.268
O ₂ Mid	5.00		5.08	0.8	5.13	0.4	5.06	-0.2	-0.7	Cm=
O ₂ High	10.00		10.06	0.6						5.094
NO _x Zero	0.0	Diluted from CC55554 1940 ppm	0.0	0.0	0.3	0.1	0.3	0.1	0.0	Co=
NO _x Low										0.33
NO _x Mid	200.0		204.4	1.1	198.2	-1.5	199.8	-1.1	0.4	Cm=
NO _x High	400.0		400.5	0.1						199.01
SO ₂ Zero	0.0	Diluted from CC8757 2105 ppm	-0.6	-0.7	-0.8	-0.2	-0.8	-0.2	0.1	Co=
SO ₂ Low										-0.81
SO ₂ Mid	45.0		44.7	-0.3	44.2	-0.6	43.2	-1.6	-1.0	Cm=
SO ₂ High	95.0		95.6	0.7						43.67

CEMS CALIBRATION DATA

Plant Name	Marathon
Sampling Location	SRU Scrubber
Date	7/19/2007
Run Number	3
Start Time	7/19/07 19:32
Stop Time	7/19/07 20:32

Plant Rep.	John Atchison
Team Leader	Greg Burch
CEM Operator	Greg Burch

Analyzer Span Values (% or ppm)		
CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 9:34 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 19:05		Posttest: 20:41 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-1.2	-1.3	-1.8	-0.6	-1.8	-0.6	0.0	Co=
CO Low		Diluted from								-1.80
CO Mid	45.0	CC93770	44.2	-0.8	43.6	-0.6	44.2	0.0	0.6	Cm=
CO High	95.0	1988 ppm	94.8	-0.2						43.91
CO ₂ Zero	0.00		0.09	0.5	-0.14	-1.2	-0.08	-0.9	0.3	Co=
CO ₂ Low		Diluted from								-0.112
CO ₂ Mid	10.00	CC26035	9.97	-0.2	9.85	-0.6	9.88	-0.5	0.1	Cm=
CO ₂ High	20.00	25.1	20.14	0.7						9.863
O ₂ Zero	0.00		0.04	0.4	0.24	2.0	0.24	2.0	0.0	Co=
O ₂ Low		Diluted from								0.241
O ₂ Mid	5.00	EB0003428	5.08	0.8	5.06	-0.2	5.09	0.0	0.3	Cm=
O ₂ High	10.00	25.0%	10.06	0.6						5.074
NO _x Zero	0.0		0.0	0.0	0.3	0.1	0.3	0.1	0.0	Co=
NO _x Low		Diluted from								0.33
NO _x Mid	200.0	CC55554	204.4	1.1	199.8	-1.1	198.2	-1.6	-0.4	Cm=
NO _x High	400.0	1940 ppm	400.5	0.1						199.00
SO ₂ Zero	0.0		-0.6	-0.7	-0.8	-0.2	-1.8	-1.2	-1.1	Co=
SO ₂ Low		Diluted from								-1.28
SO ₂ Mid	45.0	CC8757	44.7	-0.3	43.2	-1.6	41.5	-3.4	-1.7	Cm=
SO ₂ High	95.0	2105 ppm	95.6	0.7						42.35

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/19/2007**
 Run Number **4**
 Start Time **7/19/07 21:01**
 Stop Time **7/19/07 22:01**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 9:34 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 20:41		Posttest: 22:11 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-1.2	-1.3	-1.8	-0.6	-2.2	-1.0	-0.4	Co=
CO Low		Diluted from								-2.01
CO Mid	45.0	CC93770	44.2	-0.8	44.2	0.0	43.9	-0.4	-0.4	Cm=
CO High	95.0	1988 ppm	94.8	-0.2						44.02
CO ₂ Zero	0.00		0.09	0.5	-0.08	-0.9	-0.16	-1.3	-0.4	Co=
CO ₂ Low		Diluted from								-0.122
CO ₂ Mid	10.00	CC26035	9.97	-0.2	9.88	-0.5	9.90	-0.3	0.1	Cm=
CO ₂ High	20.00	25.1	20.14	0.7						9.887
O ₂ Zero	0.00		0.04	0.4	0.24	2.0	0.20	1.6	-0.4	Co=
O ₂ Low		Diluted from								0.220
O ₂ Mid	5.00	EB0003428	5.08	0.8	5.09	0.0	5.15	0.7	0.7	Cm=
O ₂ High	10.00	25.0%	10.06	0.6						5.120
NO _x Zero	0.0		0.0	0.0	0.3	0.1	1.0	0.3	0.2	Co=
NO _x Low		Diluted from								0.67
NO _x Mid	200.0	CC55554	204.4	1.1	198.2	-1.6	198.6	-1.4	0.1	Cm=
NO _x High	400.0	1940 ppm	400.5	0.1						198.39
SO ₂ Zero	0.0		-0.6	-0.7	-1.8	-1.2	-1.1	-0.5	0.7	Co=
SO ₂ Low		Diluted from								-1.43
SO ₂ Mid	45.0	CC8757	44.7	-0.3	41.5	-3.4	43.6	-1.2	2.2	Cm=
SO ₂ High	95.0	2105 ppm	95.6	0.7						42.58

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **5**
 Start Time **7/20/07 9:48**
 Stop Time **7/20/07 10:48**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 8:25 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 9:18		Posttest: 10:50 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.4	1.1	-1.0	-0.4	-1.5	Co=
CO Low		Diluted from								-0.29
CO Mid	45.0	CC93770	43.7	-1.4	44.5	0.9	46.1	2.5	1.6	Cm=
CO High	95.0	1988 ppm	95.2	0.3						45.29
CO ₂ Zero	0.00		-0.17	-0.9	-0.11	0.3	-0.07	0.5	0.2	Co=
CO ₂ Low		Diluted from								-0.091
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.75	0.4	9.81	0.6	0.3	Cm=
CO ₂ High	20.00	25.1	20.03	0.2						9.779
O ₂ Zero	0.00		0.15	1.5	0.20	0.5	0.18	0.3	-0.2	Co=
O ₂ Low		Diluted from								0.189
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.06	-1.2	5.02	-1.6	-0.4	Cm=
O ₂ High	10.00	25.0%	10.12	1.2						5.041
NO _x Zero	0.0		0.3	0.1	0.9	0.2	0.9	0.1	0.0	Co=
NO _x Low		Diluted from								0.93
NO _x Mid	200.0	CC55554	202.5	0.6	196.2	-1.6	194.1	-2.1	-0.5	Cm=
NO _x High	400.0	1940 ppm	400.2	0.0						195.15
SO ₂ Zero	0.0		-0.4	-0.4	1.7	2.2	1.4	1.8	-0.4	Co=
SO ₂ Low		Diluted from								1.52
SO ₂ Mid	45.0	CC8757	44.1	-1.0	42.0	-2.2	43.1	-1.0	1.1	Cm=
SO ₂ High	95.0	2105 ppm	94.5	-0.5						42.58

CEMS CALIBRATION DATA

Plant Name	Marathon
Sampling Location	SRU Scrubber
Date	7/20/2007
Run Number	6
Start Time	7/20/07 11:17
Stop Time	7/20/07 12:17

Plant Rep.	John Atchison
Team Leader	Greg Burch
CEM Operator	Greg Burch

Analyzer Span Values (% or ppm)		
CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

