EPA United States Environmental Protection Agency

Region 6 Compliance Assurance and Enforcement Division

INSPECTION REPORT

Inspection Date(s):	6/23,23 &25/2014		
Media:	Air		
Regulatory Program(s)	Consent Decree, Civil Action H-01-0978		
Company Name:	**Motiva Enterprises LLC**		
Facility Name:	**Motiva Enterprises LLC Convent Refinery**		
Facility Physical Location:	Hwy 44 & 70, Convent, Louisiana		
(city, state, zip code)	Convent, LA 70723		
Mailing address:	PO Box 37		
(city, state, zip code)	Convent, LA 70723		
County/Parish:	St. James Parish		
Facility Contact:	Kyle LeJeune	Environmental Engineer	
	Kyle.lejeune@Motivaent.com		
FRS Number:	220930006		
Identification/Permit Number:	2560-0001 VII		
Media Number:	AFS # 2209300001		
NAICS:	324110		
SIC:	2911		
Facility Representatives:	Oliver Boyd	Environmental Manager	225-562-6747
	Kyle LeJeune	Environmental Engineer	225-562-8379
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EPA Inspectors:	Richard Gigger	Inspector	281-983-2105
State Inspector(s):	Jason Fontenot	LDEQ	225-219-3028
	Yanfu Zhao	LDEQ	225-219-3613
	Mike Miller	LDEQ	225-219-3028
Other Inspector(s):	NA		

Metadata		
	Title:	Motiva Refining, Convent Refinery, Convent, Louisiana, St.James Parish
	Author:	US EPA Region 6 Compliance Assurance and Enforcement Division Dallas TX
	Subject:	Partial Compliance Evaluation Inspection Report
	Keywords:	refinery consent decree (CD)

EPA Lead Inspector Signature/Date	Richard Gigger Richard Gigger	10-2-2014
		Date
Supervisor Signature/Date	Samuel Tates Samuel Tates	9/17/2014
		Date

Section I - INTRODUCTION

PURPOSE OF THE INSPECTION

EPA Region 6 inspector Richard Gigger and representatives from the Louisiana Department of Environmental Quality (LDEQ) conducted an inspection of the Motiva Enterprises LLC Convent, Louisiana Refinery. At 3:00 pm on June 23, 2014, I met with Oliver Boyd, Environmental Manager for the facility, Kyle LeJeune, and other Environmental staff, for an opening conference. I presented my credentials to Mr. Boyd and informed him that this was an EPA inspection to determine compliance with the federally issued Consent Decree (Civil Action H-01-0978), which is a national priority for EPA. The inspection was a Partial Compliance Evaluation (PCE), which included an evaluation of the consent decree's (CD) four marquee issues: nitrogen oxides and sulfur dioxide ($NO_x/SO_{2)}$ reductions, leak detection and repair (LDAR), benzene waste operations (BWON) and flaring of both acid gases and hydrocarbons.

The CD consists of 19 Parts designated by Roman numerals. Of these, Parts IV - VIII requires affirmative relief, which was the focus of the inspection. These Parts address the requirements of NO_x, SO_2, CO, particulate, VOC, and benzene emission reductions through various construction projects, process additives, and process and program enhancements. Note that these inspection findings pertain only to the compliance status affecting Motiva's Convent refinery. Photos taken during the inspection are included as **Appendix 1**. Sign in sheet for the opening conference is included as **Appendix 2**.

FACILITY DESCRIPTION

Motiva's Convent refinery is located next to the Mississippi River between New Orleans and Baton Rouge, and has the capacity to refine 250,000 barrels of crude oil per day. The facility has had multiple upgrades and now operates as a fully integrated refinery with crude distillation, Fluid Catalytic Cracking Unit (FCCU), alkylation (sulfuric acid), catalytic reforming, hydrodesulphurization, isomerization, sulfur recovery, and fuel blending. The refinery produces motor gasoline, diesel fuel, jet fuel, liquefied petroleum gas, and fuel oil. Crude oil is obtained primarily by ship and pipeline, while products leave the facility by pipeline, railcar, tank truck, and marine shipping.

A plant wide process flow diagram is included in **APPENDIX 3**.

Section II - OBSERVATIONS

Part IV, NO_x Emissions Reductions from Fluidized Catalytic Cracking Unit (FCCUs):

Status: Complete. There have been no NOx emission limits exceeded during the past year.

Program Summary: Motiva shall implement a program to reduce NOx emissions with the installation and the operation of a Selective Non-Catalytic Reduction (SNCR) system at the Convent FCCU. Motiva shall incorporate lower NOx emission limits into operating permits and will demonstrate future compliance with

the lower emission limits through the use of continuous emission monitoring systems (CEM's).

Motiva has established and EPA approved a final, 365 day rolling average of 73 parts per million (ppm) and 24 hour rolling average of 98.2 ppm.

APPENDIX 4 contains the FCCU NOx 365 day and 24 hour rolling average emission trends from June 2013 - June 2014.

I observed the FCCU CEMs and that the calibration gases were of the correct concentration and up to date. I reviewed the relative accuracy test audit (RATA) results for the CEMs and found the relative accuracies to be within allowable requirements of 40 CFR, Part 60, Appendix F.

Part V, SO2 Emissions Reductions FCCUs

Status: Complete.

Program Summary: Motiva shall continue to operate the existing Wet Gas Scrubber (WGS) on the FCCU. Motiva shall incorporate lower SO2 emission limits into operating permits and will demonstrate future compliance with the lower emission limits through the use of CEMs. Part V also requires compliance with NSPS Subparts A and J for SO2, CO, particulate matter (PM) and opacity limits.

Appendix 5 contains FCCU SO2 365 day and 7 day rolling average trends from June 2013 -June 2014. The seven day rolling average limit is 50 ppm, and the 365 day rolling average limit is 25 ppm. During the inspection I observed the CEM to be properly installed and that the calibration gases were up to date and of the proper concentrations. I reviewed the RATA results for the CEM and found the relative accuracies for the CEMs to be within allowable requirements of 40 CFR, Part 60, Appendix F. There were no acid gas or hydrocarbon releases in the past year.

Appendix 6 is the FCCU CO one-hour rolling average trend (ppm and pounds per hour) from June, 2013 to June, 2014.

Appendix 7 is the most recent stack test results

Part VI, Program Enhancements Regarding Benzene Waste NESHAP.

Status: Complete.

Program Summary: Motiva shall undertake refinery-wide audits to determine its compliance with all Benzene Waste NESHAPS requirements and to take corrective action where any areas of non-compliance are identified. In addition Motiva shall undertake refinery wide measures to minimize or illuminate fugitive benzene waste emissions at the refinery.

Process water is sent to two API separators, then to two SATSU (stage activated sludge treatment units). Benzene concentrations are required to be monitored at the SATSU inlet and outlet. Analytical results for the past year are included as **Appendix 8.** The results are well below permit limits**.**

Benzene containing waste is stored in tanks 18d1, 20AT907, 20D36, 20D47,20T202,20T206, 20T 210, 20T303 (internal floating roof) and 37T314, 37T315, 37T316, 37T317 (external floating roof). Motiva provided copies of the most recent seal gap inspections. During the inspection I reviewed inspection results of the storage tanks and found the tanks being inspected at the frequency required using the correct measurement methods. No carbon canisters are used for BWON compliance at the facility.

I reviewed the sampling procedure and standard operating procedures (SOPs) being used and found the procedures written in a formal SOP and consistent with BWON sampling techniques required by 40 CFR § 61.355.

Part VII, Program Enhancements RE: Leak Detection and Repair (LDAR) Program Enhancements

Status: Complete.

Program Summary: Motiva shall undertake audits of the components in light liquid and gaseous service at each of its refineries to determine compliance with all of the requirements of the Leak Detection and Repair ("LDAR") regulations and to correct any areas of non-compliance. In addition, Motiva shall undertake the CD listed enhancements to its LDAR program consisting of refinery-wide measures to minimize or eliminate fugitive emissions from components in light liquid and gaseous service at its refineries in accordance with the schedule set forth.

Third party audits, periodic reports and other requirements of Part XI of the consent decree have been previously reported to EPA and LDEQ.

Motiva uses TEAM to conduct LDAR monitoring, repairs and follow-up monitoring. TEAM personnel are authorized to make first attempt at repair on most valves. Chronically leaking components are tracked and replaced. Drill and tap repair techniques are being used on leaking valves if the 500 ppm limit is exceeded and cannot be repaired using conventional methods. I reviewed instrument calibration logs and found that equipment calibration records are complete. TEAM has implemented a mid day and the end of day drift check. End of day drift checks are required by the CD. I reviewed the quarterly precision test results for the instruments being used at the facility, calibration gas certificates, and the most recent third party audit findings. Calibration gases observed were up to date and approximately equal to the leak definitions required by EPA Method 21. There are approximately 90 valves on the delay of repair (DOR) list for the entire refinery.

I observed that electronic data collection for LDAR monitoring is being conducted by using data loggers and leak tracking and reporting software.

Records indicate annual training is being conducted and is incorporated into new employee orientation.

I walked through several process units and observed no open ended lines or valves.

Sage Environmental Consulting did a third party audit starting on February 17, 2014. The executive summary is included as **Appendix 9.**

Part VIII, Program Enhancements RE: NSPS Subparts A and J SO2 Emissions from Sulfur Recovery Plants (SRP's) and Flaring

Status: On schedule.

Program Summary: Beginning immediately upon the lodging of this Consent Decree, Motiva agrees to take the following measures at all of its SRPs and certain flaring devices at the refineries identified in Paragraph 5. Motiva shall eliminate all reasonably preventable SO2 emissions from flaring. Motiva will implement procedures for root cause analysis of acid gas flaring incidents at all refineries. Motiva shall strive to extend the duration between SRP maintenance shutdowns (unscheduled or scheduled) to three years or greater.

The facility uses four refinery flares (numbered 1, 2, 3, and 4) subject to NSPS Subpart J. There is also a flare associated with the marine vapor recovery system (no. 5). This flare is not idled when not in use. Prior to each use the pilot gas is turned on and ignited by an electric spark. Refinery fuel gas (RFG) is used as pilot gas. It is measured for SO2 at the east-side fuel gas drum.

I observed and photographed the refinery flare gas recovery system compressors. The recovered gas is treated to remove sulfur before being sent into the fuel gas system. A description and diagram of the flare gas recovery system is included as **APPENDIX 10**. Since the CD was entered there have been 28 reportable acid gas and hydrocarbon flaring events at the facility, none within the past year.

I observed no smoke or flames being emitted by the flares. I also observed each flare using a FLIR© optical imaging device and observed no following plumes that would indicate the possibility of un-combusted hydrocarbon being present.

The facility uses five sulfur recovery units with five incinerators (**APPENDIX 11)**. The 12 hour average SO_2 emissions trends, as recorded by CEM, for the incinerators are included in **APPENDIX 12**. The trends show the 250 ppm limit has not been exceeded for the 12 months prior to the inspection, with the exception of spikes on TGTU1 (tail gas treatment unit) and TGTU5.

I observed that the SO_2 analyzer was installed correctly and the calibration gas was of the correct concentration and up to date. I reviewed the RATA results for the SRU CEMs and found the relative accuracies for the CEMs to be within the allowable requirements of 40 CFR, Part 60, Appendix F.

IX Permitting

Status: Complete.

Motiva agrees to apply for and make all reasonable efforts to obtain in a timely manner all appropriate federally enforceable permits (or construction permit waivers) for the construction of 'the pollution control technology required to meet the above pollution reductions. The facility has no un-approved AMPs

Appendix 13 contains excerpts from the most recently revised NSR operating permits. Specific CD imposed limits are incorporated into the NSR permits and the Title V permit by reference.

Section III – AREAS OF CONCERN

None noted.

Section IV – FOLLOW UP

N/A

Section V – LIST OF APPENDICES

Appendix 1 - Photo Log
Appendix 2 - Opening conference sign-in sheet
Appendix 3 - Plant wide process flow diagram
Appendix 4 – FCCU NO_x emission trends
Appendix 5 - FCCU SO_2 emission trend
Appendix 6 - FCCU CO emission trend
Appendix 7 – Most recent stack test results
Appendix 8 – benzene concentrations from SATSU inlet and outlet
Appendix 9 – executive summary of third party LDAR audit
Appendix 10 – description and diagram of flare gas recovery system
Appendix 11 – simplified SRU description and diagram
Appendix 12 – TGTU SO2 12 hour rolling averages
Appendix 13 - Operating permit excerpts

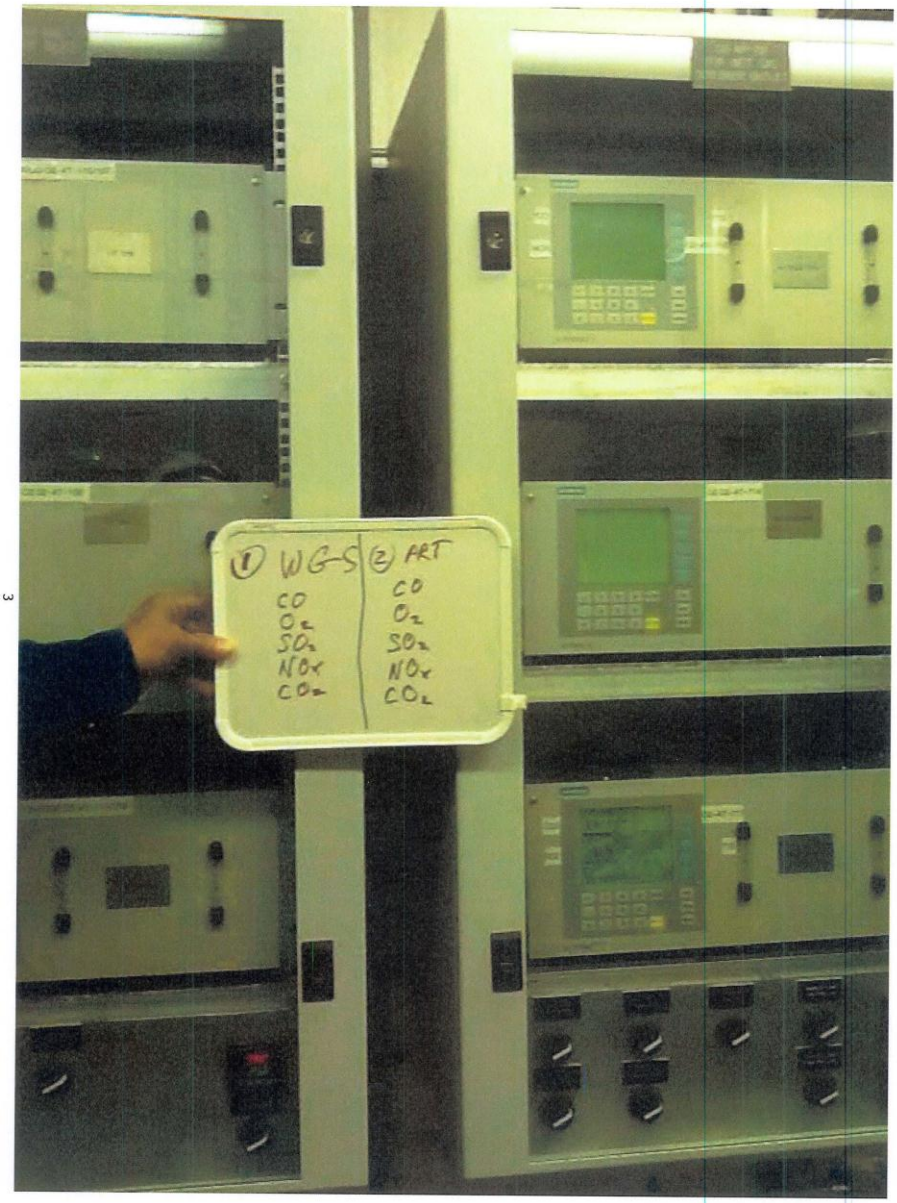
Appendix CBI (None)

Appendix 1
Photos

Appendix 1

Photograph Log

CEMs on the FCCU



CEMs on TGTU 1

CEMs on TGTU 2

13

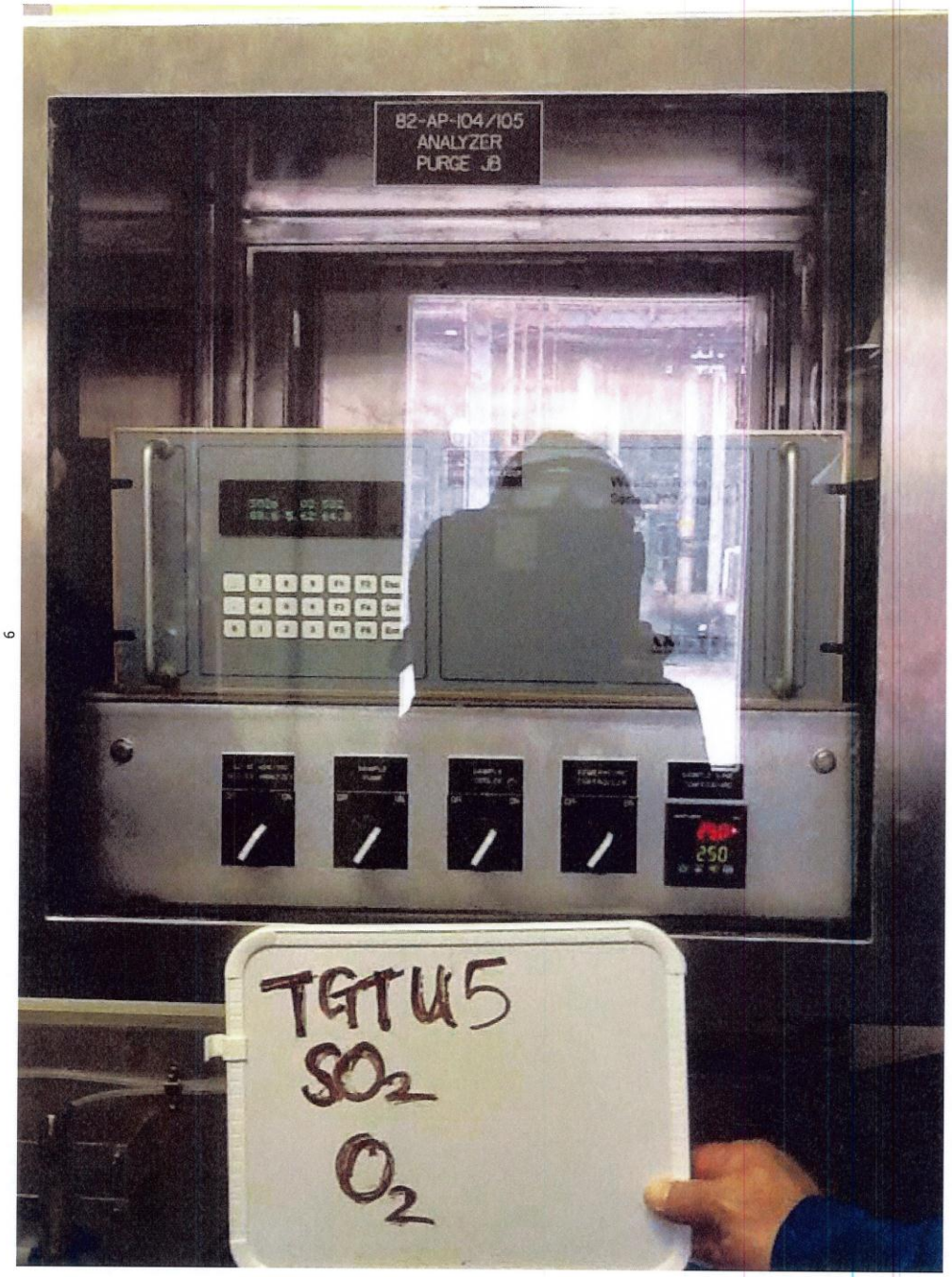
CEMs on TGTU 3

CEMs on TGTU 4

Compressors on Flare Gas Recovery System

15

CEMs on TGTU 5



Appendix 2

Opening conference sign-in sheet

Appendix 2
Opening conference sign in sheet

Personnel in Attendance
MOTIVA, CONVENT, LOUISIANA
CD Inspection
Date: _____

Name *(Please Print)*	Affiliation	Title	Contact Information *(Phone/ Email)*
Oliver Boyd	Motiva Convent Refinery	Env. Manager	225.562-6747 oliver.boyd@motivaent.com
Melissa Strickland	Motiva Convent Refinery	Water Programs Coordinator	225-562-6961 melisia.strickland2@motivaent.com
Bill Paul	Motiva Convent Refinery	Waste/RCRA	225-562-6328 William.Paul@motivaent.com
Youn Kim	Motiva	Env engineer (CEMS)	225 562 6646 youn.kim@motivaent.com
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Jason Fontenot	LDEQ	Environmental Scientist	(225)219-3028 jason.fontenot2@la.gov
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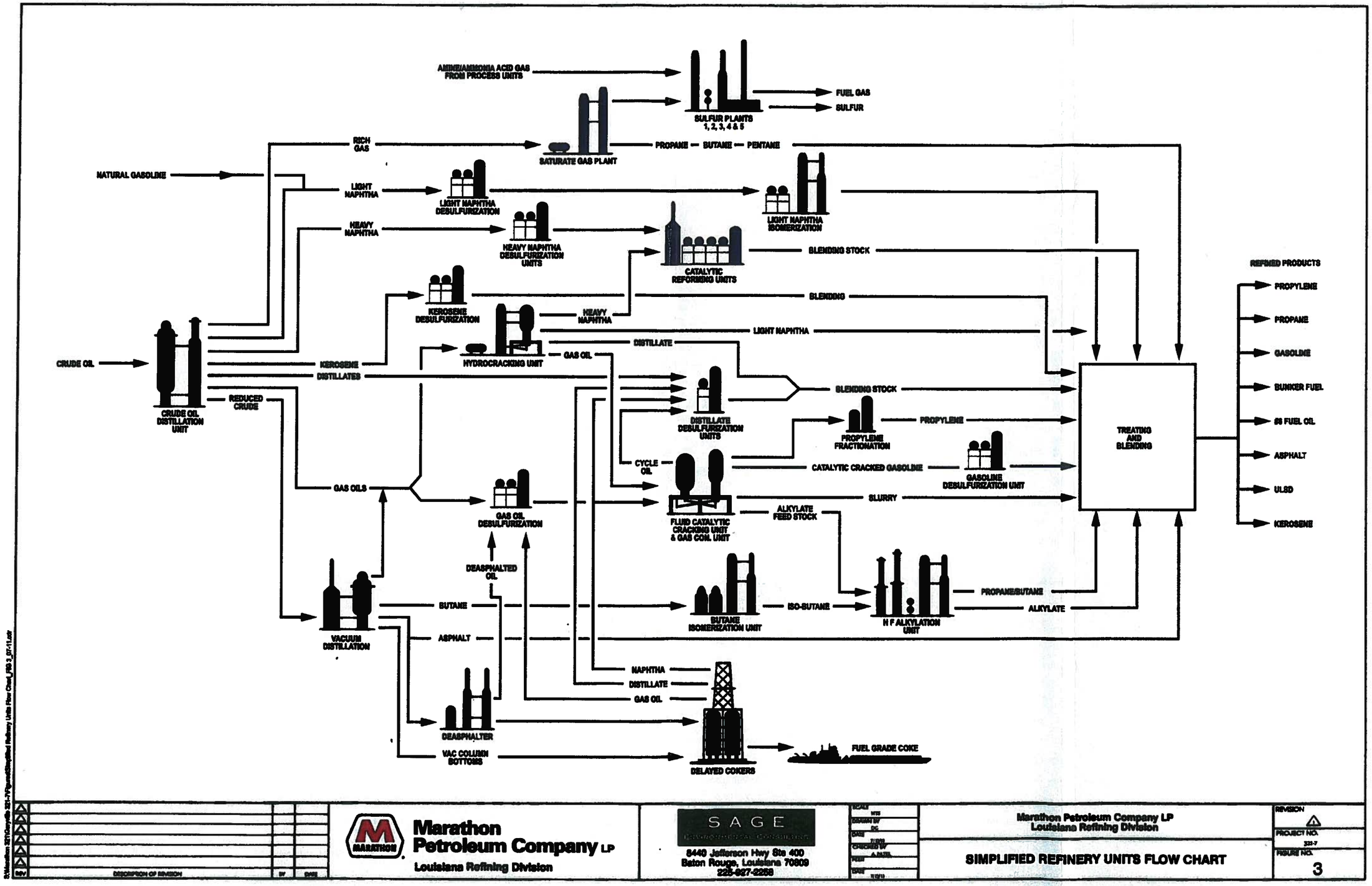
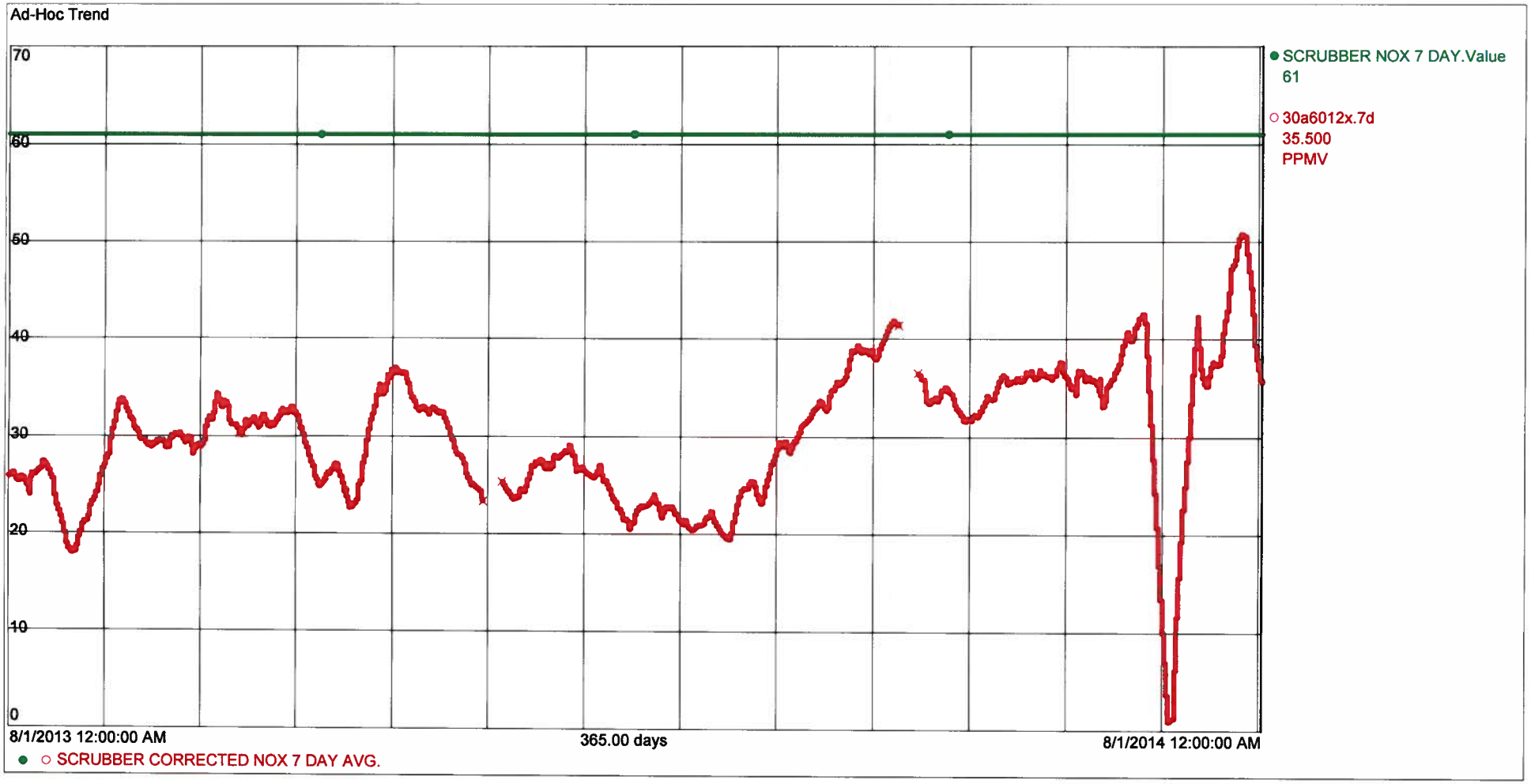
ANTHONY SCHEXNAYDER	MOTIVA	LDAR	225 562 6233 anthony.schexnayder@motivaent.com
STAN ROWE	TEAM	LDAR	225 562 6424