CALIBRATION ERROR - 8:25 hrs					SYSTEM BIAS CHECK					Calibration Correction Factors
Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)		Pretest: 10:50 System Response	Syst. Bias (% of Span)	Posttest: 12:20 System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	-1.0	-0.4	0.6	1.2	1.7	Co= -0.22
CO Low	Diluted from									Cm= 46.36
CO Mid	45.0	CC93770	43.7	-1.4	46.1	2.5	46.7	3.1	0.6	
CO High	95.0	1988 ppm	95.2	0.3						
CO ₂ Zero	0.00		-0.17	-0.9	-0.07	0.5	-0.14	0.2	-0.3	Co= -0.105
CO ₂ Low	Diluted from									Cm= 9.768
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.81	0.6	9.73	0.2	-0.4	
CO ₂ High	20.00	25.1	20.03	0.2						
O ₂ Zero	0.00		0.15	1.5	0.18	0.3	0.21	0.6	0.4	Co= 0.197
O ₂ Low	Diluted from									Cm= 5.048
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.02	-1.6	5.07	-1.1	0.5	
O ₂ High	10.00	25.0%	10.12	1.2						
NO _x Zero	0.0		0.3	0.1	0.9	0.1	0.8	0.1	0.0	Co= 0.88
NO _x Low	Diluted from									Cm= 193.11
NO _x Mid	200.0	CC55554	202.5	0.6	194.1	-2.1	192.1	-2.6	-0.5	
NO _x High	400.0	1940 ppm	400.2	0.0						
SO ₂ Zero	0.0		-0.4	-0.4	1.4	1.8	1.0	1.4	-0.4	Co= 1.15
SO ₂ Low	Diluted from									Cm= 43.30
SO ₂ Mid	45.0	CC8757	44.1	-1.0	43.1	-1.0	43.5	-0.6	0.4	
SO ₂ High	95.0	2105 ppm	94.5	-0.5						

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **7**
 Start Time **7/20/07 12:40**
 Stop Time **7/20/07 13:40**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 8:25 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 12:20		Posttest: 13:42 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.6	1.2	0.3	1.0	-0.2	Co=
CO Low		Diluted from								0.46
CO Mid	45.0	CC93770	43.7	-1.4	46.7	3.1	44.3	0.7	-2.4	Cm=
CO High	95.0	1988 ppm	95.2	0.3						45.51
CO ₂ Zero	0.00		-0.17	-0.9	-0.14	0.2	-0.13	0.2	0.0	Co=
CO ₂ Low		Diluted from								-0.134
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.73	0.2	9.72	0.2	0.0	Cm=
CO ₂ High	20.00	25.1	20.03	0.2						9.724
O ₂ Zero	0.00		0.15	1.5	0.21	0.6	0.22	0.7	0.1	Co=
O ₂ Low		Diluted from								0.219
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.07	-1.1	5.10	-0.8	0.3	Cm=
O ₂ High	10.00	25.0%	10.12	1.2						5.087
NO _x Zero	0.0		0.3	0.1	0.8	0.1	0.8	0.1	0.0	Co=
NO _x Low		Diluted from								0.83
NO _x Mid	200.0	CC55554	202.5	0.6	192.1	-2.6	191.3	-2.8	-0.2	Cm=
NO _x High	400.0	1940 ppm	400.2	0.0						191.69
SO ₂ Zero	0.0		-0.4	-0.4	1.0	1.4	0.6	1.0	-0.3	Co=
SO ₂ Low		Diluted from								0.79
SO ₂ Mid	45.0	CC8757	44.1	-1.0	43.5	-0.6	42.9	-1.2	-0.6	Cm=
SO ₂ High	95.0	2105 ppm	94.5	-0.5						43.19

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **8**
 Start Time **7/20/07 14:00**
 Stop Time **7/20/07 15:00**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 8:25 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 13:42		Posttest: 15:17 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.3	1.0	0.6	1.3	0.3	Co=
CO Low		Diluted from								0.47
CO Mid	45.0	CC93770	43.7	-1.4	44.3	0.7	46.2	2.7	2.0	Cm=
CO High	95.0	1988 ppm	95.2	0.3						45.29
CO ₂ Zero	0.00		-0.17	-0.9	-0.13	0.2	-0.14	0.2	0.0	Co=
CO ₂ Low		Diluted from								-0.134
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.72	0.2	9.71	0.1	-0.1	Cm=
CO ₂ High	20.00	25.1	20.03	0.2						9.715
O ₂ Zero	0.00		0.15	1.5	0.22	0.7	0.22	0.7	-0.1	Co=
O ₂ Low		Diluted from								0.220
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.10	-0.8	5.07	-1.1	-0.3	Cm=
O ₂ High	10.00	25.0%	10.12	1.2						5.087
NO _x Zero	0.0		0.3	0.1	0.8	0.1	0.8	0.1	0.0	Co=
NO _x Low		Diluted from								0.83
NO _x Mid	200.0	CC55554	202.5	0.6	191.3	-2.8	196.1	-1.6	1.2	Cm=
NO _x High	400.0	1940 ppm	400.2	0.0						193.68
SO ₂ Zero	0.0		-0.4	-0.4	0.6	1.0	0.8	1.3	0.2	Co=
SO ₂ Low		Diluted from								0.73
SO ₂ Mid	45.0	CC8757	44.1	-1.0	42.9	-1.2	45.4	1.4	2.6	Cm=
SO ₂ High	95.0	2105 ppm	94.5	-0.5						44.14

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **9**
 Start Time **7/20/07 15:34**
 Stop Time **7/20/07 16:34**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 8:25 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 15:17		Posttest: 16:36 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.6	1.3	0.0	0.6	-0.6	Co=
CO Low		Diluted from								0.30
CO Mid	45.0	CC93770	43.7	-1.4	46.2	2.7	46.5	2.9	0.2	Cm=
CO High	95.0	1988 ppm	95.2	0.3						46.35
CO ₂ Zero	0.00		-0.17	-0.9	-0.14	0.2	-0.15	0.1	0.0	Co=
CO ₂ Low		Diluted from								-0.142
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.71	0.1	9.72	0.2	0.1	Cm=
CO ₂ High	20.00	25.1	20.03	0.2						9.717
O ₂ Zero	0.00		0.15	1.5	0.22	0.7	0.21	0.6	-0.1	Co=
O ₂ Low		Diluted from								0.212
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.07	-1.1	5.06	-1.2	-0.1	Cm=
O ₂ High	10.00	25.0%	10.12	1.2						5.067
NO _x Zero	0.0		0.3	0.1	0.8	0.1	0.8	0.1	0.0	Co=
NO _x Low		Diluted from								0.83
NO _x Mid	200.0	CC55554	202.5	0.6	196.1	-1.6	191.2	-2.8	-1.2	Cm=
NO _x High	400.0	1940 ppm	400.2	0.0						193.61
SO ₂ Zero	0.0		-0.4	-0.4	0.8	1.3	0.7	1.1	-0.2	Co=
SO ₂ Low		Diluted from								0.75
SO ₂ Mid	45.0	CC8757	44.1	-1.0	45.4	1.4	43.6	-0.5	-1.8	Cm=
SO ₂ High	95.0	2105 ppm	94.5	-0.5						44.50

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **10**
 Start Time **7/20/07 16:54**
 Stop Time **7/20/07 17:54**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 8:25 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 16:36		Posttest: 17:58 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.0	0.6	0.6	1.2	0.6	Co=
CO Low		Diluted from								0.28
CO Mid	45.0	CC93770	43.7	-1.4	46.5	2.9	47.7	4.2	1.3	Cm=
CO High	95.0	1988 ppm	95.2	0.3						47.05
CO ₂ Zero	0.00		-0.17	-0.9	-0.15	0.1	-0.15	0.1	0.0	Co=
CO ₂ Low		Diluted from								-0.148
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.72	0.2	9.71	0.2	-0.1	Cm=
CO ₂ High	20.00	25.1	20.03	0.2						9.719
O ₂ Zero	0.00		0.15	1.5	0.21	0.6	0.21	0.6	0.0	Co=
O ₂ Low		Diluted from								0.209
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.06	-1.2	5.07	-1.1	0.1	Cm=
O ₂ High	10.00	25.0%	10.12	1.2						5.065
NO _x Zero	0.0		0.3	0.1	0.8	0.1	0.8	0.1	0.0	Co=
NO _x Low		Diluted from								0.83
NO _x Mid	200.0	CC55554	202.5	0.6	191.2	-2.8	190.4	-3.0	-0.2	Cm=
NO _x High	400.0	1940 ppm	400.2	0.0						190.80
SO ₂ Zero	0.0		-0.4	-0.4	0.7	1.1	0.5	0.9	-0.2	Co=
SO ₂ Low		Diluted from								0.59
SO ₂ Mid	45.0	CC8757	44.1	-1.0	43.6	-0.5	43.2	-0.9	-0.4	Cm=
SO ₂ High	95.0	2105 ppm	94.5	-0.5						43.41

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **11**
 Start Time **7/20/07 18:14**
 Stop Time **7/20/07 19:14**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

CALIBRATION ERROR - 8:25 hrs					SYSTEM BIAS CHECK					Calibration Correction Factors
Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)		Pretest: 17:58 System Response	Syst. Bias (% of Span)	Posttest: 19:17 System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.6	1.2	0.6	1.3	0.1	Co=
CO Low	Diluted from									0.58
CO Mid	45.0	CC93770	43.7	-1.4	47.7	4.2	46.7	3.2	-1.0	Cm=
CO High	95.0	1988 ppm	95.2	0.3						47.20
CO ₂ Zero	0.00		-0.17	-0.9	-0.15	0.1	-0.15	0.1	0.0	Co=
CO ₂ Low	Diluted from									-0.149
CO ₂ Mid	10.00	CC26035	9.68	-1.6	9.71	0.2	9.73	0.2	0.1	Cm=
CO ₂ High	20.00	25.1	20.03	0.2						9.719
O ₂ Zero	0.00		0.15	1.5	0.21	0.6	0.21	0.6	0.0	Co=
O ₂ Low	Diluted from									0.209
O ₂ Mid	5.00	EB0003428	5.18	1.8	5.07	-1.1	5.05	-1.3	-0.2	Cm=
O ₂ High	10.00	25.0%	10.12	1.2						5.062
NO _x Zero	0.0		0.3	0.1	0.8	0.1	0.9	0.1	0.0	Co=
NO _x Low	Diluted from									0.85
NO _x Mid	200.0	CC55554	202.5	0.6	190.4	-3.0	191.6	-2.7	0.3	Cm=
NO _x High	400.0	1940 ppm	400.2	0.0						191.02
SO ₂ Zero	0.0		-0.4	-0.4	0.5	0.9	0.3	0.8	-0.2	Co=
SO ₂ Low	Diluted from									0.42
SO ₂ Mid	45.0	CC8757	44.1	-1.0	43.2	-0.9	43.2	-0.9	0.0	Cm=
SO ₂ High	95.0	2105 ppm	94.5	-0.5						43.20

CEMS CALIBRATION DATA

Plant Name **Marathon**
 Sampling Location **SRU Scrubber**
 Date **7/20/2007**
 Run Number **12**
 Start Time **7/20/07 19:34**
 Stop Time **7/20/07 20:34**

Plant Rep. **John Atchison**
 Team Leader **Greg Burch**
 CEM Operator **Greg Burch**

Analyzer Span Values (% or ppm)

CO	95	ppm
CO ₂	20	%
O ₂	10	%
THC		ppm
NO _x	400	ppm
SO ₂	95	ppm

	CALIBRATION ERROR - 8:25 hrs				SYSTEM BIAS CHECK					Calibration Correction Factors
	Cylinder Value (% or ppm)	Cylinder Number	Analyzer Calibration Response	Difference (% of Span)	Pretest: 19:17		Posttest: 20:38 hrs			
					System Response	Syst. Bias (% of Span)	System Response	Syst. Bias (% of Span)	Drift (% of Span)	
CO Zero	0.0		-0.6	-0.6	0.6	1.3	0.0	0.7	-0.6	Co=
CO Low		Diluted from								0.32
CO Mid	45.0	CC93770	44.2	-0.8	46.7	2.6	46.5	2.4	-0.2	Cm=
CO High	95.0	1988 ppm	94.8	-0.2						46.64
CO ₂ Zero	0.00		0.09	0.5	-0.15	-1.2	-0.15	-1.2	0.0	Co=
CO ₂ Low		Diluted from								-0.151
CO ₂ Mid	10.00	CC26035	9.97	-0.2	9.73	-1.2	9.68	-1.4	-0.2	Cm=
CO ₂ High	20.00	25.1	20.14	0.7						9.702
O ₂ Zero	0.00		0.04	0.4	0.21	1.7	0.21	1.7	0.0	Co=
O ₂ Low		Diluted from								0.208
O ₂ Mid	5.00	EB0003428	5.08	0.8	5.05	-0.3	5.06	-0.2	0.1	Cm=
O ₂ High	10.00	25.0%	10.06	0.6						5.058
NO _x Zero	0.0		0.0	0.0	0.9	0.2	0.8	0.2	0.0	Co=
NO _x Low		Diluted from								0.85
NO _x Mid	200.0	CC55554	204.4	1.1	191.6	-3.2	189.1	-3.8	-0.6	Cm=
NO _x High	400.0	1940 ppm	400.5	0.1						190.33
SO ₂ Zero	0.0		-0.6	-0.7	0.3	1.0	0.4	1.1	0.1	Co=
SO ₂ Low		Diluted from								0.38
SO ₂ Mid	45.0	CC8757	44.7	-0.3	43.2	-1.6	42.2	-2.7	-1.1	Cm=
SO ₂ High	95.0	2105 ppm	95.6	0.7						42.70