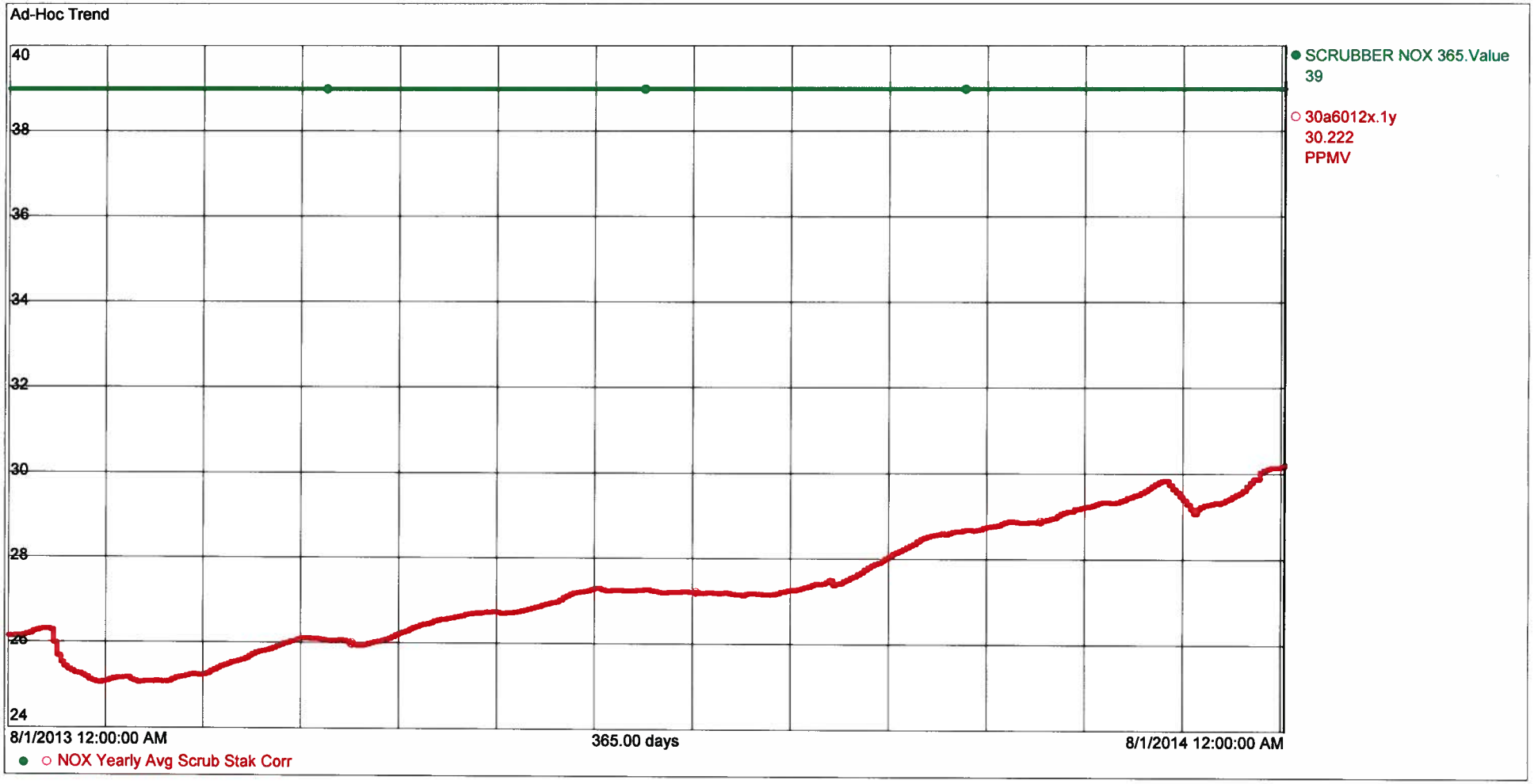
Appendix 3
Process Flow Diagram



EPA Region 6
Doc Req #3

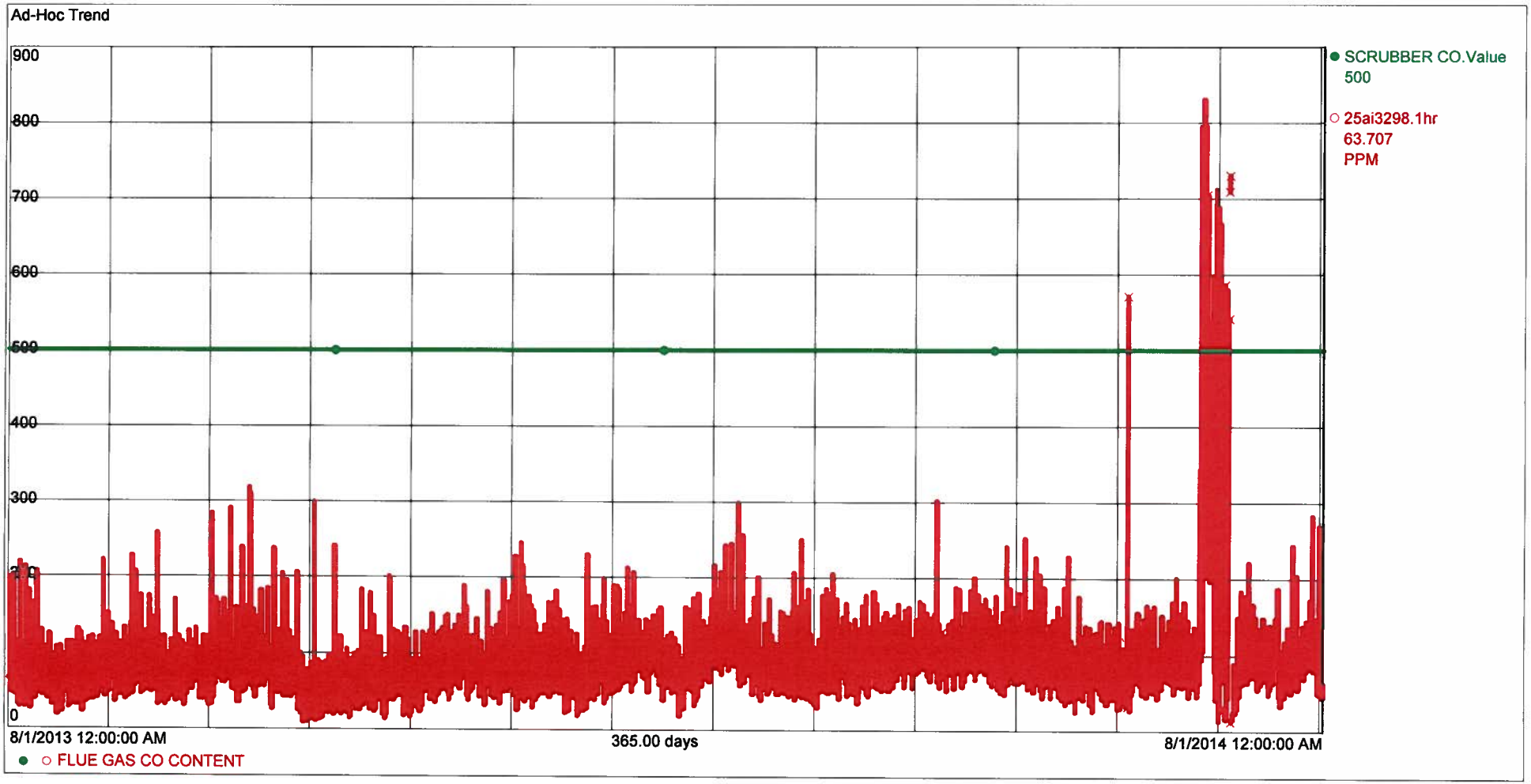
Appendix 4
FCCU NO_x emission trends


Ad-Hoc Trend
70
60
50
40
30
20
10
0
8/1/2013 12:00:00 AM
365.00 days
8/1/2014 12:00:00 AM
SCRUBBER NOX 7 DAY.Value
61
30a6012x.7d
35.500
PPMV
SCRUBBER CORRECTED NOX 7 DAY AVG.



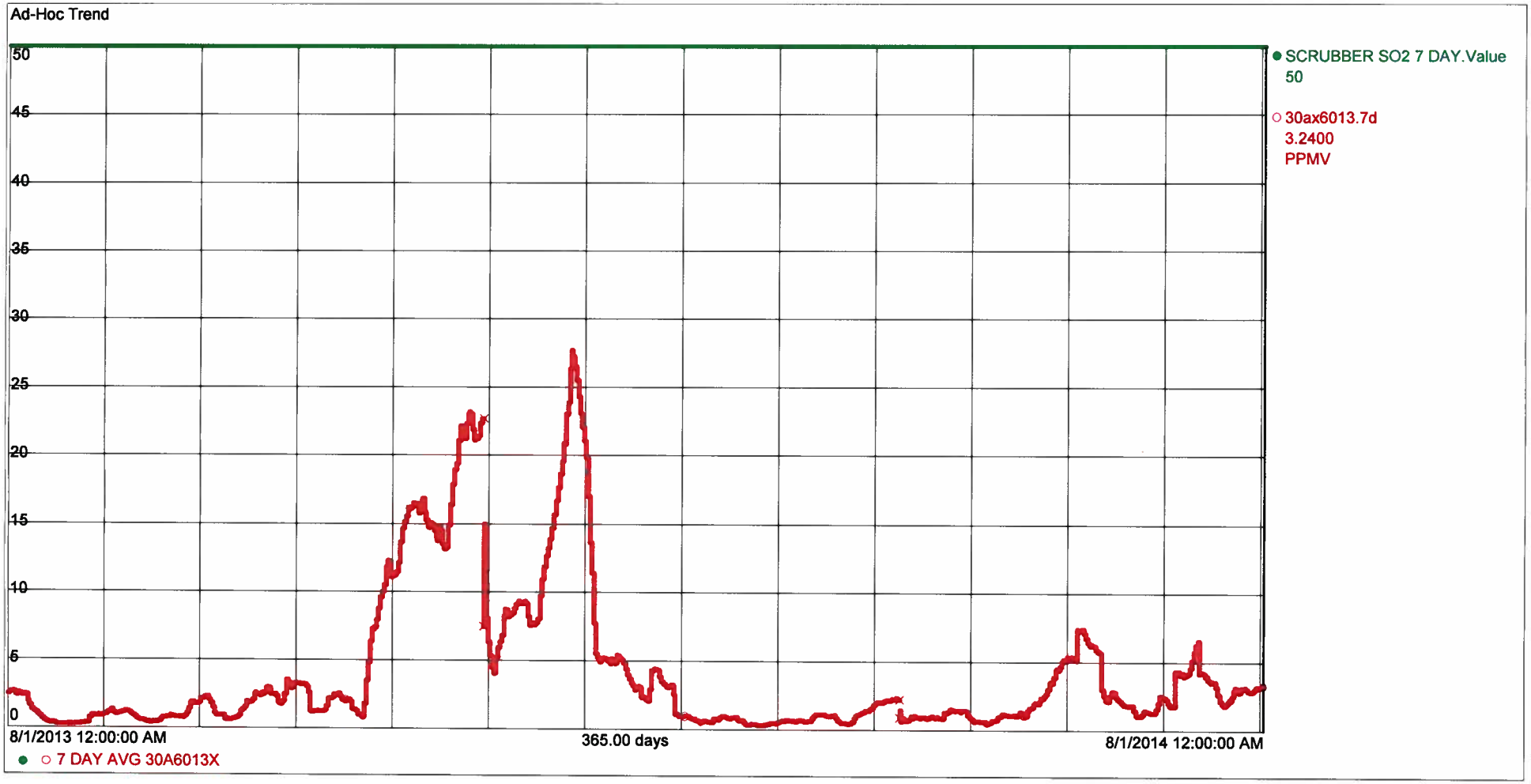
EPA Region 6
Doc Req #6

Appendix 5
FCCU CO Emission Trends

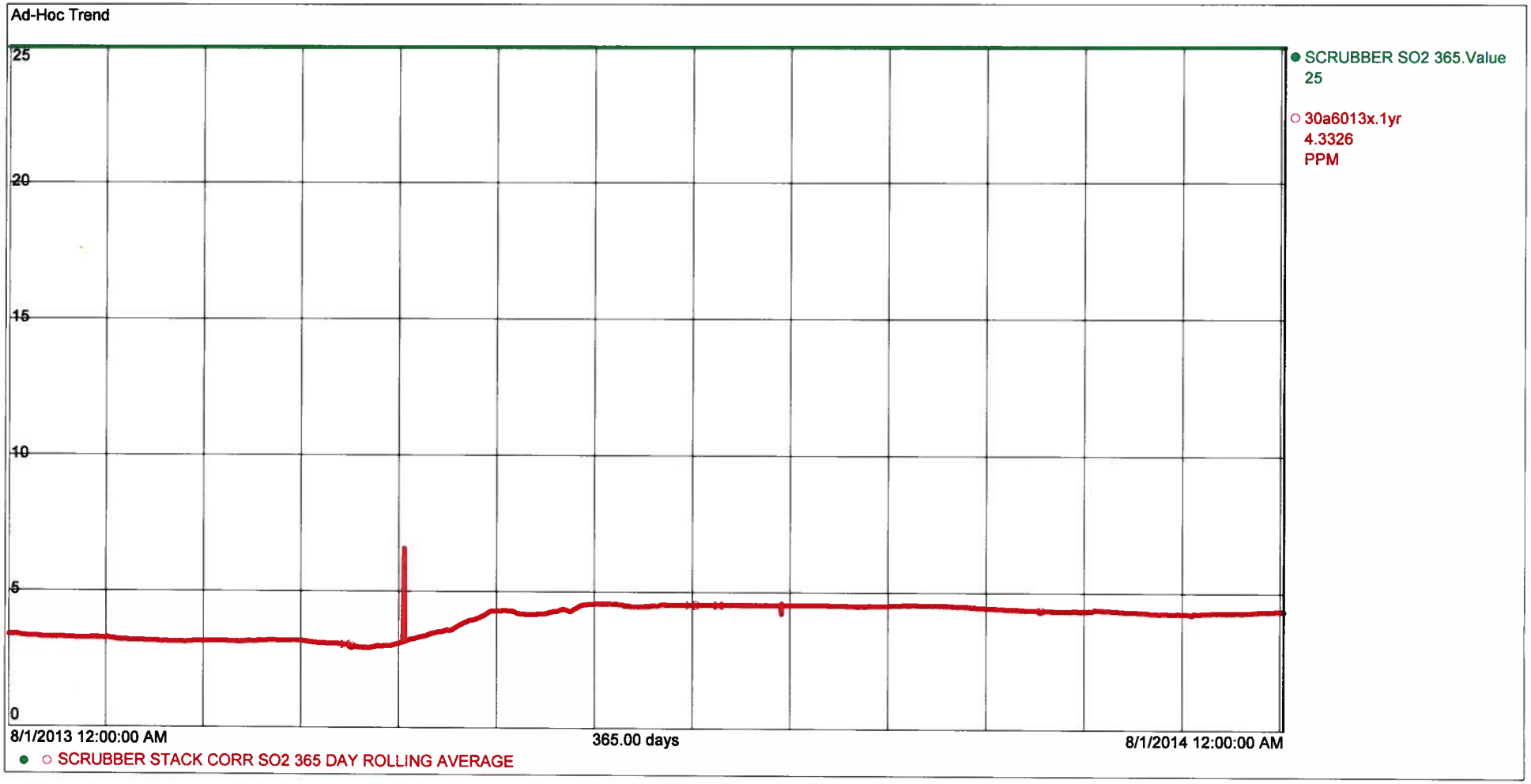


EPA Region 6
Doc Req #7

Appendix 6
FCCU SO2 Emission Trends



EPA Region 6
Doc Req # 5


Ad-Hoc Trend
25
20
15
10
5
0
8/1/2013 12:00:00 AM
365.00 days
8/1/2014 12:00:00 AM
SCRUBBER SO2 365.Value
25
30a6013x.1yr
4.3326
PPM
SCRUBBER STACK CORR SO2 365 DAY ROLLING AVERAGE

Appendix 7
Most recent stack test results

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit Number 30 CAT Scrubber Stack (EQT165)
Continuous Monitor Certification

Parameter	Relative Accuracy	Allowable Relative Accuracy
Oxides of Nitrogen	14.35%	≤ 20%
Sulfur Dioxide	4.08%*	≤ 10%*
Oxygen	0.06%O_2	≤ 1.0% O_2

* Percent of the applicable standard of 50 ppm SO_2.