**USEPA Method 205 Dilution System Verification
15-second data**

CO ₂		Comments
Date/Time	% db by vol.	
7/19/07 10:36:15	7.47	M205 Verification 3901 Mid-Level Concentration
7/19/07 10:36:30	7.44	
7/19/07 10:36:45	7.40	
7/19/07 10:37:00	7.41	7.49 % CO ₂ Trial 2 = 7.41
7/19/07 10:37:15	7.41	
7/19/07 10:37:30	7.42	
7/19/07 10:37:45	7.41	
7/19/07 10:38:00	7.42	M205 Verification 3901 Target Concentration No. 2
7/19/07 10:38:15	7.43	
7/19/07 10:38:30	7.42	
7/19/07 10:38:45	7.11	
7/19/07 10:39:00	6.84	
7/19/07 10:39:15	9.96	
7/19/07 10:39:30	13.09	
7/19/07 10:39:45	14.66	
7/19/07 10:40:00	15.00	
7/19/07 10:40:15	15.03	
7/19/07 10:40:30	15.05	15.00 % CO ₂ Trial 3 = 15.04
7/19/07 10:40:45	15.05	
7/19/07 10:41:00	15.05	
7/19/07 10:41:15	14.99	
7/19/07 10:41:30	15.02	M205 Verification 3901 Target Concentration No. 1
7/19/07 10:41:45	13.00	
7/19/07 10:42:00	9.36	
7/19/07 10:42:15	7.76	
7/19/07 10:42:30	7.51	
7/19/07 10:42:45	7.47	
7/19/07 10:43:00	7.47	
7/19/07 10:43:15	7.46	7.50 % CO ₂ Trial 3 = 7.46
7/19/07 10:43:30	7.47	
7/19/07 10:43:45	7.46	
7/19/07 10:44:00	7.46	
7/19/07 10:44:15	7.44	M205 Verification 3901 Mid-Level Concentration
7/19/07 10:44:30	7.40	
7/19/07 10:44:45	7.40	
7/19/07 10:45:00	7.41	
7/19/07 10:45:15	7.41	
7/19/07 10:45:30	7.41	
7/19/07 10:45:45	7.41	
7/19/07 10:46:00	7.40	
7/19/07 10:46:15	7.40	
7/19/07 10:46:30	7.41	
7/19/07 10:46:45	7.40	
7/19/07 10:47:00	7.40	7.49 % CO ₂ Trial 3 = 7.41
7/19/07 10:47:15	7.40	
7/19/07 10:47:30	7.40	
7/19/07 10:47:45	7.40	
7/19/07 10:48:00	7.41	
7/19/07 10:48:15	7.40	

USEPA Method 205 Dilution System Verification
15-second data

Date/Time	CO ₂ % db by vol.	Comments
7/19/07 9:32:30	27.98	
7/19/07 9:32:45	26.97	
7/19/07 9:33:00	14.48	
7/19/07 9:33:15	3.78	
7/19/07 9:33:30	0.57	
7/19/07 9:33:45	0.26	
7/19/07 9:34:00	0.21	
7/19/07 9:34:15	0.20	
7/19/07 9:34:30	0.13	Calibration Error
7/19/07 9:34:45	0.09	CO ₂ CE Zero = 0.09
7/19/07 9:35:00	0.09	
7/19/07 9:35:15	0.09	
7/19/07 9:35:30	0.09	
7/19/07 9:35:45	0.09	
7/19/07 9:36:00	3.84	
7/19/07 9:36:15	11.17	
7/19/07 9:36:30	16.00	
7/19/07 9:36:45	18.87	
7/19/07 9:37:00	19.92	
7/19/07 9:37:15	20.08	
7/19/07 9:37:30	20.11	
7/19/07 9:37:45	20.12	
7/19/07 9:38:00	20.12	
7/19/07 9:38:15	20.12	
7/19/07 9:38:30	20.12	
7/19/07 9:38:45	20.12	
7/19/07 9:39:00	20.12	
7/19/07 9:39:15	20.14	Calibration Error
7/19/07 9:39:30	20.14	CO ₂ CE Span = 20.14
7/19/07 9:39:45	20.13	
7/19/07 9:40:00	20.14	
7/19/07 9:40:15	20.14	
7/19/07 9:40:30	20.14	
7/19/07 9:40:45	20.14	
7/19/07 9:41:00	20.16	
7/19/07 9:41:15	18.72	
7/19/07 9:41:30	14.07	
7/19/07 9:41:45	10.97	
7/19/07 9:42:00	10.08	
7/19/07 9:42:15	9.99	
7/19/07 9:42:30	9.98	
7/19/07 9:42:45	9.97	
7/19/07 9:43:00	9.97	
7/19/07 9:43:15	9.97	
7/19/07 9:43:30	9.97	
7/19/07 9:43:45	9.96	
7/19/07 9:44:00	9.96	Calibration Error
7/19/07 9:44:15	9.97	CO ₂ CE Mid = 9.97
7/19/07 9:44:30	9.97	
7/19/07 9:44:45	9.96	
7/19/07 9:45:00	9.96	
7/19/07 9:45:15	9.97	
7/19/07 9:45:30	9.97	
7/19/07 9:45:45	9.99	
7/19/07 9:46:00	11.47	
7/19/07 9:46:15	13.76	
7/19/07 9:46:30	14.79	
7/19/07 9:46:45	14.97	M205 Verification 3371 Target Concentration No. 2
7/19/07 9:47:00	15.00	15.00 % CO ₂ Trial 1 = 15.00
7/19/07 9:47:15	15.01	
7/19/07 9:47:30	14.99	
7/19/07 9:47:45	15.01	
7/19/07 9:48:00	15.00	
7/19/07 9:48:15	14.99	
7/19/07 9:48:30	13.31	
7/19/07 9:48:45	9.64	
7/19/07 9:49:00	7.79	M205 Verification 3371 Target Concentration No. 1
7/19/07 9:49:15	7.50	7.50 % CO ₂ Trial 1 = 7.47
7/19/07 9:49:30	7.47	
7/19/07 9:49:45	7.45	
7/19/07 9:50:00	7.46	
7/19/07 9:50:15	7.37	
7/19/07 9:50:30	6.49	
7/19/07 9:50:45	6.79	
7/19/07 9:51:00	7.25	
7/19/07 9:51:15	7.36	
7/19/07 9:51:30	7.38	
7/19/07 9:51:45	7.39	
7/19/07 9:52:00	7.39	M205 Verification 3371 Mid-Level Concentration
7/19/07 9:52:15	7.38	7.49 % CO ₂ Trial 1 = 7.38
7/19/07 9:52:30	7.38	
7/19/07 9:52:45	7.38	
7/19/07 9:53:00	7.39	
7/19/07 9:53:15	7.39	
7/19/07 9:53:30	7.39	