The continuous oxides of nitrogen, sulfur dioxide, and oxygen monitors met the relative accuracy requirements of 40 CFR, Part 60, Appendix B, Performance Specifications 2 and 3.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit 25 CAT Regen Inlet Duct

Continuous Monitor Certification

Parameter	Relative Accuracy	Allowable Relative Accuracy
Carbon Monoxide - ppm	4.38%	≤ 10%
Oxygen - dry%	0.00%O_2	≤ 1.0%O_2
Carbon Dioxide - dry%	0.40%CO_2	≤ 1.0%CO_2

* Percent of applicable standard

The continuous carbon monoxide, oxygen, and carbon dioxide monitors met the relative accuracy requirements of 40 CFR, Part 60, Appendix B, Performance Specifications 3 and 4.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit Number 30 CAT Scrubber Stack (EQT 165)
Sulfur Dioxide Monitor Certification

Run Number	Date	Time	Reference Method Dry ppm SO_2	Monitor Reading ppm SO_2	Difference ppm SO_2
1	12/10/13	1130-1230	15.73 *	20.05 *	-4.32 *
2	12/10/13	1256-1317	19.61	15.49	4.12
3	12/10/13	1328-1349	17.61	16.40	1.21
4	12/10/13	1431-1452	10.88	12.49	-1.61
5	12/11/13	0845-0945	8.19	11.38	-3.19
6	12/11/13	1003-1024	10.16	12.63	-2.47
7	12/11/13	1036-1057	10.45	10.81	-0.36
8	12/11/13	1150-1250	8.98	9.54	-0.56
9	12/11/13	1304-1325	9.21	7.64	1.57
10	12/11/13	1338-1359	8.09	9.46	-1.37
Avg.			11.46	11.76	-0.30

Standard Deviation = 2.27 ppm SO_2

Confidence Coefficient = 1.75 ppm SO_2

I Mean Difference I + Confidence Coefficient = 2.04 ppm SO_2

Relative Accuracy = $\frac{\text{I Mean Difference I + Confidence Coefficient}}{\text{Applicable Standard (50 ppm)}}$ x 100 = 4.08%

* Data not used in calculations.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit Number 30 CAT Scrubber Stack (EQT 165)
Oxides of Nitrogen Monitor Certification

Run Number	Date	Time	Reference Method Dry ppm NO_x	Monitor Reading ppm NO_x	Difference ppm NO_x
1	12/10/13	1130-1230	26.60	25.33	1.27
2	12/10/13	1256-1317	25.83	22.79	3.04
3	12/10/13	1328-1349	26.05	22.61	3.44
4	12/10/13	1431-1452	26.26	23.18	3.08
5	12/11/13	0845-0945	26.44	20.95	5.49
6	12/11/13	1003-1024	22.00	21.57	0.43
7	12/11/13	1036-1057	20.81	19.40	1.41
8	12/11/13	1150-1250	22.25	24.12	-1.87
9	12/11/13	1304-1325	18.98 *	24.98 *	-6.00 *
10	12/11/13	1338-1359	25.04	24.34	0.70
Avg.			24.59	22.70	1.89

Standard Deviation = 2.13 ppm NO_x

Confidence Coefficient = 1.64 ppm NO_x

I Mean Difference I + Confidence Coefficient = 3.53 ppm NO_x

Relative Accuracy = $\frac{\text{I Mean Difference I + Confidence Coefficient}}{\text{Average Reference Method}} \times 100 = 14.35\%$

* Data not used in calculations.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit 25 CAT Regen Inlet Duct
Carbon Monoxide Monitor Certification

Run Number	Date	Time	Reference Method Dry ppm CO	Monitor Reading ppm CO	Difference ppm CO
1	08/30/13	0911-0932	48.54	50.11	-1.57
2	08/30/13	0945-1006	51.55	53.12	-1.57
3	08/30/13	1046-1107	50.47 *	53.59 *	-3.12 *
4	08/30/13	1120-1141	42.91	44.31	-1.40
5	08/30/13	1150-1211	41.64	43.69	-2.05
6	08/30/13	1221-1242	41.11	43.73	-2.62
7	08/30/13	1255-1316	42.25	40.75	1.50
8	08/30/13	1329-1350	34.75	33.25	1.50
9	08/30/13	1404-1425	39.44	39.44	0.00
10	08/30/13	1435-1456	37.09	34.24	2.85
Avg.			42.14	42.52	-0.37

Standard Deviation = 1.91 ppm CO

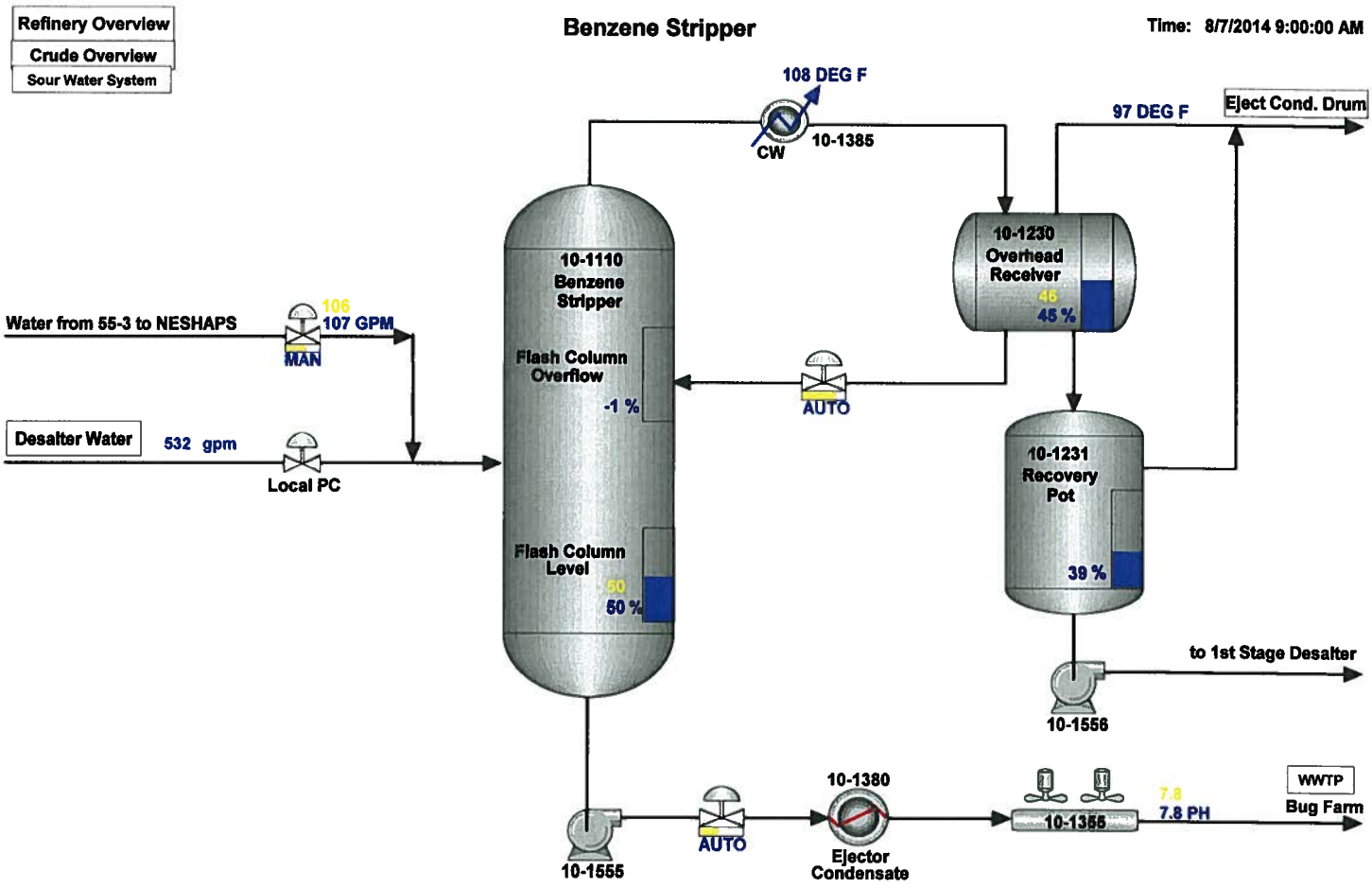
Confidence Coefficient = 1.47 ppm CO

I Mean Difference I + Confidence Coefficient = 1.85 ppm CO

$$\text{Relative Accuracy} = \frac{\text{I Mean Difference I + Confidence Coefficient}}{\text{Average Reference Method}} \times 100 = 4.38\%$$

* Data not used in calculations.

Appendix 8
BWON flow diagram


Refinery Overview
Crude Overview
Sour Water System
Benzene Stripper
Time: 8/7/2014 9:00:00 AM
108 DEG F
CW
10-1385
97 DEG F
Eject Cond. Drum
10-1230
Overhead
Receiver
45
45 %
10-1110
Benzene
Stripper
Flash Column
Overflow
-1 %
AUTO
Water from 55-3 to NESHAPS
106
107 GPM
MAN
Desalter Water
532 gpm
Local PC
10-1231
Recovery
Pot
39 %
to 1st Stage Desalter
10-1556
Flash Column
Level
50
50 %
10-1380
AUTO
Ejector
Condensate
10-1555
10-1355
7.8
7.8 PH
WWTP
Bug Farm

Appendix 9
Third Party LDAR Audit

Consent Decree
External LDAR Audit:
Final Report

Prepared for:
Marathon
Garyville Refinery

Prepared by:
Sage Environmental Consulting

May 23, 2014

SAGE
ENVIRONMENTAL CONSULTING
"Friendly Service, No Surprises!"

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GLOSSARY

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INTRODUCTION AND EXECUTIVE SUMMARY

Sage Environmental Consulting, LP (Sage) was contracted to conduct a third party consent decree audit of the leak detection and repair (LDAR) program at the Marathon Garyville Refinery (Marathon). The audit began on April 21, 2014 and closes with the issuance of this final report. The audit team consisted of Bronson Pate, Buzz Harris, Eric Rucinski and Mary Claire Lambert in the field and Joe Wilwerding offsite performing electronic data reviews. The audit scope included a detailed LDAR compliance review and comparative monitoring of components in select process units.

In accordance with the Consent Decree requirements, the audit focused on the following areas:

- Comparative monitoring;
- Observation of technician's calibration and monitoring techniques;
- Records review to ensure monitoring and repairs were completed in the required periods;
- Field audit to ensure affected equipment has been identified and included in the facility LDAR program; and
- Review to ensure records and reports have been maintained and submitted as required.

In addition, other field issues that impact LDAR compliance were audited:

- Open-ended line (OEL) control;
- Sample system flushing control; and
- LDAR monitoring routes.

The remainder of this report includes:

- An executive summary of audit results by focus area (Table 1);
- A discussion of the audit findings (Section One);
- A description of the audit methodology (Section Two); and
- A glossary of abbreviations.

Based on this in-depth audit of the Marathon Garyville Refinery LDAR program, Sage found the program to substantially comply, except for the specific findings in Table 2, with applicable federal, state, and local LDAR regulations, as well as, the LDAR provisions of the Consent Decree.

Table 1. Summary of the Audit

Comparative Monitoring	The audit performed comparative monitoring at three process units: 046, 015, and 060. At 046, the audit found a lower leak rate (0.6%) than the site average (1.7%) for the last eight quarters. At 015, the audit found a lower leak rate than the site average leak rate (0.2% vs. 0.5%). At 060, the audit found a lower leak rate (0.0%) to the site average (0.01%) for the last eight quarters. The overall Chi Square statistic indicated a 100% probability that both audit and site data are in strong agreement. These results indicate that the site is properly conducting Method 21 to identify even small leaks.
Records Review	The audit conducted an in-depth review of 618,131 electronic records for the last two full calendar years, as well as spot checks on hard copy records and reports. Out of these many records reviewed, 2103 potential issues were indentified, which resulted in 11 issues from the records review. This is a very good performance considering the in-depth review that was conducted.
Component Identification and Tagging	Component identification appears to be in good condition in 046 and 015. Very few missing tags were noted during the audit in these two units. The tags are generally legible. Monitoring routes appear to be efficient. In Unit 060, the audit found a high number of missing tags, especially in the Veolia section. Also worth noting, Unit 060 has been tagged very conservatively, and many of the missing tags and potentially overlooked equipment are questionable as to whether they really need to be tagged at all. The audit found ten (10) overlooked components which appear that they should be in the LDAR program.
Data Management	The site is using Archer data loggers with Bluetooth communication to the TVA 1000B analyzers. The LDAR database is LeakDAS v4.9.1.5. These are very capable tools, and the staff appears to be very well trained in their use.
Observation	**Calibration** was observed to use methane in air standard gases at nominal concentrations of zero; 500; 1000, 2000; and 10,000 ppm. Calibration procedures comply with Method 21 requirements and the PHX 21/TVA manufacturer's recommendations. **Monitoring** was observed to generally check all the potential leak points on a variety of component types. The monitoring pace observed is generally consistent with good leak identification.
Other Field Issues	**Open-Ended Lines (OELs)** - The audit found nine (9) OELs without proper control in the inspection of the three process units. **Sample System(s)** - No issues identified
Strengths	Contractor positions their senior field techs in the same unit as the new techs to help answer any questions that might arise. Each day over the radio at a random time, Guardian sends out a safety stop. The LDAR Technicians carry a two-part paper tag, which they attach to components with missing tags. The site/contractor was very organized and was able to close out all of these potential issues from the database review within 3 days.

SECTION ONE
AUDIT RESULTS

The LDAR Audit included a compliance review and comparative monitoring. The results of these audit activities are discussed in the following subsections as well as a brief review of particular program strengths.

1.1 Compliance Audit Results

LDAR regulations include many detailed requirements for work practices and recordkeeping. It is difficult to achieve perfect compliance with all regulatory requirements for an LDAR program. This in-depth audit (which consisted of three auditors for four days) produced the following findings (Table 2). All portions of the audit were reviewed, including comparative monitoring, records review, tagging, data management, and observation of the LDAR technicians' calibration and monitoring techniques.

Table 2. Summary of the Audit Compliance Findings

Finding No.	Citation	Unit	Findings
1	60.482-1a(a)	060	**Component Identification** The audit found the Veolia section of unit 060 has no marked up drawings or other basis for establishing stream and component applicability. No components are tagged, and the location/descriptions were not detailed enough to uniquely identify each piece of covered equipment.
2	60.482-1a 60.482-7a	060	**Overlooked Components** The audit found 10 overlooked valves that appears to have not been included the LDAR program.
3	60.482-6a	060 015 046	**Open Ended Lines** The audit found nine (9) open end line without control by cap, plug, blind, or double block valves in the inspection of the three process units. This represents an uncontrolled rate of 0.86% based on inspecting an estimated 1044 potential open ended lines.
4	60.482-7a	222	**NSPS Subpart VVa Two Consecutive Month Initial Inspections** 10 valves were found to not have two consecutive month of monitoring based on initial added date.
5	60.482-7a(c)(2)	010	**NSPS Subpart VVa Leaking Valve Follow-up Monitoring** The audit found one (1) valve that didn't receive the second month follow-up monitoring.

1.2 Comparative Monitoring Results

This section provides the results of the comparative monitoring. Section 1.2.1 reports how the site historical leak rates and Sage's comparative audit leak rates compare with each other. Section 1.2.2 describes the results of using statistical tools to determine the degree of agreement.

Comparative monitoring was performed in Units 046, 015, and 060. A subset of accessible valves was monitored in each of the units. Audit leak rates were determined by dividing the number of leaks found by the number of components monitored in each unit. Site average leak rates for the process units were determined by dividing the total number of leaks found over the previous 8 quarterly monitoring periods (2nd Quarter 2012 through 1st Quarter 2014) by the total number of valves monitored during the same period in each unit. All references to site leak rates are historical averages and ranges for the above periods. Audit and site leak rates were compared based upon a leak definition of $\geq$500 ppmv for valves as required by the Consent Decree. The comparative monitoring results are discussed below and summarized in Table 3 and Figure 1.

1.2.1 General Comparison of Leak Rates

The general comparative monitoring agreement is discussed by unit in the bulleted list below:

- In Unit 046, the site average leak rate was 1.7%, and the range of site quarterly leak rates varied from 0.9% to 2.7%. The audit team monitored 346 valves or about 24% of the unit valve population, and found 2 leaking valve for a leak rate of 0.6%. The audit leak rate was lower than the site average leak rate.
- In Unit 015, the site average leak rate was 0.5%, and the range of site quarterly leak rates varied from 0.0% to 1.0%. The audit team monitored 616 valves or about 58% of the unit valve population, and found 1 leaking valve for a leak rate of 0.2%. The audit leak rate was lower than the site average leak rate, and inside the site quarterly range of leak rates.
- In Unit 060, the site average leak rate was 0.01%, and the range of site quarterly leak rates varied from 0.0% to 0.1%. The audit team monitored 442 valves or about 63% of the unit valve population, and found 0 leaking valve for a leak rate of 0.0%. The audit leak rate was lower than the site average leak rate, and inside the site quarterly range of leak rates.
- Overall for selected units, the auditors monitored 1,404 valves finding 3 leaks for an overall leak rate of 0.2%. The site corresponding leak rate for the three units combined is 0.9%, and the range of site quarterly leak rates varied from 0.5% to 1.2%. The audit overall leak rate was lower than the site overall average leak rate for valves on selected units.

1.2.2 Statistical Comparison

Statistical analyses were performed by the Sage staff to determine the significance of differences between the audit team's monitoring data and the site LDAR team's historical monitoring data. Two statistical tests were used:

- 95% Confidence Intervals, and
- Modified Chi Square.

The 95% Confidence Intervals (CI) around the audit leak rates were compared with the site average historical leak rate ranges. The degree of overlap between the audit CI and the site quarterly range of leak rates, as well as the site average leak rate, was used as an indicator of statistical agreement.

The Chi Square statistic is a non-parametric test, which indicates the probability that both leak rate results are describing the same population. It should be noted that Chi Square does not assume that the audit leak rates are correct; it simply compares two data sets. Sage has begun using a Modified Chi Square statistic that assumes the audit leak rates are correct, and the Modified Chi Square statistic becomes 100% for cases where the site average leak rate is higher than the audit leak rate.

The statistical results of the valve monitoring, shown in Figure 1, can be summarized as follows:

- In Unit 046: Excellent Support of Monitoring Quality – the audit found a lower leak rate (0.6%) than the site average for the unit (1.7%). The site average leak rate fell inside the audit CI and most of site quarterly leak rates fell within the audit CI. The Modified Chi Square test indicates a 100% probability that site data represents effective leak detection.
- In Unit 015: Excellent Support of Monitoring Quality – the audit found a lower leak rate (0.2%) than the site average for the unit (0.5%). The site average leak rate fell inside the audit CI, and most of the site quarterly leak rates fell within the audit CI. The Modified Chi Square test indicates a 100% probability that site data represents effective leak detection.
- In Unit 060: Excellent Agreement – the audit found a lower leak rate (0.0%) than the site average for the unit (0.01%). The site average leak rate fell inside the audit CI, and all of the site quarterly leak rates fell inside the audit CI. The Modified Chi Square test indicates a 100% probability that site data represents effective leak detection.
- Overall for selected units: Excellent Support of Monitoring Quality – the audit found a lower leak rate (0.2%) than the site average for the three units (0.9%). The site average leak rate fell inside the audit CI and most of the site quarterly leak rates fell within the audit CI. The Modified Chi Square test indicates a 100% probability that site data represents effective leak detection.

The results for Unit 60 Wastewater Treating only cover the portion operated by Marathon. The section of unit 60 operated by Veolia was not tagged/identified well enough to conduct comparative monitoring properly.

Table 3. Comparative Monitoring Results

Valves at 500 ppm	Site Monitoring History Data[1]				Sage Comparative Monitoring Results[2]				
Unit	Avg. % Leak[3]	Max. % Leak	Min. % Leak	Total # Valves	# Monitored	# Leak	% Leak (based on # monitored)	95% Conf. Interval on % Leak by # monitored	$\chi 2$ % Prob.
046- Propyl Splitter	1.7%	2.7%	0.9%	1472	346	2	0.6%	0.1% to 2.1%	100%
015- Heavy Gas Oil	0.5%	1.0%	0.0%	1063	616	1	0.2%	0.0% to 0.9%	100%
060- WWT	0.01%	0.1%	0.0%	703	442	0	0.0%	0.0% to 0.8%	100%
Selected Unit Summary	0.9%	1.2%	0.5%	3238	1404	3	0.2%	0.0% to 0.6%	100%
Refinery Total Summary	0.95%	1.4%	0.6%	62999	2.2%[4]				

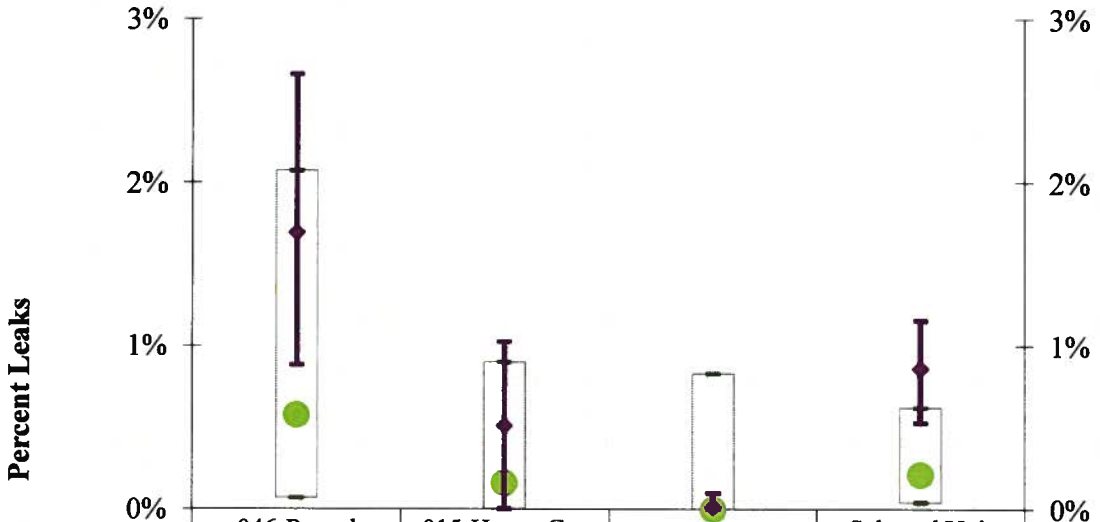
[1] Site historical data covers the range from the 2nd Quarter 2012 through the 1st Quarter 2014. The maximum and minimum leak percents are the highest and lowest quarterly values experienced during that period.

[2] Figures in ***Bold Italics*** would have been used to indicate an audit leak rate higher than the refinery average; a confidence interval that does not include the refinery average leak rate; or a Chi Square value <5%. Note that shaded grey cells are intended to be empty.

[3] Valve leaks for both the site and the audit were based on a 500 ppm leak definition as required by the Consent Decree.

[4] This represents the percent of total facility LL & GV valves monitored as part of the audit.

Figure 1. Comparative Monitoring Chart



	046-Propyl Splitter	015-Heavy Gas Oil	060-WWT	Selected Unit Summary
– CI Low	0.1%	0.0%	0.0%	0.0%
● Audit Leak %	0.6%	0.2%	0.0%	0.2%
Chi Square	100%	100%	100%	100%
– CI High	2.1%	0.9%	0.8%	0.6%
– Site Range Low	0.9%	0.0%	0.0%	0.5%
– Site Range High	2.7%	1.0%	0.1%	1.2%
◆ Site Avg. Leak %	1.7%	0.5%	0.0%	0.9%

1.3 Program Strengths

Recognition of program strengths is important to provide a balanced audit perspective. The LDAR program at Marathon Garyville Refinery has a number of program strengths worthy of mention:

- Contractor positions their senior field techs in the same unit as the new techs to help answer any questions that might arise.
- Technicians at the site are performing M21 very well.
- Each day over the radio at a random time, Guardian sends out a safety stop. Everyone stops working and takes a few minutes to look around. This is something they document on a daily basis.
- The LDAR Technicians carry a two-part paper tag, which they attach to components with missing tags. One part stays on the component in the field to identify it, while the other goes back to the office to initiate getting a permanent tag for replacement.
- The site received a potential 2103 issues from their in-depth database review. The site and contractor had documentation so organized they were able to close out all of these potential issues within 3 days.

SECTION TWO
AUDIT METHODOLOGY

The audit included two primary elements: a detailed compliance review and comparative monitoring pursuant to the Consent Decree Audit requirements. A description of the methodology used by Sage for each of these elements is as follows.

2.1 Compliance Audit Methodology

Sage performed a check of the LDAR program against the requirements within the appropriate applicable regulations. For the Marathon Garyville Refinery program, the applicable requirements are:

- 40 CFR 60 Subpart GGG and GGGa;
- 40 CFR 60 Subpart VV and VVa;
- Louisiana MACT Determination for Refinery Equipment Leak;
- US EPA Reference Method 21; and
- US EPA Consent Decree requirements.

Detailed data reviews were performed on the database. Electronic reviews of the data were done to demonstrate monitoring completion, repair deadline compliance, follow-up monitoring, and to check for monitoring pace and other anomalies. Checks were also done on completion of visual inspections for pumps and 3% cap on DTM valves on units built after the NSPS regulation promulgation date.

Interviews with key staff involved in the LDAR program were conducted. At the refinery, the interviews included the LDAR Coordinator and the monitoring technicians. The field audit included observation of the LDAR technicians. Observations were made of the technicians performing instrument warm-up, analyzer maintenance, calibration, and Method 21 monitoring.

The field audit also included an evaluation of component identification and field condition issues. Component identification checks, investigating untagged components to determine if they should be tagged, were completed in conjunction with the comparative monitoring. Investigation of field condition issues included open-ended line control, AVO leaks, and sample station flushing control. The effectiveness of monitoring routes was evaluated during comparative monitoring and technician observation.

2.2 Comparative Monitoring Methodology

The Sage team made independent Method 21 measurements on selected units in the refinery. The units were selected for comparative monitoring based on their average historical valve leak rates. Units were selected from the high, medium, and low ends of the leak rate ranking until the overall target for total valves was met. Units previously selected for comparative monitoring

were given lower priority. Dates of last monitoring were also reviewed to avoid doing comparative monitoring on units that had recently been monitored by the site LDAR team.

A default 25% target is set for the number of valves to be monitored on selected units as a starting point. The target may be reduced as low as 10% for very large units. More components were targeted for monitoring on units with relatively low leak rates to give better resolution of the leak rate if a single component were to be found leaking.

The valves within the selected units were picked for monitoring on a semi-random basis in the field. The Sage inspector identified a starting point at one end of the unit and monitored the closest valve within the process unit. The inspector then would proceed logically through the process unit selecting a fraction of valves that would meet the target (i.e., monitor 1 valve and skip the next 3 valves for a 25% target).