USEPA Method 205 Dilution System Verification
15-second data

CO ₂		
Date/Time	% db by vol.	Comments
7/19/07 9:53:45	7.40	
7/19/07 9:54:00	7.38	
7/19/07 9:54:15	7.15	
7/19/07 9:54:30	10.08	
7/19/07 9:54:45	13.11	
7/19/07 9:55:00	14.59	
7/19/07 9:55:15	14.90	
7/19/07 9:55:30	14.93	M205 Verification 3371
7/19/07 9:55:45	14.95	Target Concentration No. 2
7/19/07 9:56:00	14.95	15.00 % CO ₂ Trial 2 = 14.95
7/19/07 9:56:15	14.95	
7/19/07 9:56:30	14.95	
7/19/07 9:56:45	14.95	
7/19/07 9:57:00	14.95	
7/19/07 9:57:15	14.95	
7/19/07 9:57:30	14.95	
7/19/07 9:57:45	14.94	
7/19/07 9:58:00	14.71	
7/19/07 9:58:15	11.62	
7/19/07 9:58:30	8.56	
7/19/07 9:58:45	7.57	M205 Verification 3371
7/19/07 9:59:00	7.46	Target Concentration No. 1
7/19/07 9:59:15	7.45	7.50 % CO ₂ Trial 2 = 7.44
7/19/07 9:59:30	7.45	
7/19/07 9:59:45	7.44	
7/19/07 10:00:00	7.43	
7/19/07 10:00:15	7.44	
7/19/07 10:00:30	7.44	
7/19/07 10:00:45	7.43	
7/19/07 10:01:00	7.43	
7/19/07 10:01:15	7.40	
7/19/07 10:01:30	7.33	
7/19/07 10:01:45	7.35	
7/19/07 10:02:00	7.38	M205 Verification 3371
7/19/07 10:02:15	7.38	Mid-Level Concentration
7/19/07 10:02:30	7.37	7.49 % CO ₂ Trial 2 = 7.38
7/19/07 10:02:45	7.38	
7/19/07 10:03:00	7.38	
7/19/07 10:03:15	7.40	
7/19/07 10:03:30	7.38	
7/19/07 10:03:45	9.22	
7/19/07 10:04:00	12.44	
7/19/07 10:04:15	14.33	
7/19/07 10:04:30	14.86	
7/19/07 10:04:45	14.95	M205 Verification 3371
7/19/07 10:05:00	14.97	Target Concentration No. 2
7/19/07 10:05:15	14.97	15.00 % CO ₂ Trial 3 = 14.97
7/19/07 10:05:30	14.98	
7/19/07 10:05:45	14.97	
7/19/07 10:06:00	14.97	
7/19/07 10:06:15	14.98	
7/19/07 10:06:30	14.86	
7/19/07 10:06:45	12.06	
7/19/07 10:07:00	8.80	
7/19/07 10:07:15	7.61	M205 Verification 3371
7/19/07 10:07:30	7.47	Target Concentration No. 1
7/19/07 10:07:45	7.46	7.50 % CO ₂ Trial 3 = 7.45
7/19/07 10:08:00	7.44	
7/19/07 10:08:15	7.45	
7/19/07 10:08:30	7.44	
7/19/07 10:08:45	7.43	
7/19/07 10:09:00	7.39	
7/19/07 10:09:15	7.36	
7/19/07 10:09:30	7.38	
7/19/07 10:09:45	7.39	
7/19/07 10:10:00	7.38	
7/19/07 10:10:15	7.38	M205 Verification 3371
7/19/07 10:10:30	7.38	Mid-Level Concentration
7/19/07 10:10:45	7.39	7.49 % CO ₂ Trial 3 = 7.38
7/19/07 10:11:00	7.38	
7/19/07 10:11:15	7.38	
7/19/07 10:11:30	7.38	
7/19/07 10:11:45	7.39	
7/19/07 10:12:00	7.38	
7/19/07 10:12:15	7.39	
7/19/07 10:12:30	7.16	
7/19/07 10:12:45	6.21	
7/19/07 10:13:00	5.84	
7/19/07 10:13:15	4.90	
7/19/07 10:13:30	4.28	
7/19/07 10:13:45	4.18	
7/19/07 10:14:00	4.14	
7/19/07 10:14:15	3.50	
7/19/07 10:14:30	2.77	
7/19/07 10:14:45	2.26	

USEPA Method 205 Dilution System Verification
15-second data

Date/Time	CO ₂ % db by vol.	Comments
7/19/07 10:15:00	1.98	
7/19/07 10:15:15	1.74	
7/19/07 10:15:30	1.65	
7/19/07 10:15:45	1.60	
7/19/07 10:16:00	1.10	
7/19/07 10:16:15	0.79	
7/19/07 10:16:30	0.67	
7/19/07 10:16:45	0.57	
7/19/07 10:17:00	0.51	
7/19/07 10:17:15	0.46	
7/19/07 10:17:30	0.42	
7/19/07 10:17:45	0.39	
7/19/07 10:18:00	0.37	
7/19/07 10:18:15	0.36	
7/19/07 10:18:30	0.34	
7/19/07 10:18:45	0.33	
7/19/07 10:19:00	0.32	
7/19/07 10:19:15	0.30	
7/19/07 10:19:30	0.30	
7/19/07 10:19:45	0.29	
7/19/07 10:20:00	0.28	
7/19/07 10:20:15	0.49	
7/19/07 10:20:30	5.15	
7/19/07 10:20:45	10.69	
7/19/07 10:21:00	13.94	
7/19/07 10:21:15	14.99	
7/19/07 10:21:30	15.15	
7/19/07 10:21:45	15.18	M205 Verification 3901
7/19/07 10:22:00	15.17	Target Concentration No. 2
7/19/07 10:22:15	15.18	15.00 % CO ₂ Trial 1 = 15.17
7/19/07 10:22:30	15.18	
7/19/07 10:22:45	15.17	
7/19/07 10:23:00	15.17	
7/19/07 10:23:15	15.16	
7/19/07 10:23:30	15.13	
7/19/07 10:23:45	15.12	
7/19/07 10:24:00	15.13	
7/19/07 10:24:15	15.12	
7/19/07 10:24:30	15.13	
7/19/07 10:24:45	15.11	
7/19/07 10:25:00	15.11	
7/19/07 10:25:15	15.12	
7/19/07 10:25:30	15.08	
7/19/07 10:25:45	15.07	
7/19/07 10:26:00	12.22	
7/19/07 10:26:15	8.80	
7/19/07 10:26:30	7.65	M205 Verification 3901
7/19/07 10:26:45	7.53	Target Concentration No. 1
7/19/07 10:27:00	7.51	7.50 % CO ₂ Trial 1 = 7.51
7/19/07 10:27:15	7.51	
7/19/07 10:27:30	7.51	
7/19/07 10:27:45	7.51	
7/19/07 10:28:00	7.50	
7/19/07 10:28:15	7.49	
7/19/07 10:28:30	7.42	M205 Verification 3901
7/19/07 10:28:45	7.37	Mid-Level Concentration
7/19/07 10:29:00	7.40	7.49 % CO ₂ Trial 1 = 7.42
7/19/07 10:29:15	7.42	
7/19/07 10:29:30	7.43	
7/19/07 10:29:45	7.44	
7/19/07 10:30:00	7.43	
7/19/07 10:30:15	7.45	
7/19/07 10:30:30	7.42	
7/19/07 10:30:45	7.05	
7/19/07 10:31:00	7.73	
7/19/07 10:31:15	11.43	
7/19/07 10:31:30	13.94	
7/19/07 10:31:45	14.92	
7/19/07 10:32:00	15.06	M205 Verification 3901
7/19/07 10:32:15	15.08	Target Concentration No. 2
7/19/07 10:32:30	15.06	15.00 % CO ₂ Trial 2 = 15.05
7/19/07 10:32:45	15.07	
7/19/07 10:33:00	15.04	
7/19/07 10:33:15	15.03	
7/19/07 10:33:30	12.53	
7/19/07 10:33:45	9.06	
7/19/07 10:34:00	7.70	
7/19/07 10:34:15	7.52	M205 Verification 3901
7/19/07 10:34:30	7.49	Target Concentration No. 1
7/19/07 10:34:45	7.48	7.50 % CO ₂ Trial 2 = 7.48
7/19/07 10:35:00	7.49	
7/19/07 10:35:15	7.49	
7/19/07 10:35:30	7.49	
7/19/07 10:35:45	7.48	
7/19/07 10:36:00	7.48	

**ARI REFERENCE METHOD CEMS DATA
USEPA METHOD 205
DILUTION SYSTEM VERIFICATION**

Company: Marathon
Location: Texas City, Texas
Source: SRU Scrubber
Dilution System ID: 3371.00
Dilution Flow Rate: 5.0 Lpm
Verification date: 7/19/2007