The comparative monitoring was done only on normally accessible valves. No difficult-to-monitor or unsafe-to-monitor valves were tested, although a representative sample of elevated valves that could be monitored from fixed platforms accessible by stairs or ladders were monitored.

The audit team used a TVA 1000B and PHX 21 analyzers and certified calibration gases. The instruments were put through the Method 21 performance certification tests before the monitoring began. Multi-point calibrations were done daily using nominal zero; 500, 2000, and 10,000 ppmv methane-in-air calibration gases delivered by demand flow regulators. Drift checks were performed using the 500 ppmv standard throughout the day. Any components that monitored above 100 ppmv would have been re-checked if a drift check failed to be within –10% of the standard.

Pen and paper were used to store and manage audit monitoring data. Readings in ppm were recorded for all components monitored, but tag numbers were only recorded for components whose readings exceeded 200 ppm. Tally counters were also used to keep track of total numbers monitored.

Audit personnel were escorted by LDAR site personnel for all field work. All leaks found by the audit, as well as any other issues noted, were verified by the site LDAR escort, entered into the site database, and tagged for repair.

95% confidence intervals were calculated for the percent of leaking valves for each process unit. The purpose of these confidence intervals is to estimate the range in which the actual leak rate for valves should fall, based on the fact that the comparative monitoring tested only a sub-sample of components for only a single point in time.

The formula for the confidence interval is from "Statistical Intervals: A Guide for Practitioners" by GJ Hahn and WQ Meeker. In the formula, 'n' represents the number of valves monitored, 'x' represents the number of leaking valves, and F is the F Statistic, whose components are the level of confidence for each bound, degrees of freedom 1, and degrees of freedom 2.

To summarize the leak rates for all the monitored processes, the average of these rates was calculated, and a confidence interval was estimated for this average. The confidence interval for this average was based on a normal confidence interval. A normal confidence interval is calculated by the following equation: $\bar{x} \pm t_{\alpha/2,n-1} \frac{s}{\sqrt{n}}$, where $\bar{x}$ is the estimated sample mean, n is the number of leak rates, $t_{a/2,n-1}$ is the 97.5th percentile (so that 95% confidence is achieved with both bounds) from the Student-t distribution with *n-1* degrees of freedom, and *s* is the estimated standard deviation for the leak rates.

The confidence intervals are based on an assumption that the data are normally distributed. An additional statistical test called the Chi-Square was performed using non-parametric inferential statistics. The Chi-Square statistic ($\chi 2$) is calculated for each unit as follows:

$$\chi^2 = \sum_{i=1}^{r} \sum_{j=1}^{c} \frac{(o_{ij} - e_{ij})^2}{e_{ij}}$$

where: o= Observed values
e = Expected values
r = Number of rows in contingency table
c = Number of columns in the contingency table.

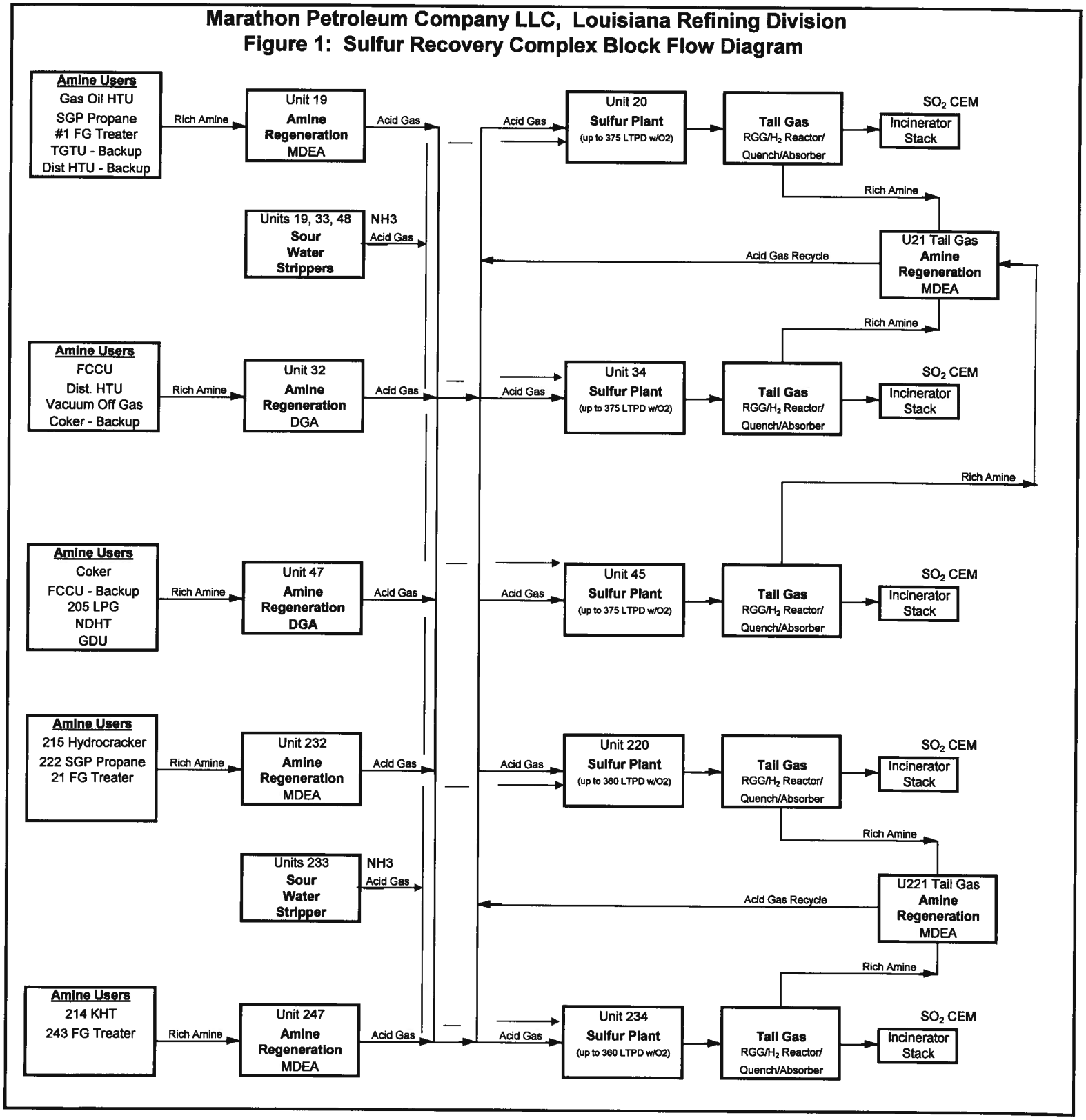
The expected value "e" for any given cell may be obtained using the observed values by multiplying the totals of the column and the row to which it belongs and then by dividing by the grand total. If "e" is less than 5, the Chi-Square test may not be appropriate.

The Chi-Square Statistic is compared to a lookup table that indicates a percent probability that the two data sets are in strong agreement. The Chi-Square Statistic is intended to compare two sets of data for agreement with no assumption that one set of data is the standard to which the other is to be compared. For this audit application, the site data is to be compared to the audit data, which is assumed to be the standard for comparison. The Chi-Square Statistic will yield a low probability of agreement for cases where the audit finds a lower leak rate than the site, and that lower probability is not a good indicator of the verification of site monitoring quality as compared to the audit monitoring. Sage now uses a Modified Chi-Square Statistic which sets the probability of agreement to 100% for any unit where the site leak rate is higher than the audit leak rate.

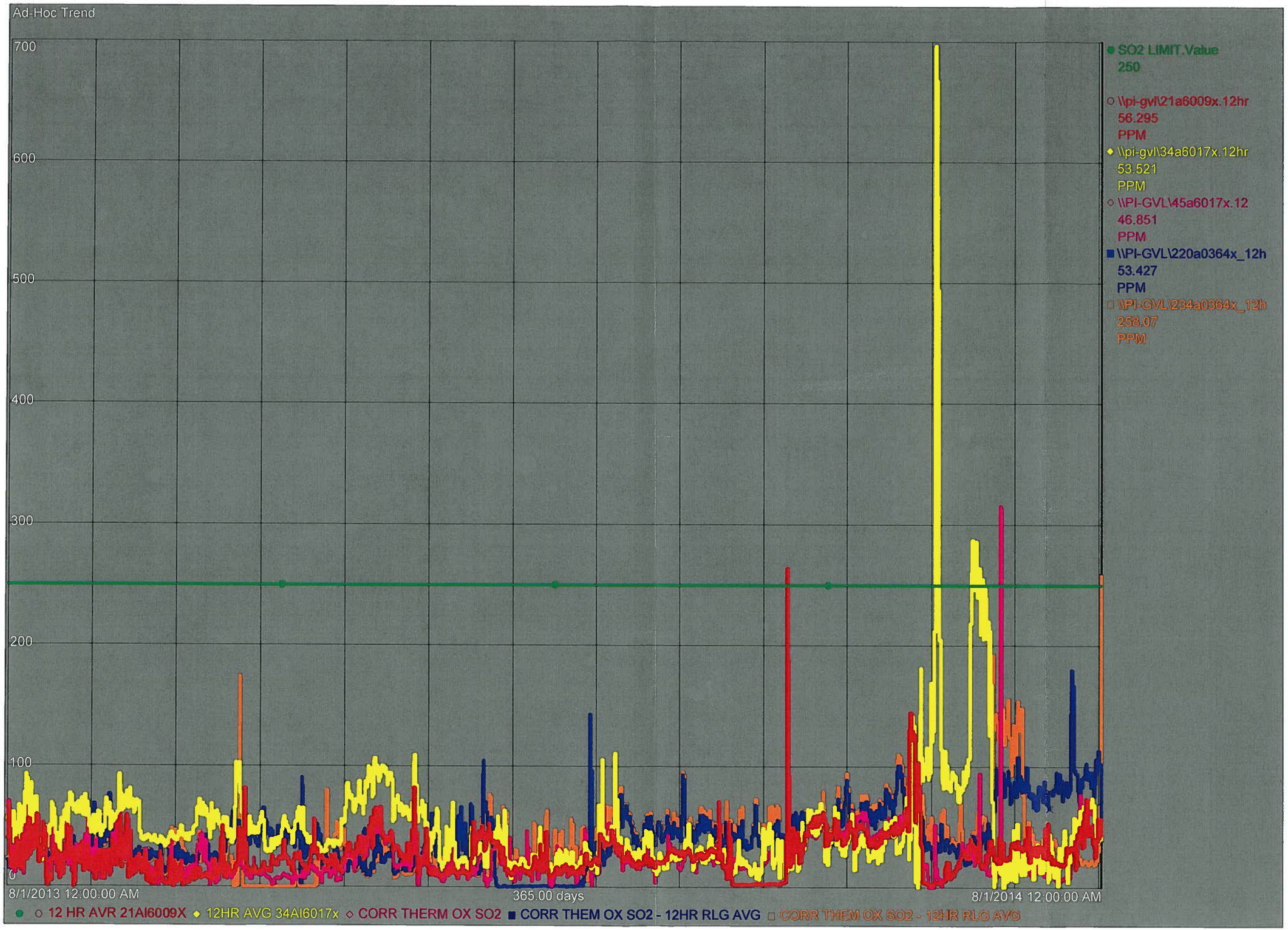
GLOSSARY	
AVO	Audio, visual, olfactory
CFR	Code of Federal Regulations
CI	Confidence Intervals
DOR	Delay of repair
DTM	Difficult-to-monitor
LDAR	Leak Detection and Repair
MOC	Management of Change
OEL	Open ended line
P&ID	Piping and Instrumentation Diagram
ppmv	Concentration in parts per million by volume
PRV	Pressure Relief Valve
PSV	Process Safety Valve
QA/QC	Quality Assurance/Quality Control
Sage	Sage Environmental Consulting, LP
TVA1000B	Thermo Environmental TVA-1000 instrument used for monitoring
US EPA	United States Environmental Protection Agency
UTM	Unsafe-to-monitor
VOC	Volatile Organic Compounds
χ^2	Chi Square Statistic

Appendix 10
Flow diagram – SRU block

Marathon Petroleum Company LLC, Louisiana Refining Division
Figure 1: Sulfur Recovery Complex Block Flow Diagram



Appendix 11
SRU SO_2 emission trends



EPA Region 6
Doc Req #29

Appendix 12
SRU RATA results

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit Number 20 Thermal Oxidizer Number 1 Stack (EQT159)

Continuous Monitor Certification

Parameter	Relative Accuracy	Allowable Relative Accuracy
Sulfur Dioxide - ppm	3.86%	≤ 20%
Sulfur Dioxide - ppm*	3.67%	≤ 20%
Oxygen - %	1.62%	≤ 20%

* Corrected to 0 percent oxygen.