Analyzer Info
Monitor type: CO₂
Monitor range: 20%
Monitor Serial No.: X1440D1/46

Initial Calibration Data

<u>Calibration Concentration</u>	<u>Calibration results</u>	<u>% Difference</u>
Zero: 0.00	Zero: 0.09	Zero: 0.46
Low: _____	Low: _____	Low: _____
Mid: 10.00	Mid: 9.97	Mid: 0.17
High: 20.00	High: 20.14	High: 0.68

Dilution System Verification

Mid level gas type: <u>EPA Protocol 1</u>	High level dilution gas type: <u>CO₂/N₂</u>
Mid level concentration: <u>7.49 %</u>	High level concentration: <u>25.1%</u>
Mid level tank serial #: <u>CC178400</u>	High level tank serial #: <u>CC26035</u>
	Target concentration No. 1: <u>7.50</u>
	Target concentration No. 2: <u>15.00</u>

Dilution System Results

Target Concentration No. 1

	<u>Instrument Response</u>	<u>% difference from average*</u>
Trial No. 1:	<u>15.00</u>	<u>0.18</u>
Trial No. 2:	<u>14.95</u>	<u>0.16</u>
Trial No. 3:	<u>14.97</u>	<u>0.01</u>
Average:	<u>14.975</u>	

Target Concentration No. 2

	<u>Instrument Response</u>	<u>% difference from average*</u>
Trial No. 1:	<u>7.47</u>	<u>0.22</u>
Trial No. 2:	<u>7.44</u>	<u>0.15</u>
Trial No. 3:	<u>7.45</u>	<u>0.07</u>
Average:	<u>7.453</u>	

% Difference from target concentration: 99.66% % Difference from target concentration: 50.31%

Mid Level Calibration Gas Results

<u>Instrument Response</u>	
Trial No. 1: <u>7.38</u>	Mid Level calibration gas concentration: <u>7.49%</u>
Trial No. 2: <u>7.38</u>	Average analyzer response: <u>7.38</u>
Trial No. 3: <u>7.38</u>	Percent difference: <u>1.42</u> *

* Must be less than 2 %

**ARI REFERENCE METHOD CEMS DATA
USEPA METHOD 205
DILUTION SYSTEM VERIFICATION**

Company: Marathon
Location: Texas City, Texas
Source: SRU Scrubber
Dilution System ID: 3901
Dilution Flow Rate: 5.0 Lpm
Verification date: 7/19/2007

Analyzer Info
Monitor type: CO₂
Monitor range: 20%
Monitor Serial No.: X1440D1/46

Initial Calibration Data

<u>Calibration Concentration</u>	<u>Calibration results</u>	<u>% Difference</u>
Zero: 0.00	Zero: 0.09	Zero: 0.46
Low:	Low:	Low:
Mid: 10.00	Mid: 9.97	Mid: 0.17
High: 20.00	High: 20.14	High: 0.68

Dilution System Verification

Mid level gas type: <u>EPA Protocol 1</u>	High level dilution gas type: <u>CO₂/N₂</u>
Mid level concentration: <u>7.49 %</u>	High level concentration: <u>25.1%</u>
Mid level tank serial #: <u>CC178400</u>	High level tank serial #: <u>CC26035</u>
	Target concentration No. 1: <u>7.50</u>
	Target concentration No. 2: <u>15.00</u>

Dilution System Results

Target Concentration No. 1

	<u>Instrument Response</u>	<u>% difference from average*</u>
Trial No. 1:	15.17	0.55
Trial No. 2:	15.05	0.24
Trial No. 3:	15.04	0.31
Average:	15.087	

Target Concentration No. 2

	<u>Instrument Response</u>	<u>% difference from average*</u>
Trial No. 1:	7.51	0.36
Trial No. 2:	7.48	0.04
Trial No. 3:	7.46	0.31
Average:	7.483	

% Difference from target concentration: 101.16% % Difference from target concentration: 50.11%

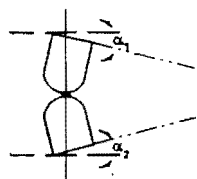
Mid Level Calibration Gas Results

	<u>Instrument Response</u>	
Trial No. 1:	7.42	Mid Level calibration gas concentration: <u>7.49%</u>
Trial No. 2:	7.41	Average analyzer response: <u>7.41</u>
Trial No. 3:	7.41	Percent difference: <u>1.02</u> *

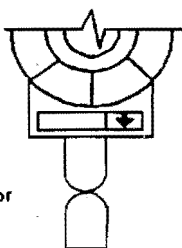
* Must be less than 2 %

E-19

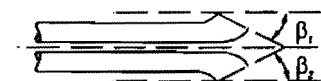
CALIBRATION DATA SHEET 2 **Type S Pitot Tube Inspection**



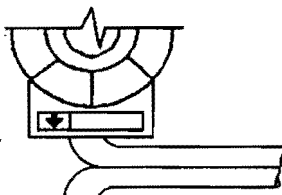
Degree indicating level position for determining α_1 and α_2 .



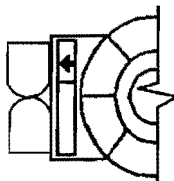
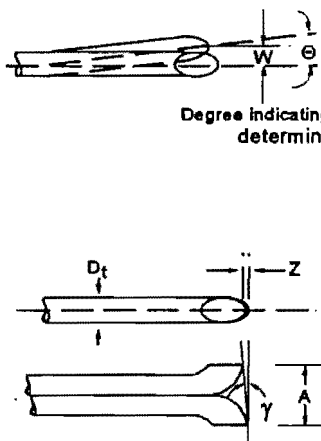
Degree indicating level position for determining β_1 and β_2 .



Degree indicating level position for determining θ .



Degree indicating level position for determining γ then calculate Z.



Level and Perpendicular?	Yes
Obstruction?	No
Damaged?	No
α_1 ($-10^\circ \leq \alpha_1 \leq +10^\circ$)	0°
α_2 ($-10^\circ \leq \alpha_2 \leq +10^\circ$)	0°
β_1 ($-5^\circ \leq \beta_1 \leq +5^\circ$)	0°
β_2 ($-5^\circ \leq \beta_2 \leq +5^\circ$)	0°
γ	0
θ	0
$z = A \tan \gamma$ ($\leq 0.125"$)	0
$w = A \tan \theta$ ($\leq 0.03125"$)	0
D_t ($3/16" \leq D_t \leq 3/8"$)	3/8
A	0.923
$A/2D_t$ ($1.05 \leq P_A/D_t \leq 1.5$)	1.23

QA/QC Check

Completeness ☒ Legibility ☒ Accuracy ☒ Specifications ☒ Reasonableness ☒

Certification

I certify that the Type S pitot tube/probe ID# P.T. 105 meets or exceeds all specifications, criteria and/or applicable design features and is hereby assigned a pitot tube calibration factor C_p of 0.84.