The continuous sulfur dioxide and oxygen monitors met the relative accuracy requirements of 40 CFR, Part 60, Appendix B, Performance Specifications 2 and 3.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit Number 20 Thermal Oxidizer Number 1 Stack (EQT159)
Sulfur Dioxide Monitor Certification

Run Number	Date	Time	Reference Method Dry ppm SO_2	Monitor Reading ppm SO_2	Difference ppm SO_2
1	03/17/14	0900-0921	15.04 *	16.77 *	-1.73 *
2	03/17/14	0930-0951	17.00	17.75	-0.75
3	03/17/14	1000-1021	20.28	19.26	1.02
4	03/17/14	1031-1052	20.52	19.49	1.03
5	03/17/14	1100-1121	18.96	19.87	-0.91
6	03/17/14	1131-1152	21.82	20.62	1.20
7	03/17/14	1200-1221	20.16	20.62	-0.46
8	03/17/14	1230-1251	20.23	21.04	-0.81
9	03/17/14	1300-1321	21.59	22.01	-0.42
10	03/17/14	1330-1351	21.18	21.90	-0.72
Avg.			20.19	20.28	-0.09

Standard Deviation = 0.90 ppm SO_2

Confidence Coefficient = 0.69 ppm SO_2

| Mean Difference | + Confidence Coefficient = 0.78 ppm SO_2

Relative Accuracy = $\frac{|\text{Mean Difference}| + \text{Confidence Coefficient}}{\text{Average Reference Method}} \times 100 = 3.86\%$

* Data not used in calculations.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Thermal Oxidizer No. 2 Stack (34-1406) (EQT161)

Continuous Monitor Certification

Parameter	Relative Accuracy	Allowable Relative Accuracy
Sulfur Dioxide - ppm	8.13%**	≤ 10%**
Sulfur Dioxide - ppm*	9.13%**	≤ 10%**
Oxygen - %	5.17%	≤ 20%

* Corrected to 0 percent oxygen.
** Percent of Applicable Standard

Note: The continuous sulfur dioxide and oxygen monitors met the relative accuracy requirements of 40 CFR, Part 60, Appendix B, Performance Specifications 2 and 3.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit 45 Thermal Oxidizer Number 3 Stack (EQT 174)
Sulfur Dioxide Monitor Certification

Corrected to 0 % oxygen

Run Number	Date	Time	Reference Method Dry % O_2	Reference Method		Monitor Reading corrected to 0% O_2 ppm SO_2	Difference ppm SO_2
				Dry ppm SO_2	corrected to 0% O_2 ppm SO_2		
1	12/30/13	1018-1039	4.67	9.70	12.49	11.57	0.92
2	12/30/13	1051-1113	4.79	8.20	10.64	10.92	-0.28
3	12/30/13	1121-1142	4.49 *	8.45 *	10.76 *	12.04 *	-1.28 *
4	12/30/13	1150-1211	4.49	9.95	12.67	11.54	1.13
5	12/30/13	1220-1241	4.50	9.78	12.46	11.52	0.94
6	12/30/13	1251-1312	4.61	9.62	12.34	12.88	-0.54
7	12/30/13	1322-1343	4.52	10.58	13.50	14.95	-1.45
8	12/30/13	1353-1414	4.69	11.39	14.69	13.69	1.00
9	12/30/13	1424-1445	4.55	10.43	13.33	13.55	-0.22
10	12/30/13	1454-1515	4.68	10.21	13.16	14.01	-0.85
Avg.			4.61	9.98	12.81	12.74	0.07

Standard Deviation = 0.95 ppm SO_2

Confidence Coefficient = 0.73 ppm SO_2

I Mean Difference I + Confidence Coefficient = 0.80 ppm SO_2

$$\text{Relative Accuracy} = \frac{\text{I Mean Difference I + Confidence Coefficient}}{\text{Average Reference Method}} \times 100 = 6.26\%$$

* Data not used in calculations.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit 45 Thermal Oxidizer Number 3 Stack (EQT 174)

Continuous Monitor Certification

Parameter	Relative Accuracy	Allowable Relative Accuracy
Sulfur Dioxide - ppm	6.24%	≤ 20%
Sulfur Dioxide – ppm*	6.26%	≤ 20%
Oxygen - %	0.02%O_2	≤ 1.0%O_2

* Corrected to 0 percent oxygen.

The continuous sulfur dioxide and oxygen monitors met the relative accuracy requirements of 40 CFR, Part 60, Appendix B, Performance Specifications 2 and 3.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Thermal Oxidizer No. 2 Stack (EQT 34-1406) (EQT161)
Sulfur Dioxide Monitor Certification

Run Number	Date	Time	Reference Method Dry ppm SO_2	Monitor Reading ppm SO_2	Difference ppm SO_2
1	06/30/14	0952-1013	26.28	9.37	16.91
2	06/30/14	1024-1045	28.99	9.80	19.19
3	06/30/14	1056-1117	29.72 *	10.30 *	19.42 *
4	06/30/14	1127-1148	29.68	9.75	19.93
5	06/30/14	1159-1220	28.88	8.97	19.91
6	06/30/14	1230-1251	28.90	7.62	21.28
7	06/30/14	1302-1323	28.11	6.69	21.42
8	06/30/14	1334-1355	24.83	8.01	16.82
9	06/30/14	1405-1426	21.21	6.77	14.44
10	06/30/14	1436-1457	21.43	6.72	14.71
Avg.			26.48	8.19	18.29

Standard Deviation = 2.66 ppm SO_2

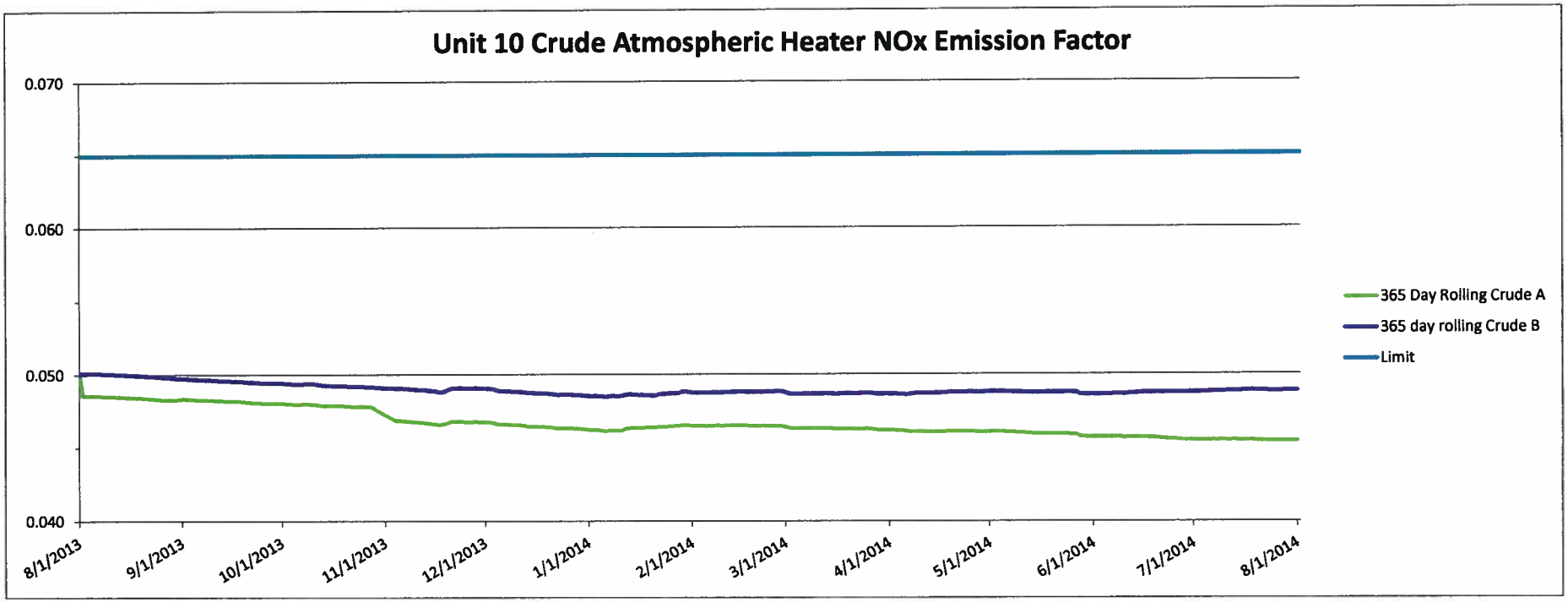
Confidence Coefficient = 2.04 ppm SO_2

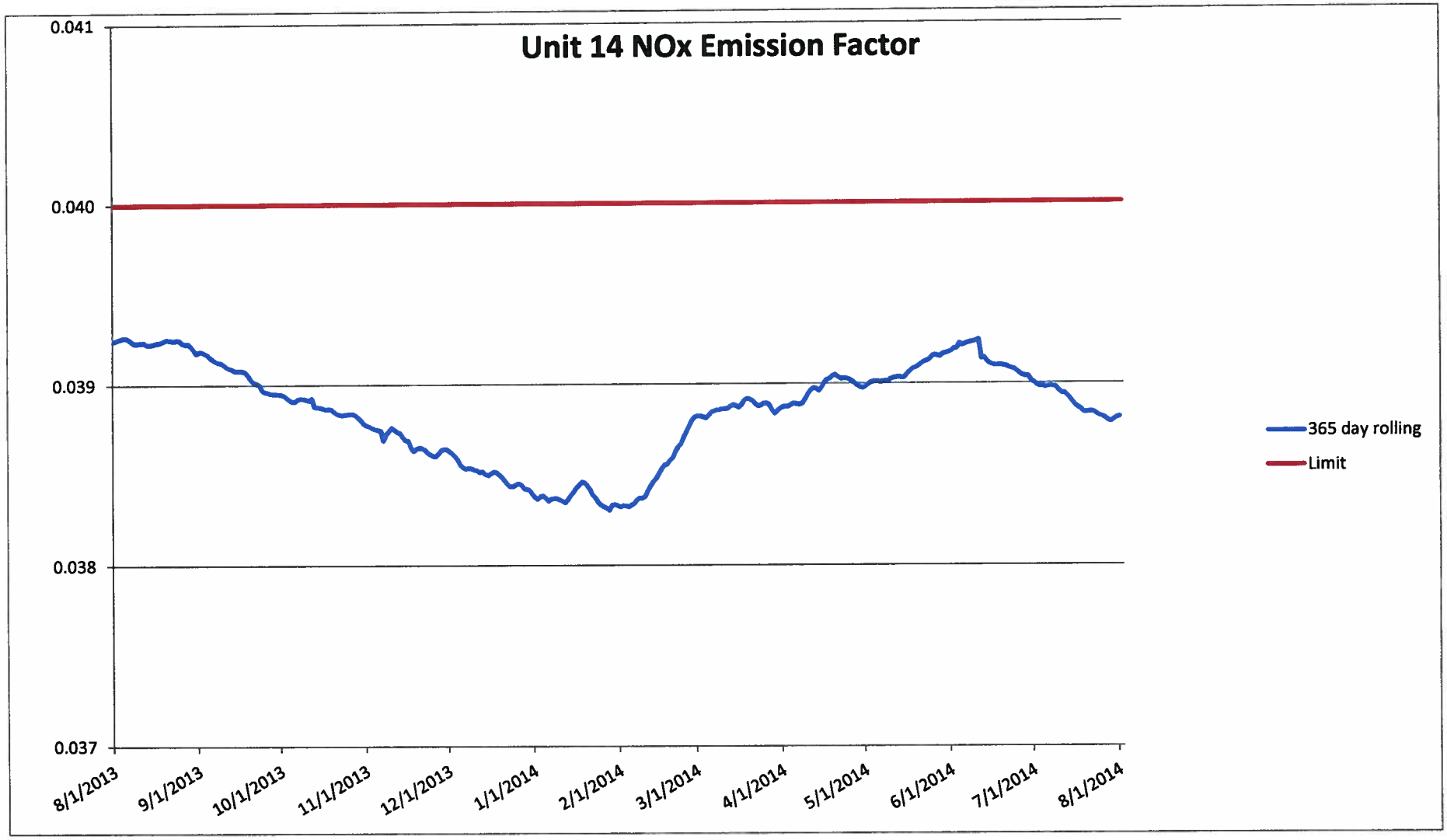
I Mean Difference I + Confidence Coefficient = 20.33 ppm SO_2

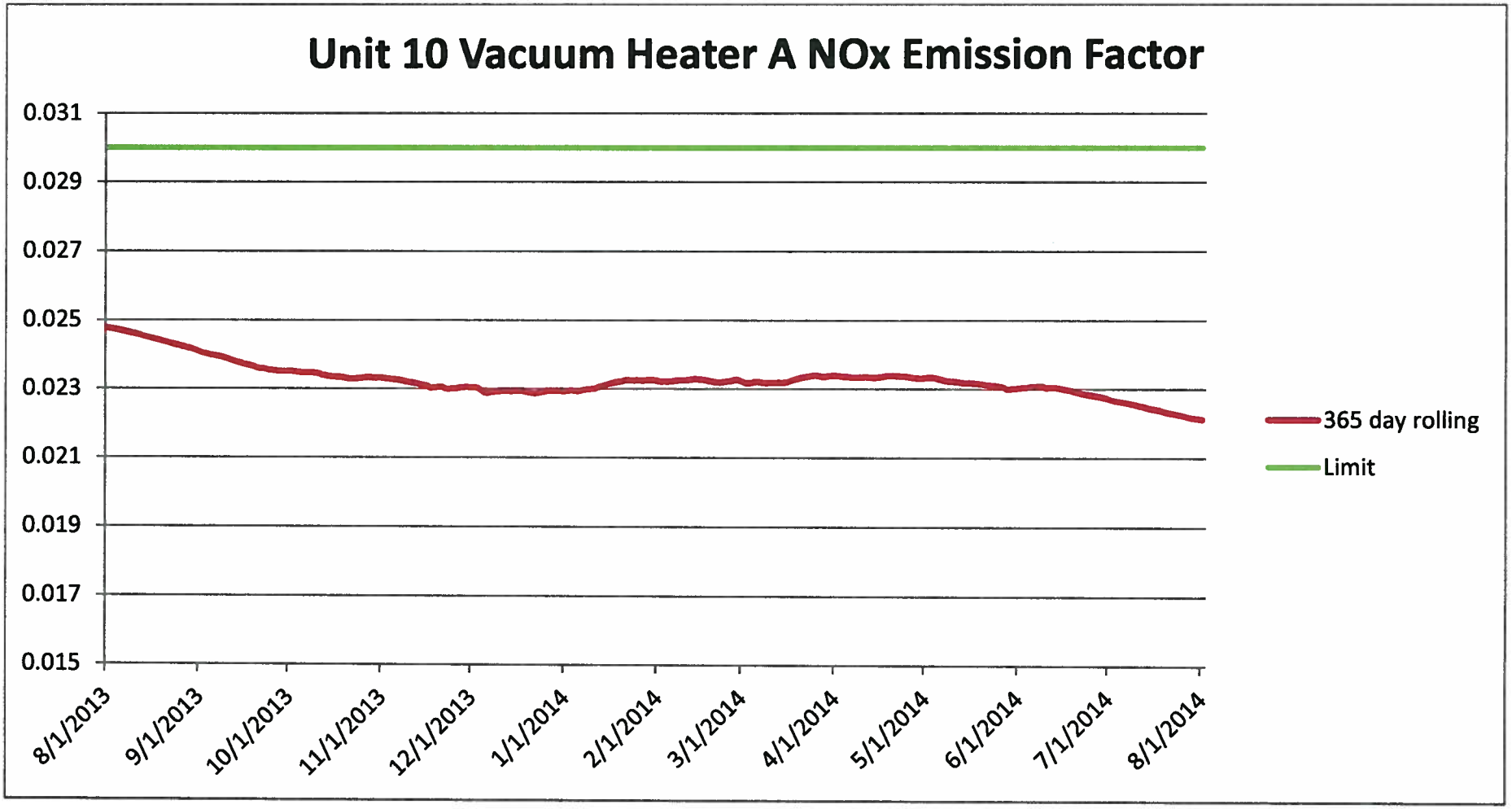
Relative Accuracy = $\frac{\text{I Mean Difference I + Confidence Coefficient}}{\text{Applicable Standard (250 ppm)}}$ x 100 = 8.13%

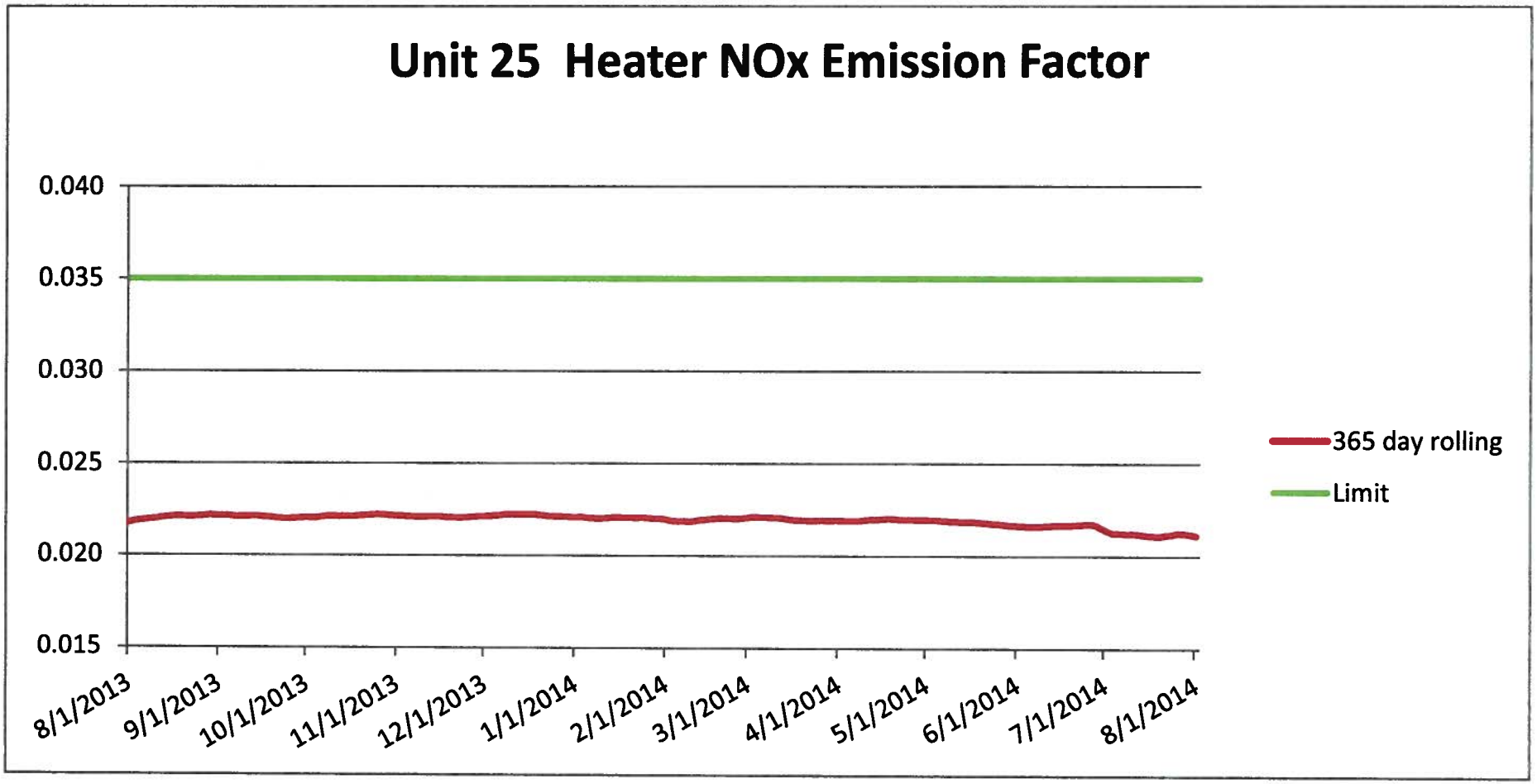
* Data not used in calculations.

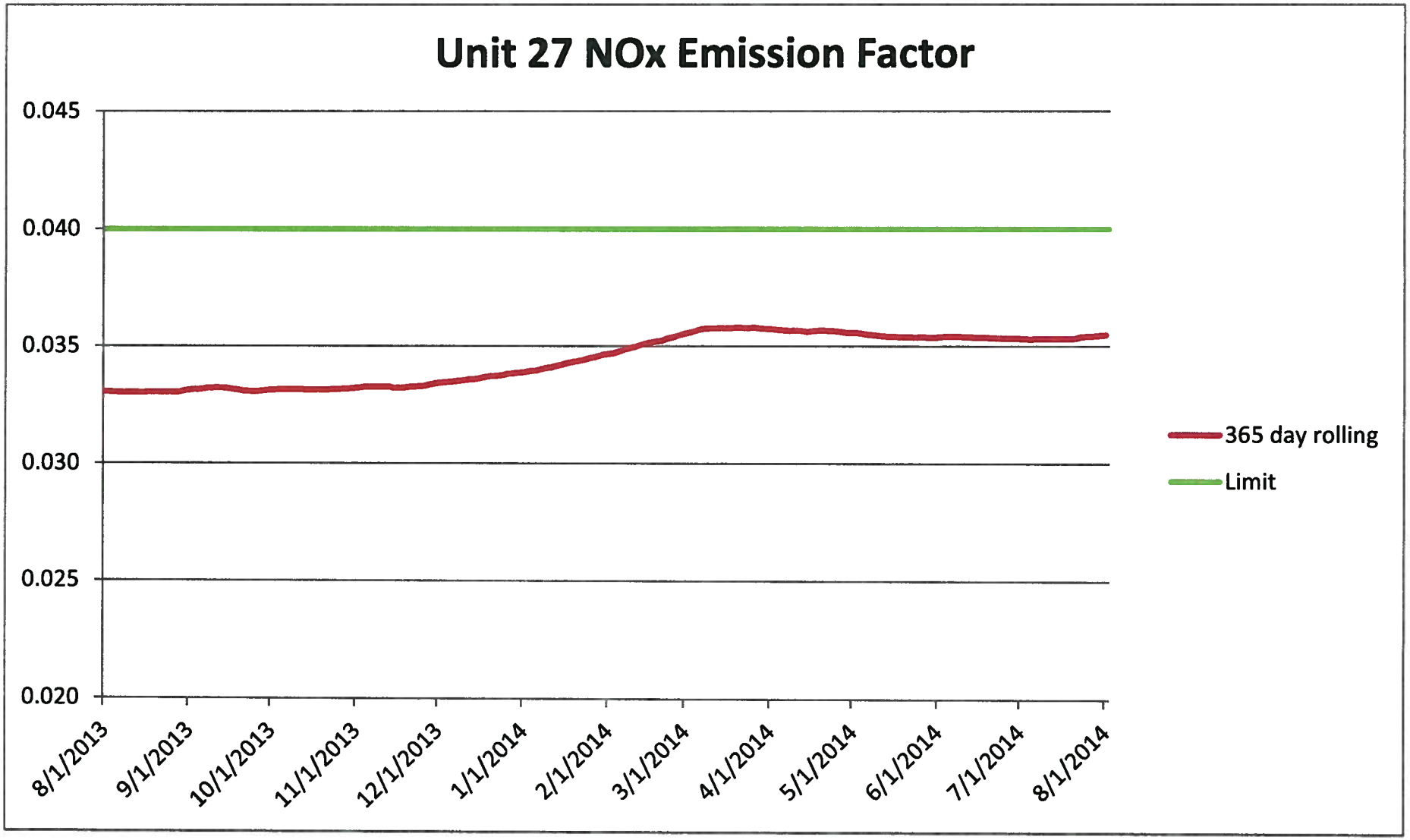
Appendix 13
Heater NOx emission trends


Unit 10 Crude Atmospheric Heater NOx Emission Factor
0.070
0.060
0.050
0.040
8/1/2013
9/1/2013
10/1/2013
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
365 Day Rolling Crude A
365 day rolling Crude B
Limit

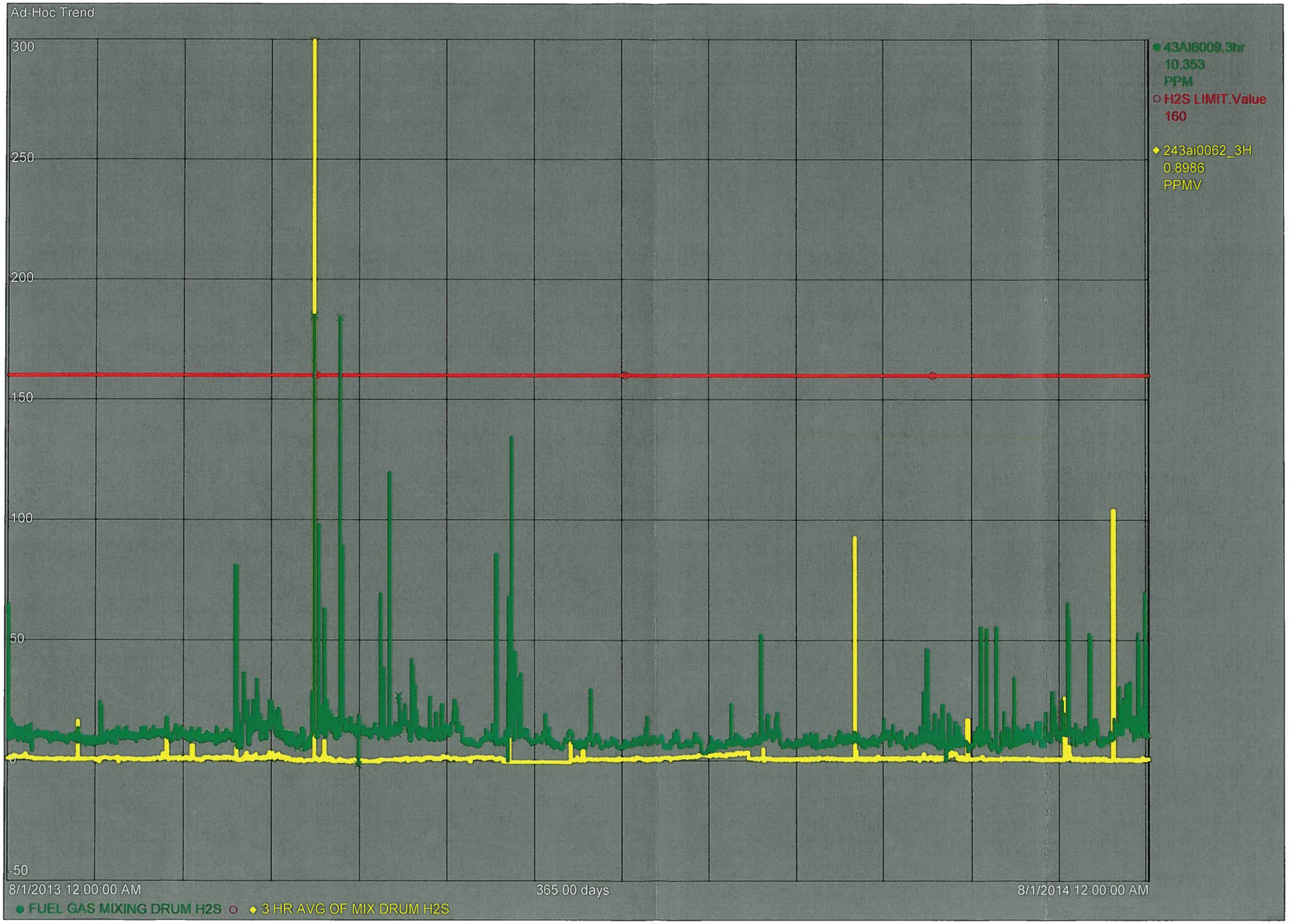

Unit 14 NOx Emission Factor
0.041
0.040
0.039
0.038
0.037
8/1/2013
9/1/2013
10/1/2013
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
365 day rolling
Limit


Unit 10 Vacuum Heater A NOx Emission Factor
0.031
0.029
0.027
0.025
0.023
0.021
0.019
0.017
0.015
8/1/2013
9/1/2013
10/1/2013
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
365 day rolling
Limit


Unit 25 Heater NOx Emission Factor
0.040
0.035
0.030
0.025
0.020
0.015
8/1/2013
9/1/2013
10/1/2013
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
365 day rolling
Limit


Unit 27 NOx Emission Factor
0.045
0.040
0.035
0.030
0.025
0.020
8/1/2013
9/1/2013
10/1/2013
11/1/2013
12/1/2013
1/1/2014
2/1/2014
3/1/2014
4/1/2014
5/1/2014
6/1/2014
7/1/2014
8/1/2014
365 day rolling
Limit

Appendix 14
Fuel gas SO_2 trends



EPA Region 6
Doc Req #33

Appendix 15
Fuel gas system RATA results

METCO ENVIRONMENTAL

SUMMARY OF RESULTS

Unit Number 43 Fuel Gas System

Parameter	Relative Accuracy	Allowable Relative Accuracy
Hydrogen Sulfide - ppm	13.07%	≤ 20%

The continuous hydrogen sulfide monitor met the relative accuracy requirements of 40 CFR, Part 60, Appendix B, Performance Specification 7.

METCO ENVIRONMENTAL

SUMMARY OF RESULTS
Unit Number 43 Fuel Gas System
Hydrogen Sulfide Monitor Certification

Run Number	Date	Time	Reference Method ppm H_2S	Monitor Reading ppm H_2S	Difference ppm H_2S
1	03/14/14	0800-0821	7.07	6.26	0.81
2	03/14/14	0824-0845	4.36	3.85	0.51
3	03/14/14	0951-0912	4.37	3.88	0.49
4	03/14/14	0918-0939	4.92	4.23	0.69
5	03/14/14	0945-1006	5.46	5.05	0.41
6	03/14/14	1011-1032	6.03	5.14	0.89
7	03/14/14	1038-1059	5.50	5.38	0.12
8	03/14/14	1105-1126	6.61	6.11	0.50
9	03/14/14	1133-1154	7.74 *	6.63 *	1.11 *
10	03/14/14	1200-1221	7.20	6.50	0.70
Average			5.72	5.16	0.57

Standard Deviation = 0.23 ppm H_2S

Confidence Coefficient = 0.18 ppm H_2S

I Mean Difference I + Confidence Coefficient = 0.75 ppm H_2S

Relative Accuracy = $\frac{\text{I Mean Difference I + Confidence Coefficient x 100}}{\text{Average Reference Method}}$ 13.07 %

* Data not used in calculations.