Certified by:

[Signature]
 Personnel (Signature/Date)

[Signature]
 Team Leader (Signature/Date)



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

APPENDIX F

Process Data

			Incinerator 1 O2			Incinerator 2 O2			Incinerator 1 T		
			87AI1296			87AI2296			87TC1120		
Run	Start	End	Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	3.08	3.66	3.90	4.17	4.20	4.22	1,538	1,550	1,587
2	7/19/2007 17:57	7/19/2007 18:57	3.31	3.60	3.89	4.13	4.14	4.14	1,550	1,554	1,557
3	7/19/2007 19:32	7/19/2007 20:32	3.27	3.62	4.20	4.07	4.11	4.13	1,540	1,552	1,569
4	7/19/2007 21:01	7/19/2007 22:01	2.94	3.50	3.64	4.05	4.08	4.10	1,543	1,546	1,550
5	7/20/2007 9:48	7/20/2007 10:48	3.31	3.82	4.49	4.11	4.14	4.19	1,537	1,553	1,578
6	7/20/2007 11:17	7/20/2007 12:17	3.23	3.69	4.29	4.24	4.28	4.29	1,536	1,537	1,541
7	7/20/2007 12:40	7/20/2007 13:40	3.19	3.64	4.03	4.14	4.18	4.24	1,544	1,549	1,551
8	7/20/2007 14:00	7/20/2007 15:00	3.30	3.55	3.83	4.13	4.14	4.15	1,552	1,554	1,555
9	7/20/2007 15:34	7/20/2007 16:34	3.17	3.42	3.73	4.04	4.05	4.07	1,553	1,558	1,561
10	7/20/2007 16:54	7/20/2007 17:54	2.68	3.42	4.35	4.01	4.03	4.03	1,551	1,564	1,584
11	7/20/2007 18:14	7/20/2007 19:14	3.05	3.62	4.44	3.99	4.00	4.03	1,514	1,556	1,584
12	7/20/2007 19:34	7/20/2007 20:34	3.29	3.72	4.05	4.07	4.09	4.11	1,534	1,545	1,555

			Incinerator 2 T			Incinerator 1 NG MSCD			Incinerator 2 NG MSCD		
			87TC2120			87FC1119			87FC2119		
Run	Start	End	Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	1,549	1,549	1,550	117	121	132	78	78	78
2	7/19/2007 17:57	7/19/2007 18:57	1,549	1,549	1,550	121	121	122	77	78	78
3	7/19/2007 19:32	7/19/2007 20:32	1,550	1,550	1,550	119	122	126	78	78	78
4	7/19/2007 21:01	7/19/2007 22:01	1,548	1,549	1,549	119	124	127	77	77	78
5	7/20/2007 9:48	7/20/2007 10:48	1,549	1,550	1,551	95	105	112	79	79	80
6	7/20/2007 11:17	7/20/2007 12:17	1,547	1,548	1,549	94	111	123	79	79	79
7	7/20/2007 12:40	7/20/2007 13:40	1,549	1,549	1,550	119	120	121	78	79	79
8	7/20/2007 14:00	7/20/2007 15:00	1,550	1,550	1,551	121	122	123	79	79	79
9	7/20/2007 15:34	7/20/2007 16:34	1,549	1,550	1,551	118	121	122	77	77	78
10	7/20/2007 16:54	7/20/2007 17:54	1,550	1,550	1,551	94	105	116	77	78	78
11	7/20/2007 18:14	7/20/2007 19:14	1,549	1,550	1,550	95	107	119	78	78	78
12	7/20/2007 19:34	7/20/2007 20:34	1,551	1,551	1,551	113	117	120	78	78	78

			Incinerator 1 Air			Incinerator 2 Air			Incinerator 1 %H2S in Tail Gas		
			87fc1108			87fc2108			87Al1083		
Run	Start	End	Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	1,726	1,849	2,050	973	975	976	0.00430	0.21212	0.48881
2	7/19/2007 17:57	7/19/2007 18:57	1,779	1,844	1,910	971	973	976	0.05960	0.11804	0.16727
3	7/19/2007 19:32	7/19/2007 20:32	1,763	1,861	1,974	964	966	972	0.05063	0.14160	0.32896
4	7/19/2007 21:01	7/19/2007 22:01	1,757	1,882	1,978	965	966	967	0.00540	0.12772	0.37803
5	7/20/2007 9:48	7/20/2007 10:48	1,386	1,588	1,722	973	982	989	0.01657	0.15549	0.52214
6	7/20/2007 11:17	7/20/2007 12:17	1,383	1,683	1,933	984	992	1,017	0.02554	0.10778	0.21268
7	7/20/2007 12:40	7/20/2007 13:40	1,764	1,831	1,904	980	987	1,015	0.04715	0.12158	0.21708
8	7/20/2007 14:00	7/20/2007 15:00	1,786	1,861	1,919	976	986	991	0.09037	0.14503	0.19053
9	7/20/2007 15:34	7/20/2007 16:34	1,723	1,836	1,908	966	968	970	0.05356	0.11823	0.19819
10	7/20/2007 16:54	7/20/2007 17:54	1,398	1,602	1,829	965	971	976	0.00943	0.26980	0.58531
11	7/20/2007 18:14	7/20/2007 19:14	1,383	1,628	1,871	973	977	979	0.02058	0.25304	0.59777
12	7/20/2007 19:34	7/20/2007 20:34	1,698	1,779	1,872	972	974	976	0.04678	0.09653	0.18888

			Incinerator 2 %H ₂ S in Tail Gas			Incinerator 1 %SO ₂ in Tail Gas			Incinerator 2 %SO ₂ in Tail Gas		
			87AI2083			87AI1084			87AI2084		
Run	Start	End	Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	0.00174	0.00229	0.00555	0.00266	0.07617	0.20646	0.00284	0.00306	0.00330
2	7/19/2007 17:57	7/19/2007 18:57	0.00160	0.00169	0.00174	0.03745	0.05777	0.07022	0.00125	0.00212	0.00354
3	7/19/2007 19:32	7/19/2007 20:32	0.00164	0.00224	0.00359	0.01382	0.06865	0.14402	0.00101	0.00113	0.00217
4	7/19/2007 21:01	7/19/2007 22:01	0.00266	0.00351	0.00421	0.01657	0.11506	0.28300	0.00430	0.00507	0.00577
5	7/20/2007 9:48	7/20/2007 10:48	0.00174	0.00545	0.00948	-0.00027	0.09615	0.17303	0.00540	0.00773	0.01030
6	7/20/2007 11:17	7/20/2007 12:17	0.01749	0.03867	0.05869	0.02536	0.13508	0.22147	0.00815	0.01499	0.02152
7	7/20/2007 12:40	7/20/2007 13:40	0.01017	0.02688	0.03690	0.05539	0.07911	0.19547	0.00420	0.00949	0.01236
8	7/20/2007 14:00	7/20/2007 15:00	0.00158	0.00168	0.00174	0.01804	0.06416	0.11747	0.00101	0.00107	0.00117
9	7/20/2007 15:34	7/20/2007 16:34	0.00156	0.00156	0.00156	0.04178	0.08300	0.11655	0.00101	0.00108	0.00119
10	7/20/2007 16:54	7/20/2007 17:54	0.00156	0.00156	0.00156	0.01804	0.03194	0.05185	0.00101	0.00188	0.00363
11	7/20/2007 18:14	7/20/2007 19:14	0.00156	0.00185	0.00328	0.01016	0.11996	0.41813	0.00211	0.00296	0.00388
12	7/20/2007 19:34	7/20/2007 20:34	0.00496	0.00555	0.00577	0.05777	0.10274	0.19144	0.00528	0.00606	0.00613

			SRU 1 AAG MSCFD TOT			SRU 1 AAG MSCFD TO 87H-2018			SRU 1 SWAG MSCFD		
			87FC1015			87FI1052			87FC1018		
Run	Start	End	Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	595	612	640	461	480	515	185	223	264
2	7/19/2007 17:57	7/19/2007 18:57	552	567	581	448	459	468	258	258	258
3	7/19/2007 19:32	7/19/2007 20:32	567	581	599	442	462	472	195	253	319
4	7/19/2007 21:01	7/19/2007 22:01	549	559	568	439	453	465	253	326	360
5	7/20/2007 9:48	7/20/2007 10:48	455	464	469	377	393	401	84	208	274
6	7/20/2007 11:17	7/20/2007 12:17	455	486	498	393	412	429	110	267	369
7	7/20/2007 12:40	7/20/2007 13:40	487	496	513	397	413	434	354	355	355
8	7/20/2007 14:00	7/20/2007 15:00	517	543	561	429	440	447	355	356	356
9	7/20/2007 15:34	7/20/2007 16:34	504	529	554	417	429	446	353	354	355
10	7/20/2007 16:54	7/20/2007 17:54	499	510	553	407	420	439	12	231	374
11	7/20/2007 18:14	7/20/2007 19:14	502	518	568	402	422	464	104	202	320
12	7/20/2007 19:34	7/20/2007 20:34	505	515	530	417	423	433	222	275	368

Run	Start	End	SRU 1 Air MSCFD			SRU 2 Air MSCFD			SRU 1 NG MSCFD		
			87FC1019	87FC1020		87FC2019	87FC2020		87FC1047		
			Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	771.173	848.347	928.456	371.874	373.588	375.994	3.520	3.520	3.520
2	7/19/2007 17:57	7/19/2007 18:57	839.449	860.162	878.509	372.403	373.107	374.532	3.520	3.520	3.520
3	7/19/2007 19:32	7/19/2007 20:32	775.308	856.412	957.917	372.862	375.906	377.129	3.520	3.520	3.520
4	7/19/2007 21:01	7/19/2007 22:01	762.619	893.262	971.810	375.648	376.266	376.846	3.520	3.520	3.520
5	7/20/2007 9:48	7/20/2007 10:48	520.234	643.584	752.968	381.555	386.645	394.468	3.529	3.668	3.790
6	7/20/2007 11:17	7/20/2007 12:17	498.239	736.276	902.692	381.698	388.827	394.451	3.684	3.739	3.802
7	7/20/2007 12:40	7/20/2007 13:40	789.548	815.557	852.391	382.810	390.270	393.415	3.370	3.491	3.646
8	7/20/2007 14:00	7/20/2007 15:00	827.171	841.134	850.754	378.770	383.654	387.165	3.270	3.428	3.520
9	7/20/2007 15:34	7/20/2007 16:34	805.535	833.322	854.937	379.116	381.620	384.294	3.338	3.477	3.520
10	7/20/2007 16:54	7/20/2007 17:54	372.667	685.345	905.057	381.919	384.235	386.868	3.516	3.518	3.520
11	7/20/2007 18:14	7/20/2007 19:14	496.961	682.234	881.256	381.110	383.299	385.743	3.520	3.520	3.520
12	7/20/2007 19:34	7/20/2007 20:34	659.978	761.634	906.501	379.114	383.654	386.610	3.509	3.512	3.517

			SRU 2 NG MSCFD			SRU 1 T			SRU 2 T		
			87FC2047			87TT1033			87TT2033		
Run	Start	End	Min	Average	Max	Min	Average	Max	Min	Average	Max
1	7/19/2007 16:20	7/19/2007 17:20	40.964	40.976	40.991	2,470	2,471	2,472	2,191	2,192	2,193
2	7/19/2007 17:57	7/19/2007 18:57	40.856	40.892	40.931	2,467	2,467	2,469	2,192	2,192	2,192
3	7/19/2007 19:32	7/19/2007 20:32	40.951	40.973	40.999	2,456	2,462	2,466	2,193	2,193	2,194
4	7/19/2007 21:01	7/19/2007 22:01	40.961	41.007	41.050	2,420	2,430	2,442	2,192	2,192	2,194
5	7/20/2007 9:48	7/20/2007 10:48	40.951	40.966	40.973	2,401	2,413	2,425	2,194	2,205	2,215
6	7/20/2007 11:17	7/20/2007 12:17	40.911	41.571	42.167	2,422	2,429	2,431	2,217	2,225	2,231
7	7/20/2007 12:40	7/20/2007 13:40	41.869	42.031	42.129	2,388	2,400	2,412	2,198	2,204	2,208
8	7/20/2007 14:00	7/20/2007 15:00	41.855	42.018	42.120	2,383	2,384	2,386	2,190	2,191	2,191
9	7/20/2007 15:34	7/20/2007 16:34	41.963	42.074	42.160	2,384	2,386	2,386	2,192	2,192	2,192
10	7/20/2007 16:54	7/20/2007 17:54	41.781	41.838	41.958	2,367	2,374	2,383	2,192	2,201	2,211
11	7/20/2007 18:14	7/20/2007 19:14	41.826	41.954	42.028	2,373	2,380	2,384	2,214	2,218	2,224
12	7/20/2007 19:34	7/20/2007 20:34	41.911	41.987	42.087	2,386	2,387	2,387	2,229	2,232	2,234



Marathon Petroleum Company LLC
Source: SRU Caustic Scrubber
Test Dates: July 19 – 20, 2007

APPENDIX G

Resumes

Greg Burch

Mr. Burch is ARI's Source Testing Division South Central Regional Manager. He has accumulated in-depth experience in conducting compliance emission tests and CEMS certification for a wide variety of industries including petrochemical and petroleum refineries. Mr. Burch has over 17 years experience in conducting on-site emissions testing with a strong background in all aspects of source testing evaluations.

Shawn Moody

Mr. Moody is a Source Sampling Field Technician. Mr. Moody is well versed in the operation and maintenance of manual source sampling equipment and has performed these functions on numerous tests for various clients throughout the Gulf Coast Region.

Mr. Moody's responsibilities include field sampling, sample analysis, data reduction and interpretation, and maintenance and calibration of continuous and manual source sampling equipment.

Zach Stornant

Mr. Stornant is a Source Sampling Field Technician. Mr. Stornant is well versed in the operation and maintenance of manual source sampling equipment and has performed these functions on numerous tests for various clients throughout the Gulf Coast Region.

Mr. Stornant's responsibilities include field sampling, sample analysis, data reduction and interpretation, and maintenance and calibration of continuous and manual source sampling equipment.

Brian Driscoll

Mr. Driscoll is a Source Sampling Field Technician. Mr. Driscoll is well versed in the operation and maintenance of manual source sampling equipment and has performed these functions on numerous tests for various clients throughout the Gulf Coast Region.

Mr. Driscoll's responsibilities include field sampling, sample analysis, data reduction and interpretation, and maintenance and calibration of continuous and manual source sampling equipment.

Steven Yuchs, PhD.

Dr. Yuchs has 11 years experience in environmental analysis and research and development. His experience includes industrial, academic and governmental laboratory management, with an emphasis in the environmental remediation sector. He is currently the Analytical Services section manager, and is responsible for all laboratory activities for ARI. He is also responsible for coordinating and developing laboratory analysis procedures, laboratory quality assurance, new methods of laboratory analysis, and laboratory data reduction.